GEN-2016-130

MODIFICATION REQUEST IMPACT STUDY

By SPP Generator Interconnection

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

EXECUTIVE SUMMARY

Southwest Power Pool performed a Modification Request Impact Study (Study) for GEN-2016-130, an active Generation Interconnection Request (GIR) with a Point of Interconnection (POI) at the Leland Old 345 kV Substation.

The GEN-2016-130 project interconnects in the Basin Electric Power Cooperative (BEPC) control area with a capacity of 202 MW as shown in Table ES-1 below. This Study has been requested to evaluate the modification of GEN-2016-130 to change the inverter configuration to 68 x GE 3.137 Inverters 2.82 MW and 5 x GE 2.8 MVA Inverters 2.52 MW. The inverters are rated at 2.82 MW and 2.52 MW respectively, and use a Power Plant Controller (PPC) to limit the total power injected into the POI. The generating capacity for GEN-2016-130 (202 MW) and the total capability (204.36 MW) exceed its Generator Interconnection Agreement (GIA) Interconnection Service amount, 202 MW, as listed in Appendix A of the GIA. As a result, the customer must ensure that the amount of power injected at the POI does not exceed the Interconnection Service amount listed in its GIA. In addition, the modification request included changes to the collection system, generator step-up transformer, generation interconnection line, main substation transformer, and reactive power devices. The existing and modified configurations for GEN-2016-130 are shown in Table ES-2.

Table ES-1: GEN-2016-130 Existing Configuration

REQUEST	POINT OF INTERCONNECTION	EXISTING GENERATOR CONFIGURATION	GIA CAPACITY (MW)
GEN-2016-130	Leland Old 345 kV Substation (659105)	101 x GE 2 MW	202

Table ES-2: GEN-2016-130 Modification Request

Facility	Modification Configuration	
Point of Interconnection	Leland Olds 345 kV Substation (659105)	
Configuration/Capacity	68 x 2.82 MW GE = 191.76 MW	5 x 2.52 MW GE = 12.6 MW
Generation Interconnection Line	Length = 19.58 miles R = 0.0009822 pu X = 0.008688 pu B = 0.095064 pu Rating MVA = 1174 MVA	
Main Substation Transformer[1]	X = 0.0849874, R = 0.0014653 Winding MVA = 135 MVA, Rating MVA = 225 MVA	
Equivalent GSU Transformer[1]	Gen 1 Equivalent Qty: 68 X = 0.057215, R = 0.0057215 Winding MVA = 2.8 MVA, Rating MVA[2] = 3.25 MVA	Gen 2 Equivalent Qty: 5 X = 0.057215, R = 0.0057215 Winding MVA = 2.5 MVA, Rating MVA[2] = 2.9 MVA
Equivalent Collector Line[2]	R = 0.004480 pu X = 0.008400 pu B = 0.059900 pu	R = 0.004480 pu X = 0.008400 pu B = 0.059900 pu
Generator Dynamic Model[3] & Power Factor	68 x GEWTG0705 (REGCAU1)[3] x 2.82 MW Leading: 0.899 Lagging: 0.899	5 x GEWTG0705 (REGCAU1)[3] x 2.52 MW Leading: 0.9 Lagging: 0.9
1) X and R based on Winding MVA 2) All pu are on 100 MVA Base 3) DYR stability model name		

SPP determined that powerflow should not be performed because the technology type of the request was unchanged with the modification. However, SPP determined that the change in inverter manufacturer from General Electric to Power Electronics required short circuit and dynamic stability analyses.

The scope of this modification request study included charging current compensation analysis, short circuit analysis, and dynamic stability analysis.

SPP performed the analyses using the modification request data based on the DISIS-2018-002/2019-001 study models:

1. 2025 Summer Peak (25SP),
2. 2025 Winter Peak (25WP)

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

The short circuit analysis was performed using the 25SP stability model modified for short circuit analysis. The results from the short circuit analysis with the updated topology showed that the maximum GEN-2016-130 contribution to three-phase fault currents in the immediate transmission systems at or near the GEN-2016-130 POI was no greater than 24.841 kA.

All three-phase fault current levels within 5 buses of the POI with the GEN-2016-130 generator online were below 40 kA.

The dynamic stability analysis was performed using Siemens PTI PSS/E version 34.8.0 software for the two modified study models: 25SP and 25WP. Eighty-four events were simulated, which included three-phase faults and single-line-to-ground stuck breaker faults.

The results of the dynamic stability analysis showed that there were several existing base case issues found in the original DISIS-2018-002/2019-001 case and the case with the GEN-2016-130 modification. These issues were not attributed to the GEN-2016-130 modification request and detailed in Appendix D.

There were no damping or voltage recovery violations attributed to the GEN-2016-130 modification 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.

The requested modification has been determined by SPP to **not be a Material Modification**. The requested modification does not have a material adverse impact on the cost or timing of any other Interconnection Request with a later Queue priority date. As the requested modification places the generating capacity of the Interconnection Request at a higher amount 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 Interconnection Service amount listed in its 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 to 0 MW in real-time, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

[1] Power System Simulator for Engineering

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

SCOPE OF STUDY

Southwest Power Pool (SPP) performed a Modification Request Impact Study (Study) for GEN-2016-130. A Modification Request Impact Study is a generation interconnection study performed to evaluate the impacts of modifying the DISIS study assumptions. The determination of the required scope of the study is dependent upon the specific modification requested and how it may impact the results of the DISIS study. Impacting the DISIS results could potentially affect the cost or timing of any Interconnection Request with a later Queue priority date, deeming the requested modification a Material Modification. The criteria sections below include reasoning as to why an analysis was either included or excluded from the scope of study.

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

STEADY-STATE ANALYSIS

SPP determined that powerflow should not be performed because the technology type of the request was unchanged with the modification.

STABILITY ANALYSIS, SHORT-CIRCUIT ANALYSIS

To determine whether stability and short circuit analyses are required, SPP evaluates the difference between the stability model parameters and, if needed, the equivalent collector system impedance between the existing configuration and the requested modification. Dynamic stability analysis and short circuit analysis would be required if the differences listed above were determined to have a significant impact on the most recently performed DISIS stability analysis.

STUDY LIMITATIONS

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

The GEN-2016-130 Interconnection Customer has requested a modification to its Interconnection Request (IR) with a Point of Interconnection (POI) at the Leland Olds 345kV Substation. At the time of report posting, GEN-2016-130 is an active Interconnection Request with a queue status of "IA FULLY EXECUTED/ON SCHEDULE." GEN-2016-130 is a solar plant with a maximum summer and winter queue capacity of 202 MW with Energy Resource Interconnection Service (ERIS) and Network Resource Interconnection Service (NRIS).

The GEN-2016-130 project is currently in the DISIS-2018-002/2019-001 cluster. Figure 2-1 shows the powerflow model single line diagram for the existing GEN-2016-130 configuration using the DISIS-2018-002/2019-001 stability models. The GEN-2016-130 project interconnects in the Basin Electric Power Cooperative (BEPC) control area with a capacity of 202 MW as shown in Table 2-1 below.

Figure 2-1: GEN-2016-130 Single Line Diagram (Existing Configuration*)

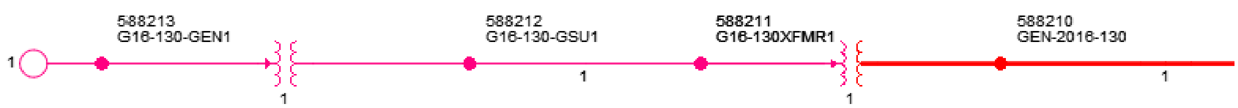

Table 2-1: GEN-2016-130 Existing Configuration

REQUEST	POINT OF INTERCONNECTION	EXISTING GENERATOR CONFIGURATION	GIA CAPACITY (MW)
GEN-2016-130	Leland Olds 345kV Substation. (659105)	101 x GE 2 MW	202 MW

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

This Study has been requested by the Interconnection Customer to evaluate the modification of GEN-2016-130 to an inverter configuration of 68 x GE 3.137 Inverters 2.82 MW and 5 x GE 2.8 MVA Inverters 2.52 MW. This generating capacity for GEN-2016-130 (204.36 MW) and the total capability (204.36 MW) exceed its Generator Interconnection Agreement (GIA) Interconnection Service amount, 202 MW, as listed in Appendix A of the GIA. As a result, the customer must ensure that the amount of power injected at the POI does not exceed the Interconnection Service amount listed in its GIA.

In addition, the modification request included changes to the collection system, generator step-up transformer, generation interconnection line, main substation transformer, and reactive power devices. Figure 2-2 shows the powerflow model single line diagram for the GEN-2016-130 modification. The existing and modified configurations for GEN-2016-130 are shown in Table 2-2.

Figure 2-2: GEN-2016-130 Single Line Diagram (Modification Configuration)

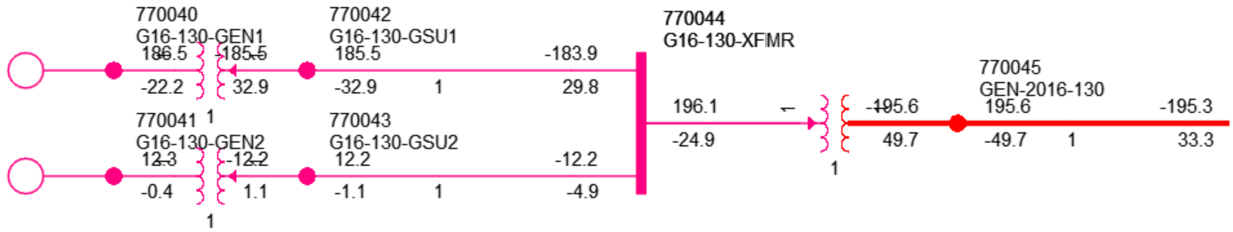

Table 2-2: GEN-2016-130 Modification Request

SPP Internal Only

Facility	Modification Configuration	
Point of Interconnection	Leland Olds 345 kV Substation (659105)	
Configuration/Capacity	68 x 2.82 MW GE = 191.76 MW	5 x 2.52 MW GE = 12.6 MW
Generation Interconnection Line	Length = 19.58 miles R = 0.0009822 pu X = 0.008688 pu B = 0.095064 pu Rating MVA = 1174 MVA	
Main Substation Transformer[1]	X = 0.0849874, R = 0.0014653 Winding MVA = 135 MVA, Rating MVA = 225 MVA	
Equivalent GSU Transformer[1]	Gen 1 Equivalent Qty: 68 X = 0.057215, R = 0.0057215 Winding MVA = 2.8 MVA, Rating MVA[2] = 3.25 MVA	Gen 2 Equivalent Qty: 5 X = 0.057215, R = 0.0057215 Winding MVA = 2.5 MVA, Rating MVA[2] = 2.9 MVA
Equivalent Collector Line[2]	R = 0.004480 pu X = 0.008400 pu B = 0.059900 pu	R = 0.004480 pu X = 0.008400 pu B = 0.059900 pu
Generator Dynamic Model[3] & Power Factor	68 x GEWTG0705 (REGCAU1)[3] x 2.82 MW Leading: 0.899 Lagging: 0.899	5 x GEWTG0705 (REGCAU1)[3] x 2.52 MW Leading: 0.9 Lagging: 0.9

1) X and R based on Winding MVA 2) All pu are on 100 MVA Base 3) DYR stability model name

EXISTING VERSUS MODIFICATION COMPARISON

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

The methodology and results of the comparisons are described below. The analysis was completed using PSS/E version 34 software.

STABILITY MODEL PARAMETERS COMPARISON

SPP determined that short circuit and dynamic stability analyses were required because of the inverter change from General Electric to Power Electronic. This is because the short circuit contribution and stability responses of the existing configuration and the requested modification's configuration may differ. The generator dynamic model for the modification can be found in Appendix A.

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

EQUIVALENT IMPEDANCE COMPARISON CALCULATION

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

SHORT CIRCUIT ANALYSIS

A short circuit study was performed using the 25SP model for GEN-2016-130. 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 345 kV POI bus. The PSS/E "Automatic Sequence Fault Calculation (ASCC)" fault analysis module was used to calculate the fault current levels in the transmission system with and without GEN-2016-130 online.

SPP created a short circuit model using the 25SP DISIS-2018-002/2019-001 stability study model by adjusting the GEN-2016-130 short circuit parameters consistent with the modification data. The adjusted parameters are shown in Table 5-1 below.

Table 5-1: Short Circuit Model Parameters*

PARAMETER	VALUE BY GENERATOR BUS#
	527482
Machine MVA Base	33.6
R (pu)	0.0
X'' (pu)	0.893

*pu values based on Machine MVA Base

RESULTS

The results of the short circuit analysis for the 25SP model are summarized in Table 5-2 and Table 5-3. The GEN-2016-130 POI bus (Leland Olds 345 kV - 659105) fault current magnitudes are provided in Table 5-2 showing a maximum fault current of 6.66 kA with the GEN-2016-130 project online. Table 5-3 shows the maximum fault current magnitudes and fault current increases with the GEN-2016-130 project online.

The maximum fault current calculated within five buses of the GEN-2016-130 POI (including the POI bus) was less than 40 kA for the 25SP model.

The maximum GEN-2016-130 contribution to three-phase fault current was about 6.37% and 24.841 kA.

Table 5-1: POI Short Circuit Results

CASE	GEN-OFF CURRENT (KA)	GEN-ON CURRENT (KA)	MAX KA CHANGE	MAX %CHANGE
25SP	6.49	6.66	0.16	2.53%

Table 5-2: 25SP Short Circuit Results

VOLTAGE (KV)	MAX. CURRENT (KA)	MAX KA CHANGE	MAX %CHANGE
69	9.415	.01	0.11%
115	19.82	0.44	0.22%
230	24.841	.412	1.69%
345	19.592	0.605	6.37%
Max	24.841	0.605	6.37%

DYNAMIC STABILITY ANALYSIS

SPP performed a dynamic stability analysis to identify the impact of the inverter configuration change and other modifications to GEN-2016-130. The analysis was performed according to SPP's Disturbance Performance Requirements[2]. The modification details are described in the Project and Modification 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 D.

METHODOLOGY AND CRITERIA

The dynamic stability analysis was performed using models developed with the requested GEN-2016-130 configuration of 68 x GE 3.137 MVA Inverters (REGCA1) and 5 x GE 2.8 MVA Inverters (REGCA1). This stability analysis was performed using PTI's PSS/E version 34.8.0 software.

The modifications requested for the GEN-2016-130 project were used to create modified stability models for this impact study based on the DISIS-2018-002/2019-001 stability study models:

1. 2025 Summer Peak (25SP),
2. 2025 Winter Peak (25WP)

The modified dynamic model data for the GEN-2016-130 project is provided in Appendix A. The modified powerflow models and associated dynamic database were initialized (no-fault test) to confirm that there were no errors in the initial conditions of the system and the dynamic data.

During the fault simulations, the active power (PELEC), reactive power (QELEC), and terminal voltage (ETERM) were monitored for GEN-2016-130 and other current and prior queued projects in their cluster group[3]. In addition, voltages of five (5) buses away from the POI of GEN-2016-130 were monitored and plotted. The machine rotor angle for synchronous machines and speed for asynchronous machines within the study areas including 659, 600, 620, 627, 635, 640, 652, 661, and 680 were monitored. In addition, the voltages of all 100 kV and above buses within the study area were monitored.

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

[3] Based on the DISIS-2018-002/2019-001 Cluster Groups

FAULT DEFINITIONS

SPP developed and simulated faults for GEN-2016-153 and GEN-2017-086 using the modified study models. 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 6-1 below. These contingencies were applied to the modified 25SP and 25WP models.

Table 6-1: Fault Definitions

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
FLT-9001-3PH	P1	*3 phase fault on the LELAND_O-BE3 (659105) to LELAND_2-BEG (659111) 345 kV line CKT 1, near LELAND_O-BE3. a. Apply fault at the LELAND_O-BE3 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.*
FLT-9002-3PH	P1	*3 phase fault on the LELAND_O-BE3 (659105) to FINSTAD345 (659060) 345 kV line CKT 1, near LELAND_O-BE3. a. Apply fault at the LELAND_O-BE3 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.*
FLT-9003-3PH	P1	*3 phase fault on the LELAND_O-BE3 345kV (659105)/ 230 kV (659106)/ 13.8 kV (659202) XFMR CKT 1, near LELAND_O-BE3 345 kV. a. Apply fault at the LELAND_O-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9004-3PH	P1	*3 phase fault on the LELAND_O-BE3 345kV (659105)/ 230 kV (659106)/ 13.8 kV (659201) XFMR CKT 1, near LELAND_O-BE3 345 kV. a. Apply fault at the LELAND_O-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
FLT-9005-3PH	P1	*3 phase fault on the LELAND_O-BE3 (659105) to ANTELOPE-BE3 (659101) 345 kV line CKT 1, near LELAND_O-BE3. a. Apply fault at the LELAND_O-BE3 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.*
FLT-9006-3PH	P1	*3 phase fault on the LELAND_O-BE3 (659105) to LO.LS-GR-BE3 (659422) 345 kV line CKT Z, near LELAND_O-BE3. a. Apply fault at the LELAND_O-BE3 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.*
FLT-9007-3PH	P1	*3 phase fault on the LELAND_O-BE3 (659105) to LO.LS-GR-BE3 (659422) 345 kV line CKT Z, near LELAND_O-BE3. a. Apply fault at the LELAND_O-BE3 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.*
FLT-9008-3PH	P1	*3 phase fault on the LELAND_O-BE3 (659105) to GEN-2016-130 (588210) 345 kV line CKT 1, near LELAND_O-BE3. a. Apply fault at the LELAND_O-BE3 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.*
FLT-9009-3PH	P1	*3 phase fault on the FINSTAD345 (659060) to FINSTAD -MW7 (655906) 345 kV line CKT 2, near FINSTAD345. a. Apply fault at the FINSTAD345 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.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT-9010-3PH	P1	*3 phase fault on the FINSTAD345 (659060) to FINSTAD -MW7 (655906) 345 kV line CKT 1, near FINSTAD345. a. Apply fault at the FINSTAD345 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.*
FLT-9011-3PH	P1	*3 phase fault on the FINSTAD345 (659060) to TANDE___-BE3 (659336) 345 kV line CKT 1, near FINSTAD345. a. Apply fault at the FINSTAD345 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.*
FLT-9012-3PH	P1	*3 phase fault on the TANDE___-BE3 (659336) to TRADEWND-UA3 (659479) 345 kV line CKT 1, near TANDE___-BE3. a. Apply fault at the TANDE___-BE3 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.*
FLT-9013-3PH	P1	*3 phase fault on the TANDE___-BE3 (659336) to BURKE___-PP3 (659404) 345 kV line CKT 1, near TANDE___-BE3. a. Apply fault at the TANDE___-BE3 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.*
FLT-9014-3PH	P1	*3 phase fault on the TANDE___-BE3 345kV (659336)/ 230 kV (659337)/ 13.8 kV (659338) XFMR CKT 1, near TANDE___-BE3 345 kV.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		a. Apply fault at the TANDE___-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.
FLT-9015-3PH	P1	*3 phase fault on the TANDE___-BE3 (659336) to TN.LS-JD-BE3 (659427) 345 kV line CKT Z, near TANDE___-BE3. a. Apply fault at the TANDE___-BE3 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.*
FLT-9016-3PH	P1	*3 phase fault on the TN.LS-JD-BE3 (655906) to RBNSNLAK-MW7 (655905) 115 kV line CKT 1, near TN.LS-JD-BE3. a. Apply fault at the TN.LS-JD-BE3 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.*
FLT-9017-3PH	P1	*3 phase fault on the COTEAU__-RR3 345kV (659218)/ 69 kV (659222)/ 13.8 kV (659219) XFMR CKT 1, near COTEAU__-RR3 345 kV. a. Apply fault at the COTEAU__-RR3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9018-3PH	P1	*3 phase fault on the COTEAU__-RR3 345kV (659218)/ 69 kV (659222)/ 13.8 kV (659231) XFMR CKT 2, near COTEAU__-RR3 345 kV. a. Apply fault at the COTEAU__-RR3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9019-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to COTEAU__-RR3 (659218) 345 kV line CKT Z, near ANTELOPE-BE3. a. Apply fault at the ANTELOPE-BE3 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.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
FLT-9020-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to ANTELP_2-BEG (659107) 345 kV line CKT 1, near ANTELOPE-BE3. a. Apply fault at the ANTELOPE-BE3 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.*
FLT-9021-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to ANTELP_2-BEG (659107) 345 kV line CKT 1, near ANTELOPE-BE3. a. Apply fault at the ANTELOPE-BE3 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.*
FLT-9022-3PH	P1	*3 phase fault on the BEPCPRXCC1 3 (659576) to BEPCPXCTG2X1 (659578) 345 kV line CKT X2, near BEPCPRXCC1 3. a. Apply fault at the BEPCPRXCC1 3 345 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.*
FLT-9023-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to BEPCPRXCC1 3 (659576) 345 kV line CKT X1, near ANTELOPE-BE3. a. Apply fault at the ANTELOPE-BE3 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.*
FLT-9024-3PH	P1	*3 phase fault on the BEPCPRXCC1 3 (659576) to BEPCPXSTG1X1 (659579) 345 kV line CKT X3, near BEPCPRXCC1 3. a. Apply fault at the BEPCPRXCC1 3 345 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.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT-9025-3PH	P1	*3 phase fault on the BEPCPRXCC1 3 (659576) to BEPCPXCTG1X1 (659577) 345 kV line CKT X1, near BEPCPRXCC1 3.* *a. Apply fault at the BEPCPRXCC1 3 345 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.*
FLT-9026-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to ROUNDUP_-BE3 (659384) 345 kV line CKT 1, near ANTELOPE-BE3.* *a. Apply fault at the ANTELOPE-BE3 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.*
FLT-9027-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to CHARL_CK-BE3 (659183) 345 kV line CKT 1, near ANTELOPE-BE3.* *a. Apply fault at the ANTELOPE-BE3 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.*
FLT-9028-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to AV.LS-BD-BE3 (659420) 345 kV line CKT Z, near ANTELOPE-BE3.* *a. Apply fault at the ANTELOPE-BE3 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.*
FLT-9029-3PH	P1	*3 phase fault on the ANTELOPE-BE3 (659101) to DGC____-BE3 (659212) 345 kV line CKT 1, near ANTELOPE-BE3.* *a. Apply fault at the ANTELOPE-BE3 345 kV bus.* *b. Clear fault after 6 cycles by tripping the faulted line.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		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.
FLT-9030-3PH	P1	*3 phase fault on the DGC____-BE3 345kV (659212)/ 230 kV (659233)/ 13.8 kV (659232) XFMR CKT 1, near DGC____-BE3 345 kV. a. Apply fault at the DGC____-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9031-3PH	P1	*3 phase fault on the LO.LS-FT-BE3 (659424) to CC.LS-LO-BE3 (659428) 345 kV line CKT 1, near LO.LS-FT-BE3. a. Apply fault at the LO.LS-FT-BE3 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.*
FLT-9032-3PH	P1	*3 phase fault on the CC.LS-LO-BE3 (659428) to CHAPELLE-BE3 (659130) 345 kV line CKT Z, near CC.LS-LO-BE3. a. Apply fault at the CC.LS-LO-BE3 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.*
FLT-9033-3PH	P1	*3 phase fault on the CHAPELLE-BE3 (659130) to FTTHOM1-LNX3 (652806) 345 kV line CKT 1, near CHAPELLE-BE3. a. Apply fault at the CHAPELLE-BE3 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.*
FLT-9034-3PH	P1	*3 phase fault on the FTTHOM1-LNX3 (652806) to FTTHOMP3 (652506) 345 kV line CKT Z, near FTTHOM1-LNX3. a. Apply fault at the FTTHOM1-LNX3 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.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT-9036-3PH	P1	*3 phase fault on the ROUNDUP_-BE3 345kV (659384)/ 115 kV (659385)/ 13.8 kV (659386) XFMR CKT 1, near ROUNDUP_-BE3 345 kV.* *a. Apply fault at the ROUNDUP_-BE3 345 kV bus.* *b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9037-3PH	P1	*3 phase fault on the JUDSON__-BE3 (659333) to PATENTGT-BE3 (659390) 345 kV line CKT 1, near JUDSON__-BE3.* *a. Apply fault at the JUDSON__-BE3 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.*
FLT-9038-3PH	P1	*3 phase fault on the CHARL_CK-BE3 (659183) to BELFELD3 (652424) 345 kV line CKT 1, near CHARL_CK-BE3.* *a. Apply fault at the CHARL_CK-BE3 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.*
FLT-9039-3PH	P1	*3 phase fault on the ROUNDUP_-BE3 (659384) to CHARL_CK-BE3 (659183) 345 kV line CKT 1, near ROUNDUP_-BE3.* *a. Apply fault at the ROUNDUP_-BE3 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.*
FLT-9040-3PH	P1	*3 phase fault on the CHARL_CK-BE3 345kV (659183)/ 115 kV (659182)/ 13.8 kV (659211) XFMR CKT 1, near CHARL_CK-BE3 345 kV.* *a. Apply fault at the CHARL_CK-BE3 345 kV bus.* *b. Clear fault after 6 cycles and trip the faulted XFMR.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
FLT-9041-3PH	P1	*3 phase fault on the CHARL_CK-BE3 (659183) to PATENTGT-BE3 (659390) 345 kV line CKT 1, near CHARL_CK-BE3. a. Apply fault at the CHARL_CK-BE3 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.*
FLT-9042-3PH	P1	*3 phase fault on the AV.LS-BD-BE3 (659420) to BD.LS-AV-BE3 (659421) 345 kV line CKT 1, near AV.LS-BD-BE3. a. Apply fault at the AV.LS-BD-BE3 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.*
FLT-9043-3PH	P1	*3 phase fault on the BD.LS-AV-BE3 (659421) to BROADLND-BE3 (659120) 345 kV line CKT Z, near BD.LS-AV-BE3. a. Apply fault at the BD.LS-AV-BE3 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.*
FLT-9044-3PH	P1	*3 phase fault on the BROADLND-BE3 345kV (659120)/ 230 kV (659205)/ 13.8 kV (659204) XFMR CKT 1, near BROADLND-BE3 345 kV. a. Apply fault at the BROADLND-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9045-3PH	P1	*3 phase fault on the DGC____-BE3 345kV (659212)/ 13.8 kV (659220)/ 13.8 kV (659221) XFMR CKT 1, near DGC____-BE3 345 kV. a. Apply fault at the DGC____-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9046-3PH	P1	*3 phase fault on the CHARL_CK-BE3 345kV (659183)/ 230 kV (659302)/ 13.8 kV (659318) XFMR CKT 1, near CHARL_CK-BE3 345 kV.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		a. Apply fault at the CHARL_CK-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.
FLT-9047-3PH	P1	*3 phase fault on the CHARL_CK-BE3 345kV (659183)/ 230 kV (659302)/ 13.8 kV (659319) XFMR CKT 2, near CHARL_CK-BE3 345 kV. a. Apply fault at the CHARL_CK-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9048-3PH	P1	*3 phase fault on the DGC____-BE3 345kV (659212)/ 13.8 kV (659214)/ 13.8 kV (659215) XFMR CKT 1, near DGC____-BE3 345 kV. a. Apply fault at the DGC____-BE3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9049-3PH	P1	*3 phase fault on the FTTHOMP3 (652506) to FTTHOM2-LNX3 (652807) 345 kV line CKT Z, near FTTHOMP3. a. Apply fault at the FTTHOMP3 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.*
FLT-9050-3PH	P1	*3 phase fault on the FTTHOMP3 345kV (652506)/ 230 kV (652507)/ 13.8 kV (652274) XFMR CKT 1, near FTTHOMP3 345 kV. a. Apply fault at the FTTHOMP3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9051-3PH	P1	*3 phase fault on the FTTHOMP3 345kV (652506)/ 230 kV (652507)/ 13.8 kV (652273) XFMR CKT 1, near FTTHOMP3 345 kV. a. Apply fault at the FTTHOMP3 345 kV bus. b. Clear fault after 6 cycles and trip the faulted XFMR.*
FLT-9052-3PH	P1	*3 phase fault on the FTTHOM2-LNX3 (652807) to GRPRAR2-LNX3 (652833) 345 kV line CKT 1, near FTTHOM2-LNX3. a. Apply fault at the FTTHOM2-LNX3 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.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		d. Leave fault on for 6 cycles, then trip the line in (b) and remove fault.
FLT-9053-3PH	P1	*3 phase fault on the CHAPELLE-BE3 (659130) to TRIPLEH__UA3 (659433) 345 kV line CKT 1, near CHAPELLE-BE3.* *a. Apply fault at the CHAPELLE-BE3 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.*
FLT-9054-3PH	P1	*3 phase fault on the FINSTAD -MW7 (655906) to OSBORN -MW7 (655919) 115 kV line CKT 1, near FINSTAD -MW7.* *a. Apply fault at the FINSTAD -MW7 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.*
FLT-9055-3PH	P1	*3 phase fault on the LOGAN___-BE4 (659108) to BLAISDEL-BE4 (659143) 230 kV line CKT 1, near LOGAN___-BE4.* *a. Apply fault at the LOGAN___-BE4 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.*
FLT-9056-3PH	P1	*3 phase fault on the LELAND_O-BE4 (659106) to LOGAN___-BE4 (659108) 230 kV line CKT 1, near LELAND_O-BE4.* *a. Apply fault at the LELAND_O-BE4 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.*
FLT-9057-3PH	P1	*3 phase fault on the LELAND_O-BE4 (659106) to GRE-STANTON4 (615901) 230 kV line CKT 1, near LELAND_O-BE4.* *a. Apply fault at the LELAND_O-BE4 230 kV bus.* *b. Clear fault after 7 cycles by tripping the faulted line.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		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.*
FLT-9058-3PH	P1	*3 phase fault on the LELAND_O-BE4 (659106) to GARRISN4 (652441) 230 kV line CKT 1, near LELAND_O-BE4.* *a. Apply fault at the LELAND_O-BE4 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.*
FLT-9059-3PH	P1	*3 phase fault on the GRE-STANTON4 (615901) to GRE-COAL TP4 (615900) 230 kV line CKT 1, near GRE-STANTON4.* *a. Apply fault at the GRE-STANTON4 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.*
FLT-9060-3PH	P1	*3 phase fault on the GRE-STANTON4 (615901) to GRE-COAL CR4 (615600) 230 kV line CKT 1, near GRE-STANTON4.* *a. Apply fault at the GRE-STANTON4 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.*
FLT-9061-3PH	P1	*3 phase fault on the GRE-COAL TP4 (615900) to GRE-COAL CR4 (615600) 230 kV line CKT 1, near GRE-COAL TP4.* *a. Apply fault at the GRE-COAL TP4 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.*
FLT-9062-3PH	P1	*3 phase fault on the GARRISN4 (652441) to GARISN1G (652457) 230 kV line CKT 1, near GARRISN4.* *a. Apply fault at the GARRISN4 230 kV bus.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		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.
FLT-9063-3PH	P1	*3 phase fault on the GARRISN4 (652441) to GARISN2G (652458) 230 kV line CKT 1, near GARRISN4. a. Apply fault at the GARRISN4 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.*
FLT-9064-3PH	P1	*3 phase fault on the GARRISN4 230kV (652441)/ 115 kV (652442)/ 13.8 kV (652642) XFMR CKT 1, near GARRISN4 230 kV. a. Apply fault at the GARRISN4 230 kV bus. b. Clear fault after 7 cycles and trip the faulted XFMR.*
FLT-9065-3PH	P1	*3 phase fault on the GARRISN4 (652441) to JAMESTN4 (652444) 230 kV line CKT 1, near GARRISN4. a. Apply fault at the GARRISN4 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.*
FLT-9066-3PH	P1	*3 phase fault on the GARRISN4 (652441) to HILKEN 4 (652466) 230 kV line CKT 1, near GARRISN4. a. Apply fault at the GARRISN4 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.*
FLT-9067-3PH	P1	*3 phase fault on the HILKEN 4 (652444) to BISMARK4 (652426) 230 kV line CKT 1, near HILKEN 4. a. Apply fault at the HILKEN 4 230 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.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT-9068-3PH	P1	*3 phase fault on the JAMESTN4 (652466) to BISMARK4 (652426) 230 kV line CKT 1, near JAMESTN4.* *a. Apply fault at the JAMESTN4 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.*
FLT-9069-3PH	P1	*3 phase fault on the WASHBRN4 (652456) to BISMARK4 (652426) 230 kV line CKT 1, near WASHBRN4.* *a. Apply fault at the WASHBRN4 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.*
FLT-9070-3PH	P1	*3 phase fault on the LELAND_O-BE4 (659106) to WASHBRN4 (652456) 230 kV line CKT 1, near LELAND_O-BE4.* *a. Apply fault at the LELAND_O-BE4 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.*
FLT-9071-3PH	P1	*3 phase fault on the LELAND_O-BE4 (659106) to LELAND_1-BEG (659110) 230 kV line CKT 1, near LELAND_O-BE4.* *a. Apply fault at the LELAND_O-BE4 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.*
FLT-9072-3PH	P1	*3 phase fault on the LELAND_O-BE4 (659106) to BASIN___-BE4 (659199) 230 kV line CKT 1, near LELAND_O-BE4.* *a. Apply fault at the LELAND_O-BE4 230 kV bus.* *b. Clear fault after 7 cycles by tripping the faulted line.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		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.
FLT-9073-3PH	P1	3 phase fault on the BASIN___-BE4 (659199) to GEN-2016-004 (587030) 230 kV line CKT 1, near BASIN___-BE4. a. Apply fault at the BASIN___-BE4 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.
FLT-9074-3PH	P1	3 phase fault on the BASIN___-BE4 230kV (659199)/ 115 kV (659109)/ 13.8 kV (659200) XFMR CKT 1, near BASIN___-BE4 230 kV. a. Apply fault at the BASIN___-BE4 230 kV bus. b. Clear fault after 7 cycles and trip the faulted XFMR.
FLT-9075-3PH	P1	3 phase fault on the BASIN___-BE7 (659109) to NWMDNTAP-MG7 (655752) 115 kV line CKT 1, near BASIN___-BE7. a. Apply fault at the BASIN___-BE7 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.
FLT-9076-3PH	P1	3 phase fault on the WASHBRN4 (652456) to WASHBRN9 (652325) 230 kV line CKT 1, near WASHBRN4. a. Apply fault at the WASHBRN4 230 kV bus. b. Clear fault after 7 cycles by tripping the faulted line. c. Wait 7 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 20 cycles, then trip the line in (b) and remove fault.
FLT-9077-3PH	P1	3 phase fault on the FINSTAD -MW7 (655906) to VANHOOK -MW7 (655920) 115 kV line CKT 1, near FINSTAD -MW7. a. Apply fault at the FINSTAD -MW7 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.

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT-9078-3PH	P1	*3 phase fault on the GARRISN4 (652441) to GARISN3G (652459) 230 kV line CKT 1, near GARRISN4. a. Apply fault at the GARRISN4 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.*
FLT-9079-3PH	P1	*3 phase fault on the LOGAN___-BE4 230kV (659108)/ 115 kV (659155)/ 13.8 kV (659208) XFMR CKT 1, near LOGAN___-BE4 230 kV. a. Apply fault at the LOGAN___-BE4 230 kV bus. b. Clear fault after 7 cycles and trip the faulted XFMR.*
FLT-9080-3PH	P1	*3 phase fault on the GRE-STANTON4 (615901) to SQBUTTE4 (657756) 230 kV line CKT 1, near GRE-STANTON4. a. Apply fault at the GRE-STANTON4 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.*
FLT-9081-3PH	P1	*3 phase fault on the LOGAN___-BE4 (659108) to GEN-2017-214 (760998) 230 kV line CKT 1, near LOGAN___-BE4. a. Apply fault at the LOGAN___-BE4 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.*
FLT-9082-3PH	P1	*3 phase fault on the COTEAU_1-RR8 (659222) to DGC UREA-BE8 (659236) 69 kV line CKT 1, near COTEAU_1-RR8. a. Apply fault at the COTEAU_1-RR8 69 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.*

FAULT ID	PLANNING EVENT	FAULT DESCRIPTIONS
		d. Leave fault on for 7 cycles, then trip the line in (b) and remove fault.
FLT1001-SLG	P4	*Apply single-phase fault at LELAND_O-BE3 on the 345kV bus after 16 cycles* *a. Trip the LELAND_O-BE3 to ANTELOPE-BE3 Transmission Line Ckt 2* *b. Trip the LELAND_O-BE3 to FINSTAD345 Transmission Line Ckt 1*
FLT1002-SLG	P4	*Apply single-phase fault at ANTELOPE-BE3 on the 345kV bus after 16 cycles* *a. Trip the ANTELOPE-BE3 to LELAND_O-BE3 Transmission Line Ckt 1* *b. Trip the ANTELOPE-BE3 to DGC____-BE3 Transmission Line Ckt 2*
FLT1003-SLG	P4	*Apply single-phase fault at ANTELOPE-BE3 on the 345kV bus after 16 cycles* *a. Trip the ANTELOPE-BE3 to ROUNDUP_-BE3 Transmission Line Ckt 1* *b. Trip the ANTELOPE-BE3 to ANTELP_2-BEG Transmission Line Ckt 1*

RESULTS

Table 6-2 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 D. The associated stability plots are also provided in Appendix D.

Table 6-1: GEN-2016-130 Dynamic Stability Results

FAULT ID	25SP			25WP		
	VOLT VIOLATION	VOLT RECOVERY	STABLE	VOLT VIOLATION	VOLT RECOVERY	STABLE
FLT-9001-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9002-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9003-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9004-3PH	Pass	Pass	Stable	Pass	Pass	Stable

FAULT ID	25SP			25WP		
	VOLT VIOLATION	VOLT RECOVERY	STABLE	VOLT VIOLATION	VOLT RECOVERY	STABLE
FLT-9005-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9006-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9007-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9008-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9009-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9010-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9011-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9012-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9013-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9014-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9015-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9016-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9017-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9018-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9019-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9020-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9021-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9022-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9023-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9024-3PH	Pass	Pass	Stable	Pass	Pass	Stable

FAULT ID	25SP			25WP		
	VOLT VIOLATION	VOLT RECOVERY	STABLE	VOLT VIOLATION	VOLT RECOVERY	STABLE
FLT-9025-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9026-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9027-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9028-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9029-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9030-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9031-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9032-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9033-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9034-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9036-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9037-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9038-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9039-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9040-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9041-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9042-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9043-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9044-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9045-3PH	Pass	Pass	Stable	Pass	Pass	Stable

FAULT ID	25SP			25WP		
	VOLT VIOLATION	VOLT RECOVERY	STABLE	VOLT VIOLATION	VOLT RECOVERY	STABLE
FLT-9046-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9047-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9048-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9049-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9050-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9051-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9052-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9053-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9054-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9055-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9056-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9057-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9058-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9059-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9060-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9061-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9062-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9063-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9064-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9065-3PH	Pass	Pass	Stable	Pass	Pass	Stable

FAULT ID	25SP			25WP		
	VOLT VIOLATION	VOLT RECOVERY	STABLE	VOLT VIOLATION	VOLT RECOVERY	STABLE
FLT-9066-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9067-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9068-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9069-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9070-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9071-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9072-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9073-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9074-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9075-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9076-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9077-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9078-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9079-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9080-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9081-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT-9082-3PH	Pass	Pass	Stable	Pass	Pass	Stable
FLT1001-SLG	Pass	Pass	Stable	Pass	Pass	Stable
FLT1002-SLG	Pass	Pass	Stable	Pass	Pass	Stable
FLT1003-SLG	Pass	Pass	Stable	Pass	Pass	Stable

The results of the dynamic stability analysis showed that there were several existing base case issues found in the original DISIS-2018-002/2019-001 case and the case with the GEN-2016-130 modification. These issues were not attributed to the GEN-2016-130 modification request and detailed in Appendix D.

There were no damping or voltage recovery violations attributed to the GEN-2016-130 modification 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.

MODIFIED 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.

As such, Interconnection Customers are allowed to increase the generating capacity of a generating facility without increasing its Interconnection Service amount stated in its GIA. This is allowable as long as they install the proper control and protection devices, and the requested modification is not determined to be a Material Modification.

RESULTS

The modified generating capacity of GEN-2016-130 (202 MW) and the total capability (204.36 MW) exceed the GIA Interconnection Service amount, 202 MW, as listed in Appendix A of the GIA. The GEN-2016-130 inverters are rated at 2.82 MW and 2.52 MW, and use a power plant controller (PPC) to limit the total power injected into the POI.

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 listed in its GIA.

MATERIAL MODIFICATION DETERMINATION

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

RESULTS

SPP determined the requested modification is **not a Material Modification** based on the results of this Modification Request Impact Study performed by SPP. SPP evaluated the impact of the requested modification on the prior study results. SPP determined that the requested modification did not negatively impact the prior study dynamic stability and short circuit results, and the modifications to the project were not enough to change the previously studied powerflow conclusions.

This determination implies that any network upgrades already required by GEN-2016-130 would not be negatively impacted and that no new upgrades are required due to the requested modification, thus not resulting in a material adverse impact on the cost or timing of any other Interconnection Request with a later Queue priority date.