Submitted to
Southwest Power Pool

Report On

GEN-2016-068
Modification Request Impact Study

Revision R1

Date of Submittal
September 17, 2020

anedenconsulting.com

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Revision History

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
09/17/2020	Aneden Consulting	Initial Report Issued.

Executive Summary

Aneden Consulting (Aneden) was retained by the Southwest Power Pool (SPP) to perform a Modification Request Impact Study (Study) for GEN-2016-068, an active generation interconnection request with a point of interconnection (POI) at the Woodring 345 kV Substation.

The GEN-2016-068 project is proposed to interconnect in the Oklahoma Gas and Electric Company (OKGE) control area with a capacity of 250 MW as shown in Table ES-1 below. This Study has been requested by the Interconnection Customer to evaluate the modification of GEN-2016-068 from the previously studied 125 x GE 2.0MW to a turbine configuration of 80 x GE 2.82 MW + 10 x GE 2.3 MW wind turbines for total capacity of 248.6 MW. In addition, the modification request included changes to the collection system, generator step-up transformers, main substation transformer, and the generation interconnection line. The modification request changes are shown in Table ES-2 below.

Table ES-1: GEN-2016-068 Existing Configuration

Request	Capacity (MW)	Existing Generator Configuration	Point of Interconnection
GEN-2016-068	250	125 x GE 2.0MW = 250 MW	Woodring 345 kV (514715)

Table ES-2: GEN-2016-068 Modification Request

<table>
<tr><th>Facility</th><th colspan="2">Existing</th><th colspan="2">Modification</th></tr>
<tr><td>Point of Interconnection</td><td colspan="2">Woodring 345 kV (514715)</td><td colspan="2">Woodring 345 kV (514715)</td></tr>
<tr><td>Configuration/Capacity</td><td colspan="2">125 x GE 2.0MW = 250 MW</td><td colspan="2">80 x GE 2.82 MW + 10 x GE 2.3 MW = 248.6 MW</td></tr>
<tr><td>Generation Interconnection Line</td><td colspan="2">Length = 37 miles
R = 0.001813 pu
X = 0.018463 pu
B = 0.310800 pu</td><td colspan="2">Length = 41 miles
R = 0.002032 pu
X = 0.019393 pu
B = 0.367610 pu</td></tr>
<tr><td>Main Substation Transformer</td><td colspan="2">X = 8.5%, R = 0.212%, Winding 168 MVA, Rate 280 MVA</td><td colspan="2">X = 9%, R = 0.138%, Winding 168 MVA, Rate 280 MVA</td></tr>
<tr><td>GSU Transformer</td><td>Gen 1 Equivalent Qty: 70:

X = 5.7%, R = 0.76%, Rating 157.5 MVA</td><td>Gen 2 Equivalent Qty: 55:

X = 5.7%, R = 0.76%, Rating 123.8 MVA</td><td>Gen 1 Equivalent Qty: 80:

X = 5.7%, R = 0.76%, Rating 224 MVA</td><td>Gen 2 Equivalent Qty: 10:

X = 5.7%, R = 0.76%, Rating 23 MVA</td></tr>
<tr><td>Equivalent Collector Line</td><td>R = 0.000357 pu
X = 0.000327 pu
B = 0.019835 pu</td><td>R = 0.000444 pu
X = 0.000407 pu
B = 0.015677 pu</td><td colspan="2">R = 0.007836 pu
X = 0.015167 pu
B = 0.182441 pu</td></tr>
</table>

SPP determined that power flow should not be performed based on the POI injection decrease of 2.39%. However, SPP determined that a turbine parameter comparison and an impedance comparison should be performed to evaluate whether fault analysis and short-circuit analysis is appropriate.

The turbine changes were from GE turbines to GE turbines, but the modeling parameters of the dynamic stability models changed significantly. The modification request resulted in a change in the equivalent impedances from the point of interconnection to the generator step up transformers of approximately 24.67%. As such a dynamic stability analysis was deemed necessary and the scope of this modification request study was expanded from a charging current compensation analysis to include both short-circuit analysis and dynamic stability analysis.

Aneden performed the analyses using the modification request data based on the DISIS-2016-002-2 Group 8 study models:

1. 2017 Winter Peak (2017WP),
2. 2018 Summer Peak (2018SP), and
3. 2026 Summer Peak (2026SP).

All analyses were performed using the PTI PSS/E version 33.7 software and the results are summarized below.

The results of the charging current compensation analysis performed using the 2017 Winter Peak, 2018 Summer Peak, and 2026 Summer Peak models showed that the GEN-2016-068 project needed 55.82 MVAr of reactor shunts on the 34.5 kV bus of the project substation, an increase from the 35.17 MVAr found in the pre-modification case. This is necessary to offset the capacitive effect on the transmission network caused by the project's transmission line and collector system during low-wind or no-wind conditions. The information gathered from the charging current compensation analysis is provided as information to the customer and Transmission Owner. SPP does not require additional reactive requirements based on the results of this analysis.

The results from the short circuit analysis with the updated topology showed that the maximum GEN-2016-068 contribution to three-phase fault currents in the immediate systems at or near GEN-2016-068 was not greater than 0.85 kA for the 2018SP and 2026SP cases. All three-phase fault current levels within 5 buses of the POI with the GEN-2016-068 generators online were below 45 kA for the 2018SP models and 2026SP models.

The dynamic stability analysis was performed using the three DISIS-2016-002-2 models 2017 Winter Peak, 2018 Summer Peak, 2026 Summer Peak. Up to 91 events were simulated, which included three-phase faults, three-phase faults on prior outage cases, and single-line-to-ground faults with stuck breakers faults.

The results of the dynamic stability analysis showed that there were no damping or voltage recovery violations 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 impact on the cost or timing of any Interconnection Request with a later Queue priority date.

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.

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

1.0 Scope of Study

Aneden Consulting (Aneden) was retained by the Southwest Power Pool (SPP) to perform a Modification Request Impact Study (Study) for GEN-2016-068. 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 PTI PSS/E version 33.7 software. The results of each analysis are presented in the following sections.

1.1 Power Flow

To determine whether power flow analysis is required, SPP evaluates the difference in the real power output at the POI between the existing configuration and the requested modification. Power flow analysis is included if the difference has a significant impact on the results of DISIS study.

1.2 Stability Analysis, Short Circuit Analysis

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

1.3 Charging Current Compensation Analysis

SPP requires that a charging current compensation analysis be performed on the requested modification configuration as it is a non-synchronous resource. The charging current compensation 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 plant's generators and capacitors are offline.

1.4 Study Limitations

The assessments and conclusions provided in this report are based on assumptions and information provided to Aneden by others. While the assumptions and information provided may be appropriate for the purposes of this report, Aneden does not guarantee that those conditions assumed will occur. In addition, Aneden did not independently verify the accuracy or completeness of the information provided. As such, the conclusions and results presented in this report may vary depending on the extent to which actual future conditions differ from the assumptions made or information used herein.

2.0 Project and Modification Request

The GEN-2016-068 Interconnection Customer has requested a modification to its Interconnection Request (IR) with a point of interconnection (POI) at the Woodring 345 kV Substation. At the time of the posting of this report, GEN-2016-068 is an active IR with a queue status of "IA FULLY EXECUTED/ON SCHEDULE." GEN-2016-068 is a wind farm, has a maximum summer and winter queue capacity of 250 MW, and has Energy Resource Interconnection Service (ERIS).

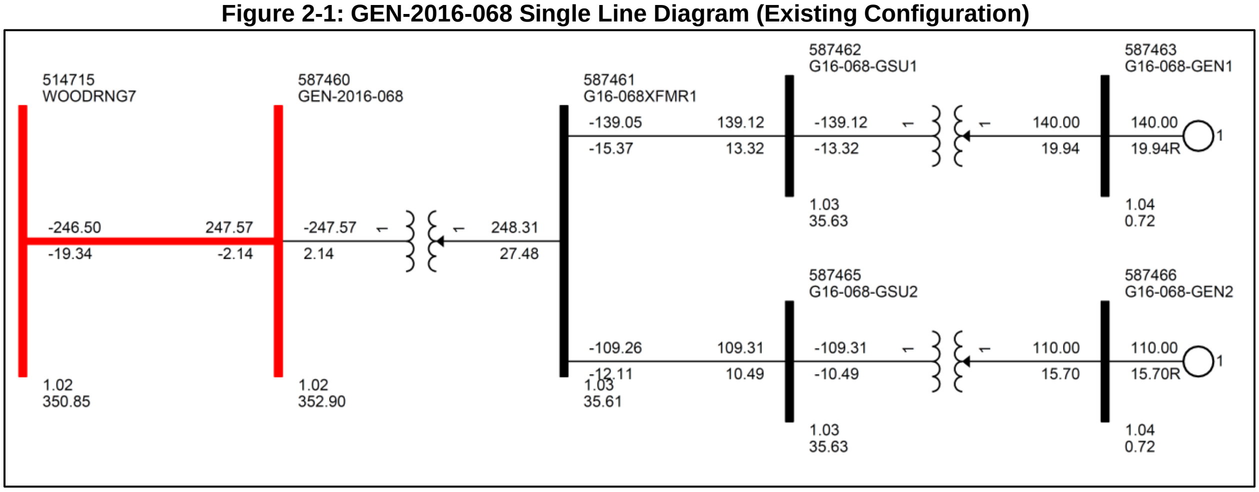
GEN-2016-068 was originally studied as part of Group 8 in the DISIS-2016-001 study. Figure 2-1 shows the power flow model single line diagram for the existing GEN-2016-068 configuration.

The GEN-2016-068 project was proposed to interconnect in the Oklahoma Gas and Electric Company (OKGE) control area with a combined nameplate capacity of 250 MW as shown in Table 2-1 below.

Table 2-1: GEN-2016-068 Existing Configuration

Request	Capacity (MW)	Existing Generator Configuration	Point of Interconnection
GEN-2016-068	250	125 x GE 2.0MW = 250 MW	Woodring 345 kV (514715)

Figure 2-1: GEN-2016-068 Single Line Diagram (Existing Configuration)



The GEN-2016-068 Modification Request included a turbine configuration change to a total of 80 x GE 2.82 MW + 10 x GE 2.3MW wind turbines for a total capacity of 248.6 MW. In addition, the modification request included changes to the collection system, generation step-up transformers, main substation transformer, and the generation interconnection line. The major modification request changes are shown in Figure 2-2 and Table 2-2 below.

Figure 2-2: GEN-2016-068 Single Line Diagram (New Configuration)

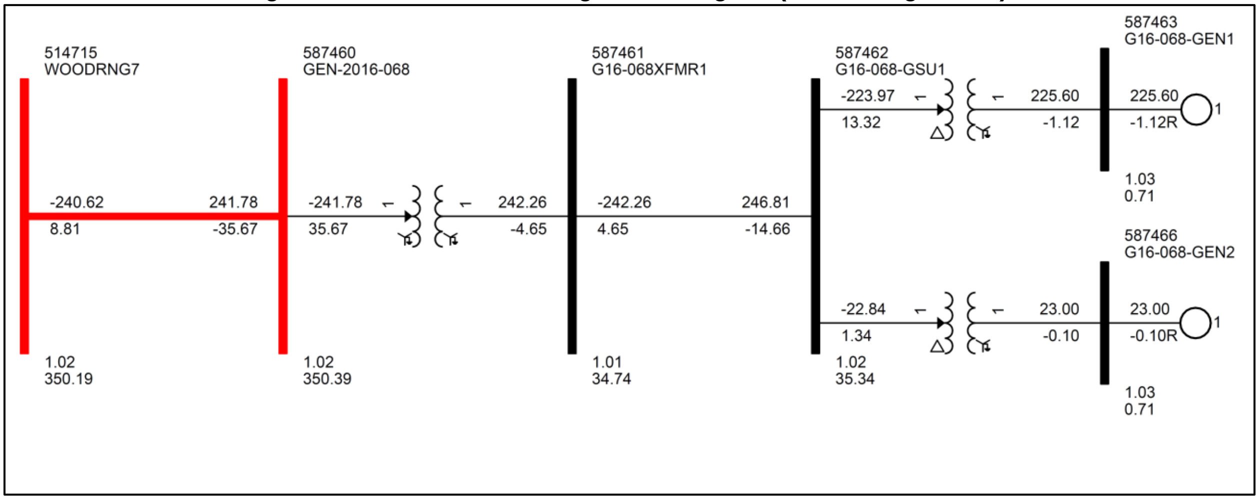


Table 2-2: GEN-2016-068 Modification Request

Facility	Existing		Modification	
Point of Interconnection	Woodring 345 kV (514715)		Woodring 345 kV (514715)	
Configuration/Capacity	125 x GE 2.0MW = 250 MW		80 x GE 2.82 MW + 10 x GE 2.3 MW = 248.6 MW	
Generation Interconnection Line	Length = 37 miles R = 0.001813 pu X = 0.018463 pu B = 0.310800 pu		Length = 41 miles R = 0.002032 pu X = 0.019393 pu B = 0.367610 pu	
Main Substation Transformer	X = 8.5%, R = 0.212%, Winding 168 MVA, Rate 280 MVA		X = 9%, R = 0.138%, Winding 168 MVA, Rate 280 MVA	
GSU Transformer	Gen 1 Equivalent Qty: 70: X = 5.7%, R = 0.76%, Rating 157.5 MVA	Gen 2 Equivalent Qty: 55: X = 5.7%, R = 0.76%, Rating 123.8 MVA	Gen 1 Equivalent Qty: 80: X = 5.7%, R = 0.76%, Rating 224 MVA	Gen 2 Equivalent Qty: 10: X = 5.7%, R = 0.76%, Rating 23 MVA
Equivalent Collector Line	R = 0.000357 pu X = 0.000327 pu B = 0.019835 pu	R = 0.000444 pu X = 0.000407 pu B = 0.015677 pu	R = 0.007836 pu X = 0.015167 pu B = 0.182441 pu	

3.0 Existing vs Modification Comparison

To determine whether stability analysis is required, the differences between the existing configuration and the requested modification were evaluated.

Aneden performed this comparison and the resulting analyses using a set of modified study models developed based on the modification request data and the three DISIS-2016-002-2 Group 8 study models:

1. 2017 Winter Peak (2017WP),
2. 2018 Summer Peak (2018SP), and
3. 2026 Summer Peak (2026SP).

The methodology and results of the comparisons are described below. The analysis was completed using PSS/E version 33.7 software.

3.1 POI Injection Comparison

The real power output at the POI was determined using PSS/E for both the existing configuration and the requested modification. The percentage change in the POI injection before and after the modification request was then compared. If the MW difference was determined to be significant, power flow analysis would be performed to assess the impact of the modification request.

SPP determined that power flow analysis was not required due to the insignificant change (decrease of 2.39%) in the real power output at the POI between the existing configuration and requested modification shown in Table 3-1.

Table 3-1: GEN-2016-068 POI Injection Comparison

Interconnection Request	Existing POI Injection from Project (MW)	MRIS POI Injection from Project (MW)	POI Injection Difference from Project %
GEN-2016-068	246.50	240.62	-2.39%

3.2 Turbine Parameters Comparison

The turbine dynamic stability models from the existing configuration and the requested modification were compared to determine if the change in modeling parameters was significant.

For the turbine collection, the turbine changes were from GE turbines to GE turbines, but the modeling parameters of the dynamic stability models did change significantly. The parameter differences are shown in Table 3-2. SPP determined that fault analysis and short-circuit analysis were required due to the change in turbines as the stability responses of the existing GE turbine and the requested modification's GE turbine may differ. The generator dynamic model for the modification can be found in Appendix A. The full parameter comparison can be found in Appendix B.

Table 3-2: Turbine Parameter Differences

Model Parameter	Existing	Modification		
	2.0MW #1	2.3MW #2	2.3MW	2.82MW
Tfv - V-regulator filter	0.15	0.15	0.50	0.50
KQi - MVAR/Volt gain	0.10	0.10	0.41	0.41
Kqd - Reactive droop gain	0.0000	0.0000	0.0094	0.0920
Qmax limit in WindFREE Mode	0.1200	0.1200	0.1565	0.1277
Qmin limit in WindFREE Mode	-0.1200	-0.1200	-0.1565	-0.1277

3.3 Equivalent Impedance Comparison Calculation

The impedances from all the components of the transmission lines, substation and step-up transformers, and equivalent collector line impedances were added in series for GEN-2016-068 before and after the modification request. The percentage increase in the impedances before and after the modification request were then compared. If the percentage increase was greater than 10%, additional dynamic stability analysis and short-circuit analysis would be performed to determine the impact of the requested modification. Table 3-3 shows the impedance differences before and after the modification request. Table 3-4 shows the increases in impedances from the original impedances to the modification request impedances.

Table 3-3: GEN-2016-068 Impedance Comparisons

System Component	Existing Model Impedances (p.u.)			Modification Request Impedances (p.u.)		
	R	*X*		*R*	*X*	
Gen Tie Line from POI to GEN-2016-068	0.00181	0.01846		0.00203	0.01939	
GEN-2016-068 collector system equivalent	0.00039	0.00036		0.00784	0.01517	
	R	*X*	*MVA Base*	*R*	*X*	*MVA Base*
GEN-2016-068 Main Transformer @ 100 MVA	0.00126	0.05058	100	0.00082	0.05357	100
GEN-2016-068 Unit GSU @ 100 MVA Base	0.0027	0.0203	100	0.00308	0.02308	100
	R	*X*	*Z*	*R*	*X*	*Z*
Total Impedance from POI to Collector System	0.006169	0.089665	0.089877	0.013768	0.111201	0.112050

Table 3-4: GEN-2016-068 Combined Impedance Comparison

Interconnection Request	Existing Impedance Z (p.u.)	MRIS Impedance Z (p.u.)	Impedance Change Z (p.u.)
GEN-2016-068	8.99%	11.20%	24.67%

SPP determined that the change in impedance (24.67%) and the change in modeling parameters have the potential to alter the project impact and would require fault analysis and short-circuit analysis to be performed to determine the impact of the requested modification.

4.0 Charging Current Compensation Analysis

The charging current compensation analysis was performed for GEN-2016-068 to determine the capacitive charging effects during 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.

4.1 Methodology and Criteria

For the GEN-2016-068 project, the generators and capacitors (if any) were switched out of service while other collector system elements remained in-service. A shunt reactor was tested at the 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).

4.2 Results

The results from the analysis showed that the GEN-2016-068 project needed an approximately 55.82 MVAr shunt reactor at the project substation, to reduce the POI MVAr to zero. Figure 4-2 illustrates the shunt reactor size needed to reduce the POI MVAr to approximately zero. This is an increase from the 35.17 MVAr found in the pre-modification cases as shown in

Figure 4-1. The final shunt reactor requirement for GEN-2016-068 is shown in Table 4-1.

The information gathered from the charging current compensation analysis is provided as information to the customer and Transmission Owner. SPP does not require additional reactive requirements based on the results of this analysis.

Table 4-1: Shunt Reactor Size for Low Wind Study

Machine	POI Bus Number	POI Bus Name	Reactor Size (MVAr)		
			17WP	18SP	26SP
GEN-2016-068	514715	Woodring 345 kV	55.82	55.82	55.82

Figure 4-1: GEN-2016-068 Single Line Diagram (Existing Shunt Reactor)

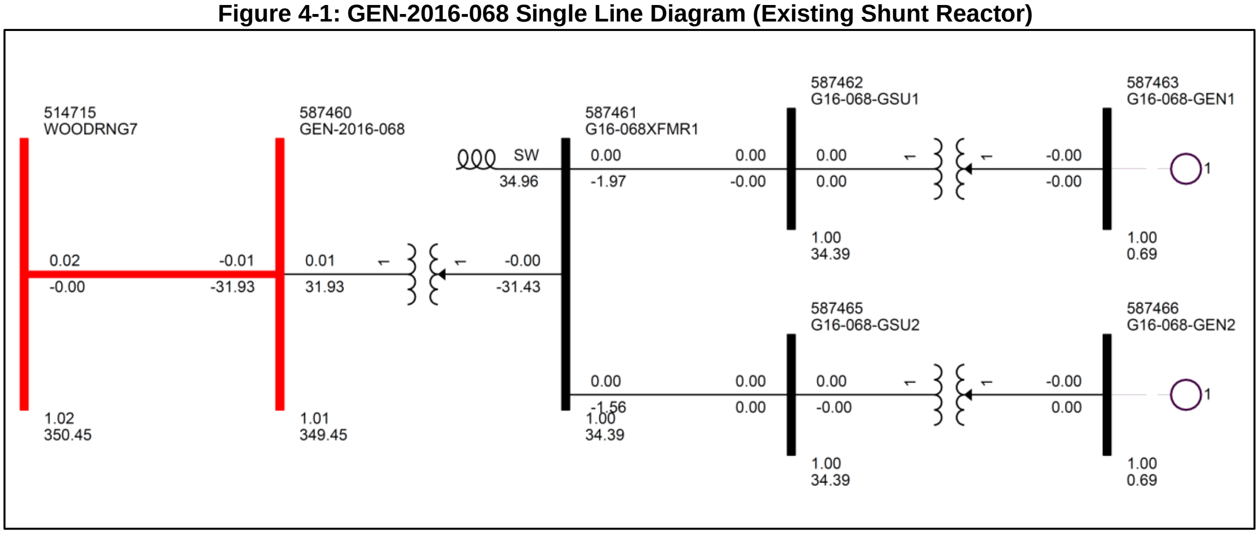
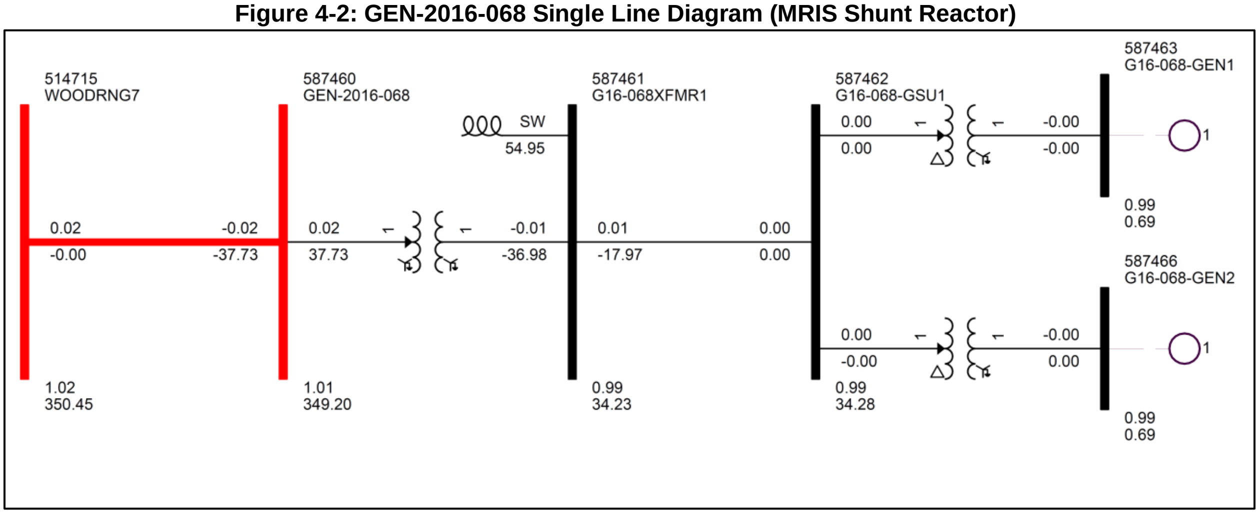


Figure 4-2: GEN-2016-068 Single Line Diagram (MRIS Shunt Reactor)



5.0 Short Circuit Analysis

A short-circuit study was performed using the 2018SP and 2026SP models for GEN-2016-068. The detail results of the short-circuit analysis are provided in Appendix C.

5.1 Methodology

The short-circuit analysis included applying a 3-phase fault on buses up to 5 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 with and without GEN-2016-068 online.

5.2 Results

The results of the short circuit analysis for the 2018SP and 2026SP models are summarized in Table 5-1 through Table 5-3 respectively. The GEN-2016-068 POI bus fault current magnitudes are provided in Table 5-1 showing a maximum fault current of 19.27 kA.

The maximum fault current calculated within 5 buses with GEN-2016-068 was less than 45 kA for the 2018SP and 2026SP models. The maximum increase in fault current was about 4.6% and 0.85 kA.

Table 5-1: POI Short Circuit Results

Case	GEN-OFF Current (kA)	GEN-ON Current (kA)	Max kA Change	Max %Change
2018SP	18.40	19.25	0.85	4.6%
2026SP	18.42	19.27	0.85	4.6%

Table 5-2: 2018SP Short Circuit Results

Voltage (kV)	Max. Current (kA)	Max kA Change	Max %Change
69	14.1	0.02	0.1%
138	44.3	0.12	0.6%
345	33.0	0.85	4.6%
Max	**44.3**	**0.85**	**4.6%**

Table 5-3: 2026SP Short Circuit Results

Voltage (kV)	Max. Current (kA)	Max kA Change	Max %Change
69	14.1	0.02	0.1%
138	43.9	0.12	0.6%
345	32.9	0.85	4.6%
Max	**43.9**	**0.85**	**4.6%**

6.0 Dynamic Stability Analysis

Aneden performed a dynamic stability analysis to identify the impact of the turbine configuration change and other modifications to the GEN-2016-068 project. The analysis was performed according to SPP's Disturbance Performance Requirements shown in Appendix D. The modification details are described in Section 2.0 above and the dynamic modeling data is provided in Appendix A. The simulation plots can be found in Appendix E.

6.1 Methodology and Criteria

The dynamic stability analysis was performed using models developed with the requested 80 x GE 2.82 MW (GEWTG2) + 10 x GE 2.3 MW (GEWTG2) turbine configuration for the GEN-2016-068 generating facilities. This stability analysis was performed using PTI's PSS/E version 33.7 software.

The stability models were developed using the models from DISIS-2016-002-2 for Group 8. The modifications requested to project GEN-2016-068 were used to create modified stability models for this impact study.

The modified dynamics model data for the DISIS-2016-001 Group 8 request, GEN-2016-068, 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.

During the fault simulations, the active power (PELEC), reactive power (QELEC), and terminal voltage (ETERM) were monitored for GEN-2016-068 and other equally and prior queued projects in Group 8. In addition, voltages of five (5) buses away from the POI of GEN-2016-068 were monitored and plotted. The machine rotor angle for synchronous machines and speed for asynchronous machines within this study area including 520 (AEPW), 524 (OKGE), 525 (WFEC), 526 (SPS), 531 (MIDW), 534 (SUNC), 536 (WERE), 540 (GMO), 541 (KCPL), were monitored. In addition, the voltages of all 100 kV and above buses within the study area were monitored.

6.2 Fault Definitions

Aneden simulated the faults previously simulated for GEN-2016-068 and selected additional fault events for GEN-2016-068 as required. The new set of faults were simulated using the modified study models. The fault events included three-phase faults, three-phase faults on prior outage cases, and single-line-to-ground faults with stuck breakers. The simulated faults are listed and described in Table 6-1 below. These contingencies were applied to the modified 2017 Winter Peak, 2018 Summer Peak, and the 2026 Summer Peak models.

Table 6-1: Fault Definitions

Fault ID	Planning Event	Fault Descriptions
FLT38-3PH	P1	3 phase fault on the Ranch Road (515576) to Open Sky (515621) 345kV line CKT 1, near Ranch Road. a. Apply fault at the Ranch Road 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT40-3PH	P1	3 phase fault on the Ranch Road (515576) to Sooner (514803) 345kV line CKT 1, near Ranch Road. a. Apply fault at the Ranch Road 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT43-3PH	P1	3 phase fault on the Sooner (514803) to G15-066T (560056) 345kV line CKT 1, near Sooner. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT46-3PH	P1	3 phase fault on the Sooner 345/138/13.8kV (514803/514802/515760) transformer CKT 1, near Sooner 345kV. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT77-3PH	P1	3 phase fault on the Marshall (514733) to Woodring (514714) 138kV line CKT 1, near Marshall. a. Apply fault at the Marshall 138kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT84-3PH	P1	3 phase fault on the G16-032-Tap (560077) to Marshall (514733) 138kV line CKT 1, near G16-032-Tap. a. Apply fault at the G16-032-Tap 138kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT85-3PH	P1	3 phase fault on the Sooner (514803) to Ranch Road (515576) 345kV line CKT 1, near Sooner. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT86-3PH	P1	3 phase fault on the Spring Creek (514881) to Northwest (514880) 345kV line CKT 1, near Spring Creek. a. Apply fault at the Spring Creek 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT87-3PH	P1	3 phase fault on the G15-066T (560056) to Cleveland (512694) 345kV line CKT 1, near G15-066T. a. Apply fault at the G15-066T 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT88-3PH	P1	3 phase fault on the G16-061-Tap (560084) to Woodring (514715) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT89-3PH	P1	3 phase fault on the Sooner (514803) – G16-061-Tap (560084) 345kV line CKT 1, near Sooner. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT102-3PH	P1	3 phase fault on the Woodring (514715) to Hunters (515476) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT104-3PH	P1	3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1, near Woodring 345kV. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT106-3PH	P1	3 phase fault on the G16-061-Tap (560084) to Sooner (514803) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT108-3PH	P1	3 phase fault on the Hunters (515476) to Chisholm (515477) 345kV line CKT 1, near Hunters. a. Apply fault at the Hunters 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator CHSVWWG1 (515927)** **Trip generator CHSHMV22-WTG (599090)** **Trip generator CHSHMV12-WTG (599089)** **Trip generator CHSVWEG1 (515926)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT109-3PH	P1	3 phase fault on the Woodring (514714) to Fairmont Tap (514709) 138kV line CKT 1, near Woodring. a. Apply fault at the Woodring 138kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT128-3PH	P1	3 phase fault on the Renfrow (515543) to Hunters (515476) 345kV line CKT 1, near Renfrow. a. Apply fault at the Renfrow 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT129-3PH	P1	3 phase fault on the Renfrow (515543) to Viola (532798) 345kV line CKT 1, near Renfrow. a. Apply fault at the Renfrow 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT130-3PH	P1	3 phase fault on the Viola (532798) to Wichita (532796) 345kV line CKT 1, near Viola. a. Apply fault at the Viola 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT134-3PH	P1	3 phase fault on the Renfrow (515543) 345/(515544) 138/(515545) 13.8kV transformer CKT 1, near Renfrow 345kV. a. Apply fault at the Renfrow 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT38-PO1	P6	**Prior outage of the Sooner (514803) – G15-066T (560056) 345kV line** 3 phase fault on the Ranch Road (515576) to Open Sky (515621) 345kV line CKT 1, near Ranch Road. a. Apply fault at the Ranch Road 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT40-PO1	P6	**Prior outage of the Sooner (514803) – G15-066T (560056) 345kV line** 3 phase fault on the Ranch Road (515576) to Sooner (514803) 345kV line CKT 1, near Ranch Road. a. Apply fault at the Ranch Road 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT89-PO1	P6	**Prior outage of the Sooner (514803) – G15-066T (560056) 345kV line** 3 phase fault on the Sooner (514803) to G16-061-Tap (560084) 345kV line CKT 1, near Sooner. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT46-PO2	P6	**Prior outage of the Sooner (514803) – Ranch Road (515576) 345kV line** 3 phase fault on the Sooner 345/138/13.8kV (514803/514802/515760) transformer CKT 1, near Sooner 345kV. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer and remove fault.
FLT106-PO3	P6	**Prior outage of the Woodring (514715) – Hunters (515476) 345kV line** 3 phase fault on the G16-061-Tap (560084) to Sooner (514803) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT104-PO4	P6	**Prior outage of the Woodring (514715) – G16-061-Tap (560084) 345kV line** 3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1, near Woodring 345kV. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT84-PO5	P6	**Prior outage of the Woodring (514714) – Wauko Tap (514711) 138kV line** 3 phase fault on the G16-032-Tap (560077) to Marshall (514733) 138kV line CKT 1, near G16-032-Tap. a. Apply fault at the G16-032-Tap 138kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT50-SB	P4	**Stuck Breaker on Sooner – G15-066T 345kV CKT 1 line** a. Apply single-phase fault at Sooner (514803) on the 345kV bus. b. After 16 cycles, trip the Sooner – G15-066T (560056) 345kV CKT 1 line c. Trip the Sooner – Ranch Road (515576) 345kV CKT 1 line, and remove the fault
FLT51-SB	P4	**Stuck Breaker on Sooner – G15-066T 345kV CKT 1 line** a. Apply single-phase fault at Sooner (514803) on the 345kV bus. b. After 16 cycles, trip the Sooner – G15-066T (560056) 345kV CKT 1 line c. Trip the Sooner – G16-061-Tap (560084) 345kV CKT 1 line, and remove the fault
FLT78-SB	P4	**Stuck Breaker on Marshall – G16-032-Tap 138kV CKT 1 line** a. Apply single-phase fault at Marshall (514733) on the 138kV bus. b. After 16 cycles, trip the Marshall – G16-032-Tap (560077) 138kV CKT 1 line c. Trip the Marshall – Woodring (514714) 138kV CKT 1 line, and remove the fault
FLT110-SB	P4	**Stuck Breaker on Woodring – G15-061-Tap 345kV circuit 1 line** a. Apply single-phase fault at Woodring (514715) on the 345kV bus. b. After 16 cycles, trip the Woodring – G16-061-Tap (560084) 345kV CKT 1 line c. Trip the Woodring – Hunters (515476) 345kV CKT 1 line, and remove the fault

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT137-SB	P4	**Stuck Breaker on Renfrow – Hunters 345kV CKT 1 line** a. Apply single-phase fault at Renfrow (515543) on the 345kV bus. b. After 16 cycles, trip the Renfrow 345/138/13.8kV (515543/515544/515545) transformer c. Trip the Renfrow – Hunter (515476) 345 kV CKT 1 line, and remove the fault
FLT138-SB	P4	**Stuck Breaker on Renfrow – Hunter 345kV CKT 1 line** a. Apply single-phase fault at Renfrow (515543) on the 345kV bus. b. After 16 cycles, trip the Renfrow – Viola (532798) 345 kV CKT 1 line, and remove the fault c. Trip the Renfrow – Hunter (515476) 345 kV CKT 1 line, and remove the fault
FLT9001-3PH	P1	3 phase fault on the Hunters (515476) to Renfrow (515543) 345kV line CKT 1, near Renfrow. a. Apply fault at the Hunters 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9002-3PH	P1	3 phase fault on the Woodring (514715) to Redngtn7 (515875) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9003-3PH	P1	3 phase fault on the Woodring (514715) to G16-061-TAP (560084) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9004-3PH	P1	3 phase fault on the Sooner (514803) to Thunder7 (515894) 345kV line CKT 1, near Sooner. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator THNDRG11 (515886)** **Trip generator THNDRG21 (515887)** **Trip generator G15-047-G2.5 (584884)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9005-3PH	P1	3 phase fault on the Sooner 345/20kV (514803/514806) transformer CKT 1, near Sooner 345kV. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT9006-3PH	P1	3 phase fault on the Sooner (514803) to G16-100-TAP (587804) 345kV line CKT 1, near Sooner. a. Apply fault at the Sooner 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9007-3PH	P1	3 phase fault on the G16-061-Tap (560084) to GEN-2016-061 (587410) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator G16-061-GEN1 (587413)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9008-3PH	P1	3 phase fault on the Redngtn7 (515875) to Mathwsn7 (515497) 345kV line CKT 1, near Redngtn7. a. Apply fault at the Redngtn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT9009-3PH	P1	3 phase fault on the Mathwsn7 (515497) to G16-045-SUB1 (587300) 345kV line CKT 1, near Mathwsn7. a. Apply fault at the Mathwsn7 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator G16-045-GEN1 (587303)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9010-3PH	P1	3 phase fault on the Mathwsn7 (515497) to G16-045-SUB2 (587304) 345kV line CKT 1, near Mathwsn7. a. Apply fault at the Mathwsn7 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator G16-045-GEN2 (587307)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9011-3PH	P1	3 phase fault on the Mathwsn7 (515497) to G16-057-SUB1 (587380) 345kV line CKT 1, near Mathwsn7. a. Apply fault at the Mathwsn7 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator G16-057-GEN1 (587383)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9012-3PH	P1	3 phase fault on the Mathwsn7 (515497) to G16-057-SUB2 (587384) 345kV line CKT 1, near Mathwsn7. a. Apply fault at the Mathwsn7 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator G16-057-GEN2 (587387)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT9013-3PH	P1	3 phase fault on the Mathwsn7 (515497) to Tatonga7 (515407) 345kV line CKT 1, near Mathwsn7. a. Apply fault at the Mathwsn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9014-3PH	P1	3 phase fault on the Mathwsn7 (515497) to Cimaron (514901) 345kV line CKT 1, near Mathwsn7. a. Apply fault at the Mathwsn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9015-3PH	P1	3 phase fault on the Mathwsn7 (515497) to Nortwst7 (514880) 345kV line CKT 1, near Mathwsn7. a. Apply fault at the Mathwsn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9016-3PH	P1	3 phase fault on the Renfrow (515543) to Grntwd7 (515646) 345kV line CKT 1, near Renfrow. a. Apply fault at the Renfrow 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. **Trip generator GRNTWDG1 (515660)** **Trip generator GRNTWDG2 (515661)** c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT104-PO3	P6	**Prior outage of the Woodring (514715) – Hunters (515476) 345kV line** 3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1, near Woodring 345kV. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT9002-PO3	P6	**Prior outage of the Woodring (514715) – Hunters (515476) 345kV line** 3 phase fault on the Woodring (514715) to Redngtn7 (515875) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT9003-PO3	P6	**Prior outage of the Woodring (514715) – Hunters (515476) 345kV line** 3 phase fault on the Woodring (514715) to G16-061-TAP (560084) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9008-PO3	P6	**Prior outage of the Woodring (514715) – Hunters (515476) 345kV line** 3 phase fault on the Redngtn7 (515875) to Mathwsn7 (515497) 345kV line CKT 1, near Redngtn7. a. Apply fault at the Redngtn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT102-PO4	P6	**Prior outage of the Woodring (514715) – G16-061-Tap (560084) 345kV line** 3 phase fault on the Woodring (514715) to Hunters (515476) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT128-PO4	P6	**Prior outage of the Woodring (514715) – G16-061-Tap (560084) 345kV line** 3 phase fault on the Renfrow (515543) to Hunters (515476) 345kV line CKT 1, near Renfrow. a. Apply fault at the Renfrow 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9002-PO4	P6	**Prior outage of the Woodring (514715) – G16-061-Tap (560084) 345kV line** 3 phase fault on the Woodring (514715) to Redngtn7 (515875) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9008-PO4	P6	**Prior outage of the Woodring (514715) – G16-061-Tap (560084) 345kV line** 3 phase fault on the Redngtn7 (515875) to Mathwsn7 (515497) 345kV line CKT 1, near Redngtn7. a. Apply fault at the Redngtn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT102-PO6	P6	**Prior outage of the Redngtn7 (515875) – Mathwsn7 (515497) 345kV line** 3 phase fault on the Woodring (514715) to Hunters (515476) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT104-PO6	P6	**Prior outage of the Redngtn7 (515875) – Mathwsn7 (515497) 345kV line** 3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1, near Woodring 345kV. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT106-PO6	P6	**Prior outage of the Redngtn7 (515875) – Mathwsn7 (515497) 345kV line** 3 phase fault on the G16-061-Tap (560084) to Sooner (514803) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT9001-PO6	P6	**Prior outage of the Redngtn7 (515875) – Mathwsn7 (515497) 345kV line** 3 phase fault on the Hunters (515476) to Renfro (515543) 345kV line CKT 1, near Renfro. a. Apply fault at the Hunters 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9003-PO6	P6	**Prior outage of the Redngtn7 (515875) – Mathwsn7 (515497) 345kV line** 3 phase fault on the Woodring (514715) to G16-061-TAP (560084) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT102-PO7	P6	**Prior outage of the Woodring 345/138/13.8kV (514715/514714/515770) transformer** 3 phase fault on the Woodring (514715) to Hunters (515476) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT106-PO7	P6	**Prior outage of the Woodring 345/138/13.8kV (514715/514714/515770) transformer** 3 phase fault on the G16-061-Tap (560084) to Sooner (514803) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9001-PO7	P6	**Prior outage of the Woodring 345/138/13.8kV (514715/514714/515770) transformer** 3 phase fault on the Hunters (515476) to Renfro (515543) 345kV line CKT 1, near Renfro. a. Apply fault at the Hunters 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9002-PO7	P6	**Prior outage of the Woodring 345/138/13.8kV (514715/514714/515770) transformer** 3 phase fault on the Woodring (514715) to Redngtn7 (515875) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9003-PO7	P6	**Prior outage of the Woodring 345/138/13.8kV (514715/514714/515770) transformer** 3 phase fault on the Woodring (514715) to G16-061-TAP (560084) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9008-PO7	P6	**Prior outage of the Woodring 345/138/13.8kV (514715/514714/515770) transformer** 3 phase fault on the Redngtn7 (515875) to Mathwsn7 (515497) 345kV line CKT 1, near Redngtn7. a. Apply fault at the Redngtn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT104-PO8	P6	**Prior outage of the Hunters (515476) – Renfrow7 (515543) 345kV line** 3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1, near Woodring 345kV. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT106-PO8	P6	**Prior outage of the Hunters (515476) – Renfrow7 (515543) 345kV line** 3 phase fault on the G16-061-Tap (560084) to Sooner (514803) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT9002-PO8	P6	**Prior outage of the Hunters (515476) – Renfrow7 (515543) 345kV line** 3 phase fault on the Woodring (514715) to Redngtn7 (515875) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9003-PO8	P6	**Prior outage of the Hunters (515476) – Renfrow7 (515543) 345kV line** 3 phase fault on the Woodring (514715) to G16-061-TAP (560084) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9008-PO8	P6	**Prior outage of the Hunters (515476) – Renfrow7 (515543) 345kV line** 3 phase fault on the Redngtn7 (515875) to Mathwsn7 (515497) 345kV line CKT 1, near Redngtn7. a. Apply fault at the Redngtn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT102-PO9	P6	**Prior outage of the G16-061-Tap (560084) – GEN-2016-061 (587410) 345kV line** 3 phase fault on the Woodring (514715) to Hunters (515476) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT104-PO9	P6	**Prior outage of the G16-061-Tap (560084) – GEN-2016-061 (587410) 345kV line** 3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1, near Woodring 345kV. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT128-PO9	P6	**Prior outage of the G16-061-Tap (560084) – GEN-2016-061 (587410) 345kV line** 3 phase fault on the Renfrow (515543) to Hunters (515476) 345kV line CKT 1, near Renfrow. a. Apply fault at the Renfrow 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9002-PO9	P6	**Prior outage of the G16-061-Tap (560084) – GEN-2016-061 (587410) 345kV line** 3 phase fault on the Woodring (514715) to Redngtn7 (515875) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9008-PO9	P6	**Prior outage of the G16-061-Tap (560084) – GEN-2016-061 (587410) 345kV line** 3 phase fault on the Redngtn7 (515875) to Mathwsn7 (515497) 345kV line CKT 1, near Redngtn7. a. Apply fault at the Redngtn7 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT102-PO10	P6	**Prior outage of the Woodrng7 (514715) – Redngtn7 (515875) 345kV line** 3 phase fault on the Woodring (514715) to Hunters (515476) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.

Table 6-1 continued

Fault ID	Planning Event	Fault Descriptions
FLT104-PO10	P6	**Prior outage of the Woodrng7 (514715) – Redngtn7 (515875) 345kV line** 3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1, near Woodring 345kV. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT106-PO10	P6	**Prior outage of the Woodrng7 (514715) – Redngtn7 (515875) 345kV line** 3 phase fault on the G16-061-Tap (560084) to Sooner (514803) 345kV line CKT 1, near G16-061-Tap. a. Apply fault at the G16-061-Tap 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9001-PO10	P6	**Prior outage of the Woodrng7 (514715) – Redngtn7 (515875) 345kV line** 3 phase fault on the Hunters (515476) to Renfro (515543) 345kV line CKT 1, near Renfro. a. Apply fault at the Hunters 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT9003-PO10	P6	**Prior outage of the Woodrng7 (514715) – Redngtn7 (515875) 345kV line** 3 phase fault on the Woodring (514715) to G16-061-TAP (560084) 345kV line CKT 1, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 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 5 cycles, then trip the line in (b) and remove fault.
FLT1001-SB	P4	**Stuck Breaker on Redngtn7 - Woodrng7 345kV CKT 1 line** a. Apply single-phase fault at Redngtn7 (515875) on the 345kV bus. b. After 16 cycles, trip the Redngtn7 (515875) – Woodrng7 (514715) 345kV CKT 1 line c. Trip the Bus Redngtn7 (515875) d. Trip Generators Rddrtg11 (515882) and Rddrtg21 (515883), and remove the fault
FLT1002-SB	P4	**Stuck Breaker on Hunters7 – Woodrng7 345kV CKT 1 line** a. Apply single-phase fault at Hunters7 (515476) on the 345kV bus. b. After 16 cycles, trip the Hunters7 (515476) – Woodrng7 (514715) 345kV CKT 1 line c. Trip the Bus Hunters7 (515476) d. Trip Generators CHSVWWG1 (515927), CHSHMV22-WTG (599090), CHSHMV12-WTG (599089) and CHSVWEG1 (515926) and remove the fault
FLT1003-SB	P4	**Stuck Breaker on G16-061-TAP – Woodrng7 345kV CKT 1 line** a. Apply single-phase fault at G16-061-TAP (560084) on the 345kV bus. b. After 16 cycles, trip the G16-061-TAP (560084) – Woodrng7 (514715) 345kV CKT 1 line c. Trip the Bus G16-061-TAP (560084) d. Trip Generator G16-061-GEN1 (587413) and remove the fault
FLT1004-SB	P4	**Stuck Breaker on the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1** a. Apply single-phase fault at Woodrng4 (514714) on the 138kV bus. b. After 16 cycles, trip the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1 c. Trip the Woodring (514714) - Otter (514708) 138kV line and remove the fault
FLT1005-SB	P4	**Stuck Breaker on Woodrng7 – Hunters7 345kV CKT 1 line** a. Apply single-phase fault at Woodrng7 (514715) on the 345kV bus. b. After 16 cycles, trip the Woodrng7 (514715) – Hunters7 (515476) 345kV CKT 1 line c. Trip the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1
FLT1006-SB	P4	**Stuck Breaker on Woodrng7 – Redngtn7 345kV CKT 1 line** a. Apply single-phase fault at Woodrng7 (514715) on the 345kV bus. b. After 16 cycles, trip the Woodrng7 (514715) – Redngtn7 (515875) 345kV CKT 1 line c. Trip the Woodring 345/138/13.8kV (514715/514714/515770) transformer CKT 1
FLT1007-SB	P4	**Stuck Breaker on Woodrng7 – Redngtn7 345kV CKT 1 line** a. Apply single-phase fault at Woodrng7 (514715) on the 345kV bus. b. After 16 cycles, trip the Woodrng7 (514715) – Redngtn7 (515875) 345kV CKT 1 line c. Trip the Woodring (514715) to G16-061-TAP (560084) 345kV line CKT 1

6.3 Results

Table 6-2 shows the results of the fault events simulated for each of the three modified cases. The associated stability plots are provided in Appendix E.

Table 6-2: GEN-2016-068 Dynamic Stability Results

Fault ID	2017WP			2018SP			2026SP		
	Volt. Recovery	Volt. Violation	Stable	Volt. Recovery	Volt. Violation	Stable	Volt. Recovery	Volt. Violation	Stable
FLT38-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT40-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT43-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT46-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT77-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT84-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT85-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT86-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT87-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT88-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT89-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT102-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT104-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT106-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT108-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT109-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT128-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT129-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT130-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT134-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9001-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9002-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9003-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9004-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9005-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9006-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9007-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9008-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9009-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9010-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9011-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9012-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9013-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9014-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9015-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9016-3PH	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT50-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT51-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable

Table 6-2 continued

Fault ID	17WP			18SP			26SP		
	Voltage Recovery	Voltage Violation	Stable	Voltage Recovery	Voltage Violation	Stable	Voltage Recovery	Voltage Violation	Stable
FLT78-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT110-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT136-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT137-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT138-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT1001-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT1002-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT1003-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT1004-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT1005-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT1006-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT1007-SB	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT38-PO1	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT40-PO1	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT89-PO1	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT46-PO2	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT106-PO3	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT104-PO3	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9002-PO3	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9003-PO3	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9008-PO3	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT102-PO4	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT104-PO4	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT128-PO4	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9002-PO4	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9008-PO4	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT84-PO5	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT102-PO6	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT104-PO6	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT106-PO6	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9001-PO6	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9003-PO6	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT102-PO7	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT106-PO7	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9001-PO7	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9002-PO7	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9003-PO7	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9008-PO7	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT104-PO8	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT106-PO8	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9002-PO8	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9003-PO8	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9008-PO8	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable

Table 6-2 continued

Fault ID	17WP			18SP			26SP		
	Voltage Recovery	Voltage Violation	Stable	Voltage Recovery	Voltage Violation	Stable	Voltage Recovery	Voltage Violation	Stable
FLT102-PO9	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT104-PO9	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT128-PO9	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9002-PO9	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9008-PO9	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT102-PO10	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT104-PO10	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT106-PO10	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9001-PO10	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable
FLT9003-PO10	Pass	Pass	Stable	Pass	Pass	Stable	Pass	Pass	Stable

There were no damping or voltage recovery violations 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.

7.0 Material Modification Determination

In accordance with Attachment V of SPP's Open Access Transmission Tariff, for modifications other than those specifically permitted by Attachment V, SPP shall evaluate the proposed modifications prior to making them and inform the Interconnection Customer in writing of whether the modifications would constitute a Material Modification. A Material Modification shall mean those modifications that have a material impact on the cost or timing of any Interconnection Request with a later Queue priority date.

7.1 Results

SPP determined the requested modification is not a Material Modification based on the results of this Modification Request Impact Study performed by Aneden. Aneden evaluated the impact of the requested modification on the prior study results. Aneden determined that the requested modification resulted in similar dynamic stability and short circuit analyses and that the prior study power flow results are not negatively impacted.

This determination implies that any network upgrades already required by GEN-2016-068 would not be negatively impacted and that no new upgrades are required due to the requested modification, thus not resulting in a material impact on the cost or timing of any Interconnection Request with a later Queue priority date.

8.0 Conclusions

The Interconnection Customer for GEN-2016-068 requested a Modification Request Impact Study to assess the impact of the turbine and facility changes to a configuration with a total of 80 x GE 2.82 MW + 10 x GE 2.3 MW wind turbines for total capacity of 248.6 MW. In addition, the modification request included changes to the collection system, generator step-up transformers, main substation transformer, and the generation interconnection line.

SPP determined that power flow should not be performed based on the POI injection decrease of 2.39%. However, SPP determined that a turbine parameter comparison and an impedance comparison should be performed to evaluate whether fault analysis and short-circuit analysis is appropriate.

The turbine changes were from GE turbines to GE turbines, but the modeling parameters of the dynamic stability models changed significantly. The modification request resulted in a change in the equivalent impedances from the point of interconnection to the generator step up transformers of approximately 24.67%. As such a dynamic stability analysis was deemed necessary and the scope of this modification request study was expanded from a charging current compensation analysis to include both short-circuit analysis and dynamic stability analysis.

The results of the charging current compensation analysis performed using the 2017 Winter Peak, 2018 Summer Peak, and 2026 Summer Peak models showed that the GEN-2016-068 project needed 55.82 MVAr of reactor shunts on the 34.5 kV bus of the project substation, an increase from the 35.17 MVAr found in the pre-modification case. This is necessary to offset the capacitive effect on the transmission network caused by the project's transmission line and collector system during low-wind or no-wind conditions. The information gathered from the charging current compensation analysis is provided as information to the customer and Transmission Owner. SPP does not require additional reactive requirements based on the results of this analysis.

The results from the short circuit analysis with the updated topology showed that the maximum GEN-2016-068 contribution to three-phase fault currents in the immediate systems at or near GEN-2016-068 was not greater than 0.85 kA for the 2018SP and 2026SP cases. All three-phase fault current levels within 5 buses of the POI with the GEN-2016-068 generators online were below 45 kA for the 2018SP models and 2026SP models.

The dynamic stability analysis was performed using the three DISIS-2016-002-2 models 2017 Winter Peak, 2018 Summer Peak, 2026 Summer Peak. Up to 91 events were simulated, which included three-phase faults, three-phase faults on prior outage cases, and single-line-to-ground faults with stuck breakers faults.

The results of the dynamic stability analysis showed that there were no damping or voltage recovery violations 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 impact on the cost or timing of any Interconnection Request with a later Queue priority date.

It is likely that the customer may be required to reduce its generation output to 0 MW in real-time, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

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