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Southwest Power Pool, Inc. (SPP)

Limited Operation Impact Study for GEN-2016-153 (Flat Ridge Wind 4)

Draft Report For Review

REP-1227 Revision #00

December 2021

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Report Revision Table

Revision	Report Revision Table	Date
0	Issue Draft Report for review for LOIS-2016-153	12/6/2021
1		
2		
3		
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Title: **Limited Operation Impact Study for GEN-2016-153 (Flat Ridge Wind 4): Draft Report REP-1227 for Review**
Date: November 2021
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EXECUTIVE SUMMARY

Southern Power Pool (SPP) requested a Limited Operation Impact Study (LOIS) for Group 08 study request GEN-2016-153 (Flat Ridge Wind 4). The LOIS required a power flow analysis, stability analysis, short-circuit analysis, and reactive capability analysis detailing the impacts of Flat Ridge Wind 4 ("FR4"). Flat Ridge Wind 4 has requested 134 MW of wind generation to be interconnected with Energy Resource Interconnection Service (ERIS) at Evergy's Viola 345kV substation in Harper County, KS for the DISIS-2016-002 cluster. Prior steady-state analysis has determined that Viola 345/138 kV transformer #2 upgrade, Arcadia substation expansion and line re-route, and the Wolf Creek to Blackberry 345kV upgrade are required for the full interconnection of Flat Ridge Wind 4. Refer to Table ES-1 for a summary of DISIS-2016-002-2 Group 08 study requests included in the analysis for each of the five study scenarios.

Table ES-1
Current Queued Interconnection Projects Included in the Analysis

Request	Size (MW)	Generator Fuel Type	Point of Interconnection	S1 (MW)	S2 (MW)	S3 (MW)	S4 (MW)	S5 (MW)
GEN-2016-119	600	Wind	Tap Spring Creek-Sooner 345 kV (587804)	Exclude	Exclude	Exclude	200	600
GEN-2016-128	176	Wind	Woodring 345kV Substation (514715)	Exclude	176	176	176	176
GEN-2016-133	187.5	Wind	Riverside 345kV Substation (509782)	187.5	187.5	187.5	187.5	187.5
GEN-2016-134	187.5	Wind	Riverside 345kV Substation (509782)	187.5	187.5	187.5	187.5	187.5
GEN-2016-137	187.5	Wind	Riverside 345kV Substation (509782)	187.5	187.5	187.5	187.5	187.5
GEN-2016-138	187.5	Wind	Riverside 345kV Substation (509782)	187.5	187.5	187.5	187.5	187.5
GEN-2016-139	100	Wind	Riverside 345kV Substation (509782)	100	100	100	100	100

Request	Size (MW)	Generator Fuel Type	Point of Interconnection	S1 (MW)	S2 (MW)	S3 (MW)	S4 (MW)	S5 (MW)
GEN-2016-141	350	Wind	Riverside 345kV Substation (509782)	350	350	350	350	350
GEN-2016-142	350	Wind	Riverside 345kV Substation (509782)	350	350	350	350	350
GEN-2016-145	175	Wind	Riverside 345kV Substation (509782)	175	175	175	175	175
GEN-2016-146	175	Wind	Riverside 345kV Substation (509782)	175	175	175	175	175
GEN-2016-153	134	Wind	Viola 345kV (588364)	134	134	134	134	134
GEN-2016-162	252	Wind	Benton 345kV (532791)	Exclude	Exclude	252	252	252
GEN-2016-163	252	Wind	Benton 345kV (532791)	Exclude	Exclude	252	252	252

SUMMARY OF POWER FLOW ANALYSIS

The power flow analysis determined a Limited Operation amount for GEN-2016-153. Refer to Table ES-2 for a summary of the scenarios performed and identified service available.

Table ES-2: **Summary of Power Flow Analysis**

Scenario	Scenario Description	LOIS (MW)
		GEN-2016-153
1	Clearwater – Viola 138kV CKT 1 Gill – Viola 138kV CKT 1 Viola 345/138kV Transformer #1 Viola 345/138kV Transformer #2 Ranch Road – Sooner 345kV CKT 1 Terminal Upgrades	0 MW
2	Scenario 1 + GEN-2016-128 dispatched at 176 MW	0 MW
3	Scenario 2 + GEN-2016-162 dispatched at 252 MW GEN-2016-163 dispatched at 252 MW	0 MW
4	Scenario 3 + GEN-2016-119 dispatched at 200 MW	0 MW

5	Scenario 4 + GEN-2016-119 dispatched at 600 MW GEN-2016-100/101 Tap-Arcadia 345kV	0 MW
6*	Scenario 5 + Reduced dispatch of JEC	134 MW

These values reflect the gross generating facility capacity prior to losses associated with the interconnection facilities. It was determined that the dispatch of the Jeffrey Energy Center ("JEC") Unit 2 and Unit 3 have an impact on GEN-2016-153's LOIS amount when the Arcadia substation expansion and Wolf Creek to Blackberry 345 kV line are in-service. When JEC is dispatched at full output, a thermal constraint exists on the Hoyt to JEC 345 kV line and therefore, GEN-2016-153 is limited to 0 MW. When JEC Unit 2 and Unit 3 are at a reduced output, GEN-2016-153 is able to have full interconnection service (134 MW). The following seasons require reduced dispatch of JEC Unit 2 and Unit 3:

- 2020 Summer Peak: 1,370 MW gross (87% of nameplate)
- 2024 Summer Peak: 1,419 MW gross (90% of nameplate)
- 2029 Summer Peak: 1,554 MW gross (99% of nameplate)

SUMMARY OF STABILITY ANALYSIS

The Stability Analysis was performed with the NERC MOD-026 and MOD-027 model validation updates implemented for the Wolf Creek Nuclear Facility ("Wolf Creek") and determined several NERC Category P6 events that included a prior outage of a transmission line out of Wolf Creek 345kV followed by a fault on a circuit connected to either Waverly or Wolf Creek 345kV substations resulted in undamped rotor angle oscillations, voltages below the acceptable recovery voltage, voltage collapse, and generation instability when GEN-2016-153 was connected at 100% output. It is worth noting that this instability is a pre-existing system condition and therefore cannot be directly attributed to connection of GEN-2016-153 to its point of interconnection ("POI").

The following transmission upgrade options were observed to mitigate the system instability observed for all contingencies:

- Wolf Creek to Blackberry 345kV circuit (previously and current assigned mitigation in DISIS-2016-001-5)

This analysis identified the potential requirement of generation curtailment at Wolf Creek to maintain system stability for certain prior outage conditions including:

- Prior outage of Wolf Creek to Waverly 345kV circuit #1
- Prior outage of Wolf Creek to Benton 345 kV circuit #1

- Prior outage of Wolf Creek to Rose Hill 345 kV circuit #1
- Prior outage of Waverly to LaCygne 345kV circuit #1
- Prior outage of Wolf Creek to Blackberry 345kV circuit #1

System instability is observed with Wolf Creek dispatched at full output and prior to GEN-2016-153's in-service date for the above prior outage conditions followed by a fault at Wolf Creek 345 kV or Waverly 345 kV. System stability is maintained for the prior outage events above when the Wolf Creek output does not exceed 900 MW gross output with or without GEN-2016-153 in-service.

It should be noted that while this Limited Operation study analyzed many of the most probable contingencies, it is not an all-inclusive list that can account for every operation situation. Additionally, the study requests may not be able to inject any power onto the Transmission System due to constraints that fall below the threshold of mitigation for a Generator Interconnection request. Because of this, it is likely that the Customers may be required to reduce their generation output to 0 MW under certain system conditions to allow system operators to maintain the reliability of the transmission network.

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SECTION 1: OBJECTIVES

The objective of this report is to provide Southern Power Pool (SPP) with the deliverables for the "Limited Operation Impact Study (LOIS) for GEN-2016-153 (Flat Ridge Wind 4)." SPP requested a Limited Operation Impact Study for one (1) generation interconnection request which requires a power flow analysis, stability analysis, short-circuit analysis, and reactive capability analysis with results in an Impact Study Report

SECTION 2: BACKGROUND

The Siemens Power Technologies International PSS/E power system simulation program Version 33.12.2 was used for this study. The DISIS-2017-001 power flow and stability cases under normal dispatch conditions were provided by SPP and updated accordingly to represent study conditions at the time of GEN-2016-153's in-service date ("ISD"). The power flow cases include the Group 08 ERIS study models. Refer to the DISIS power flow report accompanying this report for details of changes made to the cases provided. The stability models provided included the 2019 Winter Peak, 2021 Summer Peak, 2028 Summer Peak, and 2021 Light Load cases. The study request listed in Table 2-1 was included in the analysis. Table 2-2 lists each of the five scenarios studied in this analysis and indicates the status of the Group 08 queued projects. The study cases were updated to reflect these study assumptions for each of the five scenarios. The study requests with estimated ISD after GEN-2016-153 or that have been withdrawn are shown in Table 2-3 and were removed from the study models to reflect current system configurations. Refer to Section 3.1 for the changes made to the base cases to reflect the removal of previously assigned Network Upgrades and study requests. Refer to Table 2-4 for a list of previously queued projects included in the analysis.

A power flow one-line diagram for GEN-2016-153 is shown in Figure 2-1 and represents 2028 Summer Peak conditions.

The Stability Analysis determined the impacts of the new interconnecting project on the stability and voltage recovery of the nearby system and the ability of the interconnecting projects to meet FERC Order 661A. If problems with stability or voltage recovery are identified, the need for reactive compensation or system upgrades were investigated. Three-phase faults and single line-to-ground faults were examined prior to any mitigation or curtailment implemented. With exception of transformers and prior outage faults, the typical sequence of events for a three-phase fault is as follows (refer to Section 4 for a list and description of fault events analyzed):

- Apply fault at particular station
- Continue fault for five (5) cycles, clear the fault by tripping the faulted facility
- After an additional twenty (20) cycles, re-close the previous facility back into the fault

- Continue fault for five (5) additional cycles
- Trip the faulted facility and remove the fault

Refer to Appendix A for the steady-state and dynamic model data for the study project.

Table 2-1: Current Study Project Interconnection Data

Request	Size (MW)	Estimated COD	Point of Interconnection
GEN-2016-153	134	11/01/2023	Viola 345kV Substation

Table 2-2: Group 8 Queued Interconnection Projects Included in Stability Analysis

Request	Size (MW)	Estimate COD	Point of Interconnection	S1	S2	S3	S4	S5
GEN-2016-022	151.8	11/01/2022	Rose Hill (Open Sky)-Sooner (Ranch Road) 345kV	Yes	Yes	Yes	Yes	Yes
GEN-2016-031	1.5	05/29/2018	Rose Hill (Open Sky)-Sooner (Ranch Road) 345kV	Yes	Yes	Yes	Yes	Yes
GEN-2016-032	200.0	12/31/2023	Crescent Substation 138 kV	Yes	Yes	Yes	Yes	Yes
GEN-2016-061	250.7	11/21/2020	Sooner-Woodring 345 kV line	Yes	Yes	Yes	Yes	Yes
GEN-2016-068	250	12/15/2020	Woodring 345kV	Yes	Yes	Yes	Yes	Yes
GEN-2016-071	200.1	11/30/2021	Middleton Tap 138kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-073	220.0	10/30/2022	Thistle-Wichita Dbl Ckt (Buffalo Flats) 345kV	Yes	Yes	Yes	Yes	Yes
GEN-2016-119	600	12/31/2025	Spring Creek-Sooner 345kV	No	No	No	Yes (200 MW)	Yes
GEN-2016-128	176	12/31/2023	Woodring 345kV	No	Yes	Yes	Yes	Yes
GEN-2016-133	187.5	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes

GEN-2016-134	187.5	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-137	187.5	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-138	187.5	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-139	100.0	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-141	350.0	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-142	350.0	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-145	175.0	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-146	175.0	10/01/2020	Riverside 345kV Substation	Yes	Yes	Yes	Yes	Yes
GEN-2016-162	252	07/01/2024	Benton 345 kV Substation	No	No	Yes	Yes	Yes
GEN-2016-163	252	07/01/2024	Benton 345 kV Substation	No	No	Yes	Yes	Yes

Table 2-3: Interconnection Projects Not Included in the Stability Analysis

Request	Size (MW)	COD	Point of Interconnection
GEN-2016-024	55.9	Withdrawn (queued to DISIS-2017-001)	Midian 138kV Substation
GEN-2016-048	82.3	Withdrawn (queued to DISIS-2017-001)	Sooner 138 kV
GEN-2016-072	300	Withdrawn (queued to DISIS-2017-001)	Renfrow 345kV
GEN-2016-100	100	Withdrawn	Spring Creek-Sooner 345kV

GEN-2016-101	195	Withdrawn	Spring Creek-Sooner 345kV
GEN-2016-127	200.1	Withdrawn (queued to DISIS-2017-001)	Shidler 138 kV Substation
GEN-2016-135	100	Withdrawn	Riverside 345kV Substation
GEN-2016-136	75	Withdrawn	Riverside 345kV Substation
GEN-2016-140	75	Withdrawn	Riverside 345kV Substation
GEN-2016-143	175	Withdrawn	Riverside 345kV Substation
GEN-2016-144	175	Withdrawn	Riverside 345kV Substation
GEN-2016-173	252	Withdrawn (queued to DISIS-2017-001)	Creswell 69 kV Substation

Table 2-4: Previously Queued Nearby Interconnection Projects Included

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2002-004	153.0	GE.1.5MW	Latham 345kV (532800)
GEN-2005-013	199.8	Vestas V90 VCSS 1.8MW	Caney River 345kV (532780)
GEN-2007-025/GEN-2010-005	598.4	GE 1.6MW & Vestas V110 2.0MW	Viola 345kV (532798)
GEN-2008-013	300	GE 1.68/2.4MW	Hunter 345kV (515476)
GEN-2008-021	42 uprate 1261 Summer 1283 Winter	GENROU	Wolf Creek 345kV (532797)
GEN-2008-098/ GEN-2010-003	199	Gamesa G114 2.0/2.1MW	Waverly 345kV (532799)

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2009-025	59.8	Siemens 93m 2.3MW	Nardins 69kV (515528)
ASGI-2010-006 (AECI request GIA-27)	150	GE 1.5MW	Remington 138kV (301369)
GEN-2010-055	4.8	Caterpiller 1.6MW	Wekiwa 138kV (509757)
GEN-2011-057	150	Vestas V110 2.0MW	Creswell 138kV (532981)
GEN-2012-032	299	Siemens 108m 2.3MW	Open Sky 345kV (515621)
GEN-2012-033/GEN-2015-062	102.56	GE 1.79/1.8MW	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV (514815)
GEN-2012-041	121.5 Winter 85.3 Summer	Thermal	Ranch Road 345kV (515576)
GEN-2013-012	137 uprate 1420	GENROU	Redbud 345kV (514909)
GEN-2013-028	559.5	Gas CT (CC) 360MW, Steam (CC) 199.5MW	Tap on Tulsa N to GRDA1 345kV (512865)
GEN-2013-029	299	Siemens 108m VS 2.3MW	Renfrow 345kV(515543)
GEN-2014-001	199.5	Gamesa 2.1MW	Tap Wichita to Emporia Energy Center 345kV (562476)
GEN-2014-028	35 uprate 259 Winter 256 Summer	Thermal – CT 142MW, Thermal – ST 17MW	Riverton 161kV (547469)
GEN-2014-064	248.4	GE 107m 2.3MW	Otter 138kV (514708)
ASGI-2014-014	56.4 Winter 54.3 Summer	Wartsila 18V50SG 18.8MW	Ferguson 69kV (512664)

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2015-001/GEN-2016-031	201.3	Vestas V126 GridStreamer 3.3MW	Ranch Road 345kV (515576)
GEN-2015-015	154.6	Siemens 108m 2.415MW	Tap Medford Tap – Coyote 138kV (560031)
GEN-2015-016	200	Vestas V110 2.0MW	Tap Marmaton - Centerville 161kV (560029)
GEN-2015-024	217.8	GE 116m 1.8MW	Tap Thistle - Wichita 345kV Dbl CKT (560033)
GEN-2015-025	215.95	GE 1.79/1.8MW	Tap Thistle - Wichita 345kV Dbl CKT (560033)
ASGI-2015-004	54.300 Summer 56.364 Winter	Wartsila 18V50SG 18.788MW	Coffeyville Municipal Light & Power Northern Industrial Park Substation 69kV (512735)
GEN-2015-034	200	Vestas V136 GridStreamer 3.45MW	Ranch Road 345kV (515576)
GEN-2015-047	297.8	GE 2.3/2.5MW	Sooner 345kV (514803)
GEN-2015-052	300	Vestas V110 VCSS 2.0MW	Tap on Opensky (515621) to RoseHill (532794) 345kV (560053)
GEN-2015-063	299.25	Acciona 125m 3.15MW	Tap on Woodring (514715) to Matthewson (515497) 345kV (560055)
GEN-2015-066	248.4	GE 2.3MW	Tap on Cleveland (512694) to Sooner (514803) 345 kV (560056)
GEN-2015-069	300	Vestas V110 VCSS 2.0MW	Union Ridge 230kV (532874)
GEN-2015-073	200.1	Vestas V126 GridStreamer 3.45MW	Emporia Energy Center 345kV (532768)

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2015-090	220	G.E. 2.0MW	Wichita (532796)-Thistle (539801) 345kV Tap (GEN-2015-024 (560033) 345kV)
GEN-2016-009	29	Allen Bradley 14.5MW	Osage 69kV (514742)
GEN-2016-022	151.8	Vestas V126 GridStreamer 3.45MW	Ranch Road 345kV (515576)
GEN-2016-032	200	Vestas V110 VCSS 2.0MW	Tap Marshall (514733)- Cottonwood Creek (514827) 138kV, (G16-032-TAP, 560077)
GEN-2016-061	250.7	GE 2.3MW	Tap Woodring (514715) – Sooner (514803) 345kV (G16-061-TAP, 560084)
GEN-2016-068	250	GE 2.0MW	Woodring 345kV (514715)
GEN-2016-071	200.1	GE 2.3MW	Chilocco 138kV (521198)
GEN-2016-073	220	GE 2.0MW	Tap on Thistle (539801) to Wichita (532796) 345kV, ckt1&2 (Buffalo Flats 345kV; 560033)

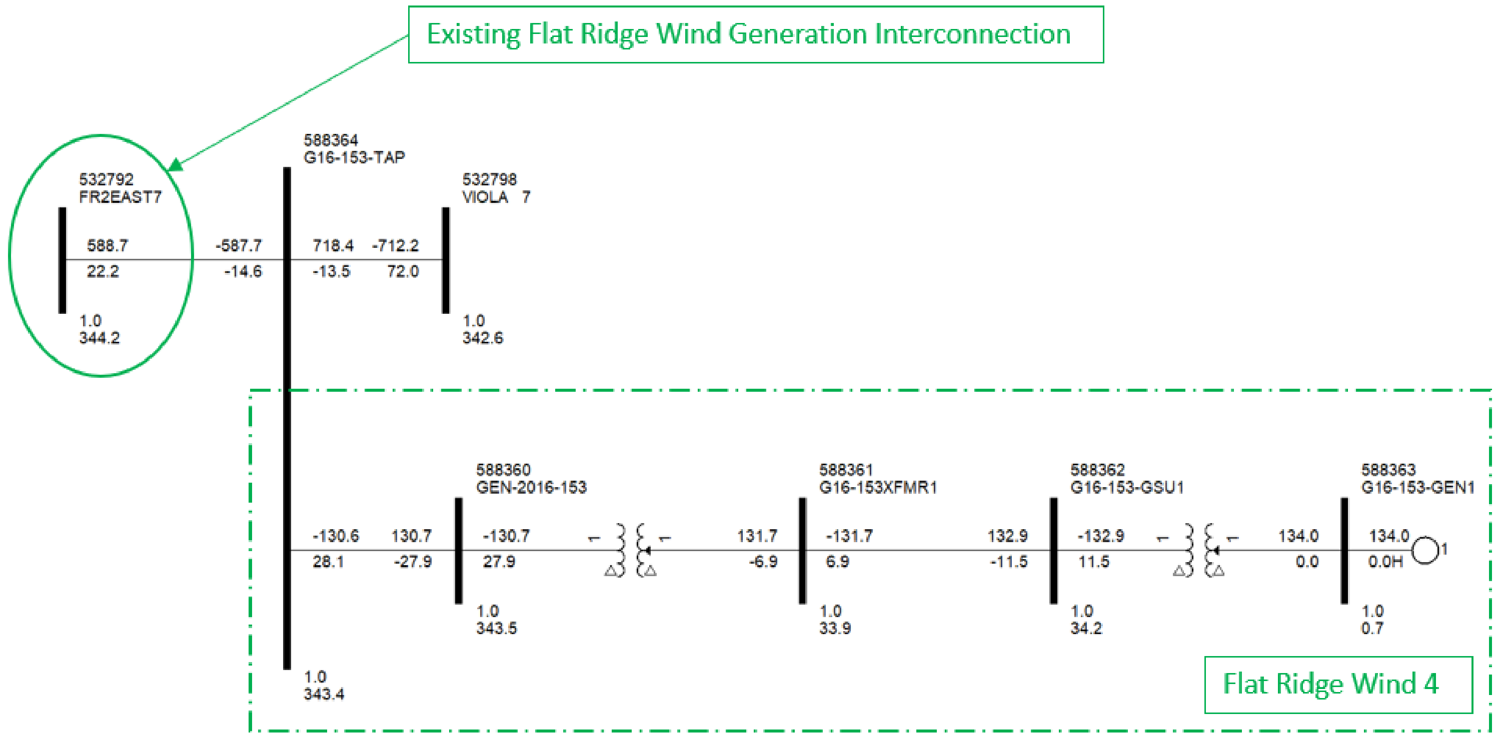

Figure 2-1. One-line diagram for interconnection project at Viola 345 kV POI (GEN-2016-153) for 2028 Summer Peak Conditions.

SECTION 3: POWER FLOW ANALYSIS

The objective of the power flow analysis was to determine the impacts of the generator interconnection on the steady-state thermal and voltage constraints on the SPP transmission system. The analysis evaluated if GEN-2016-153 can interconnect 134 MW of wind generation with Energy Resource Interconnection Service (ERIS).

3.1 Approach

MEPPI utilized the seven (7) following Before Transfer ("BC") DISIS-2017-001-1 Group 08 power flow cases for this analysis:

- Steady-State Analysis
    - 2019 Winter Peak
    - 2020 Spring
    - 2020 Summer Peak
    - 2024 Light Load
    - 2024 Summer Peak
    - 2024 Winter Peak
    - 2029 Summer Peak

The power flow cases were dispatched in accordance with DISIS Manual, Table 1: Generation Dispatch in the Power Flow Models, and Business Practices 7250 to develop the ERIS cases. Seven (7) BC cases were created by including the study request but dispatched at 0 MW for ER. Seven (7) Transfer cases ("TC") were created by including the study request and dispatched at full output for ER. Refer to the power flow report attachment for the status of other equally queued requests, previously assigned upgrades, and higher queued requests.

3.2 Steady-State Thermal and Voltage Analysis Results

The power flow analysis observed system constraints with identified Limited Operation capacity for GEN-2016-153 as shown in Table 3-1.

- Scenario 1: Includes the Clearwater – Viola 138kV CKT 1, Gill – Viola 138kV CKT 1, Viola 345/138kV Transformer #1, Viola 345/138kV Transformer #2, and Ranch Road – Sooner 345kV CKT 1 Terminal Upgrades.
- Scenario 2: Includes Scenario 1 topology plus GEN-2016-128 dispatched at 176 MW.
- Scenario 3: Includes Scenario 2 plus GEN-2016-162 dispatched at 252 MW, and GEN-2016-163 dispatched at 252 MW.
- Scenario 4: Includes Scenario 3 plus GEN-2016-119 dispatched at 200 MW.
- Scenario 5: Includes Scenario 4 plus GEN-2016-119 dispatched at 600 MW, GEN-2016-100/101 Tap-Arcadia 345kV.

The generation dispatch values in Table 3-1 reflect the gross generating facility capacity prior to losses associated with the interconnection facilities. The full power flow report can be found as an attachment to this document.

Table 3-1: Summary of Power Flow Analysis

Scenario	Scenario Description	LOIS (MW)
		GEN-2016-153
1	Clearwater – Viola 138kV CKT 1 Gill – Viola 138kV CKT 1 Viola 345/138kV Transformer #1 Viola 345/138kV Transformer #2 Ranch Road – Sooner 345kV CKT 1 Terminal Upgrades	0 MW
2	Scenario 1 + GEN-2016-128 dispatched at 176 MW	0 MW
3	Scenario 2 + GEN-2016-162 dispatched at 252 MW GEN-2016-163 dispatched at 252 MW	0 MW
4	Scenario 3 + GEN-2016-119 dispatched at 200 MW	0 MW
5	Scenario 4 + GEN-2016-119 dispatched at 600 MW GEN-2016-100/101 Tap-Arcadia 345kV	0 MW
6*	Scenario 5 + Reduced dispatch of JEC	134 MW

These values reflect the gross generating facility capacity prior to losses associated with the interconnection facilities. It was determined that the dispatch of the Jeffrey Energy Center (“JEC”) Unit 2 and Unit 3 have an impact on GEN-2016-153’s LOIS amount when the Arcadia substation expansion and Wolf Creek to Blackberry 345 kV line are in-service. When JEC is dispatched at full output, a thermal constraint exists on the Hoyt to JEC 345 kV line and therefore, GEN-2016-153 is limited to 0 MW. When JEC Unit 2 and Unit 3 are at a reduced output, GEN-2016-153 is able to have full interconnection service (134 MW). The following seasons require reduced dispatch of JEC Unit 2 and Unit 3:

- 2020 Summer Peak: 1,370 MW gross (87% of nameplate)
- 2024 Summer Peak: 1,419 MW gross (90% of nameplate)
- 2029 Summer Peak: 1,554 MW gross (99% of nameplate)

SECTION 4: STABILITY ANALYSIS

The objective of the stability analysis was to determine the impacts of GEN-2016-153 generator interconnection study request on the stability and voltage recovery on the SPP transmission system. If problems with stability or voltage recovery were identified, limited operation amounts were investigated for GEN-2016-153.

4.1 Approach

MEPPI utilized the following four (4) DISIS-2017-001 power flow dynamic databases:

- MDWG18-19W_DIS1701_G08
- MDWG18-21S_DIS1701_G08
- MDWG18-28S_DIS1701_G08
- MDWG18-21L_DIS1701_G08

Each case was examined prior to the stability analysis to ensure the case contained the proposed study project and equally queued projects listed in Tables 2-1 and 2-2 respectively. The study cases were updated by removing study requests queued to DISIS-2017-001 and were uniformly offset to maintain generation and load balance by thermal generation in the SPP footprint. The analysis did not include Network Upgrades that were expected to be in-service after the Commercial Operation Date of GEN-2016-153 except for the Viola 345/138kV transformer #2. The following Network Upgrades were not included in the analysis:

- Arcadia Substation expansion
- Wolf Creek to Blackberry 345kV circuit #1
- GEN-2016-133_146 – Sapulpa Road circuit #1

Each case was examined prior to the Stability Analysis to ensure the case contained Flat Ridge Wind 4 and any equally queued projects and previously queued projects listed in Tables 2-2 and 2-4, respectively. There was no suspect power flow data in the study area. The dynamic datasets were also verified and stable initial system conditions (i.e., “flat lines”) were achieved. Three-phase and single phase-to-ground faults listed in Table 4-1 were examined. The SCMU function internal to PSS/E was utilized to apply single phase-to-ground faults.

Table 4-1: Fault List with Contingency Description

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on the Midian (532990) to Butler (532987) 138kV line, near Midian. a. Apply fault at the Midian 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.
2	FLT02-3PH	3 phase fault on the Midian (532990) to Benton (532986) 138kV line, near Midian. a. Apply fault at the Midian 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.
3	FLT03-3PH	3 phase fault on the Midian 138/69/13.2kV (532990/533597/533082) transformer, near Midian. a. Apply fault at the Midian 138kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
4	FLT04-3PH	3 phase fault on the Benton (532986) to Chisholm (533035) 138kV line, near Benton. a. Apply fault at the Benton 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.
5	FLT05-3PH	3 phase fault on the Benton (532986) to 29th (533024) 138kV line, near Benton. a. Apply fault at the Benton 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.
6	FLT06-3PH	3 phase fault on the Benton (532986) to Belaire (532988) 138kV line, near Benton. a. Apply fault at the Benton 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.
7	FLT07-3PH	3 phase fault on the Benton 345/138/13.8kV (532791/532986/532822) transformer, near Benton. a. Apply fault at the Benton 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
8	FLT08-3PH	3 phase fault on the Butler (532987) to Altoona (533001) 138kV line, near Butler. a. Apply fault at the Butler 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.
9	FLT09-3PH	3 phase fault on the Butler (532987) to Butler (532989) 138kV line, near Butler. a. Apply fault at the Butler 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.
10	FLT10-3PH	3 phase fault on the Butler 138/69kV (532987/533583) transformer, near Butler. a. Apply fault at the Butler 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
11	FLT11-PO	**Prior outage of the Midian (532990) – Butler (532987) 138kV line** 3 phase fault on the Midian (532990) – Benton (532986) 138kV line, near Midian. a. Apply fault at the Midian 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.
12	FLT12-PO	**Prior outage of the Midian (532990) – Butler (532987) 138kV line** 3 phase fault on the Midian 138/69/13.2kV (532990/533597/533082) transformer, near Midian. a. Apply fault at the Midian 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
13	FLT13-PO	**Prior outage of the Midian (532990) – Benton (532986) 138kV line** 3 phase fault on the Midian 138/69/13.2kV (532990/533597/533082) transformer, near Midian. a. Apply fault at the Midian 138kV bus. b. Clear fault after 5 cycles by tripping the faulted line.

Cont. No.	Cont. Name	Description
14	FLT14-PO	**Prior outage of the Midian (532990) –Butler Tap (532989) 138kV line** 3 phase fault on the Midian (532990) – Benton (532986) 138kV line, near Midian. a. Apply fault at the Midian 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.
15	FLT15-SB	**Stuck Breaker on Midian – Benton 138kV circuit 1 line** a. Apply single-phase fault at Midian (532990) on the 138kV bus. b. After 16 cycles, trip the Midian – Benton (532986) 138kV circuit 1 line c. Trip the Midian – Butler (532987) 138kV circuit 1 line, and remove the fault
16	FLT16-SB	**Stuck Breaker on Midian – Benton 138kV circuit 1 line** a. Apply single-phase fault at Midian (532990) on the 138kV bus. b. After 16 cycles, trip the Midian – Benton (532986) 138kV circuit 1 line c. Trip the Midian 138/69/13.2kV (532990/533597/533082) transformer, and remove the fault
17	FLT17-SB	**Stuck Breaker on Midian – Butler 138kV circuit 1 line** a. Apply single-phase fault at Midian (532990) on the 138kV bus. b. After 16 cycles, trip the Midian – Butler (532987) 138kV circuit 1 line c. Trip the Midian 138/69/13.2kV (532990/533597/533082) transformer, and remove the fault
18	FLT18-SB	**Stuck Breaker on Butler (532987) – Butler Tap (532989) 138kV circuit 1 line** a. Apply fault at Butler (532987) on the 138kV bus. b. After 16 cycles, trip the Butler – Altoona 138 kV circuit 1 line c. Trip the Butler (532987) – Butler Tap (532989) 138kV circuit 1 line, and remove the fault
19	FLT19-SB	**Stuck Breaker on Midian 138/69/13.2kV (532990/533597/533082) transformer** a. Apply single-phase fault at Midian (532990) on the 138kV bus. b. After 16 cycles, trip the Midian 138/69/13.2kV (532990/533597/533082) transformer c. Trip the Midian – Butler (532987) 138kV circuit 1 line, and remove the fault
20	FLT20-SB	**Stuck Breaker on Midian 138/69/13.2kV (532990/533597/533082) transformer** a. Apply single-phase fault at Midian (532990) on the 138kV bus. b. After 16 cycles, trip the Midian 138/69/13.2kV (532990/533597/533082) transformer c. Trip the Midian – Benton (532986) 138kV circuit 1 line, and remove the fault
21	FLT21-3PH	3 phase fault on the Hunters (515476) to Renfro (515543) 345kV line, near Renfrow. a. Apply fault at the Renfro 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.
22	FLT22-3PH	3 phase fault on the Chisholm (515477) 345kV to Hunters (515476) 345kV line, near Hunters. 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.
23	FLT23-3PH	3 phase fault on the Renfrow (515543) to Viola (532798) 345kV line, near Renfro. a. Apply fault at the Renfro 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.
24	FLT24-3PH	3 phase fault on the Renfrow (515543) 345/(515544) 138/(515545) 13.8kV transformer, near Renfrow 345. a. Apply fault at the Renfrow 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
25	FLT25-3PH	3 phase fault on the Renfrow (515544) to MDFRDTP4 (515569) 345kV circuit 1 line, 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.
26	FLT26-3PH	3 phase fault on the Hunters (515476) to Woodring (514715) 345kV circuit 1 line, near Hunters. 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.

Cont. No.	Cont. Name	Description
27	FLT27-3PH	3 phase fault on the Renfrow (515544) to Renfrow (520409) 345kV circuit 1 line, near Hunters. 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.
28	FLT28-PO	**Prior outage on the Renfrow (515543) 345/ (515544) 138/ (515545) 13.8kV transformer** 3 phase fault on the Renfrow (515543) to Viola (532798) 345kV line, 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.
29	FLT29-PO	**Prior outage of the G16-072-Tap (560086) – Hunters (515476) 345kV line** 3 phase fault on the Renfrow (515543) – Viola (532798) 345kV line, 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.
30	FLT30-PO	**Prior outage on the Renfrow (515543) 345/ (515544) 138/ (515545) 13.8kV transformer** 3 phase fault on the Renfrow (515543) to Hunters (515476) 345kV line, 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.
31	FLT31-PO	**Prior outage on the Renfrow (515543) 345/ (515544) 138/ (515545) 13.8kV transformer** 3 phase fault on the Renfrow (515544) to MDFRDTPH (515569) 345kV line, 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.
32	FLT32-PO	**Prior outage of the Hunters (515476) – Woodring (514715) 345kV line** 3 phase fault on the Renfrow (515544) to MDFRDTPH (515569) 345kV line, 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.
33	FLT33-PO	**Prior outage of the Renfrow (515543) – Viola (532798) 345kV line** 3 phase fault on the Hunters (515476) – Renfrow (515543) 345kV line, near Hunters. 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.
34	FLT34-SB	**Stuck Breaker on Renfrow– Hunters 345kV circuit 1 line** a. Apply single-phase fault at Renfrow (515543) on the 345kV bus. b. After 16 cycles, trip the Renfrow (515543) 345/(515544) 138/(515545) 13.8kV transformer c. Trip the Renfrow – Hunters (515476) 345 kV circuit 1 line, and remove the fault
35	FLT35-SB	**Stuck Breaker on Renfrow – Viola 345kV circuit 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 – Viola (532798) 345 kV circuit 1 line, and remove the fault
36	FLT36-SB	**Stuck Breaker on Renfrow – Hunters 345kV circuit 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 circuit 1 line, and remove the fault c. Trip the Renfrow – Hunters (515476) 345kV circuit 1 line, and remove the fault
37	FLT79-3PH	3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
38	FLT80-3PH	3 phase fault on the Woodring (514715) to Redington (515875) 345kV line, 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.

Cont. No.	Cont. Name	Description
39	FLT81-3PH	3 phase fault on the Woodring (514715) to G16-061-Tap (560084) 345kV line, 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.
40	FLT84-3PH	3 phase fault on the Woodring (514714) to Otter (514708) 345kV line, 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.
41	FLT85-PO	**Prior outage of the Woodring (514715) – Redington (515875) 345kV line** 3 phase fault on the Woodring 345/138/13.8kV (514715/514714/515770) transformer, near Woodring. a. Apply fault at the Woodring 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
42	FLT86-PO	**Prior outage of the Woodring (514715) – Hunters (514476) 345kV line** 3 phase fault on the Woodring (514715) to Redington (515875) 345kV line, 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.
43	FLT87-PO	**Prior outage of the Woodring (514715) – Hunters (514476) 345kV line** 3 phase fault on the G16-061-Tap (560084) to Sooner (514803) 345kV line, 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.
44	FLT88-PO	**Prior outage of the Woodring 345/138/13.8kV (514715/514714/515770) transformer** 3 phase fault on the Woodring (514715) to Redington (515875) 345kV line, 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.
45	FLT89-PO	**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, 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.
46	FLT90-SB	**Stuck Breaker on Woodring – Hunters 345kV circuit 1 line** a. Apply single-phase fault at Woodring (514715) on the 345kV bus. b. After 16 cycles, trip the Woodring – Hunters (515476) 345kV circuit 1 line c. Trip the Woodring – Redington (515875) 345kV circuit 1 line, and remove the fault
47	FLT92-SB	**Stuck Breaker on Woodring – Hunters 345kV circuit 1 line** a. Apply single-phase fault at Woodring (514715) on the 345kV bus. b. After 16 cycles, trip the Woodring – Hunters (515476) 345kV circuit 1 line c. Trip the Woodring 345/138/13.8kV (514715/514714/515770) transformer, and remove the fault
48	FLT93-SB	**Stuck Breaker on Woodring – Redington 345kV circuit 1 line** a. Apply single-phase fault at Woodring (514715) on the 345kV bus. b. After 16 cycles, trip the Woodring – Redington (515875) 345kV circuit 1 line c. Trip the Woodring 345/138/13.8kV (514715/514714/515770) transformer, and remove the fault
49	FLT94-SB	**Stuck Breaker on Woodring – Redington 345kV circuit 1 line** a. Apply single-phase fault at Woodring (514715) on the 345kV bus. b. After 16 cycles, trip the Woodring – Redington (515875) 345kV circuit 1 line c. Trip the Woodring – G16-061-Tap (560084) 345kV circuit 1 line, and remove the fault
50	FLT125-3PH	3 phase fault on the Buffalo Flats (532782) to Thistle (539801) 345kV circuit 1 line, near Buffalo Flats. a. Apply fault at the Buffalo Flats 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.

Cont. No.	Cont. Name	Description
51	FLT126-3PH	3 phase fault on the Buffalo Flats (532782) to Thistle (539801) 345kV circuit 2 line, near Buffalo Flats. a. Apply fault at the Buffalo Flats 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.
52	FLT127-3PH	3 phase fault on the Thistle 345/138/13.8kV (539801/539802/539804) transformer a. Apply fault at the Thistle 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line and remove fault.
53	FLT128-3PH	3 phase fault on the Wichita 345/138/13.8kV (532796/532829/533040) transformer a. Apply fault at the Wichita 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line and remove fault.
54	FLT129-3PH	3 phase fault on the Thistle (539801) to Woodward (535375) 345kV circuit 1 line, near Thistle. a. Apply fault at the Thistle 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.
55	FLT130-3PH	3 phase fault on the Viola (532798) to Wichita (532796) 345kV circuit 1 line, 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.
56	FLT131-3PH	3 phase fault on the Thistle (539801) to Woodward (535375) 345kV circuit 2 line, near Viola. a. Apply fault at the Thistle 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.
57	FLT132-3PH	3 phase fault on the Wichita (532796) to Benton (532791) 345kV circuit 1 line, near Wichita. a. Apply fault at the Wichita 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.
58	FLT133-3PH	3 phase fault on the Wichita (532796) to Reno (532771) 345kV circuit 1 line, near Wichita. a. Apply fault at the Wichita 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.
59	FLT134-3PH	3 phase fault on the Wichita (532796) to Buffalo Flats (532782) 345kV circuit 1 line, near Wichita. a. Apply fault at the Wichita 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.
60	FLT135-PO	**Prior outage of the Buffalo Flats (532782) to Thistle (539801) 345kV line** 3 phase fault on the Thistle (539801) to Woodward (535375) 345kV line, near Thistle. a. Apply fault at the Thistle 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.
61	FLT136-PO	**Prior outage of the Benton (532791) to Wichita (532796) 345kV line** 3 phase fault on the Wichita (532796) to Viola (532798) 345kV line, near Wichita. a. Apply fault at the Wichita 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.
62	FLT137-PO	**Prior outage of the Buffalo Flats (532782) to Thistle (539801) 345kV line 1** 3 phase fault on the Buffalo Flats (532792) to Thistle (539801) 345kV line 2, near Buffalo Flats. a. Apply fault at the Buffalo Flats 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.

Cont. No.	Cont. Name	Description
63	FLT138-PO	**Prior outage of the Buffalo Flats (532782) to Wichita (532796) 345kV line 1** 3 phase fault on the Buffalo Flats (532792) to Wichita (532796) 345kV line 2, near Buffalo Flats. a. Apply fault at the Buffalo Flats 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.
64	FLT139-SB	**Stuck Breaker on Wichita (532796) to Benton (532791) circuit 1 line** a. Apply single-phase fault at Wichita on the 345kV bus. b. After 16 cycles, trip the Wichita – Reno (532771) 345kV circuit 1 line c. Trip the Wichita – Benton 345kV circuit 1 line, and remove the fault.
65	FLT140-SB	**Stuck Breaker on Wichita (532796) – Reno (532771) 345kV circuit 1 line** a. Apply single-phase fault at Wichita (532791) on the 345kV bus. b. After 16 cycles, trip the Wichita – Buffalo Flats (532782) 345kV circuit 1 line c. Trip the Wichita – Reno 345kV circuit 1 line, and remove the fault.
66	FLT141-SB	**Stuck Breaker on Wichita (532796) – Reno (532771) circuit 1 line** a. Apply single-phase fault at Wichita (532791) on the 345kV bus. b. After 16 cycles, trip the Wichita – Buffalo Flats (532782) 345kV circuit 2 line c. Trip the Wichita – Reno 345kV circuit 1 line, and remove the fault.
67	FLT142-SB	**Stuck Breaker on Wichita – Viola 345kV circuit 1 line** a. Apply single-phase fault at Wichita (532796) on the 345kV bus. b. After 16 cycles, trip the Wichita (532796) – Buffalo Flats (532798) 345kV circuit 1 line c. Trip the Wichita – Viola (532798) 345kV circuit 1 line, and remove the fault.
68	FLT143-SB	**Stuck Breaker on to Thistle (539801) – Woodward (535375) circuit 1 line** a. Apply single-phase fault at Thistle on the 345kV bus. b. After 16 cycles, trip the Thistle – Buffalo Flats (532782) 345kV circuit 1 line c. Trip the Thistle – Woodward 345 kV line, and remove the fault.
69	FLT144-SB	**Stuck Breaker on Thistle (539801) – Buffalo Flats (532782) 345kV circuit 1 line** a. Apply single-phase fault at Thistle on the 345kV bus. b. After 16 cycles, trip the Thistle – Buffalo Flats (532782) 345kV circuit 2 line c. Trip the Thistle – Buffalo Flats (532782) 345kV circuit 1 line, and remove the fault.
70	FLT145-3PH	3 phase fault on the Benton (532791) to Rose Hill (532794) 345kV circuit 1 line, near Benton. a. Apply fault at the Benton 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.
71	FLT146-3PH	3 phase fault on the Rose Hill (532794) to Lathams (532800) 345kV circuit 1 line, near Rose Hill. a. Apply fault at the Rose Hill 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.
72	FLT147-3PH	3 phase fault on the Benton (532791) to Wolf Creek (532797) 345kV circuit 1 line, near Benton. a. Apply fault at the Benton 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
73	FLT148-3PH	3 phase fault on the Rose Hill 345/138/13.8kV (532794/533062/532826) transformer a. Apply fault at the Benton 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
74	FLT149-3PH	3 phase fault on the Benton 345/138/13.8kV (532791/532986/532821) transformer a. Apply fault at the Benton 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
75	FLT150-3PH	3 phase fault on the Rose Hill (532794) to Wolf Creek (532797) 345kV circuit 1 line, near Rose Hill. a. Apply fault at the Rose Hill 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
76	FLT151-3PH	3 phase fault on the Wolf Creek (532797) to Waverly (532799) 345kV circuit 1 line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line and remove fault.

Cont. No.	Cont. Name	Description
77	FLT152-3PH	3 phase fault on the Wolf Creek 345/69/17 (532797/532962/533653) transformer. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
78	FLT153-3PH	3 phase fault on the Rosehill 345/138/13.8 kV (532794/533062/532831) transformer. a. Apply fault at the Rosehill 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
79	FLT154-PO	**Prior outage of the Benton to Rosehill (532794) 345kV line** 3 phase fault on the Benton (532791) to Wichita (532796) 345kV line, near Benton. a. Apply fault at the Benton 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.
80	FLT155-PO	**Prior outage of the Wolf Creek (532797) to Benton (532791) 345kV line** 3 phase fault on the Benton (532791) to Rosehill (532794) 345kV line, near Benton. a. Apply fault at the Benton 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
81	FLT156-PO	**Prior outage of the Benton to Rosehill (532794) 345kV line** 3 phase fault on the Benton 345/138/13.8kV (532791/532986/532822) transformer a. Apply fault at the Benton 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
82	FLT157-PO	**Prior outage of the Benton 345/138/13.8kV (532791/532986/532821) transformer** 3 phase fault on the Benton (532791) to Wolf Creek (532797) 345kV line, near Benton. a. Apply fault at the Benton 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
83	FLT158-PO	**Prior outage of the Benton 345/138/13.8kV (532791/532986/532821) transformer** 3 phase fault on the Benton 345/138/13.8kV (532791/532986/532822) transformer a. Apply fault at the Benton 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
84	FLT159-SB	**Stuck Breaker on Benton – Rosehill 345kV circuit 1 line** a. Apply single-phase fault at Benton (532791) on the 345kV bus. b. After 16 cycles, trip the Benton – Rosehill (532794) 345kV circuit 1 line c. Trip the Benton – Wolf Creek (532797) 345kV circuit 1 line, and remove the fault.
85	FLT160-SB	**Stuck Breaker on Benton – Rosehill 345kV circuit 1 line** a. Apply single-phase fault at Benton (532791) on the 345kV bus. b. After 16 cycles, trip the Benton – Rosehill (532794) 345kV circuit 1 line c. Trip the Benton 345/138/13.8kV (532791/532986/532822) transformer
86	FLT161-SB	**Stuck Breaker on Benton 345/138/13.8kV (532791/532986/532821) transformer** a. Apply single-phase fault at Benton (532791) on the 345kV bus. b. After 16 cycles, trip the Benton 345/138/13.8kV (532791/532986/532821) transformer c. Trip the Benton 345/138/13.8kV (532791/532986/532822) transformer
87	FLT162-SB	**Stuck Breaker on Benton 345/138/13.8kV (532791/532986/532821) transformer** a. Apply single-phase fault at Benton (532791) on the 345kV bus. b. After 16 cycles, trip the Benton 345/138/13.8kV (532791/532986/532821) transformer c. Trip the Benton – Wolf Creek (532797) 345kV circuit 1 line, and remove the fault.
88	FLT163-3PH	3 phase fault on the Creswell 138/69/13.2kV (532981/533543/533080) transformer, near Creswell. a. Apply fault at the Creswell 69kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer and remove fault.
89	FLT164-3PH	3 phase fault on the Creswell (533543) to Oak2 (533547) 69kV circuit 1 line, near Creswell. a. Apply fault at the Creswell 69kV 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.
90	FLT165-3PH	3 phase fault on the Creswell (533543) to SC7Cres2 (533555) 69kV circuit 1 line, near Creswell. a. Apply fault at the Creswell 69kV 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.

Cont. No.	Cont. Name	Description
91	FLT166-3PH	3 phase fault on the Creswell (533543) to SC4Rome2 (533553) 69kV circuit 1 line, near Creswell. a. Apply fault at the Creswell 69kV 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.
92	FLT167-3PH	3 phase fault on the Creswell (533543) to Creswels2 (533573) 69kV circuit 1 line, near Creswell. a. Apply fault at the Creswell 69kV 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.
93	FLT168-3PH	3 phase fault on the Creswels2 (533573) to Paris (533548) 69kV circuit 1 line, near Creswels2. a. Apply fault at the Creswels2 69kV 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.
94	FLT169-3PH	3 phase fault on the Creswels2 138/69/13.2kV (532981/533573/533081) transformer, near Creswels2. a. Apply fault at the Creswels2 69kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
95	FLT170-3PH	3 phase fault on the Oak 2 (533547) to PrairieJ2 (533563) 69kV circuit 1 line, near Oak 2. a. Apply fault at the Oak 2 69kV 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.
96	FLT171-3PH	3 phase fault on the Oak 2 (533547) to Rainbow2 (533549) 69kV circuit 1 line, near Oak 2. a. Apply fault at the Oak 2 69kV 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.
97	FLT172-3PH	3 phase fault on the Oak 2 (533547) to Strothr2 (533556) 69kV circuit 1 line, near Oak 2. a. Apply fault at the Oak 2 69kV 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.
98	FLT173-PO	**Prior outage of the Creswell to Oak 2 (533547) 69kV line** 3 phase fault on the Creswell (533543) to Creswls2 (533573) 69kV line, near Creswell. a. Apply fault at the Creswell 69kV 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.
99	FLT174-PO	**Prior outage of the Creswell to Oak 2 (533547) 69kV line** 3 phase fault on the Creswell (533543) to SC4Rome2 (533560) 69kV line, near Creswell. a. Apply fault at the Creswell 69kV 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.
100	FLT175-PO	**Prior outage of the Creswell to Oak 2 (533547) 69kV line** 3 phase fault on the Creswell (533543) to Creswell 138/69/13.2kV (532981/533543/533080) transformer a. Apply fault at the Creswell 69kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
101	FLT176-PO	**Prior outage of the Creswell 138/69/13.2kV (532981/533543/533080) transformer** 3 phase fault on the Creswell (533543) to Creswls2 (533573) 69kV line, near Creswell. a. Apply fault at the Creswell 69kV 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.
102	FLT177-PO	**Prior outage of the Creswell 138/69/13.2kV (532981/533543/533080) transformer** 3 phase fault on the Creswell (533543) to SC4Rome2 (533553) 69kV line, near Creswell. a. Apply fault at the Creswell 69kV 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.

Cont. No.	Cont. Name	Description
103	FLT178-SB	**Stuck Breaker on Creswell – Creswls2 345kV circuit 1 line** a. Apply single-phase fault at Creswell (533543) on the 69kV bus. b. After 16 cycles, trip the Creswell – Creswls2 (533573) 69kV circuit 1 line c. Trip the Creswell – Oak 2 (533547) 69kV circuit 1 line, and remove the fault.
104	FLT179-SB	**Stuck Breaker on Creswell – Creswls2 345kV circuit 1 line** a. Apply single-phase fault at Creswell (533543) on the 69kV bus. b. After 16 cycles, trip the Creswell – Creswls2 (533573) 69kV circuit 1 line c. Trip the Creswels2 138/69/13.2kV (532981/533543/533080) transformer, and remove the fault.
105	FLT185-3PH	3 phase fault on the Rose Hill (532794) to Lathams (532800) 345kV circuit 1 line, near Rose Hill. a. Apply fault at the Rose Hill 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.
106	FLT186-3PH	3 phase fault on the Waverly (532799) to LaCygne (542981) 345kV circuit 1 line, near Waverly. a. Apply fault at the Waverly 345kV bus. b. Clear Waverly end of the line after 3.6 cycles
107	FLT187-3PH	3 phase fault on the Wolf Creek (532797) to Waverly (532799) 345kV circuit 1 line, near Waverly. a. Apply fault at the Waverly 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line and remove fault.
108	FLT188-PO	**Prior outage of the Wolf Creek (532797) to Waverly (532799) 345kV line** a. Trip the Wolf Creek to Waverly 345 kV line. b. Solve for powerflow steady state. Then the following stability contingency: 3 phase fault on the Wolf Creek (532797) to Rose Hill (532794) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line and remove fault.
109	FLT189-PO	**Prior outage of the Wolf Creek (532797) to Rose Hill (532794) 345kV line** a. Trip the Wolf Creek to Rose Hill 345 kV line. b. Solve for powerflow steady state. Then the following stability contingency: 3 phase fault on the Wolf Creek (532797) to Benton (532791) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
110	FLT205-SB	**Stuck Breaker on Wolf Creek – Waverly 345kV circuit 1 line** a. Apply single-phase fault at Wolf Creek (532797) on the 345kV bus. b. After 3.6 cycles, trip the Wolf Creek – Waverly (532799) 345kV circuit 1 line c. After 6.6 additional cycles, trip Wolf Creek 345/69kV transformer (532797/533653/532962) and remove fault.
111	FLT206-SB	**Stuck Breaker on Wolf Creek – Benton 345kV circuit 1 line** a. Apply single-phase fault at Wolf Creek (532797) on the 345kV bus. b. After 3.6 cycles, trip the Wolf Creek – Benton (532791) 345kV circuit 1 line c. After 6.6 additional cycles, remove fault.
112	FLT207-SB	**Stuck Breaker on Wolf Creek – Rose Hill 345kV circuit 1 line** a. Apply single-phase fault at Wolf Creek (532797) on the 345kV bus. b. After 3.6 cycles, trip the Wolf Creek – Rose Hill (532794) 345kV circuit 1 line c. After 6.6 additional cycles, remove fault.
113	FLT208-SB	**Stuck Breaker on Wolf Creek – Waverly 345kV circuit 1 line** a. Apply single-phase fault at Wolf Creek (532797) on the 345kV bus. b. After 3.6 cycles, trip the Wolf Creek – Waverly (532799) 345kV circuit 1 line c. After 6.6 additional cycles, remove fault.
114	FLT209-SB	**Stuck Breaker on Wolf Creek 345/69kV transformer circuit 1 line** a. Apply single-phase fault at Wolf Creek (532797) on the 345kV bus. b. After 3.6 cycles, trip Wolf Creek 345/69kV transformer (532797/533653/532962) c. After 6.6 additional cycles, remove fault.

Cont. No.	Cont. Name	Description
115	FLT210-PO	**Prior outage of the LaCygne (542981) – Waverly (532799) 345kV line** a. Trip LaCygne (542981) – Waverly (532799) 345kV line b. Solve for powerflow steady state Then the following stability contingency: 3 phase fault on the Wolf Creek (532797) – Rose Hill (532794) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 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 3.6 cycles, then trip the line in (b) and remove fault.
116	FLT211-PO	**Prior outage of the LaCygne (542981) – Waverly (532799) 345kV line** a. Trip LaCygne (542981) – Waverly (532799) 345kV line b. Solve for powerflow steady state Then the following stability contingency: 3 phase fault on the Wolf Creek (532797) – Benton (532791) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 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 3.6 cycles, then trip the line in (b) and remove fault.
117	FLT212-PO	**Prior outage of the LaCygne (542981) – Waverly (532799) 345kV line** a. Trip LaCygne (542981) – Waverly (532799) 345kV line b. Solve for powerflow steady state Then the following stability contingency: 3 phase fault on the LaCygne (542981) – West Gardner (542965) 345kV line, near LaCygne. a. Apply fault at the LaCygne 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.
118	FLT213-PO	**Prior outage of the LaCygne (542981) – Waverly (532799) 345kV line** a. Trip LaCygne (542981) – Waverly (532799) 345kV line b. Solve for powerflow steady state Then the following stability contingency: 3 phase fault on the LaCygne (542981) – Stilwell (542968) 345kV line, near LaCygne. a. Apply fault at the LaCygne 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.
119	FLT214-PO	**Prior outage of the LaCygne (542981) – Waverly (532799) 345kV line** a. Trip LaCygne (542981) – Waverly (532799) 345kV line b. Solve for powerflow steady state Then the following stability contingency: 3 phase fault on the LaCygne (542981) – Neosho (532793) 345kV line, near LaCygne. a. Apply fault at the LaCygne 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.
120	FLT215-PO	**Prior outage on the Waverly (532799) – LaCygne (542981) 345kV line** a. Trip LaCygne (542981) – Waverly (532799) 345kV line b. Solve for powerflow steady state 3 phase fault on the Wolf Creek (532797) – Waverly (532799) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.

Cont. No.	Cont. Name	Description
121	FLT216-PO	**Prior outage on the Wolf Creek (532797) – Benton (532791) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Waverly (532799) – LaCygne (542981) 345kV line, near Waverly. a. Apply fault at the Waverly 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
122	FLT217-PO	**Prior outage on the Wolf Creek (532797) – Benton (532791) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Wolf Creek (532797) – Waverly (532799) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
123	FLT218-PO	**Prior outage on the Wolf Creek (532797) – Benton (532791) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Wolf Creek (532797) – Rose Hill (532794) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
124	FLT219-PO	**Prior outage on the Wolf Creek (532797) – Rose Hill (532794) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Waverly (532799) – LaCygne (542981) 345kV line, near Waverly. a. Apply fault at the Waverly 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
125	FLT220-PO	**Prior outage on the Wolf Creek (532797) – Rose Hill (532794) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Wolf Creek (532797) – Benton (532791) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
126	FLT221-PO	**Prior outage on the Wolf Creek (532797) – Rose Hill (532794) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Wolf Creek (532797) – Waverly (532799) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
127	FLT222-PO	**Prior outage on the Wolf Creek (532797) – Waverly (532799) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Wolf Creek (532797) – Benton (532791) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
128	FLT223-PO	**Prior outage on the Wolf Creek (532797) – Waverly (532799) 345kV line** a. Solve for powerflow steady state 3 phase fault on the Wolf Creek (532797) – Rose Hill (532794) 345kV line, near Wolf Creek. a. Apply fault at the Wolf Creek 345kV bus. b. Clear fault after 3.6 cycles by tripping the faulted line.
129	FLT224	3 phase fault on the Viola 345/138/13.2kV (532798/533075/532832) transformer, near Viola. a. Apply fault at the Viola 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
130	FLT225-PO	**Prior outage on the Viola 345/138/13.2kV (532798/533075/532832) transformer** a. Solve for powerflow steady state 3 phase fault on the Viola (532798) – Renfrow (515543) 345kV line, 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.

Cont. No.	Cont. Name	Description
131	FLT226-PO	**Prior outage on the Viola 345/138/13.2kV (532798/533075/532832) transformer** a. Solve for powerflow steady state 3 phase fault on the Viola (532798) – Wichita (532796) 345kV line, 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.

Bus voltages, machine rotor angles, and previously queued generation in the study area were monitored in addition to bus voltages and machine rotor angles in the following areas:

- 520 AEPW
- 524 OKGE
- 525 WFEC
- 526 SPS
- 531 MIDW
- 534 SUNC
- 536 WERE
- 540 GMO
- 541 KCPL

Requested and previously queued generation outside the above study area were also monitored.

4.2 Stability Analysis Results

The Stability Analysis determined that all NERC Category P1 and P4 contingencies resulted in system stability and acceptable voltage and rotor angle recovery for all scenarios examined. However, several NERC Category P6 events that include a prior outage at the Wolf Creek 345kV substation followed by a fault on a circuit connected to either Waverly or Wolf Creek 345kV substations resulted in undamped rotor angle oscillations, voltages below the acceptable recovery voltage, voltage collapse, and generation instability when all generation interconnection requests were at 100% output.

Refer to Tables 4-2 through 4-6 for a summary of the Stability Analysis results for the contingencies listed in Table 4-1. Tables 4-2 through 4-6 are a summary of the stability results for the 2019 Winter Peak, 2021 Summer Peak, 2028 Summer Peak, and 2021 Light Load conditions for Scenarios 1 through 5 and states whether the system remained stable, if generation tripped offline, if acceptable voltage recovery was observed after the fault was cleared, and if the voltage recovered to above 0.9 p.u. and below 1.1 p.u. post fault steady-state conditions. Voltage recovery criteria includes ensuring that the transient voltage recovery is between 0.7 p.u. within 2.5 seconds after the fault is cleared and 1.2 p.u. at any point after the fault is cleared and ending in a steady-state voltage (for N-1 contingencies) at the pre-contingent level or at least above 0.9 p.u. and below 1.1. p.u.

Table 4-2: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 1

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
1	FLT01-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
2	FLT02-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
3	FLT03-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
4	FLT04-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
5	FLT05-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
6	FLT06-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
7	FLT07-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
8	FLT08-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
9	FLT09-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
10	FLT10-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
11	FLT11-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
12	FLT12-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
13	FLT13-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
14	FLT14-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
15	FLT15-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
16	FLT16-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
17	FLT17-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
18	FLT18-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
19	FLT19-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
20	FLT20-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
21	FLT21-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
22	FLT22-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
23	FLT23-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
24	FLT24-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
25	FLT25-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
26	FLT26-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
27	FLT27-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
28	FLT28-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-2: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 1 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
29	FLT29-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
30	FLT30-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
31	FLT31-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
32	FLT32-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
33	FLT33-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
34	FLT34-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
35	FLT35-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
36	FLT36-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
37	FLT79-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
38	FLT80-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
39	FLT81-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
40	FLT84-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
41	FLT85-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
42	FLT86-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
43	FLT87-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
44	FLT88-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
45	FLT89-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
46	FLT90-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
47	FLT92-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
48	FLT93-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
49	FLT94-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
50	FLT125-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
51	FLT126-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
52	FLT127-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
53	FLT128-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
54	FLT129-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
55	FLT130-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
56	FLT131-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-2: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 1 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
57	FLT132-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
58	FLT133-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
59	FLT134-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
60	FLT135-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
61	FLT136-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
62	FLT137-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
63	FLT138-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
64	FLT139-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
65	FLT140-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
66	FLT141-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
67	FLT142-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
68	FLT143-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
69	FLT144-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
70	FLT145-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
71	FLT146-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
72	FLT147-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
73	FLT148-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
74	FLT149-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
75	FLT150-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
76	FLT151-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
77	FLT152-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
78	FLT153-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
79	FLT154-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
80	FLT155-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
81	FLT156-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
82	FLT157-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
83	FLT158-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
84	FLT159-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-2: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 1 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
85	FLT160-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
86	FLT161-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
87	FLT162-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
88	FLT163-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
89	FLT164-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
90	FLT165-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
91	FLT166-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
92	FLT167-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
93	FLT168-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
94	FLT169-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
95	FLT170-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
96	FLT171-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
97	FLT172-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
98	FLT173-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
99	FLT174-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
100	FLT175-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
101	FLT176-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
102	FLT177-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
103	FLT178-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
104	FLT179-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
105	FLT185-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
106	FLT186-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
107	FLT187-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
108	FLT188-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
109	FLT189-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
110	FLT205-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
111	FLT206-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
112	FLT207-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-2: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 1 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
113	FLT208-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
114	FLT209-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
115	FLT210-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
116	FLT211-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
117	FLT212-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
118	FLT213-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
119	FLT214-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
120	FLT215-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
121	FLT216-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
122	FLT217-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
123	FLT218-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
124	FLT219-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
125	FLT220-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
126	FLT221-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
127	FLT222-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
128	FLT223-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
129	FLT224-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
130	FLT225-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
131	FLT226-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-3: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 2

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
1	FLT01-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
2	FLT02-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
3	FLT03-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
4	FLT04-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
5	FLT05-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
6	FLT06-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
7	FLT07-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
8	FLT08-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
9	FLT09-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
10	FLT10-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
11	FLT11-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
12	FLT12-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
13	FLT13-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
14	FLT14-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
15	FLT15-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
16	FLT16-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
17	FLT17-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
18	FLT18-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
19	FLT19-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
20	FLT20-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
21	FLT21-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
22	FLT22-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
23	FLT23-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
24	FLT24-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
25	FLT25-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
26	FLT26-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
27	FLT27-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
28	FLT28-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-3: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 2 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
29	FLT29-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
30	FLT30-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
31	FLT31-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
32	FLT32-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
33	FLT33-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
34	FLT34-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
35	FLT35-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
36	FLT36-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
37	FLT79-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
38	FLT80-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
39	FLT81-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
40	FLT84-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
41	FLT85-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
42	FLT86-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
43	FLT87-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
44	FLT88-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
45	FLT89-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
46	FLT90-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
47	FLT92-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
48	FLT93-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
49	FLT94-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
50	FLT125-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
51	FLT126-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
52	FLT127-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
53	FLT128-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
54	FLT129-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
55	FLT130-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
56	FLT131-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-3: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 2 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
57	FLT132-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
58	FLT133-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
59	FLT134-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
60	FLT135-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
61	FLT136-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
62	FLT137-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
63	FLT138-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
64	FLT139-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
65	FLT140-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
66	FLT141-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
67	FLT142-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
68	FLT143-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
69	FLT144-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
70	FLT145-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
71	FLT146-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
72	FLT147-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
73	FLT148-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
74	FLT149-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
75	FLT150-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
76	FLT151-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
77	FLT152-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
78	FLT153-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
79	FLT154-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
80	FLT155-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
81	FLT156-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
82	FLT157-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
83	FLT158-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
84	FLT159-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-3: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 2 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
85	FLT160-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
86	FLT161-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
87	FLT162-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
88	FLT163-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
89	FLT164-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
90	FLT165-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
91	FLT166-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
92	FLT167-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
93	FLT168-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
94	FLT169-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
95	FLT170-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
96	FLT171-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
97	FLT172-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
98	FLT173-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
99	FLT174-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
100	FLT175-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
101	FLT176-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
102	FLT177-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
103	FLT178-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
104	FLT179-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
105	FLT185-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
106	FLT186-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
107	FLT187-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
108	FLT188-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
109	FLT189-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
110	FLT205-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
111	FLT206-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
112	FLT207-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-3: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 2 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
113	FLT208-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
114	FLT209-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
115	FLT210-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
116	FLT211-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
117	FLT212-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
118	FLT213-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
119	FLT214-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
120	FLT215-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
121	FLT216-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
122	FLT217-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
123	FLT218-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
124	FLT219-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
125	FLT220-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
126	FLT221-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
127	FLT222-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
128	FLT223-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
129	FLT224-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
130	FLT225-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
131	FLT226-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-4: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 3

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
1	FLT01-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
2	FLT02-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
3	FLT03-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
4	FLT04-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
5	FLT05-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
6	FLT06-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
7	FLT07-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
8	FLT08-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
9	FLT09-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
10	FLT10-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
11	FLT11-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
12	FLT12-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
13	FLT13-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
14	FLT14-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
15	FLT15-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
16	FLT16-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
17	FLT17-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
18	FLT18-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
19	FLT19-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
20	FLT20-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
21	FLT21-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
22	FLT22-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
23	FLT23-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
24	FLT24-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
25	FLT25-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
26	FLT26-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
27	FLT27-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
28	FLT28-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-4: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 3 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
29	FLT29-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
30	FLT30-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
31	FLT31-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
32	FLT32-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
33	FLT33-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
34	FLT34-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
35	FLT35-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
36	FLT36-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
37	FLT79-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
38	FLT80-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
39	FLT81-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
40	FLT84-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
41	FLT85-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
42	FLT86-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
43	FLT87-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
44	FLT88-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
45	FLT89-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
46	FLT90-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
47	FLT92-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
48	FLT93-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
49	FLT94-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
50	FLT125-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
51	FLT126-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
52	FLT127-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
53	FLT128-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
54	FLT129-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
55	FLT130-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
56	FLT131-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-4: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 3 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
57	FLT132-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
58	FLT133-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
59	FLT134-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
60	FLT135-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
61	FLT136-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
62	FLT137-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
63	FLT138-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
64	FLT139-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
65	FLT140-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
66	FLT141-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
67	FLT142-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
68	FLT143-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
69	FLT144-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
70	FLT145-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
71	FLT146-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
72	FLT147-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
73	FLT148-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
74	FLT149-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
75	FLT150-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
76	FLT151-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
77	FLT152-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
78	FLT153-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
79	FLT154-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
80	FLT155-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
81	FLT156-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
82	FLT157-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
83	FLT158-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
84	FLT159-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-4: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 3 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
85	FLT160-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
86	FLT161-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
87	FLT162-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
88	FLT163-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
89	FLT164-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
90	FLT165-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
91	FLT166-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
92	FLT167-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
93	FLT168-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
94	FLT169-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
95	FLT170-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
96	FLT171-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
97	FLT172-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
98	FLT173-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
99	FLT174-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
100	FLT175-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
101	FLT176-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
102	FLT177-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
103	FLT178-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
104	FLT179-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
105	FLT185-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
106	FLT186-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
107	FLT187-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
108	FLT188-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
109	FLT189-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
110	FLT205-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
111	FLT206-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
112	FLT207-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-4: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 3 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
113	FLT208-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
114	FLT209-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
115	FLT210-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
116	FLT211-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
117	FLT212-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
118	FLT213-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
119	FLT214-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
120	FLT215-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
121	FLT216-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
122	FLT217-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
123	FLT218-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
124	FLT219-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
125	FLT220-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
126	FLT221-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
127	FLT222-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
128	FLT223-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
129	FLT224-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
130	FLT225-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
131	FLT226-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-5: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 4

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
1	FLT01-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
2	FLT02-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
3	FLT03-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
4	FLT04-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
5	FLT05-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
6	FLT06-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
7	FLT07-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
8	FLT08-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
9	FLT09-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
10	FLT10-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
11	FLT11-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
12	FLT12-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
13	FLT13-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
14	FLT14-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
15	FLT15-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
16	FLT16-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
17	FLT17-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
18	FLT18-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
19	FLT19-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
20	FLT20-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
21	FLT21-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
22	FLT22-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
23	FLT23-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
24	FLT24-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
25	FLT25-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
26	FLT26-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
27	FLT27-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
28	FLT28-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-5: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 4 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
29	FLT29-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
30	FLT30-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
31	FLT31-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
32	FLT32-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
33	FLT33-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
34	FLT34-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
35	FLT35-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
36	FLT36-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
37	FLT79-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
38	FLT80-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
39	FLT81-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
40	FLT84-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
41	FLT85-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
42	FLT86-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
43	FLT87-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
44	FLT88-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
45	FLT89-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
46	FLT90-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
47	FLT92-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
48	FLT93-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
49	FLT94-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
50	FLT125-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
51	FLT126-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
52	FLT127-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
53	FLT128-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
54	FLT129-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
55	FLT130-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
56	FLT131-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-5: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 4 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
57	FLT132-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
58	FLT133-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
59	FLT134-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
60	FLT135-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
61	FLT136-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
62	FLT137-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
63	FLT138-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
64	FLT139-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
65	FLT140-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
66	FLT141-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
67	FLT142-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
68	FLT143-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
69	FLT144-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
70	FLT145-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
71	FLT146-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
72	FLT147-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
73	FLT148-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
74	FLT149-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
75	FLT150-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
76	FLT151-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
77	FLT152-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
78	FLT153-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
79	FLT154-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
80	FLT155-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
81	FLT156-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
82	FLT157-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
83	FLT158-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
84	FLT159-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-5: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 4 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
85	FLT160-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
86	FLT161-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
87	FLT162-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
88	FLT163-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
89	FLT164-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
90	FLT165-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
91	FLT166-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
92	FLT167-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
93	FLT168-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
94	FLT169-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
95	FLT170-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
96	FLT171-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
97	FLT172-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
98	FLT173-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
99	FLT174-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
100	FLT175-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
101	FLT176-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
102	FLT177-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
103	FLT178-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
104	FLT179-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
105	FLT185-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
106	FLT186-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
107	FLT187-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
108	FLT188-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
109	FLT189-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
110	FLT205-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
111	FLT206-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
112	FLT207-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-5: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 4 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
113	FLT208-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
114	FLT209-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
115	FLT210-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
116	FLT211-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
117	FLT212-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
118	FLT213-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
119	FLT214-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
120	FLT215-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
121	FLT216-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
122	FLT217-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
123	FLT218-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
124	FLT219-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
125	FLT220-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
126	FLT221-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
127	FLT222-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
128	FLT223-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
129	FLT224-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
130	FLT225-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
131	FLT226-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-6: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 5

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
1	FLT01-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
2	FLT02-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
3	FLT03-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
4	FLT04-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
5	FLT05-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
6	FLT06-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
7	FLT07-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
8	FLT08-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
9	FLT09-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
10	FLT10-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
11	FLT11-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
12	FLT12-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
13	FLT13-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
14	FLT14-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
15	FLT15-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
16	FLT16-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
17	FLT17-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
18	FLT18-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
19	FLT19-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
20	FLT20-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
21	FLT21-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
22	FLT22-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
23	FLT23-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
24	FLT24-3PH	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
25	FLT25-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
26	FLT26-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
27	FLT27-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
28	FLT28-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-6: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 5 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
29	FLT29-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
30	FLT30-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
31	FLT31-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
32	FLT32-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
33	FLT33-PO	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*	-	-	Compliant	Stable*
34	FLT34-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
35	FLT35-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
36	FLT36-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
37	FLT79-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
38	FLT80-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
39	FLT81-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
40	FLT84-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
41	FLT85-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
42	FLT86-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
43	FLT87-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
44	FLT88-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
45	FLT89-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
46	FLT90-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
47	FLT92-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
48	FLT93-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
49	FLT94-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
50	FLT125-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
51	FLT126-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
52	FLT127-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
53	FLT128-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
54	FLT129-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
55	FLT130-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
56	FLT131-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

* GEN-2013-029 was gnetted for simulation of these faults as its dynamic model creates unrealistic numerical perturbations in real power when subjected to fault near its POI.

Table 4-6: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 5 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
57	FLT132-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
58	FLT133-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
59	FLT134-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
60	FLT135-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
61	FLT136-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
62	FLT137-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
63	FLT138-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
64	FLT139-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
65	FLT140-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
66	FLT141-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
67	FLT142-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
68	FLT143-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
69	FLT144-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
70	FLT145-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
71	FLT146-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
72	FLT147-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
73	FLT148-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
74	FLT149-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
75	FLT150-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
76	FLT151-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
77	FLT152-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
78	FLT153-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
79	FLT154-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
80	FLT155-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
81	FLT156-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
82	FLT157-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
83	FLT158-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
84	FLT159-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-6: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 5 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
85	FLT160-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
86	FLT161-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
87	FLT162-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
88	FLT163-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
89	FLT164-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
90	FLT165-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
91	FLT166-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
92	FLT167-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
93	FLT168-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
94	FLT169-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
95	FLT170-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
96	FLT171-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
97	FLT172-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
98	FLT173-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
99	FLT174-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
100	FLT175-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
101	FLT176-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
102	FLT177-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
103	FLT178-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
104	FLT179-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
105	FLT185-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
106	FLT186-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
107	FLT187-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
108	FLT188-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
109	FLT189-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
110	FLT205-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
111	FLT206-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
112	FLT207-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Table 4-6: Stability Analysis Summary of Results for 2019 Winter, 2021 Summer, 2028 Summer Peak, and 2021 Light Load Conditions for Scenario 5 (cont.)

Cont. No.	Cont. Name	2019 Winter Peak				2021 Summer Peak				2028 Summer Peak				2021 Light Load			
		Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.			Less than .70 p.u.	Greater than 1.20 p.u.		
113	FLT208-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
114	FLT209-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
115	FLT210-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
116	FLT211-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
117	FLT212-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
118	FLT213-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
119	FLT214-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
120	FLT215-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
121	FLT216-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
122	FLT217-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
123	FLT218-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
124	FLT219-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
125	FLT220-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
126	FLT221-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
127	FLT222-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
128	FLT223-PO	System Instability Observed				System Instability Observed				System Instability Observed				-	-	Compliant	Stable
129	FLT224-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
130	FLT225-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
131	FLT226-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Generation capacity was investigated to determine the maximum amount of generation that can be interconnected while observing acceptable voltage and generator response pursuant to SPP Performance Criteria. The following is a summary of the results:

- P1 and P4 events for all seasons/years and scenarios resulted in system stability and acceptable voltage recovery with GEN-2016-153 dispatched at full output.
- P6 (prior outage) events at Wolf Creek 345kV and Waverly 345kV
  - Voltage instability is observed prior to GEN-2016-153 study request being in-service with Wolf Creek at full output (pre-existing condition) for 2019 Winter Peak, 2021 Summer Peak, 2028 Summer Peak conditions.
  - Voltage stability is maintained for pre-existing conditions and study request dispatched at 100% with Wolf Creek curtailed to 900 MW gross output for 2019 Winter Peak, 2021 Summer Peak, 2028 Summer Peak conditions.
  - Note Wolf Creek is out of service for 2021 Light Load conditions, thus there are no stability concerns and GEN-2016-153 can connect at full output in all five scenarios examined.

System stability and acceptable voltage recovery was observed for all NERC Category P1 and P4 faults for all five scenarios in all study years/seasons with GEN-2016-153 dispatched at full output. Refer to Figure 4-1 and Figure 4-2 for a representative voltages and real and reactive power response near Viola for FLT130-3PH for 2019 Winter Peak Conditions for Scenario 5, showing that system stability is maintained, and all voltages recover within SPP Performance Criteria. FLT130-3PH is a three-phase fault at Viola 345 kV Switch resulting in the loss of Viola to Wichita 345 kV circuit #1.

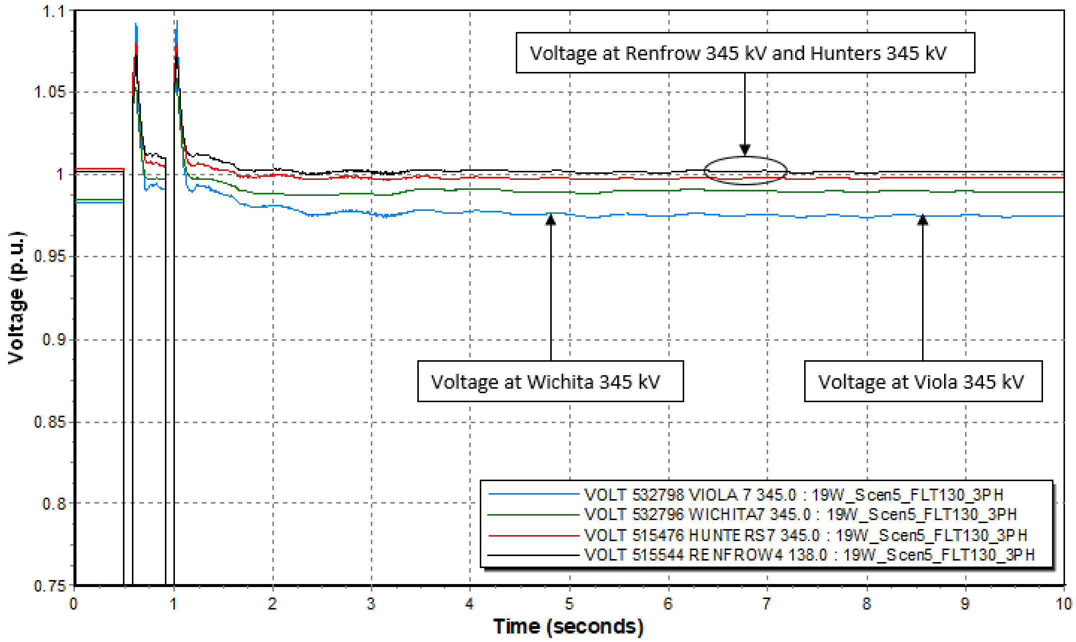

Figure 4-1: Representative plot of voltages near Viola 345 kV for 2019 Winter Peak Scenario 5 conditions for contingency FLT130-3PH.

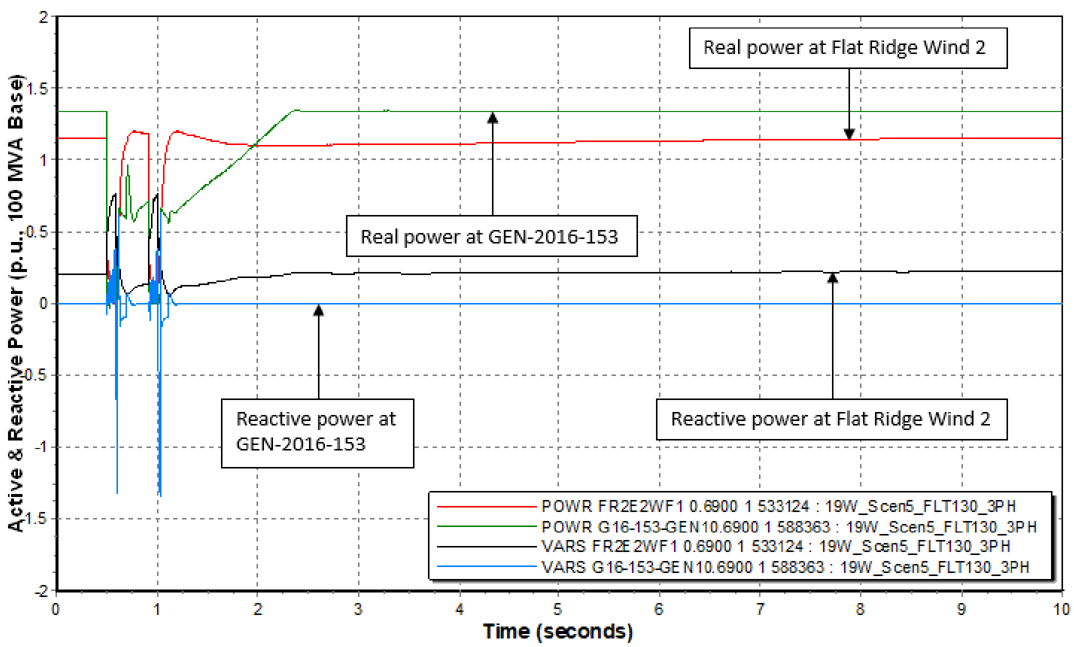

Figure 4-2: Representative plot of real and reactive powers from machines near Viola 345 kV for 2019 Winter Peak Scenario 5 conditions for contingency FLT130-3PH.

As observed in the stability results table, system instability is present in all study seasons/years. Therefore, the results and figures discussed in this section represent the 2019 Winter Peak case (Scenario 5) but are indicative of all study years/seasons. For the following fault combinations, undamped power oscillations and rotor angle instability was observed at Wolf Creek for the cases without generation curtailment:

- Prior outage of Wolf Creek to Waverly 345 kV
  - FLT-188-PO, FLT-222-PO, FLT-223-PO
- Prior outage of LaCygne to Waverly 345 kV
  - FLT-210-PO, FLT-211-PO
- Prior outage of Wolf Creek to Benton 345 kV
  - FLT-216-PO, FLT-217-PO
- Prior outage of Wolf Creek to Rose Hill 345 kV
  - FLT-219-PO, FLT-221-PO

With Wolf Creek curtailed to approximately 900 MW gross output following the prior outage event, the rotor angle oscillations are quickly damped at Wolf Creek. Refer to Figure 4-3 for representative plots of the Wolf Creek rotor angles before generation curtailment and with Wolf Creek curtailed to 900 MW for FLT-188-PO. FLT-188-PO is a prior outage of the Wolf Creek to Waverly 345 kV line followed by a three-phase fault and loss of Wolf Creek to Rose Hill 345 kV. Refer to Figure 4-4 for representative plots of the Wolf Creek real and reactive power before generation curtailment and with Wolf Creek curtailed to 900 MW for FLT-188-PO. It is observed that with curtailment of the Wolf Creek generator, the Wolf Creek rotor angle quickly damps and is within acceptable SPP Performance Criteria.

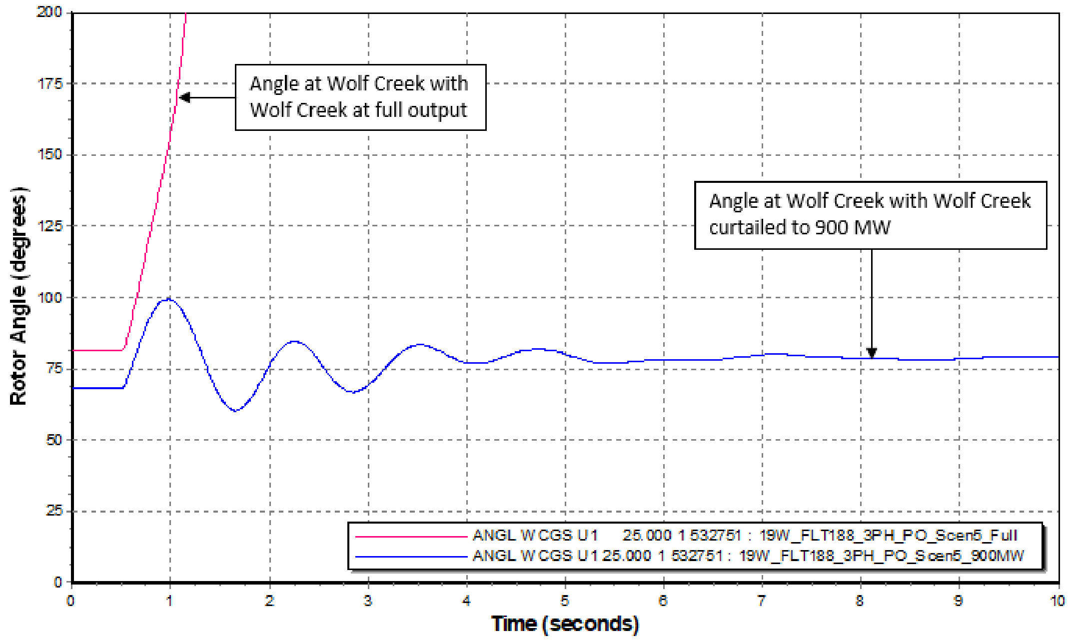

Figure 4-3: Representative plot of Wolf Creek rotor angle for 2019 Winter Peak Scenario 5 conditions with and without the Wolf Creek curtailment.

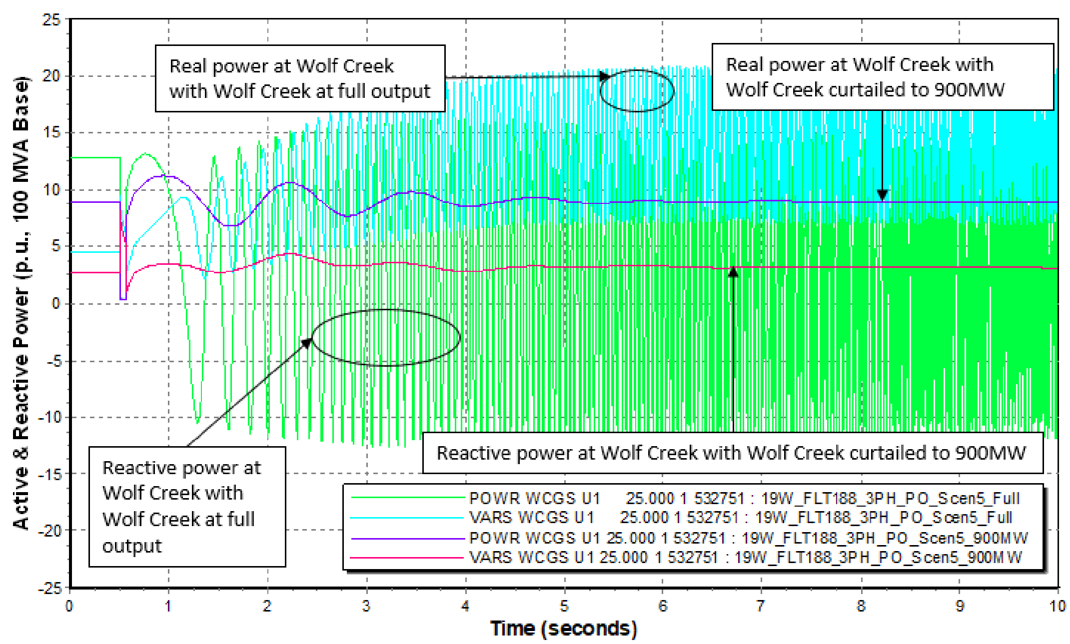

Figure 4-4: Representative plot of Wolf Creek real and reactive power for 2019 Winter Peak Scenario 5 conditions with and without the Wolf Creek curtailment.

This stability analysis identified Wolf Creek to Blackberry 345 kV circuit #1 as mitigation for GEN-2016-153 to connect at full output.

Refer to Figures 4-5 through 4-7 for representative plots of the Wolf Creek rotor angle, real and reactive power and voltages near Wolf Creek with Wolf Creek to Blackberry 345 kV circuit #1 in-service for FLT188-PO. It is observed that with addition of Wolf Creek to Blackberry 345 kV circuit #1, the Wolf Creek rotor angle quickly damps, and all voltages recover within acceptable SPP Performance Criteria.

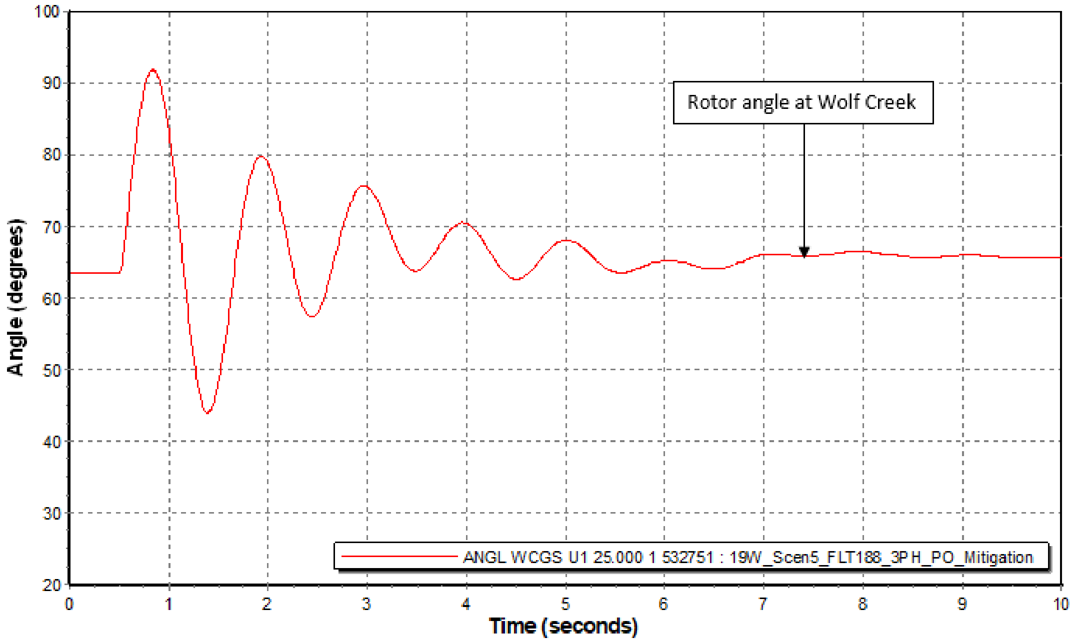

Figure 4-5: Representative plot of Wolf Creek rotor angle for 2019 Winter Peak Scenario 5 conditions with Wolf Creek to Blackberry 345 kV circuit #1 in-service.

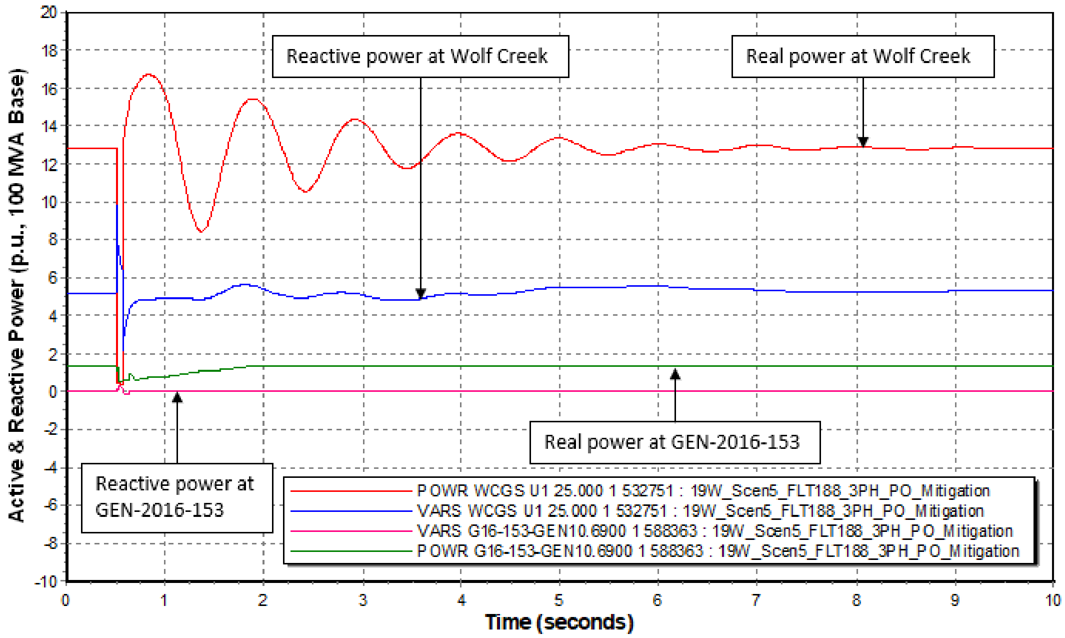

Figure 4-6: Representative plot of real and reactive power for 2019 Winter Peak Scenario 5 conditions with Wolf Creek to Blackberry 345 kV circuit #1 in-service.

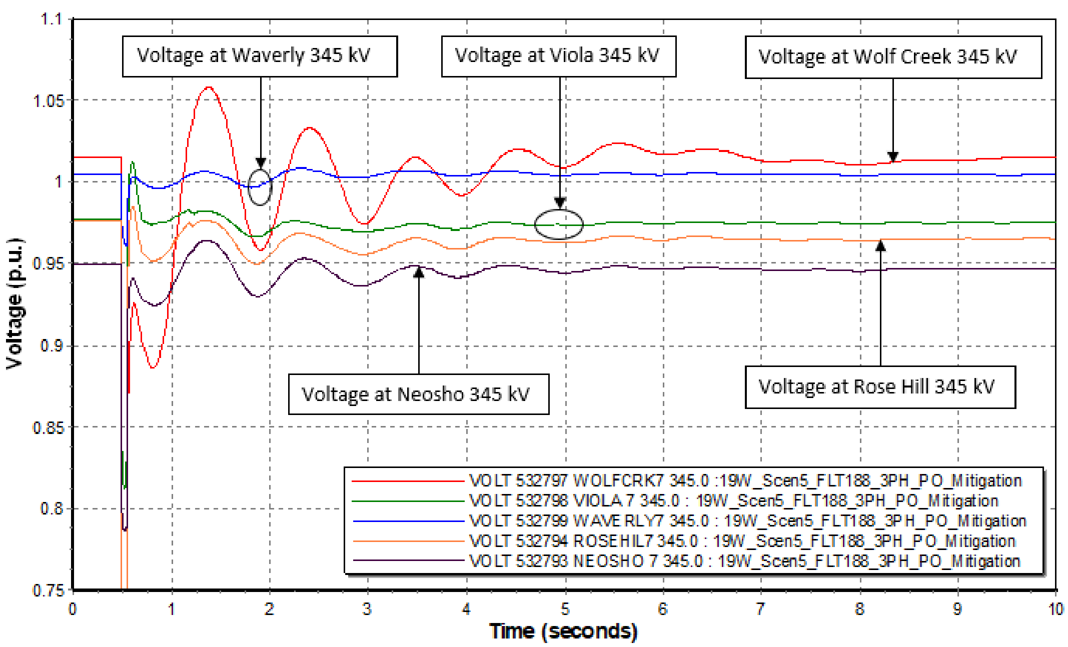

Figure 4-7: Representative plot of voltages near Wolf Creek for 2019 Winter Peak Scenario 5 conditions with Wolf Creek to Blackberry 345 kV circuit #1 in-service.

4.3 Reactive Compensation Analysis Results

A reactive compensation analysis was performed on the 2028 Summer Peak case for all scenarios to determine the amount of charging current added by the interconnection facilities of GEN-2016-153 and the amount of shunt reactive compensation, located at the low-voltage side of the collector substation bus(es) that will be required to offset the charging current of the request's interconnection facilities.

The reactor size is generally equal to the sum of the B values of the collector system and generator lead line to the POI. Additional locations and appropriate bifurcation may be required for atypical facility designs. Table 4-7 lists the reactor size identified during this analysis.

Table 4-7: Reactor Size Identified for 2028 Summer Peak Conditions

Seasonal Case	Scenario	Reactor Size
28 Summer Peak	Scenario1	-80.50MVAR
	Scenario2	-80.50MVAR
	Scenario3	-80.50MVAR
	Scenario4	-80.50MVAR
	Scenario5	-82.90MVAR

SECTION 5: SHORT-CIRCUIT ANALYSIS

The Short-Circuit Analysis was performed on the 2028 Summer Peak case to determine the increase in the maximum fault current from requests that the protective equipment on the SPP transmission system may need to be rated to interrupt. Each Transmission Owner will need to further evaluate, within the Facilities Study, whether their existing or planned facilities are adequately rated or will require replacement.

This analysis assessed breaker adequacy and fault duties at GEN-2016-153's POI and for each bus up-to and including five buses away from POI. No outages were assumed to find maximum short-circuit current that flows through the breaker. This analysis was conducted by using PSS\E's Automatic Sequence Fault Calculation (ASCC) function. Table 5-1 summarize results of this short circuit analysis.

Table 5-1: Short-Circuit Currents for 2028 Summer Peak Conditions

THREE PHASE FAULT													
				Scenario -1		Scenario -2		Scenario -3		Scenario -4		Scenario -5	
Bus Number	Bus Name	Bus Voltage	Unit	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)
514708	OTTER 4	138	AMP	9699.8	-82.4	9705.5	-82.4	9706	-82.4	9712.1	-82.4	9714.9	-82.4
514709	FRMNTAP4	138	AMP	18673	-83.1	18708	-83.1	18711	-83.1	18734	-83.1	18741	-83.1
514711	WAUKOTP4	138	AMP	16020	-81.9	16043	-81.9	16044	-81.9	16060	-81.9	16064	-81.9
514714	WOODRNG4	138	AMP	19977	-83.5	20020	-83.5	20022	-83.5	20050	-83.5	20058	-83.5
514715	WOODRNG7	345	AMP	18529	-85	18842	-85.1	18854	-85.1	18974	-85.1	19059	-85
514719	CLYDE 2	69	AMP	4402.7	-73.6	4403.3	-73.6	4403.5	-73.6	4404	-73.6	4404.2	-73.6
514733	MARSHL 4	138	AMP	8390.9	-80.8	8394.9	-80.8	8395.2	-80.8	8399	-80.8	8399	-80.8
514739	MEDFORD2	69	AMP	5448.9	-76.6	5449.7	-76.6	5450.1	-76.6	5450.7	-76.6	5451.1	-76.6
514803	SOONER 7	345	AMP	24532	-86.5	24585	-86.5	24606	-86.5	25434	-86.5	26898	-86.4
514804	MIDLTNT4	138	AMP	8995.9	-80.6	8997	-80.6	9000.8	-80.6	9003.1	-80.6	9005.3	-80.6
515375	WWRDEHV7	345	AMP	19751	-86	19755	-86	19762	-86.1	19774	-86	19774	-86
515426	RDRUNNR4	138	AMP	8402.3	-81.3	8405.1	-81.3	8407.2	-81.3	8409.9	-81.3	8412.1	-81.3
515476	HUNTERS7	345	AMP	13313	-84.8	13401	-84.8	13414	-84.8	13451	-84.8	13477	-84.8
515477	CHSHLMV7	345	AMP	13295	-84.8	13383	-84.8	13396	-84.8	13433	-84.8	13459	-84.8
515497	MATHWSN7	345	AMP	32759	-86	32817	-86	32824	-86	33110	-86	33110	-86
515543	RENFROW7	345	AMP	12276	-84.7	12315	-84.7	12336	-84.7	12355	-84.7	12369	-84.7
515544	RENFROW4	138	AMP	14326	-84.8	14340	-84.8	14349	-84.8	14358	-84.8	14364	-84.8
515546	GRANTCO4	138	AMP	6446.1	-81.1	6448.9	-81.1	6450.5	-81.1	6452.2	-81.1	6453.4	-81.1
515547	GRANTCO2	69	AMP	7464	-80.7	7465.7	-80.7	7466.6	-80.7	7467.8	-80.7	7468.6	-80.7
515569	MDFRDTP4	138	AMP	11449	-83.4	11457	-83.4	11462	-83.4	11468	-83.4	11472	-83.4
515581	COYOTE 4	138	AMP	8251.3	-80.3	8253.4	-80.3	8255.4	-80.3	8258	-80.3	8260.3	-80.3
515621	OPENSKY7	345	AMP	12412	-86.7	12417	-86.7	12458	-86.8	12520	-86.8	12618	-86.7
515646	GRNTWD 7	345	AMP	10801	-84.6	10831	-84.6	10847	-84.6	10861	-84.6	10872	-84.6
515852	DGRASSE7	345	AMP	14480	-85.8	14482	-85.8	14496	-85.8	14501	-85.8	14502	-85.8
515853	DGRASSE4	138	AMP	15367	-85.3	15368	-85.3	15373	-85.3	15375	-85.3	15375	-85.3
515875	REDNGTN7	345	AMP	17802	-85	17912	-85	17918	-85	18006	-85	18027	-84.9
515877	REDDIRT7	345	AMP	17797	-85	17908	-85	17913	-85	18002	-85	18023	-84.9
520409	WFEC_RNFRO4	138	AMP	10579	-82.9	10586	-82.9	10591	-82.9	10595	-82.9	10598	-82.9
520434	WAKTASW4	138	AMP	6317.3	-80.1	6319	-80.1	6320.1	-80.1	6321.3	-80.1	6321.9	-80.1
520452	WAKTASB4	138	AMP	6283.5	-80.1	6285.1	-80.1	6286.3	-80.1	6287.4	-80.1	6288	-80.1
521085	WAKITA 2	69	AMP	5154.3	-83.9	5154.8	-83.9	5155.1	-83.9	5155.5	-83.9	5155.7	-83.9
522397	MEDFORD4	138	AMP	7475.6	-82.1	7479.1	-82.1	7481.3	-82.1	7483.6	-82.1	7485.3	-82.1
522398	PONDCRK4	138	AMP	5085.6	-81.5	5087.2	-81.5	5088.2	-81.5	5089.3	-81.5	5090.1	-81.5
531469	SPERVIL7	345	AMP	13062	-82.9	13062	-82.9	13067	-82.9	13067	-82.9	13068	-82.9
532766	JEC N 7	345	AMP	23611	-87.1	23611	-87.1	23615	-87.1	23615	-87.1	23615	-87.1
532768	EMPEC 7	345	AMP	17539	-86	17539	-86	17552	-86	17552	-86	17552	-86
532769	LANG 7	345	AMP	17322	-86	17322	-86	17334	-86	17334	-86	17335	-86
532770	MORRIS 7	345	AMP	12821	-85.4	12822	-85.4	12826	-85.4	12826	-85.4	12826	-85.4
532771	RENO 7	345	AMP	11893	-86	11893	-86	11930	-86	11931	-86	11932	-86
532773	SUMMIT 7	345	AMP	11209	-85.9	11209	-85.9	11218	-85.9	11219	-85.9	11219	-85.9
532774	SWISVAL7	345	AMP	16122	-85.2	16122	-85.2	16126	-85.2	16127	-85.2	16127	-85.2
532780	CANEYRV7	345	AMP	9775.4	-85.6	9776.1	-85.6	9829.2	-85.6	9832.2	-85.6	9835.7	-85.6
532782	BUFFALO7	345	AMP	20089	-86.2	20095	-86.2	20329	-86.2	20338	-86.2	20345	-86.2
532783	KINGMAN7	345	AMP	6780.7	-86.4	6781.2	-86.4	6801.4	-86.4	6802.1	-86.4	6802.7	-86.4
532784	NINN1WF7	345	AMP	5655.4	-86.5	5655.7	-86.5	5668.8	-86.5	5669.3	-86.5	5669.7	-86.5

Table 5-1: Short Circuit Currents for 2028 Summer Peak Conditions (cont.)

THREE PHASE FAULT													
				Scenario -1		Scenario -2		Scenario -3		Scenario -4		Scenario -5	
Bus Number	Bus Name	Bus Voltage	Unit	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)
532791	BENTON 7	345	AMP	18514	-85.7	18519	-85.7	19390	-85.8	19404	-85.8	19419	-85.8
532792	FR2EAST7	345	AMP	6713.8	-85.5	6716.5	-85.5	6728.3	-85.5	6730.2	-85.5	6731.7	-85.5
532794	ROSEHIL7	345	AMP	18346	-85.8	18350	-85.8	18763	-85.8	18783	-85.8	18808	-85.8
532795	FR2WEST7	345	AMP	5372.4	-85.5	5374	-85.5	5381.2	-85.5	5382.4	-85.5	5383.3	-85.5
532796	WICHITA7	345	AMP	23398	-86	23407	-86	23792	-86	23805	-86	23817	-86
532797	WOLFCRK7	345	AMP	15733	-86.6	15733	-86.6	15801	-86.7	15803	-86.7	15806	-86.7
532798	VIOLA 7	345	AMP	13731	-85.1	13746	-85.1	13811	-85.1	13821	-85.1	13830	-85.1
532799	WAVERLY7	345	AMP	14453	-86.3	14454	-86.3	14503	-86.3	14504	-86.3	14506	-86.3
532800	LATHAMS7	345	AMP	10323	-85.6	10324	-85.6	10395	-85.6	10398	-85.6	10403	-85.6
532801	ELKRVR17	345	AMP	9120.9	-85.5	9121.6	-85.5	9176.5	-85.5	9179.5	-85.5	9183	-85.5
532802	WAVERTX7	345	AMP	12309	-85.8	12309	-85.8	12344	-85.8	12345	-85.8	12346	-85.8
532856	SWISVAL6	230	AMP	20951	-85.2	20951	-85.2	20955	-85.2	20955	-85.2	20955	-85.2
532863	MORRIS 6	230	AMP	13900	-85.2	13900	-85.2	13903	-85.2	13903	-85.2	13903	-85.2
532871	CIRCLE 6	230	AMP	9952.4	-84.8	9952.5	-84.8	9956.8	-84.8	9957	-84.8	9957.1	-84.8
532981	CRESWLN4	138	AMP	9112.3	-82.3	9113.2	-82.3	9120	-82.3	9121.7	-82.3	9123.3	-82.3
532982	OXFORD 4	138	AMP	9337.2	-83	9338.2	-83	9353.5	-83	9355.1	-83	9356.8	-83
532984	SUMNER 4	138	AMP	10191	-82.9	10192	-82.9	10212	-82.9	10214	-82.9	10216	-82.9
532985	TCROCK 4	138	AMP	5464.7	-83.3	5465	-83.3	5470.9	-83.3	5471.4	-83.3	5472	-83.3
532986	BENTON 4	138	AMP	27209	-85.9	27213	-85.9	27722	-86	27733	-86	27745	-86
532987	BUTLER 4	138	AMP	10295	-79.8	10295	-79.8	10346	-79.8	10347	-79.8	10349	-79.8
532988	BELAIRE4	138	AMP	18456	-85.1	18458	-85.1	18675	-85.2	18680	-85.2	18685	-85.2
532990	MIDIAN 4	138	AMP	10471	-80.9	10471	-80.9	10527	-80.9	10528	-80.9	10530	-80.9
532991	WEAVER 4	138	AMP	21430	-84.1	21433	-84.1	21648	-84.1	21656	-84.1	21666	-84.1
532992	TIMBJCT4	138	AMP	5854.3	-83.3	5854.7	-83.3	5861.4	-83.3	5862.1	-83.3	5862.7	-83.3
533011	HALSTD 4	138	AMP	8290.7	-84.4	8291	-84.4	8305.1	-84.4	8305.6	-84.4	8306	-84.4
533013	MOUND 4	138	AMP	6916.8	-84.2	6916.9	-84.2	6924.7	-84.2	6925	-84.2	6925.2	-84.2
533015	BENTLEY4	138	AMP	10750	-84.7	10750	-84.7	10777	-84.7	10778	-84.7	10779	-84.7
533016	WWUPLNT4	138	AMP	8120.4	-84.4	8120.7	-84.4	8135.7	-84.4	8136.2	-84.4	8136.7	-84.4
533024	29TH 4	138	AMP	19064	-85.2	19066	-85.2	19298	-85.3	19304	-85.3	19310	-85.3
533029	59TH ST4	138	AMP	16944	-83.6	16946	-83.6	17040	-83.6	17045	-83.6	17050	-83.6
533035	CHISHLM4	138	AMP	21008	-84.8	21010	-84.8	21206	-84.8	21212	-84.8	21218	-84.8
533036	CLEARWT4	138	AMP	14013	-85.2	14016	-85.2	14063	-85.2	14066	-85.2	14069	-85.2
533037	COMOTAR4	138	AMP	18183	-84.9	18185	-84.9	18388	-85	18393	-85	18399	-85
533038	COWSKIN4	138	AMP	17391	-84.7	17393	-84.7	17474	-84.7	17478	-84.7	17481	-84.7
533039	ELPASO 4	138	AMP	23860	-84.2	23864	-84.2	24088	-84.2	24098	-84.2	24109	-84.2
533040	EVANS N4	138	AMP	32878	-86.8	32884	-86.8	33167	-86.8	33177	-86.8	33187	-86.8
533041	EVANS S4	138	AMP	32878	-86.8	32884	-86.8	33167	-86.8	33177	-86.8	33187	-86.8
533042	FARBER 4	138	AMP	15633	-83.7	15635	-83.7	15722	-83.7	15727	-83.7	15732	-83.7
533044	GILL E 4	138	AMP	21692	-84.6	21696	-84.6	21826	-84.6	21833	-84.6	21840	-84.6
533045	GILL W 4	138	AMP	21692	-84.6	21696	-84.6	21826	-84.6	21833	-84.6	21840	-84.6
533046	GILL S 4	138	AMP	21692	-84.6	21696	-84.6	21826	-84.6	21833	-84.6	21840	-84.6
533047	GILL 4	138	AMP	21692	-84.6	21696	-84.6	21826	-84.6	21833	-84.6	21840	-84.6
533049	HOOVERN4	138	AMP	17007	-85	17009	-85	17094	-85	17097	-85	17101	-85
533051	INTERST4	138	AMP	15592	-84.3	15594	-84.3	15664	-84.4	15667	-84.3	15670	-84.3
533052	PARKCTY4	138	AMP	19828	-84.7	19830	-84.7	20022	-84.8	20028	-84.8	20033	-84.7

Table 5-1: Short Circuit Currents for 2028 Summer Peak Conditions (cont.)

THREE PHASE FAULT													
				Scenario -1		Scenario -2		Scenario -3		Scenario -4		Scenario -5	
Bus Number	Bus Name	Bus Voltage	Unit	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)
533053	LAKERDG4	138	AMP	17162	-85.5	17164	-85.5	17246	-85.5	17249	-85.5	17252	-85.5
533054	MAIZE 4	138	AMP	20836	-85.1	20839	-85.1	20981	-85.1	20986	-85.1	20990	-85.1
533059	ELPASOE4	138	AMP	23860	-84.2	23864	-84.2	24088	-84.2	24098	-84.2	24109	-84.2
533060	NOEASTE4	138	AMP	19967	-85	19970	-85	20205	-85.1	20211	-85.1	20218	-85.1
533062	ROSEHIL4	138	AMP	30275	-86.2	30281	-86.2	30698	-86.2	30717	-86.2	30739	-86.2
533063	SC10BEL4	138	AMP	9646	-81.7	9647	-81.7	9670.6	-81.7	9672.3	-81.7	9674.1	-81.7
533064	17TH 4	138	AMP	17052	-84.6	17054	-84.6	17177	-84.6	17181	-84.6	17185	-84.6
533065	SG12COL4	138	AMP	19555	-85.5	19558	-85.5	19654	-85.5	19657	-85.5	19660	-85.5
533068	STEARMN4	138	AMP	18955	-84.2	18958	-84.2	19107	-84.2	19113	-84.2	19120	-84.2
533070	SLATECRK4	138	AMP	6725.6	-82.3	6726	-82.3	6729	-82.3	6729.7	-82.3	6730.4	-82.3
533071	WACO S 4	138	AMP	18989	-84.7	18992	-84.7	19091	-84.7	19096	-84.7	19101	-84.7
533072	WACO 4	138	AMP	18989	-84.7	18992	-84.7	19091	-84.7	19096	-84.7	19101	-84.7
533074	45TH ST4	138	AMP	23911	-85.5	23914	-85.5	24065	-85.6	24071	-85.6	24076	-85.6
533075	VIOLA 4	138	AMP	23848	-85.7	23861	-85.7	23955	-85.7	23966	-85.7	23975	-85.7
533304	LANG 3	115	AMP	14486	-85.2	14486	-85.2	14489	-85.2	14489	-85.2	14489	-85.2
533380	SPRGCRK3	115	AMP	3804.3	-72	3804.3	-72	3805.3	-72	3805.3	-72	3805.4	-72
533394	CORONAD3	115	AMP	7630.9	-84.5	7630.9	-84.5	7631.8	-84.5	7631.8	-84.5	7631.8	-84.5
533412	ARKVALI3	115	AMP	10768	-83.5	10768	-83.5	10772	-83.5	10772	-83.5	10772	-83.5
533413	CIRCLE 3	115	AMP	23232	-85.8	23232	-85.8	23253	-85.8	23253	-85.8	23254	-85.8
533414	CITIES 3	115	AMP	8531.2	-83.2	8531.3	-83.2	8534.5	-83.2	8534.6	-83.2	8534.7	-83.2
533415	DAVIS 3	115	AMP	8650.6	-82.8	8650.7	-82.8	8654.2	-82.8	8654.4	-82.8	8654.5	-82.8
533416	RENO 3	115	AMP	26128	-86.1	26129	-86.1	26166	-86.1	26168	-86.1	26169	-86.1
533419	HEC 3	115	AMP	21549	-85.6	21549	-85.6	21567	-85.6	21568	-85.6	21568	-85.6
533421	HEC GT 3	115	AMP	22586	-85.8	22586	-85.8	22605	-85.8	22606	-85.8	22607	-85.8
533426	MANVILE3	115	AMP	11648	-84	11648	-84	11650	-84	11650	-84	11650	-84
533428	MCPHER 3	115	AMP	15628	-86	15628	-86	15631	-86	15631	-86	15631	-86
533429	MOUNDRG3	115	AMP	8607	-83.4	8607.2	-83.4	8614.4	-83.4	8614.6	-83.4	8614.9	-83.4
533438	WMCPHER3	115	AMP	15650	-85.7	15650	-85.7	15654	-85.7	15654	-85.7	15654	-85.7
533439	WHEATLD3	115	AMP	7918.3	-84.1	7918.3	-84.1	7919.2	-84.1	7919.2	-84.1	7919.2	-84.1
533506	DAVIS 2	69	AMP	7468.3	-82.7	7468.3	-82.7	7469.8	-82.7	7469.9	-82.7	7469.9	-82.7
533541	AKRON 2	69	AMP	6719	-82.4	6719.3	-82.4	6723.9	-82.4	6724.3	-82.4	6724.8	-82.4
533543	CRESWLN2	69	AMP	12907	-84	12908	-84	12916	-84	12917	-84	12919	-84
533558	TIMBJCT2	69	AMP	8140.5	-84.4	8140.9	-84.4	8147.7	-84.4	8148.3	-84.4	8148.9	-84.4
533559	UDALL 2	69	AMP	7023.3	-84.2	7023.6	-84.2	7029.1	-84.2	7029.6	-84.2	7030	-84.2
533561	WINFLD 2	69	AMP	6351	-82	6351.2	-82	6353.8	-82	6354.2	-82	6354.6	-82
533573	CRESWLS2	69	AMP	12907	-84	12908	-84	12916	-84	12917	-84	12919	-84
533597	MIDIANW2	69	AMP	13769	-82.2	13770	-82.2	13815	-82.2	13816	-82.2	13817	-82.2
533626	BURLJCT2	69	AMP	4797.5	-85.8	4797.5	-85.8	4798.4	-85.8	4798.4	-85.8	4798.5	-85.8
533629	CC2SHAR2	69	AMP	4525.1	-81.4	4525.1	-81.4	4525.9	-81.4	4526	-81.4	4526	-81.4
533653	WOLFCRK2	69	AMP	5825.1	-87.2	5825.1	-87.2	5826.5	-87.2	5826.6	-87.2	5826.6	-87.2
533786	CHISHLM2	69	AMP	19595	-85.3	19597	-85.3	19676	-85.3	19678	-85.3	19681	-85.3
533795	GILL E 2	69	AMP	29003	-84.9	29007	-84.9	29130	-84.9	29136	-84.9	29142	-84.9
533796	GILL W 2	69	AMP	29003	-84.9	29007	-84.9	29130	-84.9	29136	-84.9	29142	-84.9
533798	GILLJCT2	69	AMP	20353	-81.9	20354	-81.9	20420	-81.9	20423	-81.9	20426	-81.9
533802	HAYSVJS2	69	AMP	7899.7	-83.7	7900	-83.7	7908	-83.7	7908.4	-83.7	7908.9	-83.7

Table 5-1: Short Circuit Currents for 2028 Summer Peak Conditions (cont.)

THREE PHASE FAULT													
				Scenario -1		Scenario -2		Scenario -3		Scenario -4		Scenario -5	
Bus Number	Bus Name	Bus Voltage	Unit	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)	/I+/	AN(I+)
533804	HAYSVJN2	69	AMP	13505	-78.4	13506	-78.4	13534	-78.4	13535	-78.4	13537	-78.4
533813	MACARTH2	69	AMP	20983	-81.1	20984	-81.1	21056	-81.1	21060	-81.1	21063	-81.1
533850	VULCAN 2	69	AMP	18635	-84.1	18636	-84.1	18687	-84.1	18689	-84.1	18692	-84.1
533851	VULCTP 2	69	AMP	21918	-84.4	21921	-84.4	21991	-84.5	21994	-84.4	21998	-84.4
539000	RAGO 4	138	AMP	3941.5	-80.5	3941.7	-80.5	3943.4	-80.5	3943.6	-80.5	3943.7	-80.5
539001	ANTHONY4	138	AMP	5009.7	-80.9	5010	-80.9	5013.1	-80.9	5013.4	-80.9	5013.7	-80.9
539002	BLF-CRK4	138	AMP	4693.6	-81.3	4694	-81.3	4696.9	-81.3	4697.2	-81.3	4697.4	-81.3
539003	CLDWELL4	138	AMP	5584.2	-80.8	5584.8	-80.8	5589.3	-80.8	5589.9	-80.8	5590.3	-80.8
539008	MILAN_GOAB	138	AMP	11803	-76.7	11806	-76.7	11828	-76.7	11831	-76.7	11833	-76.7
539009	CONWAY	138	AMP	12578	-76.3	12581	-76.3	12606	-76.3	12609	-76.3	12611	-76.3
539638	FLATRDG4	138	AMP	15452	-85.6	15453	-85.6	15469	-85.6	15471	-85.6	15472	-85.6
539668	HARPER 4	138	AMP	7194.1	-79	7194.7	-79	7200.4	-79	7201	-79	7201.4	-79
539675	MILANTP4	138	AMP	9832.9	-73.9	9834.7	-73.9	9849	-73.9	9850.6	-73.9	9851.9	-73.9
539676	MILAN 4	138	AMP	10431	-75.3	10433	-75.3	10451	-75.3	10453	-75.3	10454	-75.3
539800	CLARKCOUNTY7	345	AMP	12934	-83.2	12934	-83.2	12942	-83.2	12943	-83.2	12943	-83.2
539801	THISTLE7	345	AMP	16191	-85.6	16194	-85.6	16240	-85.6	16244	-85.6	16246	-85.6
539804	THISTLE4	138	AMP	17403	-86.4	17404	-86.4	17425	-86.4	17427	-86.4	17427	-86.4
539852	P1 MPT PRI	345	AMP	10557	-83.8	10557	-83.8	10563	-83.8	10563	-83.8	10563	-83.8
542965	W.GRDNR7	345	AMP	24711	-85.6	24711	-85.6	24717	-85.6	24717	-85.6	24717	-85.6
542981	LACYGNE7	345	AMP	24631	-86.8	24631	-86.8	24645	-86.8	24646	-86.8	24647	-86.8
560053	G15-052T	345	AMP	12891	-86.5	12894	-86.5	12994	-86.5	13023	-86.5	13066	-86.5
560080	G16-046-TAP	345	AMP	11123	-79.5	11124	-79.5	11128	-79.4	11129	-79.4	11129	-79.4
560084	G16-061-TAP	345	AMP	15585	-85.1	15690	-85.1	15698	-85.1	15864	-85	16070	-85
562476	G14-001-TAP	345	AMP	10530	-85.1	10531	-85.1	10567	-85.1	10568	-85.1	10569	-85.1
578530	FR3HV	345	AMP	4926.2	-85.5	4927.6	-85.5	4933.6	-85.5	4934.6	-85.5	4935.3	-85.5
582008	GEN-2011-008	345	AMP	10324	-83	10325	-83	10329	-83.1	10330	-83.1	10330	-83
583370	GEN-2012-024	345	AMP	11074	-83.3	11075	-83.3	11080	-83.3	11081	-83.3	11081	-83.3
583850	GEN-2014-001	345	AMP	7048.4	-84.9	7048.7	-84.9	7064.1	-84.9	7064.6	-84.9	7065	-84.9
584570	GEN-2015-015	138	AMP	5819.2	-81.8	5820.4	-81.8	5821.3	-81.8	5822.5	-81.8	5823.4	-81.8
584900	GEN-2015-052	345	AMP	12843	-86.5	12846	-86.5	12944	-86.5	12973	-86.5	13016	-86.5
585100	GEN-2015-073	345	AMP	13363	-85.4	13363	-85.4	13370	-85.4	13370	-85.4	13370	-85.4
585250	GEN-2015-090	345	AMP	5056.4	-86.3	5056.7	-86.3	5066.9	-86.3	5067.3	-86.3	5067.6	-86.3
587410	GEN-2016-061	345	AMP	15585	-85.1	15690	-85.1	15698	-85.1	15864	-85	16070	-85
587460	GEN-2016-068	345	AMP	6465.5	-84.9	6499.8	-84.9	6501.1	-84.9	6513.9	-84.9	6523	-84.9
587500	GEN-2016-073	345	AMP	14866	-85.8	14869	-85.8	14995	-85.8	15000	-85.8	15003	-85.8
587880	GEN-2016-111	345	AMP	6686.6	-85.7	6686.8	-85.7	6693.9	-85.7	6694.1	-85.7	6694.3	-85.7
587884	G16-111-TAP	345	AMP	10235	-86.1	10236	-86.1	10254	-86.1	10254	-86.1	10255	-86.1
587894	G16-112-TAP	345	AMP	9967.6	-86	9967.9	-86	9980	-86	9980.4	-86	9980.8	-86
588190	GEN-2016-128	345	AMP	N/A	N/A	7904.7	-84.8	7906.7	-84.8	7926.6	-84.8	7940.7	-84.8
588320	GEN-2016-162	345	AMP	N/A	N/A	N/A	N/A	9697.6	-85.4	9700.5	-85.4	9703.9	-85.4
588330	GEN-2016-163	345	AMP	N/A	N/A	N/A	N/A	8577.4	-85.3	8579.7	-85.3	8582.2	-85.3
588360	GEN-2016-153	345	AMP	7112.7	-84.9	7115.8	-84.9	7129.5	-84.9	7131.7	-84.9	7133.4	-84.9
588364	G16-153-TAP	345	AMP	7427.8	-85.5	7431.3	-85.5	7446.4	-85.5	7448.7	-85.5	7450.6	-85.5

SECTION 6: CONCLUSIONS

SUMMARY OF POWER FLOW ANALYSIS

The power flow analysis determined a Limited Operation amount for GEN-2016-153. Refer to Table 6-1 for a summary of the scenarios performed and identified service available.

Table 6-1: Summary of the Power Flow Analysis

Scenario	Scenario Description	LOIS (MW)
		GEN-2016-153
1	Clearwater – Viola 138kV CKT 1 Gill – Viola 138kV CKT 1 Viola 345/138kV Transformer #1 Viola 345/138kV Transformer #2 Ranch Road – Sooner 345kV CKT 1 Terminal Upgrades	0 MW
2	Scenario 1 + GEN-2016-128 dispatched at 176 MW	0 MW
3	Scenario 2 + GEN-2016-162 dispatched at 252 MW GEN-2016-163 dispatched at 252 MW	0 MW
4	Scenario 3 + GEN-2016-119 dispatched at 200 MW	0 MW
5	Scenario 4 + GEN-2016-119 dispatched at 600 MW GEN-2016-100/101 Tap-Arcadia 345kV	0 MW
6*	Scenario 5 + Reduced dispatch of JEC	134 MW

These values reflect the gross generating facility capacity prior to losses associated with the interconnection facilities. It was determined that the dispatch of the Jeffrey Energy Center ("JEC") Unit 2 and Unit 3 have an impact on GEN-2016-153's LOIS amount when the Arcadia substation expansion and Wolf Creek to Blackberry 345 kV line are in-service. When JEC is dispatched at full output (1,570 MW), a thermal constraint exists on the Hoyt to JEC 345 kV line and therefore, GEN-2016-153 is limited to 0 MW. When JEC Unit 2 and Unit 3 are at a reduced output, GEN-2016-153 is able to have full interconnection service (134 MW). The following seasons require reduced dispatch of JEC Unit 2 and Unit 3:

- 2020 Summer Peak: 1,370 MW gross (87% of nameplate)

- 2024 Summer Peak: 1,419 MW gross (90% of nameplate)
- 2029 Summer Peak: 1,554 MW gross (99% of nameplate)

SUMMARY OF STABILITY ANALYSIS

The Stability Analysis determined that with the Wolf Creek NERC MOD-026 and MOD-027 model validation updates several P6 events that include a fault on a circuit connected to either Waverly or Wolf Creek 345kV substations resulted in undamped rotor angle oscillations, voltages below the acceptable recovery voltage, voltage collapse, and generation instability when GEN-2016-153 was connected at 100% output. It is worth noting that this instability is a pre-existing system condition and cannot be directly attributed to interconnection of GEN-2016-153 to its POI.

This analysis identified the potential requirement of generation curtailment at Wolf Creek for certain prior outage conditions including:

- Wolf Creek to Blackberry 345kV circuit #1
- Wolf Creek to Waverly 345kV circuit #1
- Wolf Creek to Benton 345 kV circuit #1
- Wolf Creek to Rose Hill 345 kV circuit #1
- Waverly to LaCygne 345kV circuit #1

The Transmission Owner is advised to update the existing Wolf Creek Operating Guide accordingly.

Also, it is observed that connecting Wolf Creek to Blackberry 345 kV circuit #1 mitigates this instability and allows for GEN-2016-153 to connect at full output. With addition of Wolf Creek to Blackberry 345 kV circuit #1, the Wolf Creek rotor angle quickly damps, and all voltages recover within acceptable SPP Performance Criteria.

It should be noted that while this Limited Operation study analyzed many of the most probable contingencies, it is not an all-inclusive list that can account for every operation situation. Additionally, the study requests may not be able to inject any power onto the Transmission System due to constraints that fall below the threshold of mitigation for a Generator Interconnection request. Because of this, it is likely that the Customers may be required to reduce their generation output to 0 MW under certain system conditions to allow system operators to maintain the reliability of the transmission network.

APPENDIX A: STEADY-STATE AND DYNAMIC MODEL DATA

Base Case Power Flows

Three base case power flows were provided to MEPPI by SPP:

- MDWG18-19W_DIS1701-BASE.sav
- MDWG18-21S_DIS1701-BASE.sav
- MDWG18-28S_DIS1701-BASE.sav
- MDWG18-21L_DIS1701-AD0-BASE.sav

Three dynamic files were provide to MEPPI by SPP:

- MDWG18-19W_DIS1701-BASE.dyr
- MDWG18-21S_DIS1701-BASE.dyr
- MDWG18-28S_DIS1701-BASE.dyr
- MDWG18-21L_DIS1701-AD0-BASE.dyr

GEN-2016-153

- Wind Farm Size: 134 MW
- Interconnection:
  - Voltage: 345 kV
  - POI: Tap Viola – Flat Ridge 2 East 345 kV (Bus 588364)
  - Transformer: 138/34.5 kV step-up transformer
    - MVA: 140 Winding MVA
    - Voltage: 138/34.5 kV
    - Z: 9.8%
  - Transmission Line:
    - R = 0.000360 p.u.
    - X = 0.001130 p.u.
    - B = 0.000000 p.u.
- Collector System Equivalent Model:
  - Transmission Line:
    - R = 0.006510 p.u.
    - X = 0.006020 p.u.\
    - B = 0.058880 p.u.
- Wind Farm Parameters – Vestas V110 Mk10D OptiSpeed 2.0 MW
  - Machine Terminal Voltage: 0.7 kV
  - Rated Power: 134 MW
  - Number of Wind Turbines: 67
  - Generator Step-Up Transformer:
    - MVA: 140.7 Winding MVA
    - High Voltage: 34.5 kV
    - Low Voltage: 0.7 kV
    - Z: 9%

The dynamic data for GEN-2016-153 is shown below:

588363 'USRMDL' '1' 'VWCO81' 1 1 2 45 23 104 1 0 2000.0000 690.0000 901.7885 700.0000 2.6200 0.6786 0.0160 0.4503 94.2478 0.4503 94.2478 30.0000 0.2000 1.2000 0.1000 0.0018 0.7018 0.0384 1.3298 0.0000 422.2301 184.6106 0.0300 0.0000 0.0300 0.3000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 3.0000 0.0000 4736.7543 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 /

0 'USRMDL' 0 'VWVA81' 8 0 2 0 0 30 588363 '1'/

0 'USRMDL' 0 'VWLV81' 8 0 3 65 10 35 588363 '1' 1 0.8500 0.0010 0.0700 18.6662 74.6683 74.6683 74.6683 2.0000 0.0000 1.5152 0.8796 1.4400 2000.0000 690.0000 1.0000 0.3500 0.0500 0.2500 0.0200 3.0000 4.0000 9999.0000 0.0160 -12.0000 0.9000 0.0500 0.0000 0.0100 60.0000 1.0000 1.0000 1.0000 0.0000 0.0000 0.0000 100.0000 0.0001 0.0070 1.0000 0.0000 40.0000 1.0000 0.0000 0.0000 0.1700 0.0000 0.2000 1.0000 1.0000 1.1500 1.1000 2.0000 0.0000 0.0000 0.0000 0.2000 40.0000 777.0000 15.0000 0.0000 1.0000 1.4637

0.0000 0.0000 0.0000 /

0 'USRMDL' 0 'VWPW81' 8 0 3 40 7 30 588363 '1' 0 1.0000 0.5000 -0.5000 -0.9995 1.9038 0.9800 0.9600 0.2000 0.2000 0.4500 0.4500 0.0000 0.0000 0.0159 0.0159 1.0000 0.0250 0.0250 0.0000 0.8500 0.9000 0.9300 1.0800 1.1000 1.2000 1.0000 1.4000 0.0000 0.0000 1.0000 5.0000 5.0000 6.0000 0.0250 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000/

0 'USRMDL' 0 'VWME81' 8 0 2 10 8 0 588363 '1' 2000.0000 422.2301 4736.7543 1246.6332 85.8900 0.0000 0.0000 3824.4671 33.2614 0.0000 /

0 'USRMDL' 0 'VWM781' 8 0 2 10 8 5 588363 '1' 0.0159 0.0159 0.1000 0.1000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 /

0 'USRMDL' 0 'VWVP81' 0 2 7 30 0 18 588363 '1' 1 1 0 0 0 0.8500 11.0000 0.8500 11.0000 0.9000 60.0000 1.1000 3600.0000 1.1600 1800.0000 1.2400 60.0000 1.3600 30.0000 1.3600 30.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.1500 0.8000 3.0000 0.8000 3.0000 0.8000 3.0000 /

0 'USRMDL' 0 'VWFP81' 0 2 3 12 0 7 588363 '1' 0 56.4000 0.2000 56.4000 0.2000 56.4000 0.2000 63.6000 0.2000 63.6000 0.2000 63.6000 0.2000 /

APPENDIX B: PLOTS FOR 2019 WINTER PEAK CONDITIONS

Plots available upon request

APPENDIX C: PLOTS FOR 2021 SUMMER PEAK CONDITIONS

Plots available upon request

APPENDIX D: PLOTS FOR 2028 SUMMER PEAK CONDITIONS

Plots available upon request

APPENDIX E: PLOTS FOR 2021 LIGHT LOAD CONDITIONS

Plots available upon request