Definitive Interconnection System Impact Study for Generation Interconnection Requests

(DISIS-2015-002-1)

August 2016

Generator Interconnection

SPP Southwest Power Pool

Revision History

Date	Author	Change Description
2/5/2016	SPP	Draft issued to Transmission Owners for review
2/12/2016	SPP	Report Issued (DISIS-2015-002). Some stability analysis still pending. Group 2, 6, 7, 15 and 16 Interconnection Request Results not included in this issue.
2/22/2016	SPP	Draft issued to Transmission Owners for Group 2, 6, and 7 review
2/29/2016	SPP	Report Issued (DISIS-2015-002) to include Group 2, 6, and 7 Results. Some stability analysis still pending. 15 and 16 Interconnection Request Results not included in this issue.
3/17/2016	SPP	Draft issued to Transmission Owners for Group 15, and 16 review
3/29/2016	SPP	Report Issued (DISIS-2015-002) to include Group 15 and 16 Results. Group 16 stability analysis still pending.
4/28/2016	SPP	Report Issued to include Group 16 stability analysis
8/01/2016	SPP	ReStudy to account for withdrawn projects.
8/05/2016	SPP	DISIS-2015-002-1 reposted for AECI Affected System Cost Allocation correction and update to Introduction Section Stand-Alone Language

Executive Summary

Pursuant to the Generator Interconnection Procedures (GIP) of the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Definitive Interconnection System Impact Study (DISIS). The Interconnection Customers' requests have been clustered together for the following System Impact Cluster Study window which closed September 30, 2015. The Interconnection Customers will be referred to in this study as the DISIS-2015-002 Interconnection Customers. This System Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling approximately 7,340.9 MW of new generation which would be located within the transmission systems of American Electric Power – Western (AEPW), Basin Electric Power Cooperative (BPEC), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Southwestern Public Service (SPS), Southwestern Power Administration (SWPA), Sunflower Electric Power Corporation\Mid-Kansas Electric Company, LLC (SUNC\MKEC), Western Area Power Administration (WAPA), Westar Energy, Inc. (WERE), and Western Farmers Electric Cooperative (WFEC). The various generation interconnection requests have differing proposed in-service dates[1]. The generation interconnection requests included in this System Impact Cluster Study are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date. This study represents the "Stand-Alone" analysis for remaining Interconnection Requests in the DISIS-2015-002 analysis.

Power flow analysis has indicated that for the power flow cases studied, 7,340.9 MW of nameplate generation may be interconnected with transmission system reinforcements within the SPP transmission system. For the analyses that has been completed, dynamic stability and power factor analysis has determined the need for reactive compensation in accordance with SPP stability and voltage recovery requirements including FERC Order #661-A for wind farm interconnection requests. Those reactive requirements are listed for each interconnection request within this report. Dynamic stability analysis has determined that the transmission system will remain stable with the assigned Network Upgrades and necessary reactive compensation requirements. A short circuit analysis has been performed with available short circuit values given in the stability study for each group in the appendices of this report. A short circuit analysis has been performed with available short circuit values given in the stability study for each group in the appendices of this report.

In no way does this study guarantee operation for all periods of time. This interconnection study identifies and assigns transmission reinforcements for Energy Resource Interconnection Service

[1] The generation interconnection requests in-service dates may need to be deferred based on the required lead time for the Network Upgrades necessary. The Interconnection Customers that proceed to the Interconnection Facilities Study will be provided a new in-service date based on the Facility Study's time for completion of the Network Upgrades necessary or as otherwise provided for in the GIP.

(ERIS) interconnection injection constraints (defined as a 20% or greater distribution factor impact for outage based constraints and 3% or greater distribution factor impact for system intact constraints) and Network Resource Interconnection Service (NRIS) constraints (defined as 3% or greater distribution factor impact), if requested by the Customer. These constraints are listed in Appendix G-T (Thermal) and Appendix G-V (Voltage). This interconnection study does not assign transmission reinforcements for all potential transmission constraints. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Interconnection Customer(s) may be required to reduce their generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

The total estimated minimum cost for interconnecting the DISIS-2015-002 Interconnection Customers is estimated at $677,958,271. The following costs are not included in this total –

- **Costs Not Included** – Costs on Affected Systems for particularly Associated Electric Cooperative Inc. (AECI), Mid-Continent Independent System Operator (MISO), and Minnkota Power Cooperative, Inc (MPC).

These costs determined at this time are shown in Appendix E and F. For Interconnection Requests that result in an interconnection to, or modification to, the transmission facilities of the Western-UGP (WAPA), a National Environmental Policy Act (NEPA) Environmental Review will be required. The Interconnection Customer will be required to execute and Environmental Review Agreement per Section 8.6.1 of the GIP.

Interconnection Service to DISIS-2015-002 Interconnection Customers is also contingent upon higher queued customers paying for certain required network upgrades. **<u>The in-service date for the DISIS customers will be deferred until the construction of these network upgrades can be completed.</u>** These costs also do not include the Interconnection Customer Interconnection Facilities as defined by the SPP Open Access Transmission Tariff (OATT) or the additional SPP transmission network constraints identified through this study and shown in Appendix H.

Constraints listed in Appendix H do not require transmission reinforcement for Interconnection Service, but could require Interconnection Customer to reduce generation in operational conditions. These transmission constraints occur when this study's generation is dispatched into the SPP footprint for Energy Resource Interconnection Service (ERIS) or when this study's generation is dispatched into the interconnecting Transmission Owner's (T.O.) area for Network Resource Interconnection Service (NRIS).

It should be noted that the additional network constraints identified in Appendix H may also be identified by a Transmission Service Request (TSR) and may need to be verified by associated studies. With a defined source and sink in a TSR, the list of network constraints will be refined and expanded to account for all Network Upgrade requirements. The required interconnection costs listed in Appendix E and F do not include costs associated with the deliverability of the energy to load or other customers. These costs are determined by separate studies should the Customer decide to submit a Transmission Service Request through SPP's Open Access Same Time

Information System (OASIS) as required by Attachment Z1 of the SPP OATT. Furthermore, this DISIS neither guarantees transmission service or deliverability of the requested resource.

When applicable, affected system thermal and voltage constraints are listed in Appendix H-T-AS and Appendix H-V-AS. Affected System constraints could require an affects system impact study review by the affected party or affected system parties. The affected system impact study could result in identifying additional affected transmission system reinforcement network upgrades required for interconnection.

NERC FAC-002-2 Compliance Statement

SPP, as Planning Coordinator has studied the reliability impact of interconnecting new or materially modified generation requesting interconnection to the Transmission System of SPP and any affected systems as requested by those entities. Affected systems include both the systems of SPP Transmission Owners and systems not included in the SPP Tariff footprint. The impact of the generation interconnection on affected systems will be further coordinated with the following systems as part of the coordinated planning procedures as described in Section 6 of this report and summarized below.

- Impacts on Associated Electric Cooperative Inc. (AECI) – For any observed violations of thermal overloads on AECI facilities, AECI has been notified by SPP to evaluate the violations for impacts on its transmission system.
- Impacts on Mid Continent Independent System Operation (MISO) – MISO has been contacted and provided a list of interconnection requests that proceed to move forward into the Interconnection Facilities Study Queue. MISO is evaluating the Interconnection Requests for impacts.
- Impacts on Minnkota Power Cooperative, Inc (MPC) – MPC has been contacted and provided a list of interconnection requests that proceed to move forward into the Interconnection Facilities Study Queue. MP is evaluating the Interconnection Requests for impacts.

This analysis adheres to NERC standards, regional, and Transmission Owner planning criteria, as related to generator interconnections. Facility interconnection requirements will be fully evaluated by the Transmission Owners during the Interconnection Facilities Study.

This analysis evaluates steady-state (Section 8), short-circuit (Section 9), and dynamic studies (Section 9) to evaluate system performance under both normal and contingency conditions. Study assumptions (Section 2) and system performance (Section 3) are documented in this report. Alternatives considered and coordinated recommendations are documented in Section 8 and Section 9.

Table of Contents

1 Introduction

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Definitive Interconnection System Impact Study (DISIS) for certain generation interconnection requests in the SPP Generation Interconnection Queue. These interconnection requests have been clustered together for the following System Impact Study window which closed September 30, 2015. The customers will be referred to in this study as the DISIS-2015-002 Interconnection Customers. This DISIS analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling 7,340.9 MW of new generation which would be located within the transmission systems of American Electric Power – Western (AEPW), Basin Electric Power Cooperative (BPEC), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Southwestern Public Service (SPS), Southwestern Power Administration (SWPA), Sunflower Electric Power Corporation\Mid-Kansas Electric Company, LLC (SUNC\MKEC), Western Area Power Administration (WAPA), Westar Energy, Inc. (WERE), and Western Farmers Electric Cooperative (WFEC). The various generation interconnection requests have differing proposed in-service dates[2]. The generation interconnection requests included in this System Impact Study are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date. This study represents the “Stand-Alone” analysis for remaining Interconnection Requests in the DISIS-2015-002 analysis.

The primary objective of this DISIS is to identify the system constraints, transient instabilities, and over-dutied equipment associated with connecting the generation to the area transmission system. The Impact Study and other subsequent Interconnection Studies are designed to identify required Transmission Owner Interconnection Facilities, Network Upgrades and other Direct Assignment Facilities needed to inject power into the grid at each specific point of interconnection.

[2] The generation interconnection requests in-service dates may need to be deferred based on the required lead time for the Network Upgrades necessary. The Interconnection Customers that proceed to the Facility Study will be provided a new in-service date based on the completion of the Facility Study or as otherwise provided for in the GIP.

2 Model Development (Study Assumptions)

2.1.1 Interconnection Requests Included in the Cluster

SPP included all interconnection requests that submitted a Definitive Interconnection System Impact Study Agreement no later than September 30, 2015 and were subsequently accepted by Southwest Power Pool under the terms of the Generator Interconnection Procedures (GIP) that were in effect at the time this study commenced on October 1, 2015. The interconnection requests that are included in this study are listed in Appendix A.

2.1.2 Affected System Interconnection Request

Also included in this Definitive Interconnection System Impact Study is one (1) Affected System Study. The Affected System Interconnection Requests have been given the designations with the "ASGI" prefix. These requests are listed in Appendix A. Affected System Interconnection Requests were only studied in "cluster" scenarios.

2.1.3 Previously Queued Interconnection Requests

The previous queued requests included in this study are listed in Appendix B. In addition to the Base Case Upgrades, the previous queued requests and associated upgrades were assumed to be in-service and added to the Base Case models. These projects were dispatched as Energy Resources Interconnection Service (ERIS) with equal distribution across the SPP footprint. Prior queued projects that requested Network Resource Interconnection Service (NRIS) were also dispatched in separate NRIS scenarios into the balancing authority of the interconnecting transmission owner.

2.2 Development of Base Cases

2.2.1 Power Flow

The 2015 series Integrated Transmission Planning models (used in the 2016 ITPNT) including the 2016 winter peak (16WP) season, the 2017 spring (17G) and 2017 summer peak (17SP) seasons, the 2020 light load (20L), summer (20SP) and winter peak (20WP) seasons, and the 2025 summer peak (25SP) season were the starting seasonal models for this study.

2.2.2 Dynamic Stability

The 2015 series SPP Model Development Working Group (MDWG) Models for 2016 winter peak (16WP) season, 2017 summer peak (17SP) season, and the 2025 summer peak (25SP) season cases were used as starting points for this study.

2.2.3 Short Circuit

The 2017 and 2025 summer peak stability cases are used for this analysis.

2.2.4 Base Case Upgrades

The following facilities are part of the SPP Transmission Expansion Plan, the Balanced Portfolio or recently approved Priority Projects. These facilities have an approved Notification to Construct (NTC) or are in construction stages and were assumed to be in-service at the time of dispatch and added to the base case models. The DISIS-2015-002 Interconnection Customers have not been assigned advancement costs for the below listed projects. The DISIS-2015-002 Interconnection

Customers Generation Facilities in service dates may need to be delayed until the completion of the following upgrades. In some cases, the in-service date is beyond the allowable time a customer can delay. In this case, the Interconnection Customer may move forward with Limited Operation or remain in the DISIS Queue for additional study cycles. If for some reason, construction on these projects is discontinued, additional restudies will be needed to determine the interconnection needs of the DISIS Interconnection Customers.

- 2012 Integrated Transmission Plan (2012 ITP10) Projects
  - Woodward-Tatonga-Mathewson-Cimarron 345kV transmission line circuit #2, scheduled for 2018 in-service[3]
  - Chisholm – Gracemont 345kV transmission line, and Chisholm 345/230kV transformer circuit #1, scheduled for 3/1/2018 in-service[4]
- 2015 Integrated Transmission Plan Near Term (2015 ITPNT) Projects
  - Potash Junction – Intrepid – IMC #1 – Livingston Ridge 115kV rebuild
  - National Enrichment Plant – Targa – Cardinal 115kV circuit #1 rebuild
- Gentleman – Thedford (Cherry County) – Holt County 345kV circuit #1 scheduled for 2018 in-service[5]
- Hoskins – Neligh East 345/115 kV Project[6]
  - Neligh East 345/115 kV substation and transformer
  - Neligh East Area 115 kV upgrades to support new station
  - Hoskins – Neligh East 345 kV circuit #1
- High Priority Incremental Loads (HPILs) Projects[7]:
  - TUCO Interchange – Yoakum – Hobbs Interchange 345/230 kV Project
    - TUCO Interchange – Yoakum – Hobbs Interchange 345 kV circuit #1 and associated terminal equipment upgrades
    - Hobbs 345/230/13 kV transformer circuit #1
    - Yoakum 345/230/13 kV transformer circuit #1
  - Chaves County – Price – CV Pines – Capitan 115 kV circuit #1
  - China Draw – Yeso Hills 115 kV circuit #1
  - Dollarhide – Toboso Flats 115 kV circuit #1
  - Hobbs Interchange – Kiowa 345 kV circuit #1
  - Kiowa – North Loving – China Draw 345/115 kV Projects
    - Kiowa – North Loving – China Draw circuit #1 and associated terminal equipment upgrades
    - China Draw 345/115/13 kV transformer circuit #1
    - North Loving 345/115/13 kV transformer circuit #1
  - Kiowa – Road Runner 345/230/115 kV Projects

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[3] SPP Notification to Construct (NTC) 200223
[4] SPP Notification to Construct (NTC) 200240 and 200255
[5] SPP Notification to Construct (NTC) 200220
[6] SPP Regional Reliability 2012 ITP 10 Project Per SPP-NTC-200220
[7] Per Network Upgrades assigned in High Priority Incremental Loads (HPILs) study, Including Direct Assigned Upgrades, Projects in SPP-NTC-200256 and SPP-NTC-200283.

        - Kiowa 345/230 kV transformer circuit #1
        - Road Runner 345/115/13 kV transformer circuit #1
    - Livingston Ridge – Sage Brush – Lagarto – Cardinal 115 kV circuit #1
    - North Loving – South Loving 115 kV circuit #1
    - Ponderosa – Ponderosa Tap 115 kV circuit #1
- Nebraska City – Mullin Creek – Sibley 345kV circuit #1 build, scheduled for 12/31/2016 in-service[8]

2.2.5 Contingent Upgrades

The following facilities do not yet have approval. These facilities have been assigned to higher queued interconnection customers. These facilities have been included in the models for the DISIS-2015-002 study and are assumed to be in service. This list may not be all inclusive. The DISIS-2015-002 Interconnection Customers, at this time, do not have responsibility for these facilities but may later be assigned the cost of these facilities if higher queued customers terminate their Generation Interconnection Agreement or withdraw from the interconnection queue. The DISIS-2015-002 Interconnection Customer Generation Facilities in-service dates may need to be delayed until the completion of the following upgrades.

- Upgrades assigned to DISIS-2010-002 Interconnection Customers:
    - Twin Church – Dixon County 230 kV circuit #1 rerate (320 MVA).
    - Buckner – Spearville 345 kV circuit #1 terminal equipment.
- Upgrades assigned to DISIS-2011-001 Interconnection Customers:
    - Hoskins – Dixon County – Twin Church 230 kV circuit #1 conductor clearance increase.
    - (NRIS only) Woodward District EHV Phase Shifting Transformer.
- Upgrades assigned to DISIS-2012-002 Interconnection Customers:
    - Lake Creek – Lone Wolf 69 kV circuit #1 reset CT, placed in-service
- Upgrades assigned to DISIS-2013-002 Interconnection Customers:
    - Battle Creek – County Line – Neligh East 115kV circuit #1 rebuild.
- Upgrades assigned to DISIS-2014-002 Interconnection Customers:
    - Arnold – Ransom 115kV circuit #1, terminal equipment replacement.
    - Tolk – Plant X 230kV circuit #1 and circuit #2, re-conductor.
    - Tuco 345/230kV transformer replacement.
- Upgrades assigned to DISIS-2015-001 Interconnection Customers:
    - Beach – GEN-2010-048 Tap 115kV circuit #1 replace terminal equipment.
    - Cimarron River Tap – Kismet – Cudahy – Crooked Creek 115kV circuit #1 rebuild.
    - Greenburg – Shooting Star 115kV circuit #1 rebuild.
    - Kress Interchange – Swisher 115kV circuit #1 replace terminal equipment.
    - Oklaunion 345kV Reactive Power Support
        - Install two (2) 130Mvar Capacitor Bank(s).
    - (NRIS Only) Cox Interchange – Hale County 115kV circuit #1 rebuild.

[8] SPP Notification to Construct (NTC) 20097 and 20098

- (NRIS Only) Potter County Interchange 345/230/13kV Transformer circuit #2, build.
- (NRIS Only) Renfrow – Renfrow 138kV circuit #1 rebuild.
- (NRIS Only) Sundown Interchange 230/115/13.8kV transformer circuit #1 replacement.
- (NRIS Only) Crawfish Draw Substation 345/230kV
    - Build new 345/230kV substation along TUCO – Border 345kV and TUCO – Swisher 230kV. Tie in and Terminate TUCO 345kV, Border 345kV, TUCO 230kV, and Swisher 230kV at Crawfish Draw (TUCO 2).
    - Build 345/230/13kV transformer
- (NRIS Only) Wolfforth – Terry County 115kV circuit #1 replace terminal equipment.
- (NRIS Only) Wolfforth Interchange 230/225/13.2kV circuit #1 replacement.

2.2.6 Potential Upgrades Not in the Base Case

Any potential upgrades that do not have a Notification to Construct (NTC) and are not explicitly listed within this report have not been included in the base case. These upgrades include any identified in the SPP Extra-High Voltage (EHV) overlay plan, or any other SPP planning study other than the upgrades listed above in the previous section.

2.2.7 Regional Groupings

The interconnection requests listed in Appendix A are grouped together into ten (10) active regional groups based on geographical and electrical impacts. These groupings are shown in Appendix C.

To determine interconnection impacts, ten (10) different generation dispatch scenarios of the spring, summer, and winter base case models are developed to accommodate the regional groupings.

2.3 Development of Analysis Cases

2.3.1 Power Flow

For Variable Energy Resources (VER) (solar/wind) in each power flow case, Energy Resource Interconnection Service (ERIS), is evaluated for the generating plants within a geographical area of the interconnection request(s) for the VERs dispatched at 100% nameplate of maximum generation. The VERs in the remote areas are dispatched at 20% nameplate of maximum generation. These projects are dispatched across the SPP footprint using load factor ratios.

Peaking units are not dispatched in the 2017 spring, 2020 light, or in the “High VER” summer and winter peaks. To study peaking units’ impacts, the 2016 winter peak and 2017 summer peak, 2020 summer and winter peaks, and 2025 summer peak models are developed with peaking units dispatched at 100% of the nameplate rating and VERs dispatched at 20% of the nameplate rating. Each interconnection request is also modeled separately at 100% nameplate for certain analyses.

All generators (VER and peaking) that requested Network Resource Interconnection Service (NRIS) are dispatched in an additional analysis into the interconnecting Transmission Owner’s (T.O.) area at 100% nameplate with Energy Resource Interconnection Service (ERIS) only requests at 80% nameplate. This method allows for identification of network constraints that are common between regional groupings to have affecting requests share the mitigating upgrade costs throughout the cluster.

2.3.1.1 Additional Sensitivities Considered – The following sensitivities were run for situations prevalent to the local area for which they were considered

- North Dakota – Canadian border – The phase shifting transformer to Saskatchewan Power (also known as B-10T) and Miles City DC Tie were dispatched at the following levels
    - 2016 Winter Peak –
        - Miles City DC Tie– 200MW East to West transfer
        - B-10T – 65MW South to North transfer
    - 2017 Summer Peak –
        - Miles City DC Tie – 200MW East to West transfer
        - B-10T – 200MW North to South transfer
    - Other Seasons
        - Miles City DC Tie – 140MW East to West transfer (20WP)
        - Miles City DC Ties – 92MW East to West transfer (17G & 20L)
        - B-10T – 0MW

2.3.2 Dynamic Stability
For each group, all interconnection requests are dispatched at 100% nameplate output while the other groups are dispatched at 20% output for VERs and 100% output for thermal requests.

2.3.2.1 Additional Sensitivities Considered

- North Dakota – Canadian border – The phase shifting transformer to Saskatchewan Power (also known as B-10T) and Miles City DC Tie were dispatched at the following levels
    - 2016 Winter Peak –
        - Miles City DC Tie– 200MW East to West transfer
        - B-10T – 65MW South to North transfer
    - 2017 Summer Peak –
        - Miles City DC Tie – 200MW East to West transfer
        - B-10T – 200MW North to South transfer

2.3.3 Short Circuit
The dynamic stability models (2017 SP and 2025 SP) are used for this analysis.

3 Identification of Network Constraints (System Performance)

3.1.1 Thermal Overloads
Network constraints are found by using PSS/E AC Contingency Calculation (ACCC) analysis with PSS/E MUST First Contingency Incremental Transfer Capability (FCITC) analysis on the entire cluster grouping dispatched at the various levels previously mentioned.

For Energy Resource Interconnection Service (ERIS), thermal overloads are determined for system intact (n-0) (greater than 100% of Rate A - normal) and for contingency (n-1) (greater than 100% of Rate B – emergency) conditions.

The overloads are then screened to determine which of generator interconnection requests have at least

- 3% Distribution Factor (DF) for system intact conditions (n-0),
- 20% DF upon outage based conditions (n-1),
- or 3% DF on contingent elements that resulted in a non-converged solution.

Appropriate transmission support is then determined to mitigate the constraints.

Interconnection Requests that requested Network Resource Interconnection Service (NRIS) are also studied in a separate NRIS analysis to determine if any constraint measured greater than or equal to a 3% DF. If so, these constraints are also considered for transmission reinforcement under NRIS.

3.1.2 Voltage

For non-converged power flow solutions that are determined to be caused by lack of voltage support, appropriate transmission support will be determined to mitigate the constraint.

After all thermal overload and voltage support mitigations are determined; a full ACCC analysis is then performed to determine voltage constraints. The following voltage performance guidelines are used in accordance with the Transmission Owner local planning criteria.

SPP Areas (69kV+):

Transmission Owner	Voltage Criteria (System Intact)	Voltage Criteria (Contingency)
AEPW	0.95 – 1.05 pu	0.92 – 1.05 pu
GRDA	0.95 – 1.05 pu	0.90 – 1.05 pu
SWPA	0.95 – 1.05 pu	0.90 – 1.05 pu
OKGE	0.95 – 1.05 pu	0.90 – 1.05 pu
OMPA	0.95 – 1.05 pu	0.90 – 1.05 pu
WFEC	0.95 – 1.05 pu	0.90 – 1.05 pu
SWPS	0.95 – 1.05 pu	0.90 – 1.05 pu
MIDW	0.95 – 1.05 pu	0.90 – 1.05 pu
SUNC	0.95 – 1.05 pu	0.90 – 1.05 pu
KCPL	0.95 – 1.05 pu	0.90 – 1.05 pu
INDN	0.95 – 1.05 pu	0.90 – 1.05 pu
SPRM	0.95 – 1.05 pu	0.90 – 1.05 pu
NPPD	0.95 – 1.05 pu	0.90 – 1.05 pu
WAPA	0.95 – 1.05 pu	0.90 – 1.05 pu
WERE L-V	0.95 – 1.05 pu	0.93 – 1.05 pu

WERE H-V	0.95 – 1.05 pu	0.95 – 1.05 pu
EMDE L-V	0.95 – 1.05 pu	0.90 – 1.05 pu
EMDE H-V	0.95 – 1.05 pu	0.92 – 1.05 pu
LES	0.95 – 1.05 pu	0.90 – 1.05 pu
OPPD	0.95 – 1.05 pu	0.90 – 1.05 pu

SPP Buses with more stringent voltage criteria:

Bus Name/Number	Voltage Criteria (System Intact)	Voltage Criteria (Contingency)
TUCO 230kV 525830	0.925 – 1.05 pu	0.925 – 1.05 pu
Wolf Creek 230kV 532797	0.985 – 1.03 pu	0.985 – 1.03 pu
FCS 646251	1.001 – 1.047 pu	1.001 – 1.047 pu

Affected System Areas (115kV+):

Transmission Owner	Voltage Criteria (System Intact)	Voltage Criteria (Contingency)
EES-EAI	0.95 – 1.05 pu	0.90 – 1.05 pu
LAGN	0.95 – 1.05 pu	0.90 – 1.05 pu
EES	0.95 – 1.05 pu	0.90 – 1.05 pu
AMMO	0.95 – 1.05 pu	0.90 – 1.05 pu
CLEC	0.95 – 1.05 pu	0.90 – 1.05 pu
LAFA	0.95 – 1.05 pu	0.90 – 1.05 pu
LEPA	0.95 – 1.05 pu	0.90 – 1.05 pu
XEL	0.95 – 1.05 pu	0.90 – 1.05 pu
MP	0.95 – 1.05 pu	0.90 – 1.05 pu
SMMPA	0.95 – 1.05 pu	0.90 – 1.05 pu
GRE	0.95 – 1.05 pu	0.90 – 1.10 pu
OTP	0.95 – 1.05 pu	0.90 – 1.05 pu
OTP-H (115kV+)	0.97 – 1.05 pu	0.92 – 1.10 pu
ALTW	0.95 – 1.05 pu	0.90 – 1.05 pu
MEC	0.95 – 1.05 pu	0.90 – 1.05 pu
MDU	0.95 – 1.05 pu	0.90 – 1.05 pu
SPC	0.95 – 1.05 pu	0.95 – 1.05 pu
DPC	0.95 – 1.05 pu	0.90 – 1.05 pu
ALTE	0.95 – 1.05 pu	0.90 – 1.05 pu

The constraints identified through the voltage scan are then screened for the following for each interconnection request. 1) 3% DF on the contingent element and 2) 2% change in pu voltage. In certain conditions, engineering judgement was used to determine whether or not a generator had impacts to voltage constraints.

3.1.3 Dynamic Stability

Stability issues considered for transmission reinforcement under ERIS. Generators that fail to meet low voltage ride-through requirements (FERC Order #661-A) or SPP's stability criteria for damping or dynamic voltage recovery are assigned upgrades such that these requirements can be met.

3.1.4 Upgrades Assigned

Thermal overloads that require transmission support to mitigate are discussed in Section 8 and listed in Appendix G-T. Voltage constraints that may require transmission support are discussed in Section 8 and listed in Appendix G-V (Cluster Analysis). Constraints that are identified solely through the stability analysis are discussed in Section 8 and the appropriate appendix for the detailed stability study of that Interconnection Request. All of these upgrades are cost assigned in Appendix E and Appendix F.

Other network constraints not requiring transmission reinforcements are shown in Appendix H (Cluster Analysis). With a defined source and sink in a Transmission Service Request, this list of network constraints can be refined and expanded to account for all Network Upgrade requirements for firm transmission service. Additional constraints identified by multi-element contingencies are listed in Appendix I.

In no way does the list of constraints in Appendix G (Cluster Analysis) identify all potential constraints that guarantee operation for all periods of time. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

4 Determination of Cost Allocated Network Upgrades

Cost Allocated Network Upgrades of Variable Energy Resources (VER) (solar/wind) generation interconnection requests are determined using the 2017 spring model. Cost Allocated Network Upgrades of peaking units is determined using the 2020 summer peak model. A PSS/E and MUST sensitivity analysis is performed to determine the Distribution Factors (DF), a distribution factor with no contingency that each generation interconnection request has on each new upgrade. The impact each generation interconnection request has on each upgrade project is weighted by the size of each request. Finally the costs due by each request for a particular project are then determined by allocating the portion of each request's impact over the impact of all affecting requests.

For example, assume that there are three Generation Interconnection requests, X, Y, and Z that are responsible for the costs of Upgrade Project '1'. Given that their respective PTDF for the project have been determined, the cost allocation for Generation Interconnection request 'X' for Upgrade Project 1 is found by the following set of steps and formulas:

- Determine an Impact Factor on a given project for all responsible GI requests:

  Request X Impact Factor on Upgrade Project 1 = PTDF(%)(X) * MW(X) = X1

  Request Y Impact Factor on Upgrade Project 1 = PTDF(%)(Y) * MW(Y) = Y1

  Request Z Impact Factor on Upgrade Project 1 = PTDF(%)(Z) * MW(Z) = Z1

- Determine each request's Allocation of Cost for that particular project:

$$\text{Request X's Project 1 Cost Allocation (\$)} = \frac{\text{Network Upgrade Project 1 Cost(\$)} * X1}{X1 + Y1 + Z1}$$

- Repeat previous for each responsible GI request for each Project

The cost allocation of each needed Network Upgrade is determined by the size of each request and its impact on the given project. This allows for the most efficient and reasonable mechanism for sharing the costs of upgrades.

4.1.1 Credits/Compensation for Amounts Advanced for Network Upgrades

Interconnection Customer shall be entitled to either credits or potentially Long Term Congestion Rights (LTCR), otherwise known as compensation, in accordance with Attachment Z2 of the SPP Tariff for any Network Upgrades, including any tax gross-up or any other tax-related payments associated with the Network Upgrades, and not refunded to the Interconnection Customer.

5 Required Interconnection Facilities

The requirement to interconnect the 7,340.9 MW of generation into the existing and proposed transmission systems in the affected areas of the SPP transmission footprint consist of the necessary cost allocated shared facilities listed in Appendix F by upgrade. The interconnection requirements for the cluster total an estimated $677,958,271 not including the following costs.

- **Costs Not Included** – Costs on Affected Systems for particularly Associated Electric Cooperative Inc. (AECI), Mid-Continent Independent System Operator (MISO), and Minnkota Power Cooperative, Inc (MPC).

Interconnection Facilities specific to each generation interconnection request are listed in Appendix E. A preliminary one-line drawing for each generation interconnection request are listed in Appendix D.

For an explanation of how required Network Upgrades and Interconnection Facilities were determined, refer to the section on "Identification of Network Constraints."

5.1.1 Facilities Analysis

The interconnecting Transmission Owner for each Interconnection Request has provided its preliminary analysis of required Transmission Owner Interconnection Facilities and the associated

Network Upgrades, shown in Appendix D. This analysis was limited only to the expected facilities to be constructed by the Transmission Owner at the Point of Interconnection. These costs are included within one-line diagrams in Appendix D and also listed in Appendix E and F as combined "Interconnection Costs". If the one-lines and costs in Appendix D have been updated by the Transmission Owner's Interconnection Facilities Study, those costs will be noted in the appendix. These costs will be further refined by the Transmission Owner as part of the Interconnection Facilities Study. Any additional Network Upgrades identified by this DISIS beyond the Point of Interconnection are defined and estimated by either the Transmission Owner or by SPP. These additional Network Upgrade costs will also be refined further by the Transmission Owner within the Interconnection Facilities Study.

5.1.2 Environmental Review

For Interconnection Requests that result in an interconnection to, or modification to, the transmission facilities of the Western-UGP, a National Environmental Policy Act (NEPA) Environmental Review will be required. The Interconnection Customer will be required to execute and Environmental Review Agreement per Section 8.6.1 of the GIP.

6 Affected Systems Coordination

The following procedures are in place to coordinate with Affected Systems.

- Impacts on Associated Electric Cooperative Inc. (AECI) – For any observed violations of thermal overloads on AECI facilities, AECI has been notified by SPP to evaluate the violations for impacts on its transmission system. AECI has instructed SPP to notify the affected Interconnection Customers after posting of this study to contact AECI for an Affected System Study Agreement to further study the impacts on the AECI system.
- Impacts on Mid Continent Independent System Operation (MISO) – Per SPP's agreement with MISO, MISO has been contacted and provided a list of interconnection requests that proceed to move forward into the Interconnection Facilities Study Queue. MISO is evaluating the Interconnection Requests for impacts and will be in contact with affected Interconnection Customers.
  - For potential impacts see Appendix H-T – Affected System and Appendix H-V – Affected System
- Impacts on Minnkota Power Cooperative, Inc (MPC) – MPC has been contacted and provided a list of interconnection requests that proceed to move forward into the Interconnection Facilities Study Queue. MPC is evaluating the Interconnection Requests for impacts.
  - For potential impacts see Appendix H-T – Affected System and Appendix H-V – Affected System
- Impacts to other affected systems – For any observed violations of thermal overloads or voltage constraints, SPP will contact the owner of the facility for further information.

7 Power Flow Analysis

7.1.1 Power Flow Analysis Methodology

The ACCC function of PSS/E is used to simulate single element and special (i.e., breaker-to-breaker, multi-element, etc.) contingencies in portions or all of the modeled control areas of SPP, as well as, other control areas external to SPP and the resulting scenarios analyzed. Single element and multi-element contingencies are evaluated.

7.1.2 Power Flow Analysis

A power flow analysis is conducted for each Interconnection Customer's facility using modified versions of the 2016 winter peak (16WP) season, the 2017 spring (17G) and 2017 summer peak (17SP) seasons, the 2020 light load (20L), summer (20SP) and winter peak (20WP) seasons, and the 2025 summer peak (25SP) seasonal models. The output of the Interconnection Customer's facility is offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource Interconnection Service request (ERIS). Certain requests that are also pursuing Network Resource Interconnection Service (NRIS) have an additional analysis conducted for displacing resources in the interconnecting Transmission Owner's balancing area.

8 Power Flow Results

8.1 Cluster Group 1 (Woodward Area)

In addition to the 4,377.5 MW of previously queued generation in the area, 1,162.8 MW of new interconnection service was studied.

Several ERIS thermal constraints were observed for system intact and N-1 conditions including Cleo Corner – Cleo Corner Tap 138kV circuit #1, Cimarron – Draper 345kV circuit #1, GEN-2015-095 Tap – Rose Valley – Noel SW 138kV circuit #1, Roman Nose – Southard 138kV circuit #1, and Woodward 345/138/13kV circuit #1 and circuit #2. To alleviate the thermal violations, terminal equipment upgrades will be required for Cleo Corner – Cleo Corner Tap 138kV circuit #1 and Cimarron – Draper Lake 345kV circuit #1. Cimarron – Draper Lake 345kV circuit #1 terminal equipment upgrade is currently assigned per SPP-NTC-200329. GEN-2015-095 Tap – Rose Valley – Noel SW 138kV will be required to be rebuilt and Woodward 345/138/13kV circuit #1 and circuit #2 transformers will need to be replaced with larger capacity transformers. Roman Nose – Southard 138kV overload can be alleviated by the advancement of Woodward – Tatonga – Mathewson – Cimarron 345kV transmission circuit #2. Woodward – Tatonga – Mathewson – Cimarron 345kV transmission circuit #2 has been previously cost allocated as a regional upgrade per SPP-NTC-200223 from the 2012 SPP Integrated Transmission Plan 10-Year (2012 ITP 10) with a current anticipated in-service date of July, 2018.

In additional to the ERIS constraints mitigations, NRIS constraints mitigation include higher queued assigned Woodward Phase Shifting Transformer and the advancement of Woodward – Tatonga – Mathewson – Cimarron 345kV transmission circuit #2.

For Group 1 Cluster Analysis cost allocation, please refer to Appendix E and F.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
CIMARRON - DRAPER LAKE 345KV CKT 1	717	103.6296	GRACEMONT - MINCO 345KV CKT 1
	Mitigation		**Replace terminal equipment**
CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	117.8972	System Intact
CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	142.716	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
	Mitigation		**Replace terminal equipment**
G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	120.4845	System Intact
G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	228	113.7538	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	113.4116	System Intact
NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	228	109.1245	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
	Mitigation		**Rebuild GEN-2015-095 Tap – Rose Valley – Noel 138kV circuit #1**
ROMAN NOSE - SOUTHARD 138KV CKT 1	153	106.4715	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
	Mitigation		**Woodward – Tatonga – Mathewson 345kV circuit #2**
WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1	493	103.523	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493	103.9633	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
	Mitigation		**Replace Woodward 345/138/13kV transformer circuit #1 and #2**

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
CLEARWATER - MILAN TAP 138KV CKT 1	110	101.4557	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
	Mitigation		**Woodward – Tatonga – Mathewson 345kV circuit #2**
CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	110.5718	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
ROMAN NOSE - SOUTHARD 138KV CKT 1	153	122.0403	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
	Mitigation		**Replace terminal equipment**
FPL SWITCH - WOODWARD 138KV CKT 1	185	117.112	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
	Mitigation		**Woodward – Tatonga – Mathewson 345kV circuit #2, and Higher Queued Woodward Phase Shifting Transformer Upgrade**

8.1.1 Group 1 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service. All of these amounts listed are based on the assumption that the Woodward District Phase Shifting Transformer goes into service no later than June 1, 2017.

Limited Operation Analysis		
Interconnection Request	MW	Constraint that most limits LOIS
GEN-2015-048	80	Cleo Corner – Cleo Corner Tap 138kV
GEN-2015-057	0	Cimarron – Draper Lake 345KV
GEN-2015-059	0	Cimarron – Draper Lake 345KV
GEN-2015-060	175	GEN-2015-095 Tap – Rose Valley 138kV
GEN-2015-081	180	None
	0 (NRIS)	Several NRIS constraints
GEN-2015-093	250	None
GEN-2015-095	126)	GEN-2015-095 Tap – Rose Valley 138kV & Noel - Rose Valley – Mooreland 138kV

8.2 Cluster Group 2 (Hitchland Area)

In addition to the 3,616.20 MW of previously queued generation in the area, 200.0 MW of new interconnection service was studied. With the addition of the Group 2 Interconnection Requests, the contingency analysis observed non-convergence for Hitchland – Finney 345kV contingency. Review of the non-convergence results suggest potential voltage collapse(s) in the Beaver and Badger areas during the Hitchland – Finney 345kV contingency. The following transmission reinforcements were incrementally added or advanced from their proposed in-service dates to mitigate the potential voltage collapse:

- Woodward – Tatonga – Mathewson – Cimarron 345kV transmission circuit #2
- Walkemeyer 345/115kV project for non-competitive upgrades only
- Beaver County +125Mvar Static Var Compositor (SVC)

The Woodward – Tatonga – Mathewson – Cimarron 345kV transmission circuit #2 has been previously cost allocated as a regional upgrade per SPP-NTC-200223 from the 2012 SPP Integrated Transmission Plan 10-Year (2012 ITP 10) with a current anticipated in-service date of July, 2018.

Once the non-converged contingencies were solved, additional critical constraints requiring transmission reinforcements are listed below while the complete list of individual constraints requiring additional transmission reinforcements displayed in Appendix G-T.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Non Converged Contingency	N/A	N/A	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
Non Converged Contingency	N/A	N/A	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
	Mitigation		**Woodward – GEN-2011-051 – Tatonga – Mathewson 345kV circuit #2, Walkemeyer Project, and Beaver County Reactive Power Support.**
POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	116.6448	System Intact
	Mitigation		**Second Potter County Interchange 345/230/13kV Transformer assigned to higher queued request for NRIS only upgrades**

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
No current study Group 02 NRIS requests			

8.2.1 Group 2 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service.

Limited Operation Analysis		
Interconnection Request	MW	Constraint that most limits LOIS
GEN-2014-037	0	Voltage Collapse for Finney-Hitchland 345kV System Intact – Bushland Interchange – Potter 345kV and Potter County 345/230/15V Transformer CKT 1
	110	Voltage Collapse for Finney-Hitchland 345kV (assuming Bushland Interchange – Potter 345kV and Potter 345/230/13kV transformer are mitigated before 2025)

8.3 Cluster Group 3 (Spearville Area)

In addition to the 3,235.83 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No current study DISIS-2015-002 Interconnection Customer(s) are located in this geographical group.

8.4 Cluster Group 4 (Northwest Kansas Area)

In addition to the 1,532.2 MW of previously queued generation in the area, 600.2 MW of new interconnection service was studied. No new constraints were observed at this time.

For Group 4 Cluster Analysis cost allocation, please refer to Appendix E and F.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Current no new ERIS constraints in group 04			

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
No current study Group 04 NRIS requests			

8.4.1 Group 4 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service.

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-061	200	None
GEN-2015-064	197.8	None
GEN-2015-065	202.4	None

8.5 Cluster Group 6 (South Texas Panhandle/New Mexico Area)

In addition to the 4,550.77 MW of previously queued generation in the area, 1,011.68 MW of new interconnection service was studied. The large amount of new generation under study in addition to the previous generation already in the queue in this area resulted in potential voltage collapse throughout the entire study area and in all 345kV lines connecting the study area to the rest of the SPP footprint. ERIS contingency analysis observed non-converged contingencies on lines leading to the north and east of the study area were encountered. To mitigate these non-converged contingencies, the following Network Upgrade(s) were required.

- New 345kV line from Tuco area to the proposed Chisolm 345kV substation near Sweetwater, OK. This is a second 345kV line that runs parallel to the existing Tuco-Woodward 345kV line. This project includes tapping the 345kV line into the existing Border 345kV station.
    - This project also includes the Crawfish Draw 345kV substation that includes a Crawfish Draw 345/230kV autotransformer. The Crawfish Draw 345kV substation has been assigned to DISIS-2015-001 Interconnection Customers.
- A new 345kV line/tie from the proposed Chisholm 345kV substation to a substation near Chisolm that would tap into the Border-Woodward 345kV line with a five terminal 345kV breaker-and-a-half substation.
    - This upgrade also includes advancing the previously assigned Chisholm – Gracemont 345kV Project.
- Add 600MVars of capacitive reactive compensation at Border 345kV substation. This reactive compensation includes 300MVars of capacitor banks (6 – 50 Mvar banks) and a +300Mvar Static Var Compensator (SVC).
- Add 100Mvars of capacitive and inductive reactive compensation at Oklaunion 345kV substation. This reactive compensation includes +/-100Mvar SVC.
    - Also included were the 2 x 130Mvar capacitor banks assigned to DISIS-2015-001 Interconnection Customers
- Advancement of the Hobbs-Yoakum-Tuco 345kV line to meet the in-service dates of the study generation.

Once the non-converged solutions were mitigated, additional overloads were observed and mitigated as described in the table below.

Cluster ERIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
Non-Converged Contingency	N/A	N/A	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
Non-Converged Contingency	N/A	N/A	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
Non-Converged Contingency	N/A	N/A	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
Non-Converged Contingency	N/A	N/A	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
Non-Converged Contingency	N/A	N/A	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
Non-Converged Contingency	N/A	N/A	G14-074T 345.00 - OKLAUNION 345KV CKT 1
Non-Converged Contingency	N/A	N/A	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
Non-Converged Contingency	N/A	N/A	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
Non-Converged Contingency	N/A	N/A	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
Non-Converged Contingency	N/A	N/A	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
Non-Converged Contingency	N/A	N/A	P12:230:AEPW:ELKCITY6:SWEETWT6
Non-Converged Contingency	N/A	N/A	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
Non-Converged Contingency	N/A	N/A	P12:345:SPS:J07.1.FINN.HITCH
Non-Converged Contingency	N/A	N/A	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
Non-Converged Contingency	N/A	N/A	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
Non-Converged Contingency	N/A	N/A	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1	360.92	100.6422	NEWHART 230 - POTTER COUNTY INTERCHANGE 230KV CKT 1
CARLISLE INTERCHANGE - LP-DOUD_TP 3115.00 115KV CKT 1	177	100.2975	LUBBOCK SOUTH INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	105.6208	System Intact
DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	350.6	102.0399	NEWHART 230 - PLANT X STATION 230KV CKT 1
	Mitigation		**Build Crawfish Draw – Border – Chisholm circuit #2, Chisholm tie into Border – Woodward, Build Border and Oklaunion reactive power support**
CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	111.692	System Intact
	Mitigation		**Replace transformer**
GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	130.5235	System Intact
	Mitigation		**Replace terminal equipment**
GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	117.5205	System Intact
STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	113.2775	System Intact
STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	111.4968	System Intact
	Mitigation		**Rebuild or re-conductor line**
POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	109.8194	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
	Mitigation		**Install second Potter County 345/230/13kV transformer. Currently assigned costs to higher queued NRIS request(s).**
TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	644	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	700	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1

	Mitigation	**Built Crawfish Draw 345/230kV Substation, Tie in TUCO – Swisher 230kV and TUCO – Border 345kV. Build Crawfish Draw 345/230/13kV Transformer. Current assigned costs to higher queued NRIS request(s)**

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
No current study Group 06 NRIS requests			

8.5.1 Group 6 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service.

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-020	0	Multiple
GEN-2015-031	0	Multiple
GEN-2015-056	0	Multiple
GEN-2015-058	0	Multiple
GEN-2015-068	0	Multiple
GEN-2015-075	0	Multiple
GEN-2015-079	0	Multiple
GEN-2015-080	0	Multiple

8.6 Cluster Group 7 (Southwestern Oklahoma Area)

In addition to the 1,923.90 MW of previously queued generation in the area, 413.70 MW of new interconnection service was studied.

Several ERIS thermal constraints were observed for system intact and N-1 conditions including Sequoyah – Cornville Tap – Naples Tap - Payne 138kV circuit #1, Grapevine – Sweetwater 230kV circuit #1, and Norge Road – Southwestern 138kV circuit #1. To alleviate the thermal violations, rebuild or re-conductor will be required for Grapevine – Sweetwater 230kV circuit #1 and Norge Road – Southwestern 138kV circuit #1. WFEC has recent provided updating ratings for Anadarko – Sequoyah – Cornville Tap – Naples Tap – Payne 138kV circuit #1 to SPP GI. SPP GI has evaluated the updated ratings in this restudy analysis and determined the Cornville Tap – Naples Tap – Payne 138kV circuit is still a constraint for system intact conditions. To alleviate the overload, Cornville Tap – Naples Tap - Payne 138kV circuit #1 will be required to be rebuild or re-conductored.

Cluster ERIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	124.6348	System Intact
NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	121.388	System Intact

CORN TAP - SEQUOYAHJ4 138.00 138KV CKT 1	132	106.8338	System Intact
	Mitigation		**Updated ratings & rebuild/re-conductor of Cornville Tap – Naples – Payne 138kV**
GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	350.57	99.5	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	381.24	127.0248	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	137.1842	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
	Mitigation		**Rebuild or re-conductor line**
NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1	136	100.904	System Intact
	Mitigation		**Rebuild Norge Road – Southwestern Station 138kV**

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
No current study Group 07 NRIS requests			

8.6.1 Group 7 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service.

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-055	0	Grapevine - Sweetwater 230kV CKT 1
GEN-2015-071	0	Grapevine - Sweetwater 230kV CKT 1
GEN-2015-084	0	Cornville Tap – Naples Tap – Sequoyah 138kV
GEN-2015-085	0	Cornville Tap – Naples Tap – Sequoyah 138kV

8.7 Cluster Group 8 (North Oklahoma/South Central Kansas Area)

In addition to the 5,226.06 MW of previously queued generation in the area, 2,348.00 MW of new interconnection service was studied. ERIS constraints were observed along the Mathewson – GEN-2015-063 Tap transmission circuit. The emergency rating for Mathewson – GEN-2015-063 Tap 345kV is planned to be 2000 amps (1195MVA) after Mathewson Substation is in-service. Mathewson Substation is currently planned to be in-service by June 2016. In additional, current study work will be required to replace terminal equipment to achieve conductor limit to alleviate the thermal overload on this transmission circuit. Emporia Energy Center – Swissvale – West Gardner 345kV circuit #1 constraints would require terminal equipment upgrades to alleviate the current study thermal overloads.

Although, several group 08 requests elected to not proceed with the Network Resource Interconnection Service (NRIS) service type prior to the execution of the Interconnection Facilities Studies (IFS), Associated Electric Cooperative Inc. (AECI) is still performing the Affected System Study. DISIS-2015-002-1 power flow analysis observed overloading impacts identified on the AECI system around the Cleveland area. These impacts could be below the SPP Generation Interconnection Energy Resource Interconnection Service (ERIS) outage distribution factor criteria of 20% or system intact power distribution factor criteria of 3%, but could be required for mitigation by the AECI's Generation Interconnection criteria. These Interconnection Customers will need to contract with AECI for Affected System Studies to determine whether AECI facilities are impacted.

- GEN-2015-034
- GEN-2015-047
- GEN-2015-052
- GEN-2015-062
- GEN-2015-063
- GEN-2015-066
- GEN-2015-067
- GEN-2015-083

For Group 8 Cluster Analysis cost allocation, please refer to Appendix E and F.

Cluster ERIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	371	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
CLEAVELAND - SILVER CITY 138KV CKT 1	174	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
	Mitigation		**Replace Cleveland – Cleveland bus tie terminal equipment and rebuild/re-conductor Cleveland – Silver City 138kV. These upgrades would be pending the AECI affected system study.**
G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	125.2078	NORTHWEST - SPRING CREEK 345KV CKT 1
	Mitigation		**After the installation of Mathewson, the line will have an 1195 MVA rating. Additional current study will be required to upgrade terminal equipment to achieve conductor limit**
SWISSVALE - WEST GARDNER 345KV CKT 1	717	121.2614	HOYT - STRANGER CREEK 345KV CKT 1
	Mitigation		**Replace terminal equipment**
EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	119.2027	HOYT - STRANGER CREEK 345KV CKT 1
	Mitigation		**Replace terminal equipment**

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
SWISSVALE - WEST GARDNER 345KV CKT 1	717	100.7418	HOYT - STRANGER CREEK 345KV CKT 1
	Mitigation		**Replace terminal equipment**

8.7.1 Group 8 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service. Limited Operation amounts are calculated based on constraints with the SPP transmission system. Once the Affected System Impact studies are completed, these Limited Operation amounts could be further restricted by affected systems constraints.

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-034	200	None
GEN-2015-047	282	GEN-2015-063 Tap – Mathewson 345kV
GEN-2015-052	300	None
GEN-2015-062	4.0	GEN-2015-063 Tap – Mathewson 345kV

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-063	282	GEN-2015-063 Tap – Mathewson 345kV
GEN-2015-066	248.4	None
GEN-2015-067	150	None
GEN-2015-069	0	Swissvale – W Gardner 345kV
GEN-2015-073	0	Swissvale – W Gardner 345kV
GEN-2015-083	125	None
GEN-2015-090	220	None

8.8 Cluster Group 9 (Nebraska Area)

In addition to the 2,927.7 MW of previously queued generation in the area, 574.4 MW of new interconnection service was studied. ERIS analysis observed constraints on Gavins Point – Yankton Junction 115kV circuit #1 and Petersburg – North Petersburg 115kV circuit #1. Mitigations for the overloads include rebuilding or re-conductoring Gavins Point – Yankton 115kV circuit #1 and Petersburg – North Petersburg 115kV. Transmission facilities on the WAPA system will require National Environmental Policy Act (NEPA) review. For more information on the NEPA Environmental Review, please refer to Section 8.6.1 of the GIP.

Cluster ERIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
GAVINS POINT - YANKON JCT 115KV CKT 1	120	118.2407	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
	Mitigation		**Rebuild or re-conductor line**
PETERSBRG.N7115.00 - PETERSBURG 115KV CKT Z1	137	102.2948	ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1
	Mitigation		**Rebuild or re-conductor line**

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
Currently no additional NRIS only constraints			

8.8.1 Group 9 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service. Limited Operation amounts are calculated based on constraints with the SPP transmission system. Once the Affected System Impact studies are completed, these Limited Operation amounts could be further restricted by affected systems constraints.

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-053	32	Petersburg – North Petersburg 115kV
GEN-2015-076	66	Gavins – Yankton 115kV
GEN-2015-087	66	None

Limited Operation Analysis		
Interconnection Request	MW	Constraint that most limits LOIS
GEN-2015-088	300	None

8.9 Cluster Group 10 (Southeast Oklahoma/Northeast Texas Area)

There is no current study Interconnection Request(s) in the Group 10 geographical region.

8.10 Cluster Group 12 (Northwest Arkansas Area)

There is no current study Interconnection Request(s) in the Group 12 geographical region.

8.11 Cluster Group 13 (Northeast Kansas/Northwest Missouri Area)

There is no current study Interconnection Request(s) in the Group 13 geographical region.

8.12 Cluster Group 14 (South Central Oklahoma Area)

In addition to the 612.50 MW of previously queued generation in the area, 279.0 MW of new interconnection service was studied. Currently, no new ERIS constraints were found in this area.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No ERIS Group 14 constraints			

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
No current study Group 14 NRIS requests			

8.12.1 Group 14 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service.

Limited Operation Analysis		
Interconnection Request	MW	Constraint that most limits LOIS
GEN-2015-045	20	None
GEN-2015-092	250	None

8.13 Group 15 (Eastern South Dakota)

In addition to approximately 1,915.70 MW of previously queued generation in the area, 100 MW of new interconnection service was studied. ERIS contingency analysis observed thermal constraints for GI-1301 Tap – Watertown 115kV circuit #1 and Split Rock – White 345kV circuit #1. GI-1301 Tap – Watertown 115kV circuit will be required to be rebuilt or re-conductored and Split Rock – White will need terminal equipment upgrades. Transmission facilities on the WAPA system will require

National Environmental Policy Act (NEPA) review. For more information on the NEPA Environmental Review, please refer to Section 8.6.1 of the GIP. Also, certain constraints were found to be relieved in the short term by the MISO project, Ellendale MVP – Big Stone South 345kV line. MISO will need to perform an Affected System Study to determine potential impacts on their system.

Cluster ERIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
G13_001IST 115.00 - WATERTOWN 115KV CKT 1'	121	110.4503	Groton 345/115kV transformer
	Mitigation		**Rebuild 26 miles of 115kV line**
SPLIT ROCK - WHITE 345KV CKT 1	717	99.9	BROOKING COUNTY - LYON COUNTY 345KV CKT 1
	Mitigation		**Replace terminal equipment**

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
No current study Group 15 NRIS requests			

After constraints for transmission reinforcement upgrades were mitigated, the following steady-state voltage violations require mitigation. One step of 5.0Mvars at the Ordway 115kV capacitor bank(s) will be required to mitigate the steady state voltage observed after contingency.

Cluster ERIS Voltage Constraints				
MONITORED ELEMENT	**TC Voltage (PU)**	**VMIN (PU)**	**VMAX (PU)**	**CONTINGENCY**
ORDWAY 115KV	0.80	0.9	1.05	GROTON - ORDWAY 115KV CKT 1
ORDWAY 69KV	0.80	0.9	1.05	GROTON - ORDWAY 115KV CKT 1
	Mitigation			Groton – Ordway 115kV CKT 2

8.13.1 Group 15 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service. Limited Operation amounts are calculated based on constraints with the SPP transmission system. Once the Affected System Impact studies are completed, these Limited Operation amounts could be further restricted by affected systems constraints.

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-097	34	GI13_001-Watertown 115kV

8.14 Group 16 (Western North Dakota)

In addition to approximately 3,247.81 MW of previously queued generation in the area, 651.2 MW of new interconnection service was studied. Due to the amount of generation being interconnected in this group, large flows were observed on the Holt County – Grand Island 345kV line and potential voltage collapse was observed for the outage of that line. The mitigation is for Group 16 Interconnection Requests –to advance Holt – Thedford – Gentleman 345kV line that is also assigned to Group 9 Interconnection Requests. With the addition of 250MW of wind generation at the Daglum substation (currently under construction) on the Belfield – Rhame 230kV line, potential voltage collapse was observed for the outage of the Daglum – Belfield line. This will require a new 230kV line, approximately 28 miles long to be constructed from Daglum to Dickinson. The Dickinson 230/115kV auto was also shown to overload. This transformer replacement is cost assigned to current study requests. Transmission facilities on the WAPA system will require National Environmental Policy Act (NEPA) review. For more information on the NEPA Environmental Review, please refer to Section 8.6.1 of the GIP. Also, certain constraints were found to be relieved in the short term by the MISO project, Ellendale MVP – Big Stone South 345kV line. MISO will need to perform an Affected System Study to determine potential impacts on their system.

Cluster ERIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
Non-converged contingency	N/A	N/A	BELFIELD - DAGLUM 4230.00 230KV CKT 1
	Mitigation		**Build new 28 mile line from Daglum – Dickinson 230kV**
Non-converged contingency	N/A	N/A	G09_001IST 345.00 - GROTON 345KV CKT 1
Non-converged contingency	N/A	N/A	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
	Mitigation		**Previously Allocated Upgrade for RoundUp – Patent Gate – Kummer Rdige Project**
Non-converged contingency	n/a	n/a	HESKETT - WISHEK 230KV CKT 1
Non-converged contingency	n/a	n/a	MERRCRT4 230.00 - WISHEK 230KV CKT 1
Non-converged contingency	n/a	n/a	RIEL - ROSEAU 500KV CKT 1
Non-converged contingency	n/a	n/a	ROSEAU - ROSEAUM 2 500.00 500KV CKT 1
Non-converged contingency	n/a	n/a	CENTER - CNTSHNT3 345.00 345KV CKT Z1
Non-converged contingency	n/a	n/a	ELLENDALE - OAKES 230KV CKT 1
Non-converged contingency	n/a	n/a	FORBES - ROSEAU 500KV CKT 1
BUFFALO - JAMESTOWN 345KV CKT 1	705	109	System Intact
ELLENDALE - OAKES 230KV CKT 1	319.0	118.6155	System Intact
ELLENDLMVP4 230.00 - J316_SUB 230.00 230KV CKT 1	319.0	120.8457	System Intact
	Mitigation		**MISO / MH Review**
DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	121.2902	System Intact
	Mitigation		**build second Dickinson 230/115/13kV transformer**
NESET 4 230.00 - TIOGA 230KV CKT 1	200	137.0638	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
	Mitigation		**New rating available**
BROADLAND - HURON 230KV CKT 1	400	101.3711	System Intact
	Mitigation		**New rating available**

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
No current study Group 15 NRIS requests			

Cluster ERIS Voltage Constraints				
MONITORED ELEMENT	**TC Voltage (PU)**	**VMIN (PU)**	**VMAX (PU)**	**CONTINGENCY**
HANLON 69KV	0.889	0.9	1.05	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
	Mitigation			**Two (2) steps of 5Mvars totaling to 10Mvars at Hanlon 69kV**

8.14.1 Group 16 (Limited Operation)

Limited Operation results are listed below. While these results are based on the criteria listed in GIP 8.4.3, the Interconnection Customer may request additional scenarios for Limited Operation based on higher queued Interconnection Requests not being placed in service. Limited Operation amounts are calculated based on constraints with the SPP transmission system. Once the Affected System Impact studies are completed, these Limited Operation amounts could be further restricted by affected systems constraints.

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that most limits LOIS**
GEN-2015-046	0	Dickinson 230/115/13kV Transformer
GEN-2015-091	0	Belfield – Daglum non-convergence &Dickinson 230/115/13kV Transformer
GEN-2015-096	0	Belfield – Daglum non-convergence &Dickinson 230/115/13kV Transformer
GEN-2015-098	0	Belfield – Daglum non-convergence &Dickinson 230/115/13kV Transformer

8.15 Curtailment and System Reliability

In no way does this study guarantee operation for all periods of time. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

9 Stability & Short Circuit Analysis

A stability and short circuit analysis is conducted for each Interconnection Customer using modified versions of the 2015 series SPP Model Development Working Group (MDWG) Models 2016 winter (16WP), 2017 summer (17SP), and 2025 summer peak (25SP) dynamic cases[9]. The stability analysis is conducted with all upgrades in service that are identified in the power flow analysis unless otherwise noted in the individual group stability study. For each group, the interconnection requests are studied at 100% nameplate output while the other groups are dispatched at 20% output for Variable Energy Resource (VER) requests and 100% output for other requests. The output of the Interconnection Customer's facility is offset in each model by a reduction in output of existing online SPP generation. Each Interconnection Request is studied in a Stand Alone scenario in addition to the cluster scenario. A synopsis is included for each group. The entire stability study for each group can be found in the Appendices.

Short-circuit analysis is performed but verification of over-dutied equipment is performed by the Transmission Owner within the Interconnection Facilities Study. Results of that analysis may require additional costs to replace circuit breakers and associated equipment.

9.1 Cluster Group 1 (Woodward Area)

The Group 1 stability analysis for this area is being performed by S&C Electric (S&C). It was determined that for certain prior outage conditions that study generation will need to be curtailed. Stability analysis has determined that with all previously assigned and currently assigned Network Upgrades placed in service the transmission system will remain stable and low voltage ride through requirements are satisfied for the probable contingencies studied. Power Factor requirements are listed in the table below. In addition, some Interconnection Requests may have requirements for reactors under low wind conditions as identified in the S&C Group 1 report.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Power Factor Requirement at POI*	
				Lagging (supplying)	Leading (absorbing)
GEN-2015-048	200	Vestas V110	Cleo Corner 138kV	0.95	0.95
GEN-2015-057	100	G.E. 2.3MW	Minco 345kV	0.95	0.95
GEN-2015-059	6.3	G.E. 1.79MW	Minco 345kV	0.95	0.95
GEN-2015-060	250	G.E. 1.79MW	Woodward EHV District 138kV	0.95	0.95
GEN-2015-081	180	Vestes V110	Tap on the Woodward - Tatonga 345kV line (G11_051-TAP)	0.95	0.95

[9] Short Circuit analysis performed only on the 2017 and 2025 Summer Peak seasonal model. Group 6 Stability Analysis also includes 2020 Summer and Winter Peak seasons.

Request	Size (MW)	Generator Model	Point of Interconnection	Power Factor Requirement at POI*	
				Lagging (supplying)	Leading (absorbing)
GEN-2015-093	250	G.E. 2MW	Gracemont 345kV	0.95	0.95
GEN-2015-095	176	Vestes V110	Tap on Mooreland-Noel Switch 138kV	0.95	0.95

*As reactive power is required for all projects, the final requirement in the GIA will be the pro-forma 95% lagging to 95% leading at the point of interconnection.
** Requirement for reactors for low wind conditions

9.2 Cluster Group 2 (Hitchland Area)

The Group 2 stability analysis for this area was performed by ABB. Power Factor requirements are listed in the table below. Stability analysis has determined that with all previously assigned and currently assigned Network Upgrades placed in service the transmission system will remain stable and low voltage ride through requirements are satisfied for the probable contingencies studied. It was determined for prior outage conditions that Network Upgrades assigned in the powerflow analysis were required for a steady state solution prior to stability analysis. These prior outage conditions determined a need for curtailment of studied generation in the case of certain transmission outages. In addition, some Interconnection Requests may have requirements for reactors under low wind conditions as identified in the ABB Group 2 report.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Power Factor Requirement at POI*	
				Lagging (supplying)	Leading (absorbing)
GEN-2014-037	200.0	Vestas V110 2.0 MW	Tap Hitchland – Beaver County 345kV (Optima 345kV)	0.95	0.95

*As reactive power is required for all projects, the final requirement in the GIA will be the pro-forma 95% lagging to 95% leading at the point of interconnection.
** Requirement for reactors for low wind conditions

9.3 Cluster Group 3 (Spearville Area)

In addition to the 3,235.83 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No current study DISIS-2015-002 Interconnection Customer(s) are located in this geographical group.

9.4 Cluster Group 4 (Northwest Kansas)

The Group 4 stability analysis was not performed again for this restudy. The original analysis in DISIS-2015-002 is still valid.

9.5 Cluster Group 6 (South Texas Panhandle/New Mexico)

The Group 6 stability analysis for this area was performed by Mitsubishi Electric Power Products Inc. (MEPPI). Power Factor requirements are listed in the table below. It was determined for prior outage conditions that Network Upgrades assigned in the powerflow analysis were required for a steady state solution prior to stability analysis. The Stability analysis has shown that the following upgrades are needed to mitigate certain contingencies:

- Tuco – Yoakum – Hobbs 345kV circuit 1
- Yoakum 345/230kV transformer and Hobb 345/230kV transformer
- OKU reactive power support
    - +/- 100Mvar SVC
- Border reactive power support (600Mvar total)
    - +300Mvar SVC
    - 300Mvar capacitor bank
- Seminole – Mustang 115kV circuit 1

The higher queued GEN-2014-074 tripped off line due to transient high voltage for a fault that takes the Tuco to Rio Blanco 345kV line out of service. An adjustment of the GEN-2014-074 substation transformer tap kept the generator on line for the fault. However, it is anticipated that a more robust dynamic reactive solution at GEN-2014-074 will be necessary.

With all previously assigned and currently assigned Network Upgrades placed in service the transmission system will remain stable and low voltage ride through requirements are satisfied for the probable contingencies studied. In addition, some Interconnection Requests may have requirements for reactors under low wind conditions as identified in the MEPPI Group 6 report.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Power Factor Requirement at POI*	
				Lagging (supplying)	Leading (absorbing)
GEN-2015-020	100	Eaton Power Xpert Solar 1.67MW	Oasis 115kV	0.95	0.95
GEN-2015-031	150.5	GE 1.79 & GE 2.3 MW	Tap Amarillo – Swisher 230kV	0.95	0.95
GEN-2015-056	101.2	GE 2.3 MW	Crossroads 345kV	0.95	0.95
GEN-2015-058	50	Power Electronics Solar 1.667 MW	Atoka 115kV	0.95	0.95
GEN-2015-068	300	GE 2.0 MW	Tuco 345kV	0.95	0.95
GEN-2015-075	51.48	GE 3.96 MW	Carlisle 69kV	0.95	0.95
GEN-2015-079	129.2	GE LV5 3.8 MW	Tap Yoakum-Hobbs 230kV	0.95	0.95
GEN-2015-080	129.2	GE LV5 3.8 MW	Tap Yoakum-Hobbs 230kV	0.95	0.95

*As reactive power is required for all projects, the final requirement in the GIA will be the pro-forma 95% lagging to 95% leading at the point of interconnection.
** Requirement for reactors for low wind conditions

9.6 Cluster Group 7 (Southwest Oklahoma)

The Group 7 stability analysis was not performed again for this restudy. The original analysis in DISIS-2015-002 is still valid.

9.7 Cluster Group 8 (South Central Kansas/North Oklahoma)

The Group 8 stability analysis was not performed again for this restudy. The original analysis in DISIS-2015-002 is still valid. GEN-2015-073 is currently being evaluated for wind turbine change modification impacts. This GEN-2015-073 turbine modification analysis will be posted once completed in another report posting.

9.8 Cluster Group 9 (Nebraska)

The Group 9 stability analysis for this area was performed by Mitsubishi Electric Power Products Inc. (MEPPI). The stability analysis has identified oscillation issues at the Fairbury generation facility and at the Broken Bow generation facility for certain contingencies. It was determined that these issues were not caused by the study generation, and that the issues are prior existing. Stability analysis has determined that with all previously assigned and currently assigned Network Upgrades placed in service the transmission system will remain stable and low voltage ride through requirements are satisfied for the probable contingencies studied. Power Factor requirements are listed in the table below. In addition, some Interconnection Requests may have requirements for reactors under low wind conditions as identified in the Group 9 report.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Power Factor Requirement at POI*	
				Lagging (supplying)	Leading (absorbing)
GEN-2015-053	50	GE 1.79 MW	Antelope 115kV	0.95	0.95
GEN-2015-076	158.4	Vestas 3.3-117 3.3 MW	Belden 115kV	0.95	0.95
GEN-2015-087	66	Vestas V100 2.0 MW	Tap on Fairbury to Hebron 115kV	0.95	0.95
GEN-2015-088	300	Vestas V100 2.0 MW	Tap on Moore to Pauline 345kV	0.95	0.95

*As reactive power is required for all projects, the final requirement in the GIA will be the pro-forma 95% lagging to 95% leading at the point of interconnection.
** Requirement for reactors for low wind conditions

9.9 Cluster Group 10 (Southeast Oklahoma/Northeast Texas Area)

There is no current study Interconnection Request(s) in the Group 10 geographical region.

9.10 Cluster Group 12 (Northwest Arkansas Area)

There is no current study Interconnection Request(s) in the Group 12 geographical region.

9.11 Cluster Group 13 (Northeast Kansas/Northwest Missouri Area)

There is no current study Interconnection Request(s) in the Group 13 geographical region.
** Requirement for reactors for low wind conditions

9.12 Cluster Group 14 (South Central Oklahoma)

The Group 14 stability analysis was not performed again for this restudy. The original analysis in DISIS-2015-002 is still valid.

9.13 Cluster Group 15 (Eastern South Dakota)

The Group 15 stability analysis was not performed again for this restudy. The original analysis in DISIS-2015-002 is still valid.

9.14 Cluster Group 16 (Western North Dakota)

The Group 16 stability analysis was not performed again for this restudy. The original analysis in DISIS-2015-002 is still valid. GEN-2015-098 is currently being evaluated for wind turbine change modification impacts. This GEN-2015-098 turbine modification analysis will be posted once completed in another report posting.

10 Conclusion

The minimum cost of interconnecting 7,340.9 MW of new generation interconnection requests included in this Definitive Interconnection System Impact Study is estimated at $677,958,271 not including the following costs.

- **Costs Not Included** – Costs on Affected Systems for particularly Associated Electric Cooperative Inc. (AECI) and the Mid-Continent Independent System Operator (MISO).

Interconnection Requests allocated Network Upgrades and Transmission Owner Interconnection Facilities listed in Appendix E and F. For Interconnection Requests that result in an interconnection to, or modification to, the transmission facilities of the Western-UGP (WAPA), a National Environmental Policy Act (NEPA) Environmental Review will be required. The Interconnection Customer will be required to execute and Environmental Review Agreement per Section 8.6.1 of the GIP.

These costs do not include the cost of upgrades of other transmission facilities listed in Appendix H which are Network Constraints. These interconnection costs do not include any cost of any Network Upgrades that are identified as required through the short circuit analysis. Potential over-duty circuit breakers capability will be identified by the Transmission Owner in the Interconnection Facilities Study.

Further refinement of total estimated interconnection costs will be provided, should the Interconnection Customer meet the requirements for acceptance and choose to move into the Interconnection Facilities Study following the posting of this DISIS. The Interconnection Facilities Study may include additional study analysis, additional facility upgrades not yet identified by this DISIS, such as circuit breaker replacements and affected system facilities, and further refinement of existing cost estimates.

The required interconnection costs listed in Appendices E, and F, and other upgrades associated with Network Constraints do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request (TSR) through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP Open Access Transmission Tariff (OATT).

11 Appendices

11.1 A: Generation Interconnection Requests Considered for Impact Study

See next page.

A: Generation Interconnection Requests Considered for Study

Request	Amount	Service	Area	Requested Point of Interconnection	Proposed Point of Interconnection	Requested In-Service Date	In Service Date Delayed Until no earlier than*
ASGI-2015-006	9.00	ER	SWPA	Tupelo 138kV	Tupelo 138kV		TBD
GEN-2014-037	200.00	ER	SPS	Tap Hitchland - Beaver County Dbl Ckt (Optima) 345kV	Tap Hitchland - Beaver County Dbl Ckt (Optima) 345kV	9/30/2017	TBD
GEN-2015-020	100.00	ER	SPS	Oasis 115kV	Oasis 115kV	12/1/2016	TBD
GEN-2015-031	150.50	ER	SPS	Tap Amarillo South - Swisher 230kV	Tap Amarillo South - Swisher 230kV	9/1/2017	TBD
GEN-2015-034	200.00	ER	OKGE	Ranch Road 345kV	Ranch Road 345kV	10/31/2017	TBD
GEN-2015-045	20.00	ER	AEPW	Tap Lawton - Sunnyside (Terry Road) 345kV	Tap Lawton - Sunnyside (Terry Road) 345kV	12/1/2017	TBD
GEN-2015-046	300.00	ER	WAPA	Tande 345kV	Tande 345kV	12/1/2017	TBD
GEN-2015-047	300.00	ER	OKGE	Sooner 345kV	Sooner 345kV	12/1/2017	TBD
GEN-2015-048	200.00	ER	OKGE	Cleo Corner 138kV	Cleo Corner 138kV	12/1/2017	TBD
GEN-2015-052	300.00	ER	WERE	Tap Open Sky - Rose Hill 345kV	Tap Open Sky - Rose Hill 345kV	12/1/2017	TBD
GEN-2015-053	50.00	ER	NPPD	Antelope 115kV	Antelope 115kV	12/31/2017	TBD
GEN-2015-055	40.00	ER	WFEC	Erick 138kV	Erick 138kV	10/30/2016	TBD
GEN-2015-056	101.20	ER	SPS	Crossroads 345kV	Crossroads 345kV	12/1/2017	TBD
GEN-2015-057	100.00	ER	OKGE	Minco 345kV	Minco 345kV	12/1/2016	TBD
GEN-2015-058	50.00	ER	SPS	Atoka 115kV	Atoka 115kV	10/1/2017	TBD
GEN-2015-059	6.30	ER	OKGE	Minco 345kV	Minco 345kV	2/1/2016	TBD
GEN-2015-060	250.50	ER	OKGE	Woodward EHV 138kV	Woodward EHV 138kV	12/31/2021	TBD
GEN-2015-061	200.00	ER	SUNCMKEC	Mingo 345kV	Mingo 345kV	12/31/2018	TBD
GEN-2015-062	4.50	ER	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV	3/1/2016	TBD
GEN-2015-063	300.00	ER	OKGE	Tap Woodring - Mathewson 345kV	Tap Woodring - Mathewson 345kV	12/1/2017	TBD
GEN-2015-064	197.80	ER	SUNCMKEC	Mingo 115kV	Mingo 115kV	11/1/2017	TBD
GEN-2015-065	202.40	ER	SUNCMKEC	Mingo 345kV	Mingo 345kV	11/1/2017	TBD
GEN-2015-066	248.40	ER	OKGE	Tap Cleveland - Sooner 345kV	Tap Cleveland - Sooner 345kV	12/1/2017	TBD
GEN-2015-067	150.00	ER	OKGE	Sooner 138kV	Sooner 138kV	10/1/2017	TBD
GEN-2015-068	300.00	ER	SPS	TUCO Interchange 345kV	TUCO Interchange 345kV	12/1/2017	TBD
GEN-2015-069	300.00	ER	WERE	Union Ridge 230kV	Union Ridge 230kV	12/1/2017	TBD
GEN-2015-071	200.00	ER	AEPW	Chisholm 345kV	Chisholm 345kV	9/30/2017	TBD
GEN-2015-073	200.10	ER/NR	WERE	Emporia Energy Center 345kV	Emporia Energy Center 345kV	12/31/2018	TBD
GEN-2015-075	51.50	ER	SPS	Carlisle 69kV	Carlisle 69kV	12/1/2018	TBD
GEN-2015-076	158.40	ER	NPPD	Belden 115kV	Belden 115kV	7/31/2017	TBD
GEN-2015-079	129.20	ER	SPS	Tap Yoakum - Hobbs Interchange 230kV	Tap Yoakum - Hobbs Interchange 230kV	10/1/2018	TBD
GEN-2015-080	129.20	ER	SPS	Tap Yoakum - Hobbs Interchange 230kV	Tap Yoakum - Hobbs Interchange 230kV	5/1/2019	TBD
GEN-2015-081	180.00	ER/NR	OKGE	Tap Woodward - Tatonga (GEN-2011-051 Tap) 345kV	Tap Woodward - Tatonga (GEN-2011-051 Tap) 345kV	7/1/2018	TBD
GEN-2015-083	125.00	ER	WERE	Belle Plain 138kV	Belle Plain 138kV	12/31/2017	TBD
GEN-2015-084	51.30	ER	AEPW	Hollis 138kV	Hollis 138kV	12/10/2018	TBD
GEN-2015-085	122.40	ER	AEPW	Altus Junction 138kV	Altus Junction 138kV	12/10/2018	TBD
GEN-2015-087	66.00	ER/NR	NPPD	Tap Fairbury - Hebron 115kV	Tap Fairbury - Hebron 115kV	1/1/2019	TBD
GEN-2015-088	300.00	ER/NR	NPPD	Tap Moore - Pauline 345kV	Tap Moore - Pauline 345kV	1/1/2019	TBD
GEN-2015-090	220.00	ER	WERE	Tap Thistle - Wichita 345kV Dbl CKT	Tap Thistle - Wichita 345kV Dbl CKT	12/1/2017	TBD

Request	Amount	Service	Area	Requested Point of Interconnection	Proposed Point of Interconnection	Requested In-Service Date	In Service Date Delayed Until no earlier than*
GEN-2015-091	101.20	ER	WAPA	Daglum 230kV	Daglum 230kV	12/1/2017	TBD
GEN-2015-092	250.00	ER	AEPW	Tap Lawton - Sunnyside (Terry Road) 345kV	Tap Lawton - Sunnyside (Terry Road) 345kV	12/1/2017	TBD
GEN-2015-093	250.00	ER	OKGE	Gracemont 345kV	Gracemont 345kV	12/1/2017	TBD
GEN-2015-095	176.00	ER	WFEC	Tap Rose Valley - Mooreland 138kV	Tap Rose Valley - Mooreland 138kV	12/1/2017	TBD
GEN-2015-096	150.00	ER	WAPA	Tap Belfied - Rhame 230kV	Tap Belfied - Rhame 230kV	12/31/2017	TBD
GEN-2015-097	100.00	ER	WAPA	Groton 115kV	Groton 115kV	12/31/2016	TBD
GEN-2015-098	100.00	ER	WAPA	Mingusville 230kV	Mingusville 230kV	12/15/2017	TBD
Total:	7,340.90						

*In-Service Date for each request is to be determined after the Interconnection Facility Study is completed.

11.2 B: Prior Queued Interconnection Requests

See next page.

B: Prior Queued Interconnection Requests

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
ASGI-2010-006	150.00	AECI	Remington 138kV	AECI queue Affected Study
ASGI-2010-010	42.20	SPS	Lovington 115kV	Lea County Affected Study
ASGI-2010-020	30.00	SPS	Tap LE-Tatum - LE-Crossroads 69kV	Lea County Affected Study
ASGI-2010-021	15.00	SPS	Tap LE-Saunders Tap - LE-Anderson 69kV	Lea County Affected Study
ASGI-2011-001	27.30	SPS	Lovington 115kV	On-Line
ASGI-2011-002	20.00	SPS	Herring 115kV	On-Line
ASGI-2011-003	10.00	SPS	Hendricks 69kV	On-Line
ASGI-2011-004	20.00	SPS	Pleasant Hill 69kV	Under Study (DISIS-2011-002)
ASGI-2012-002	18.15	SPS	FE-Clovis Interchange 115kV	Under Study (DISIS-2012-002)
ASGI-2012-006	22.50	SUNCMKEC	Tap Hugoton - Rolla 69kV	Under Study (DISIS-2012-001)
ASGI-2013-001	11.50	SPS	PanTex South 115kV	Under Study (DISIS-2013-001)
ASGI-2013-002	18.40	SPS	FE Tucumcari 115kV	Under Study (DISIS-2013-001)
ASGI-2013-003	18.40	SPS	FE Clovis 115kV	Under Study (DISIS-2013-001)
ASGI-2013-004	36.60	SUNCMKEC	Morris 115kV	Under Study (DISIS-2013-002)
ASGI-2013-005	1.65	SPS	FE Clovis 115kV	Under Study (DISIS-2013-002)
ASGI-2013-006	2.00	SPS	SP-Erskine 115kV	
ASGI-2014-001	2.50	SPS	SP-Erskine 115kV	Under Study (DISIS-2014-001)
ASGI-2014-014	56.40	GRDA	Ferguson 69kV	Under Study (DISIS-2014-002)
ASGI-2015-001	6.13	SUNCMKEC	Ninnescah 115kV	Under Study (DISIS-2015-001)
ASGI-2015-002	2.00	SPS	SP-Yuma 69kV	Under Study (DISIS-2015-001)
ASGI-2015-004	56.36	GRDA	Coffeyville City 69kV	Under Study (DISIS-2015-001)
G176	100.00	XEL	Yankee 115kV	
G255	100.00	XEL	Yankee 115kV	MISO Queued Request
G359	150.00	MDU	MDU 230 kV system near Ellendale	MISO Queued Request
G380	150.00	OTP	Rugby 115kV	MISO Queued Request
G408	12.00	XEL	Tap McHenry - Souris 115kV	MISO Queued Request
G502	50.60	MP	Milton Young 230kV	MISO Queued Request
G586	30.00	XEL	Yankee 115kV	
G645	50.00	GRE	Ladish 115kV	MISO Queued Request
G723	10.00	MDU	Haskett 115kV	MISO Queued Request
G736	200.00	OTP	Big Stone South 230kV	
G752	150.00	MDU	Tap Bison - Hettinger 230kV	MISO Queued Request
G788	49.00	GRE	Ladish 115kV	MISO Queued Request
G830	99.00	GRE	GRE McHenry 115kV	MISO Queued Request
GEN-2001-014	96.00	WFEC	Ft Supply 138kV	On-Line
GEN-2001-026	74.30	WFEC	Washita 138kV	On-Line
GEN-2001-033	180.00	SPS	San Juan Tap 230kV	On-Line at 120MW
GEN-2001-036	80.00	SPS	Norton 115kV	On-Line
GEN-2001-037	100.00	OKGE	FPL Moreland Tap 138kV	On-Line
GEN-2001-039A	105.00	SUNCMKEC	Shooting Star Tap 115kV	On-Line
GEN-2001-039M	100.00	SUNCMKEC	Central Plains Tap 115kV	On-Line
GEN-2002-004	200.00	WERE	Latham 345kV	On-Line at 150MW
GEN-2002-005	120.00	WFEC	Red Hills Tap 138kV	On-Line
GEN-2002-008	240.00	SPS	Hitchland 345kV	On-Line at 120MW
GEN-2002-008IS	40.50	WAPA	Edgeley 115kV [Pomona 115kV]	Commercial Operation
GEN-2002-009	80.00	SPS	Hansford 115kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2002-009IS	40.00	WAPA	Ft Thompson 69kV [Hyde 69kV]	Commercial Operation
GEN-2002-022	240.00	SPS	Bushland 230kV	On-Line
GEN-2002-023N	0.80	NPPD	Harmony 115kV	On-Line
GEN-2002-025A	150.00	SUNCMKEC	Spearville 230kV	On-Line
GEN-2003-004	100.00	WFEC	Washita 138kV	On-Line
GEN-2003-005	100.00	WFEC	Anadarko - Paradise (Blue Canyon) 138kV	On-Line
GEN-2003-006A	200.00	SUNCMKEC	Elm Creek 230kV	On-Line
GEN-2003-019	250.00	MIDW	Smoky Hills Tap 230kV	On-Line
GEN-2003-020	160.00	SPS	Martin 115kV	On-Line
GEN-2003-021N	75.00	NPPD	Ainsworth Wind Tap 115kV	On-Line
GEN-2003-022	120.00	AEPW	Weatherford 138kV	On-Line
GEN-2004-014	154.50	SUNCMKEC	Spearville 230kV	On-Line at 100MW
GEN-2004-020	27.00	AEPW	Weatherford 138kV	On-Line
GEN-2004-023	20.60	WFEC	Washita 138kV	On-Line
GEN-2004-023N	75.00	NPPD	Columbus Co 115kV	On-Line
GEN-2005-003	30.60	WFEC	Washita 138kV	On-Line
GEN-2005-003IS	100.00	WAPA	Nelson 115kV	Commercial Operation
GEN-2005-008	120.00	OKGE	Woodward 138kV	On-Line
GEN-2005-008IS	50.00	WAPA	Hilken 230kV [Ecklund 230kV]	Commercial Operation
GEN-2005-012	250.00	SUNCMKEC	Ironwood 345kV	On-Line at 160MW
GEN-2005-013	201.00	WERE	Caney River 345kV	On-Line
GEN-2006-001IS	10.00	XEL	Marshall 115kV	Commercial Operation
GEN-2006-002	101.00	AEPW	Sweetwater 230kV	On-Line
GEN-2006-002IS	51.00	WAPA	Wessington Springs 230kV	Commercial Operation
GEN-2006-006IS	10.00	XEL	Marshall 115kV	Commercial Operation
GEN-2006-015IS	50.00	WAPA	Hilken 230kV [Ecklund 230kV]	Commercial Operation
GEN-2006-018	170.00	SPS	TUCO Interchange 230kV	On-Line
GEN-2006-020N	42.00	NPPD	Bloomfield 115kV	On-Line
GEN-2006-020S	18.90	SPS	DWS Frisco 115kV	On-Line
GEN-2006-021	101.00	SUNCMKEC	Flat Ridge Tap 138kV	On-Line
GEN-2006-024S	19.80	WFEC	Buffalo Bear Tap 69kV	On-Line
GEN-2006-026	502.00	SPS	Hobbs 230kV & Hobbs 115kV	On-Line
GEN-2006-031	75.00	MIDW	Knoll 115kV	On-Line
GEN-2006-035	225.00	AEPW	Sweetwater 230kV	On-Line at 132MW
GEN-2006-037N1	75.00	NPPD	Broken Bow 115kV	On-Line
GEN-2006-038N005	80.00	NPPD	Broken Bow 115kV	On-Line
GEN-2006-038N019	80.00	NPPD	Petersburg North 115kV	On-Line
GEN-2006-043	99.00	AEPW	Sweetwater 230kV	On-Line
GEN-2006-044	370.00	SPS	Hitchland 345kV	On-Line at 120MW
GEN-2006-044N	40.50	NPPD	North Petersburg 115kV	On-Line
GEN-2006-046	131.00	OKGE	Dewey 138kV	On-Line
GEN-2007-011N08	81.00	NPPD	Bloomfield 115kV	On-Line
GEN-2007-013IS	50.00	WAPA	Wessington Springs 230kV	Commercial Operation
GEN-2007-014IS	100.00	WAPA	Wessington Springs 230kV	Commercial Operation
GEN-2007-015IS	100.00	WAPA	Hilken 230kV [Ecklund 230kV]	Commercial Operation
GEN-2007-017IS	166.00	WAPA	Ft Thompson-Grand Island 345kV	On Schedule
GEN-2007-018IS	234.00	WAPA	Ft Thompson-Grand Island 345kV	On Schedule
GEN-2007-020IS	16.00	WAPA	Nelson 115kV	Commercial Operation
GEN-2007-021	201.00	OKGE	Tatonga 345kV	On-Line
GEN-2007-023IS	50.00	WAPA	Formit-Summit 115kV	On Suspension

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2007-025	300.00	WERE	Viola 345kV	On-Line
GEN-2007-027IS	99.00	WAPA	Bismarck-Garrison 230kV #1	On Suspension
GEN-2007-040	200.00	SUNCMKEC	Buckner 345kV	On-Line at 132MW
GEN-2007-043	200.00	OKGE	Minco 345kV	On-Line
GEN-2007-044	300.00	OKGE	Tatonga 345kV	On-Line at 199MW
GEN-2007-046	200.00	SPS	Hitchland 115kV	On-Line
GEN-2007-050	170.00	OKGE	Woodward EHV 138kV	On-Line at 150MW
GEN-2007-052	150.00	WFEC	Anadarko 138kV	On-Line
GEN-2007-062	765.00	OKGE	Woodward EHV 345kV	On Schedule for 2016 and 2017
GEN-2008-003	101.00	OKGE	Woodward EHV 138kV	On-Line
GEN-2008-008IS	5.00	WAPA	Nelson 115kV	Commercial Operation
GEN-2008-013	300.00	OKGE	Hunter 345kV	On-Line at 235MW
GEN-2008-018	250.00	SPS	Finney 345kV	On-Line
GEN-2008-021	42.00	WERE	Wolf Creek 345kV	On-Line
GEN-2008-022	300.00	SPS	Crossroads 345kV	On-Line
GEN-2008-023	150.00	AEPW	Hobart Junction 138kV	On-Line
GEN-2008-037	101.00	WFEC	Slick Hills 138kV	On-Line
GEN-2008-044	197.80	OKGE	Tatonga 345kV	On-Line
GEN-2008-047	300.00	OKGE	Beaver County 345kV	On-Line
GEN-2008-051	322.00	SPS	Potter County 345kV	On-Line at 161MW
GEN-2008-079	99.20	SUNCMKEC	Crooked Creek 115kV	On-Line
GEN-2008-086N02	201.00	NPPD	Meadow Grove 230kV	On-Line
GEN-2008-092	200.60	MIDW	Post Rock 230kV	On-Line
GEN-2008-098	100.80	WERE	Waverly 345kV	On-Line
GEN-2008-119O	60.00	OPPD	S1399 161kV	On-Line
GEN-2008-123N	89.70	NPPD	Tap Pauline - Hildreth (Rosemont) 115kV	On Schedule for 2016
GEN-2008-124	200.10	SUNCMKEC	Ironwood 345kV	On Schedule for 2016
GEN-2008-129	80.00	KCPL	Pleasant Hill 161kV	On-Line
GEN-2009-001IS	200.00	WAPA	Groton-Watertown 345kV	On Schedule
GEN-2009-006IS	90.00	WAPA	Mission 115kV	On Suspension
GEN-2009-007IS	100.00	WAPA	Mission 115kV	On Suspension
GEN-2009-008	199.50	MIDW	South Hays 230kV	On-Line
GEN-2009-018IS	100.00	WAPA	Groton 115kV	Commercial Operation
GEN-2009-020	48.30	MIDW	Walnut Creek 69kV	On-Line
GEN-2009-020AIS	130.50	WAPA	Tripp Junction 115kV	Commercial Operation
GEN-2009-025	59.80	OKGE	Nardins 69kV	On-Line
GEN-2009-026IS	110.00	WAPA	Dickenson-Heskett 230kV	On Schedule
GEN-2009-040	73.80	WERE	Marshall 115kV	On Schedule for 2016
GEN-2010-001	300.00	OKGE	Beaver County 345kV	On-Line
GEN-2010-001IS	99.00	WAPA	Bismarck-Glenham 230kV	On Schedule
GEN-2010-003	100.80	WERE	Waverly 345kV	On-Line
GEN-2010-003IS	34.00	WAPA	Wessington Springs 230kV	Commercial Operation
GEN-2010-005	299.20	WERE	Viola 345kV	On-Line at 170MW
GEN-2010-006	205.00	SPS	Jones 230kV	On-Line
GEN-2010-007IS	172.50	WAPA	Antelope Valley 345kV	On Suspension
GEN-2010-009	165.60	SUNCMKEC	Buckner 345kV	On-Line
GEN-2010-011	29.70	OKGE	Tatonga 345kV	On-Line
GEN-2010-014	358.80	SPS	Hitchland 345kV	On Schedule for 2018
GEN-2010-036	4.60	WERE	6th Street 115kV	On-Line
GEN-2010-040	300.00	OKGE	Cimarron 345kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2010-041	10.50	OPPD	S1399 161kV	On Schedule for 2015
GEN-2010-045	197.80	SUNCMKEC	Buckner 345kV	On Schedule for 2017
GEN-2010-046	56.00	SPS	TUCO Interchange 230kV	On Schedule for 2016
GEN-2010-048	70.00	MIDW	Tap Beach Station - Redline 115kV	FACILITY STUDY STAGE
GEN-2010-051	200.00	NPPD	Tap Hoskins - Twin Church (Dixon County) 230kV	On Suspension
GEN-2010-055	4.50	AEPW	Wekiwa 138kV	On-Line
GEN-2010-057	201.00	MIDW	Rice County 230kV	On-Line
GEN-2011-008	600.00	SUNCMKEC	Clark County 345kV	On Schedule for 2016
GEN-2011-010	100.80	OKGE	Minco 345kV	On-Line
GEN-2011-011	50.00	KCPL	Iatan 345kV	On-Line
GEN-2011-014	201.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (GEN-2011-014 Tap) 345kV	On Schedule for 2016
GEN-2011-016	200.10	SUNCMKEC	Ironwood 345kV	On Suspension
GEN-2011-018	73.60	NPPD	Steele City 115kV	On-Line
GEN-2011-019	299.00	OKGE	Woodward 345kV	On Schedule for 2017
GEN-2011-020	299.00	OKGE	Woodward 345kV	On Schedule for 2017
GEN-2011-022	299.00	SPS	Hitchland 345kV	On Schedule for 2016 (150MW) and 2017 (149MW)
GEN-2011-025	80.00	SPS	Tap Floyd County - Crosby County 115kV	On Schedule for 2016
GEN-2011-027	120.00	NPPD	Tap Hoskins - Twin Church (Dixon County) 230kV	On Suspension
GEN-2011-037	7.00	WFEC	Blue Canyon 5 138kV	On-Line
GEN-2011-040	111.00	OKGE	Carter County 138kV	On-Line
GEN-2011-045	205.00	SPS	Jones 230kV	On-Line
GEN-2011-046	27.00	SPS	Lopez 115kV	On-Line
GEN-2011-048	175.00	SPS	Mustang 230kV	On-Line
GEN-2011-049	250.70	OKGE	Border 345kV	On Schedule for 2016
GEN-2011-050	109.80	AEPW	Santa Fe Tap 138kV	On Schedule for 2016
GEN-2011-051	104.40	OKGE	Tap Woodward - Tatonga 345kV (GEN-2011-051 Tap)	On Schedule for 2017
GEN-2011-054	300.00	OKGE	Cimarron 345kV	On-Line
GEN-2011-056	3.60	NPPD	Jeffrey 115kV	On-Line
GEN-2011-056A	3.60	NPPD	John 1 115kV	On-Line
GEN-2011-056B	4.50	NPPD	John 2 115kV	On-Line
GEN-2011-057	150.40	WERE	Creswell 138kV	On-Line
GEN-2012-001	61.20	SPS	Cirrus Tap 230kV	On-Line
GEN-2012-004	41.40	OKGE	Carter County 138kV	On-Line
GEN-2012-006IS	125.01	WAPA	Williston-Ch. Creek 230kV	On Schedule
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV	On-Line
GEN-2012-009IS	99.00	WAPA	Fort Randall 115kV	On Suspension
GEN-2012-012IS	75.00	WAPA	Wolf Point-Circle 115kV	On Suspension
GEN-2012-014IS	99.50	WAPA	Groton 115kV	On Schedule
GEN-2012-020	478.00	SPS	TUCO 230kV	On Schedule for 2016
GEN-2012-021	4.80	LES	Terry Bundy Generating Station 115kV	On-Line
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV	On Schedule for 2016
GEN-2012-028	74.80	WFEC	Gotebo 69kV	On-Line
GEN-2012-032	300.00	OKGE	Open Sky 345kV	On-Line
GEN-2012-033	98.10	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV	On-Line
GEN-2012-034	7.00	SPS	Mustang 230kV	On-Line
GEN-2012-035	7.00	SPS	Mustang 230kV	On-Line
GEN-2012-036	7.00	SPS	Mustang 230kV	On-Line
GEN-2012-037	203.00	SPS	TUCO 345kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2012-041	121.50	OKGE	Ranch Road 345kV	On-Line
GEN-2013-001IS	90.00	WAPA	Summit-Watertown 115kV	On Suspension
GEN-2013-002	50.60	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2	On Schedule for 2016
GEN-2013-007	100.30	OKGE	Tap Prices Falls - Carter 138kV	On-Line
GEN-2013-008	1.20	NPPD	Steele City 115kV	On-Line
GEN-2013-009IS	19.50	WAPA	Redfield NW 115kV	Commercial Operation
GEN-2013-010	99.00	SUNCMKEC	Tap Spearville - Post Rock (North of GEN-2011-017 Tap) 345kV	On Schedule for 2018
GEN-2013-011	30.00	AEPW	Turk 138kV	On-Line
GEN-2013-012	147.00	OKGE	Redbud 345kV	On-Line
GEN-2013-016	203.00	SPS	TUCO 345kV	On Schedule for 2017
GEN-2013-019	73.60	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2	On Schedule for 2016
GEN-2013-022	25.00	SPS	Norton 115kV	On Schedule for 2016
GEN-2013-027	150.00	SPS	Tap Tolk - Yoakum 230kV	IA Pending
GEN-2013-028	559.50	GRDA	Tap N Tulsa - GRDA 1 345kV	On Schedule for 2017
GEN-2013-029	300.00	OKGE	Renfrow 345kV	On-Line for 151.6MW
GEN-2013-030	300.00	OKGE	Beaver County 345kV	On Schedule for 2016 (200MW) and 2017 (100MW)
GEN-2013-032	204.00	NPPD	Antelope 115kV	On Schedule for 2017
GEN-2013-033	28.00	MIDW	Knoll 115kV	On Schedule for 2016
GEN-2014-001	200.60	WERE	Tap Wichita - Emporia Energy Center (GEN-2014-001 Tap) 345kV	On Suspension
GEN-2014-001IS	103.70	WAPA	Newell-Maurine 115kV	FACILITY STUDY STAGE
GEN-2014-002	10.50	OKGE	Tatonga 345kV (GEN-2007-021 POI)	On Schedule for 2015
GEN-2014-003	15.80	OKGE	Tatonga 345kV (GEN-2007-044 POI)	On Schedule for 2015
GEN-2014-003IS	91.00	WAPA	Culbertson 115kV	On Schedule
GEN-2014-004	4.00	NPPD	Steele City 115kV (GEN-2011-018 POI)	On-Line
GEN-2014-004IS	384.20	WAPA	Charlie Creek 345kV	FACILITY STUDY STAGE
GEN-2014-005	5.70	OKGE	Minco 345kV (GEN-2011-010 POI)	On-Line
GEN-2014-006IS	125.00	WAPA	Williston 115kV	On Schedule
GEN-2014-010IS	150.00	WAPA	Neset 115kV	On Schedule
GEN-2014-012	225.00	SPS	Tap Hobbs Interchange - Andrews 230kV	On Schedule for 2018
GEN-2014-013	73.50	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV	On-Line
GEN-2014-014IS	151.50	WAPA	Belfield-Rhame 230kV	On Schedule
GEN-2014-020	100.00	AEPW	Tuttle 138kV	On Schedule for 2017
GEN-2014-021	300.00	KCPL	Tap Nebraska City - Mullin Creek 345kV	On Schedule for 2016
GEN-2014-025	2.40	MIDW	Walnut Creek 69kV	On-Line
GEN-2014-028	35.00	EMDE	Riverton 161kV	On Schedule for 2016
GEN-2014-031	35.80	NPPD	Meadow Grove 230kV	On-Line
GEN-2014-032	10.20	NPPD	Meadow Grove 230kV	On Schedule for 2016
GEN-2014-033	70.00	SPS	Chaves County 115kV	On Schedule for 2016
GEN-2014-034	70.00	SPS	Chaves County 115kV	On Schedule for 2016
GEN-2014-035	30.00	SPS	Chaves County 115kV	On Schedule for 2018
GEN-2014-039	73.40	NPPD	Friend 115kV	On Schedule for 2017
GEN-2014-040	320.40	SPS	Castro 115kV	On Schedule for 2016
GEN-2014-041	120.80	SUNCMKEC	Arnold 115kV	On Suspension
GEN-2014-047	40.00	SPS	Crossroads 345kV	IA Pending
GEN-2014-056	250.00	OKGE	Minco 345kV	On Schedule for 2016
GEN-2014-057	250.00	AEPW	Tap Lawton - Sunnyside (Terry Road) 345kV	On Schedule for 2016

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2014-064	248.40	OKGE	Otter 138kV	On Suspension
GEN-2014-074	152.00	SPS	Tap TUCO Interchange - Oklaunion (GEN-2014-074 Tap) 345kV	FACILITY STUDY STAGE
GEN-2015-001	200.00	OKGE	Ranch Road 345kV	On Schedule for 2016
GEN-2015-004	52.90	OKGE	Border 345kV	IA Pending
GEN-2015-005	200.10	KCPL	Tap Nebraska City - Sibley 345kV	FACILITY STUDY STAGE
GEN-2015-007	160.00	NPPD	Hoskins 345kV	FACILITY STUDY STAGE
GEN-2015-013	120.00	WFEC	Synder 138kV	FACILITY STUDY STAGE
GEN-2015-014	150.00	SPS	Tap Cochran - Lehman 115kV	FACILITY STUDY STAGE
GEN-2015-015	154.60	OKGE	Tap Medford Tap - Coyote 138kV	FACILITY STUDY STAGE
GEN-2015-016	200.00	KCPL	Tap Marmaton - Centerville 161kV	FACILITY STUDY STAGE
GEN-2015-021	20.00	SUNCMKEC	Johnson Corner 115kV	FACILITY STUDY STAGE
GEN-2015-022	112.00	SPS	Swisher 115kV	FACILITY STUDY STAGE
GEN-2015-023	300.70	NPPD	Holt County 345kV	FACILITY STUDY STAGE
GEN-2015-024	220.00	WERE	Tap Thistle - Wichita 345kV Dbl CKT	On Schedule for 2016
GEN-2015-025	220.00	WERE	Tap Thistle - Wichita 345kV Dbl CKT	FACILITY STUDY STAGE
GEN-2015-027	4.90	SUNCMKEC	Crooked Creek 115kV	FACILITY STUDY STAGE
GEN-2015-029	161.00	OKGE	Tatonga 345kV	IA Pending
GEN-2015-030	200.10	OKGE	Sooner 345kV	IA Pending
Gray County Wind (Montezuma)	110.00	SUNCMKEC	Gray County Tap 115kV	On-Line
J003	20.00	MDU	Baker 115kV	MISO Queued Request
J249	180.00	MDU	MDU Tatanka 230kV	MISO Queued Request
J262	100.00	OTP	Jamestown 345	MISO Queued Request
J263	100.00	OTP	Jamestown 345	MISO Queued Request
J290	150.00	XEL	Tap Glenboro South - Rugby 230kV	MISO Queued Request
J316	150.00	MDU	MDU 230 kV Tatanka-Ellendale line	MISO Queued Request
J436	150.00	OTP	Big Stone South 345kV	MISO Queued Request
J437	150.00	OTP	Big Stone South 345kV	MISO Queued Request
J442	200.00	OTP	Big Stone 230 kV	MISO Queued Request
Llano Estacado (White Deer)	80.00	SPS	Llano Wind 115kV	On-Line
MPC01200	98.90	OTP	Maple River 230kV	On-line (54.9MW)/ IA Pending (44MW)
MPC02100	99.3	OTP	Center- Mandan 230kV	On Schedule for 2016
NPPD Distributed (Broken Bow)	8.30	NPPD	Broken Bow 115kV	On-Line
NPPD Distributed (Buffalo County Solar)	10.00	NPPD	Kearney Northeast	On-Line
NPPD Distributed (Burt County Wind)	12.00	NPPD	Tekamah & Oakland 115kV	On-Line
NPPD Distributed (Burwell)	3.00	NPPD	Ord 115kV	On-Line
NPPD Distributed (Columbus Hydro)	45.00	NPPD	Columbus 115kV	On-Line
NPPD Distributed (North Platte - Lexington)	54.00	NPPD	Multiple: Jeffrey 115kV, John_1 115kV, John_2 115kV	On-Line
NPPD Distributed (Ord)	11.90	NPPD	Ord 115kV	On-Line
NPPD Distributed (Stuart)	2.10	NPPD	Ainsworth 115kV	On-Line
SPS Distributed (Dumas 19th St)	20.00	SPS	Dumas 19th Street 115kV	On-Line
SPS Distributed (Etter)	20.00	SPS	Etter 115kV	On-Line
SPS Distributed (Hopi)	10.00	SPS	Hopi 115kV	On-Line
SPS Distributed (Jal)	10.00	SPS	S Jal 115kV	On-Line
SPS Distributed (Lea Road)	10.00	SPS	Lea Road 115kV	On-Line
SPS Distributed (Monument)	10.00	SPS	Monument 115kV	On-Line
SPS Distributed (Moore E)	25.00	SPS	Moore East 115kV	On-Line
SPS Distributed (Ocotillo)	10.00	SPS	S_Jal 115kV	On-Line
SPS Distributed (Sherman)	20.00	SPS	Sherman 115kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
SPS Distributed (Spearman)	10.00	SPS	Spearman 69kV	On-Line
SPS Distributed (TC-Texas County)	20.00	SPS	Texas County 115kV	On-Line
SPS Distributed (Yuma)	2.57	SPS	SP-Yuma 69kV	On-Line
Total:	34,482.9			

11.3 C: Study Groupings

See next page

C. Study Groups

GROUP 1: WOODWARD AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-014	96.00	WFEC	Ft Supply 138kV
GEN-2001-037	100.00	OKGE	FPL Moreland Tap 138kV
GEN-2005-008	120.00	OKGE	Woodward 138kV
GEN-2006-024S	19.80	WFEC	Buffalo Bear Tap 69kV
GEN-2006-046	131.00	OKGE	Dewey 138kV
GEN-2007-021	201.00	OKGE	Tatonga 345kV
GEN-2007-043	200.00	OKGE	Minco 345kV
GEN-2007-044	300.00	OKGE	Tatonga 345kV
GEN-2007-050	170.00	OKGE	Woodward EHV 138kV
GEN-2007-062	765.00	OKGE	Woodward EHV 345kV
GEN-2008-003	101.00	OKGE	Woodward EHV 138kV
GEN-2008-044	197.80	OKGE	Tatonga 345kV
GEN-2010-011	29.70	OKGE	Tatonga 345kV
GEN-2010-040	300.00	OKGE	Cimarron 345kV
GEN-2011-010	100.80	OKGE	Minco 345kV
GEN-2011-019	299.00	OKGE	Woodward 345kV
GEN-2011-020	299.00	OKGE	Woodward 345kV
GEN-2011-051	104.40	OKGE	Tap Woodward - Tatonga 345kV (GEN-2011-051 Tap)
GEN-2011-054	300.00	OKGE	Cimarron 345kV
GEN-2014-002	10.50	OKGE	Tatonga 345kV (GEN-2007-021 POI)
GEN-2014-003	15.80	OKGE	Tatonga 345kV (GEN-2007-044 POI)
GEN-2014-005	5.70	OKGE	Minco 345kV (GEN-2011-010 POI)
GEN-2014-020	100.00	AEPW	Tuttle 138kV
GEN-2014-056	250.00	OKGE	Minco 345kV
GEN-2015-029	161.00	OKGE	Tatonga 345kV
PRIOR QUEUED SUBTOTAL	4,377.50		
GEN-2015-048	200.00	OKGE	Cleo Corner 138kV
GEN-2015-057	100.00	OKGE	Minco 345kV
GEN-2015-059	6.30	OKGE	Minco 345kV
GEN-2015-060	250.50	OKGE	Woodward EHV 138kV
GEN-2015-081	180.00	OKGE	Tap Woodward - Tatonga (GEN-2011-051 Tap) 345kV
GEN-2015-093	250.00	OKGE	Gracemont 345kV
GEN-2015-095	176.00	WFEC	Tap Rose Valley - Mooreland 138kV
CURRENT CLUSTER SUBTOTAL	1,162.80		
AREA TOTAL	5,540.30		

GROUP 2: HITCHLAND AREA Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2011-002	20.00	SPS	Herring 115kV
ASGI-2013-001	11.50	SPS	PanTex South 115kV
GEN-2002-008	240.00	SPS	Hitchland 345kV
GEN-2002-009	80.00	SPS	Hansford 115kV
GEN-2002-022	240.00	SPS	Bushland 230kV
GEN-2003-020	160.00	SPS	Martin 115kV
GEN-2006-020S	18.90	SPS	DWS Frisco 115kV
GEN-2006-044	370.00	SPS	Hitchland 345kV
GEN-2007-046	200.00	SPS	Hitchland 115kV
GEN-2008-047	300.00	OKGE	Beaver County 345kV
GEN-2008-051	322.00	SPS	Potter County 345kV
GEN-2010-001	300.00	OKGE	Beaver County 345kV
GEN-2010-014	358.80	SPS	Hitchland 345kV
GEN-2011-014	201.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (GEN-2011-014 Tap) 345kV
GEN-2011-022	299.00	SPS	Hitchland 345kV
GEN-2013-030	300.00	OKGE	Beaver County 345kV
Llano Estacado (White Deer)	80.00	SPS	Llano Wind 115kV
SPS Distributed (Dumas 19th St)	20.00	SPS	Dumas 19th Street 115kV
SPS Distributed (Etter)	20.00	SPS	Etter 115kV
SPS Distributed (Moore E)	25.00	SPS	Moore East 115kV
SPS Distributed (Sherman)	20.00	SPS	Sherman 115kV
SPS Distributed (Spearman)	10.00	SPS	Spearman 69kV
SPS Distributed (TC-Texas County)	20.00	SPS	Texas County 115kV
PRIOR QUEUED SUBTOTAL	3,616.20		
GEN-2014-037	200.00	SPS	Tap Hitchland - Beaver County Dbl Ckt (Optima) 345kV
CURRENT CLUSTER SUBTOTAL	200.00		
AREA TOTAL	3,816.20		

GROUP 3: SPEARVILLE AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2012-006	22.50	SUNCMKEC	Tap Hugoton - Rolla 69kV
ASGI-2015-001	6.13	SUNCMKEC	Ninnescah 115kV
GEN-2001-039A	105.00	SUNCMKEC	Shooting Star Tap 115kV
GEN-2002-025A	150.00	SUNCMKEC	Spearville 230kV
GEN-2004-014	154.50	SUNCMKEC	Spearville 230kV
GEN-2005-012	250.00	SUNCMKEC	Ironwood 345kV
GEN-2006-021	101.00	SUNCMKEC	Flat Ridge Tap 138kV
GEN-2007-040	200.00	SUNCMKEC	Buckner 345kV
GEN-2008-018	250.00	SPS	Finney 345kV
GEN-2008-079	99.20	SUNCMKEC	Crooked Creek 115kV
GEN-2008-124	200.10	SUNCMKEC	Ironwood 345kV
GEN-2010-009	165.60	SUNCMKEC	Buckner 345kV
GEN-2010-045	197.80	SUNCMKEC	Buckner 345kV
GEN-2011-008	600.00	SUNCMKEC	Clark County 345kV
GEN-2011-016	200.10	SUNCMKEC	Ironwood 345kV
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV
GEN-2013-010	99.00	SUNCMKEC	Tap Spearville - Post Rock (North of GEN-2011-017 Tap) 345kV
GEN-2015-021	20.00	SUNCMKEC	Johnson Corner 115kV
GEN-2015-027	4.90	SUNCMKEC	Crooked Creek 115kV
Gray County Wind (Montezuma)	110.00	SUNCMKEC	Gray County Tap 115kV
PRIOR QUEUED SUBTOTAL	**3,235.83**		
AREA TOTAL	**3,235.83**		

GROUP 4: NORTHWEST KANSAS AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2013-004	36.60	SUNCMKEC	Morris 115kV
GEN-2001-039M	100.00	SUNCMKEC	Central Plains Tap 115kV
GEN-2003-006A	200.00	SUNCMKEC	Elm Creek 230kV
GEN-2003-019	250.00	MIDW	Smoky Hills Tap 230kV
GEN-2006-031	75.00	MIDW	Knoll 115kV
GEN-2008-092	200.60	MIDW	Post Rock 230kV
GEN-2009-008	199.50	MIDW	South Hays 230kV
GEN-2009-020	48.30	MIDW	Walnut Creek 69kV
GEN-2010-048	70.00	MIDW	Tap Beach Station - Redline 115kV
GEN-2010-057	201.00	MIDW	Rice County 230kV
GEN-2013-033	28.00	MIDW	Knoll 115kV
GEN-2014-025	2.40	MIDW	Walnut Creek 69kV
GEN-2014-041	120.80	SUNCMKEC	Arnold 115kV
PRIOR QUEUED SUBTOTAL	**1,532.20**		
GEN-2015-061	200.00	SUNCMKEC	Mingo 345kV
GEN-2015-064	197.80	SUNCMKEC	Mingo 115kV
GEN-2015-065	202.40	SUNCMKEC	Mingo 345kV
CURRENT CLUSTER SUBTOTAL	**600.20**		
AREA TOTAL	**2,132.40**		

GROUP 6: SOUTH TEXAS PANHANDLE/NEW MEXICO AREA			
Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2010-010	42.20	SPS	Lovington 115kV
ASGI-2010-020	30.00	SPS	Tap LE-Tatum - LE-Crossroads 69kV
ASGI-2010-021	15.00	SPS	Tap LE-Saunders Tap - LE-Anderson 69kV
ASGI-2011-001	27.30	SPS	Lovington 115kV
ASGI-2011-003	10.00	SPS	Hendricks 69kV
ASGI-2011-004	20.00	SPS	Pleasant Hill 69kV
ASGI-2012-002	18.15	SPS	FE-Clovis Interchange 115kV
ASGI-2013-002	18.40	SPS	FE Tucumcari 115kV
ASGI-2013-003	18.40	SPS	FE Clovis 115kV
ASGI-2013-005	1.65	SPS	FE Clovis 115kV
ASGI-2013-006	2.00	SPS	SP-Erskine 115kV
ASGI-2014-001	2.50	SPS	SP-Erskine 115kV
ASGI-2015-002	2.00	SPS	SP-Yuma 69kV
GEN-2001-033	180.00	SPS	San Juan Tap 230kV
GEN-2001-036	80.00	SPS	Norton 115kV
GEN-2006-018	170.00	SPS	TUCO Interchange 230kV
GEN-2006-026	502.00	SPS	Hobbs 230kV & Hobbs 115kV
GEN-2008-022	300.00	SPS	Crossroads 345kV
GEN-2010-006	205.00	SPS	Jones 230kV
GEN-2010-046	56.00	SPS	TUCO Interchange 230kV
GEN-2011-025	80.00	SPS	Tap Floyd County - Crosby County 115kV
GEN-2011-045	205.00	SPS	Jones 230kV
GEN-2011-046	27.00	SPS	Lopez 115kV
GEN-2011-048	175.00	SPS	Mustang 230kV
GEN-2012-001	61.20	SPS	Cirrus Tap 230kV
GEN-2012-020	478.00	SPS	TUCO 230kV
GEN-2012-034	7.00	SPS	Mustang 230kV
GEN-2012-035	7.00	SPS	Mustang 230kV
GEN-2012-036	7.00	SPS	Mustang 230kV
GEN-2012-037	203.00	SPS	TUCO 345kV
GEN-2013-016	203.00	SPS	TUCO 345kV
GEN-2013-022	25.00	SPS	Norton 115kV
GEN-2013-027	150.00	SPS	Tap Tolk - Yoakum 230kV
GEN-2014-012	225.00	SPS	Tap Hobbs Interchange - Andrews 230kV
GEN-2014-033	70.00	SPS	Chaves County 115kV
GEN-2014-034	70.00	SPS	Chaves County 115kV
GEN-2014-035	30.00	SPS	Chaves County 115kV
GEN-2014-040	320.40	SPS	Castro 115kV
GEN-2014-047	40.00	SPS	Crossroads 345kV
GEN-2014-074	152.00	SPS	Tap TUCO Interchange - Oklaunion (GEN-2014-074 Tap) 345kV
GEN-2015-014	150.00	SPS	Tap Cochran - Lehman 115kV
GEN-2015-022	112.00	SPS	Swisher 115kV
SPS Distributed (Hopi)	10.00	SPS	Hopi 115kV
SPS Distributed (Jal)	10.00	SPS	S Jal 115kV
SPS Distributed (Lea Road)	10.00	SPS	Lea Road 115kV
SPS Distributed (Monument)	10.00	SPS	Monument 115kV
SPS Distributed (Ocotillo)	10.00	SPS	S_Jal 115kV
SPS Distributed (Yuma)	2.57	SPS	SP-Yuma 69kV
PRIOR QUEUED SUBTOTAL	4,550.77		

GEN-2015-020	100.00	SPS	Oasis 115kV
GEN-2015-031	150.50	SPS	Tap Amarillo South - Swisher 230kV
GEN-2015-056	101.20	SPS	Crossroads 345kV
GEN-2015-058	50.00	SPS	Atoka 115kV
GEN-2015-068	300.00	SPS	TUCO Interchange 345kV
GEN-2015-075	51.50	SPS	Carlisle 69kV
GEN-2015-079	129.20	SPS	Tap Yoakum - Hobbs Interchange 230kV
GEN-2015-080	129.20	SPS	Tap Yoakum - Hobbs Interchange 230kV
CURRENT CLUSTER SUBTOTAL	**1,011.60**		
AREA TOTAL	**5,562.37**		

GROUP 7: SOUTHWEST OKLAHOMA AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-026	74.30	WFEC	Washita 138kV
GEN-2002-005	120.00	WFEC	Red Hills Tap 138kV
GEN-2003-004	100.00	WFEC	Washita 138kV
GEN-2003-005	100.00	WFEC	Anadarko - Paradise (Blue Canyon) 138kV
GEN-2003-022	120.00	AEPW	Weatherford 138kV
GEN-2004-020	27.00	AEPW	Weatherford 138kV
GEN-2004-023	20.60	WFEC	Washita 138kV
GEN-2005-003	30.60	WFEC	Washita 138kV
GEN-2006-002	101.00	AEPW	Sweetwater 230kV
GEN-2006-035	225.00	AEPW	Sweetwater 230kV
GEN-2006-043	99.00	AEPW	Sweetwater 230kV
GEN-2007-052	150.00	WFEC	Anadarko 138kV
GEN-2008-023	150.00	AEPW	Hobart Junction 138kV
GEN-2008-037	101.00	WFEC	Slick Hills 138kV
GEN-2011-037	7.00	WFEC	Blue Canyon 5 138kV
GEN-2011-049	250.70	OKGE	Border 345kV
GEN-2012-028	74.80	WFEC	Gotebo 69kV
GEN-2015-004	52.90	OKGE	Border 345kV
GEN-2015-013	120.00	WFEC	Synder 138kV
PRIOR QUEUED SUBTOTAL	1,923.90		
GEN-2015-055	40.00	WFEC	Erick 138kV
GEN-2015-071	200.00	AEPW	Chisholm 345kV
GEN-2015-084	51.30	AEPW	Hollis 138kV
GEN-2015-085	122.40	AEPW	Altus Junction 138kV
CURRENT CLUSTER SUBTOTAL	413.70		
AREA TOTAL	2,337.60		

GROUP 8: NORTH OKLAHOMA/SOUTH CENTRAL KANSAS AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2010-006	150.00	AECI	Remington 138kV
ASGI-2014-014	56.40	GRDA	Ferguson 69kV
ASGI-2015-004	56.36	GRDA	Coffeyville City 69kV
GEN-2002-004	200.00	WERE	Latham 345kV
GEN-2005-013	201.00	WERE	Caney River 345kV
GEN-2007-025	300.00	WERE	Viola 345kV
GEN-2008-013	300.00	OKGE	Hunter 345kV
GEN-2008-021	42.00	WERE	Wolf Creek 345kV
GEN-2008-098	100.80	WERE	Waverly 345kV
GEN-2009-025	59.80	OKGE	Nardins 69kV
GEN-2010-003	100.80	WERE	Waverly 345kV
GEN-2010-005	299.20	WERE	Viola 345kV
GEN-2010-055	4.50	AEPW	Wekiwa 138kV
GEN-2011-057	150.40	WERE	Creswell 138kV
GEN-2012-032	300.00	OKGE	Open Sky 345kV
GEN-2012-033	98.10	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV
GEN-2012-041	121.50	OKGE	Ranch Road 345kV
GEN-2013-012	147.00	OKGE	Redbud 345kV
GEN-2013-028	559.50	GRDA	Tap N Tulsa - GRDA 1 345kV
GEN-2013-029	300.00	OKGE	Renfrow 345kV
GEN-2014-001	200.60	WERE	Tap Wichita - Emporia Energy Center (GEN-2014-001 Tap) 345kV

GEN-2014-028	35.00	EMDE	Riverton 161kV
GEN-2014-064	248.40	OKGE	Otter 138kV
GEN-2015-001	200.00	OKGE	Ranch Road 345kV
GEN-2015-015	154.60	OKGE	Tap Medford Tap - Coyote 138kV
GEN-2015-016	200.00	KCPL	Tap Marmaton - Centerville 161kV
GEN-2015-024	220.00	WERE	Tap Thistle - Wichita 345kV Dbl CKT
GEN-2015-025	220.00	WERE	Tap Thistle - Wichita 345kV Dbl CKT
GEN-2015-030	200.10	OKGE	Sooner 345kV
PRIOR QUEUED SUBTOTAL	**5,226.06**		
GEN-2015-034	200.00	OKGE	Ranch Road 345kV
GEN-2015-047	300.00	OKGE	Sooner 345kV
GEN-2015-052	300.00	WERE	Tap Open Sky - Rose Hill 345kV
GEN-2015-062	4.50	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV
GEN-2015-063	300.00	OKGE	Tap Woodring - Mathewson 345kV
GEN-2015-066	248.40	OKGE	Tap Cleveland - Sooner 345kV
GEN-2015-067	150.00	OKGE	Sooner 138kV
GEN-2015-069	300.00	WERE	Union Ridge 230kV
GEN-2015-073	200.10	WERE	Emporia Energy Center 345kV
GEN-2015-083	125.00	WERE	Belle Plain 138kV
GEN-2015-090	220.00	WERE	Tap Thistle - Wichita 345kV Dbl CKT
CURRENT CLUSTER SUBTOTAL	**2,348.00**		
AREA TOTAL	**7,574.06**		

GROUP 9: NEBRASKA AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2002-023N	0.80	NPPD	Harmony 115kV
GEN-2003-021N	75.00	NPPD	Ainsworth Wind Tap 115kV
GEN-2004-023N	75.00	NPPD	Columbus Co 115kV
GEN-2006-020N	42.00	NPPD	Bloomfield 115kV
GEN-2006-037N1	75.00	NPPD	Broken Bow 115kV
GEN-2006-038N005	80.00	NPPD	Broken Bow 115kV
GEN-2006-038N019	80.00	NPPD	Petersburg North 115kV
GEN-2006-044N	40.50	NPPD	North Petersburg 115kV
GEN-2007-011N08	81.00	NPPD	Bloomfield 115kV
GEN-2007-017IS	166.00	WAPA	Ft Thompson-Grand Island 345kV
GEN-2007-018IS	234.00	WAPA	Ft Thompson-Grand Island 345kV
GEN-2008-086N02	201.00	NPPD	Meadow Grove 230kV
GEN-2008-119O	60.00	OPPD	S1399 161kV
GEN-2008-123N	89.70	NPPD	Tap Pauline - Hildreth (Rosemont) 115kV
GEN-2009-040	73.80	WERE	Marshall 115kV
GEN-2010-041	10.50	OPPD	S1399 161kV
GEN-2010-051	200.00	NPPD	Tap Hoskins - Twin Church (Dixon County) 230kV
GEN-2011-018	73.60	NPPD	Steele City 115kV
GEN-2011-027	120.00	NPPD	Tap Hoskins - Twin Church (Dixon County) 230kV
GEN-2011-056	3.60	NPPD	Jeffrey 115kV
GEN-2011-056A	3.60	NPPD	John 1 115kV
GEN-2011-056B	4.50	NPPD	John 2 115kV
GEN-2012-021	4.80	LES	Terry Bundy Generating Station 115kV
GEN-2013-002	50.60	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2
GEN-2013-008	1.20	NPPD	Steele City 115kV
GEN-2013-019	73.60	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2
GEN-2013-032	204.00	NPPD	Antelope 115kV
GEN-2014-004	4.00	NPPD	Steele City 115kV (GEN-2011-018 POI)

GEN-2014-013	73.50	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV
GEN-2014-031	35.80	NPPD	Meadow Grove 230kV
GEN-2014-032	10.20	NPPD	Meadow Grove 230kV
GEN-2014-039	73.40	NPPD	Friend 115kV
GEN-2015-007	160.00	NPPD	Hoskins 345kV
GEN-2015-023	300.70	NPPD	Holt County 345kV
NPPD Distributed (Broken Bow)	8.30	NPPD	Broken Bow 115kV
NPPD Distributed (Buffalo County Solar)	10.00	NPPD	Kearney Northeast
NPPD Distributed (Burt County Wind)	12.00	NPPD	Tekamah & Oakland 115kV
NPPD Distributed (Burwell)	3.00	NPPD	Ord 115kV
NPPD Distributed (Columbus Hydro)	45.00	NPPD	Columbus 115kV
NPPD Distributed (North Platte - Lexington)	54.00	NPPD	Multiple: Jeffrey 115kV, John_1 115kV, John_2 115kV
NPPD Distributed (Ord)	11.90	NPPD	Ord 115kV
NPPD Distributed (Stuart)	2.10	NPPD	Ainsworth 115kV
PRIOR QUEUED SUBTOTAL	**2,927.70**		
GEN-2015-053	50.00	NPPD	Antelope 115kV
GEN-2015-076	158.40	NPPD	Belden 115kV
GEN-2015-087	66.00	NPPD	Tap Fairbury - Hebron 115kV
GEN-2015-088	300.00	NPPD	Tap Moore - Pauline 345kV
CURRENT CLUSTER SUBTOTAL	**574.40**		
AREA TOTAL	**3,502.10**		

GROUP 10: SOUTHEAST OKLAHOMA/NORTHEAST TEXAS AREA

Request	Capacity	Area	Proposed Point of Interconnection
AREA TOTAL	**0.00**		

GROUP 12: NORTHWEST ARKANSAS AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2013-011	30.00	AEPW	Turk 138kV
PRIOR QUEUED SUBTOTAL	**30.00**		
AREA TOTAL	**30.00**		

GROUP 13: NORTHWEST MISSOURI AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2008-129	80.00	KCPL	Pleasant Hill 161kV
GEN-2010-036	4.60	WERE	6th Street 115kV
GEN-2011-011	50.00	KCPL	Iatan 345kV
GEN-2014-021	300.00	KCPL	Tap Nebraska City - Mullin Creek 345kV
GEN-2015-005	200.10	KCPL	Tap Nebraska City - Sibley 345kV
PRIOR QUEUED SUBTOTAL	**634.70**		
AREA TOTAL	**634.70**		

GROUP 14: SOUTH CENTRAL OKLAHOMA AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2011-040	111.00	OKGE	Carter County 138kV
GEN-2011-050	109.80	AEPW	Santa Fe Tap 138kV
GEN-2012-004	41.40	OKGE	Carter County 138kV
GEN-2013-007	100.30	OKGE	Tap Prices Falls - Carter 138kV
GEN-2014-057	250.00	AEPW	Tap Lawton - Sunnyside (Terry Road) 345kV
PRIOR QUEUED SUBTOTAL	**612.50**		
ASGI-2015-006	9.00	SWPA	Tupelo 138kV
GEN-2015-045	20.00	AEPW	Tap Lawton - Sunnyside (Terry Road) 345kV
GEN-2015-092	250.00	AEPW	Tap Lawton - Sunnyside (Terry Road) 345kV
CURRENT CLUSTER SUBTOTAL	**279.00**		
AREA TOTAL	**891.50**		

GROUP 15: E-SOUTH DAKOTA AREA			
Request	Capacity	Area	Proposed Point of Interconnection
G176	100.00	XEL	Yankee 115kV
G255	100.00	XEL	Yankee 115kV
G586	30.00	XEL	Yankee 115kV
G736	200.00	OTP	Big Stone South 230kV
GEN-2002-009IS	40.00	WAPA	Ft Thompson 69kV [Hyde 69kV]
GEN-2007-013IS	50.00	WAPA	Wessington Springs 230kV
GEN-2007-014IS	100.00	WAPA	Wessington Springs 230kV
GEN-2007-023IS	50.00	WAPA	Formit-Summit 115kV
GEN-2009-001IS	200.00	WAPA	Groton-Watertown 345kV
GEN-2009-018IS	100.00	WAPA	Groton 115kV
GEN-2010-001IS	99.00	WAPA	Bismarck-Glenham 230kV
GEN-2010-003IS	34.00	WAPA	Wessington Springs 230kV
GEN-2012-014IS	99.50	WAPA	Groton 115kV
GEN-2013-001IS	90.00	WAPA	Summit-Watertown 115kV
GEN-2013-009IS	19.50	WAPA	Redfield NW 115kV
GEN-2014-001IS	103.70	WAPA	Newell-Maurine 115kV
J436	150.00	OTP	Big Stone South 345kV
J437	150.00	OTP	Big Stone South 345kV
J442	200.00	OTP	Big Stone 230 kV
PRIOR QUEUED SUBTOTAL	**1,915.70**		
GEN-2015-097	100.00	WAPA	Groton 115kV
CURRENT CLUSTER SUBTOTAL	**100.00**		
AREA TOTAL	**2,015.70**		

GROUP 16: W-NORTH DAKOTA AREA

Request	Capacity	Area	Proposed Point of Interconnection
G359	150.00	MDU	MDU 230 kV system near Ellendale
G380	150.00	OTP	Rugby 115kV
G408	12.00	XEL	Tap McHenry - Souris 115kV
G502	50.60	MP	Milton Young 230kV
G645	50.00	GRE	Ladish 115kV
G723	10.00	MDU	Haskett 115kV
G752	150.00	MDU	Tap Bison - Hettinger 230kV
G788	49.00	GRE	Ladish 115kV
G830	99.00	GRE	GRE McHenry 115kV
GEN-2005-008IS	50.00	WAPA	Hilken 230kV [Ecklund 230kV]
GEN-2006-015IS	50.00	WAPA	Hilken 230kV [Ecklund 230kV]
GEN-2007-015IS	100.00	WAPA	Hilken 230kV [Ecklund 230kV]
GEN-2007-027IS	99.00	WAPA	Bismarck-Garrison 230kV #1
GEN-2009-026IS	110.00	WAPA	Dickenson-Heskett 230kV
GEN-2010-007IS	172.50	WAPA	Antelope Valley 345kV
GEN-2012-006IS	125.01	WAPA	Williston-Ch. Creek 230kV
GEN-2012-012IS	75.00	WAPA	Wolf Point-Circle 115kV
GEN-2014-003IS	91.00	WAPA	Culbertson 115kV
GEN-2014-004IS	384.20	WAPA	Charlie Creek 345kV
GEN-2014-006IS	125.00	WAPA	Williston 115kV
GEN-2014-010IS	150.00	WAPA	Neset 115kV
GEN-2014-014IS	151.50	WAPA	Belfield-Rhame 230kV
J003	20.00	MDU	Baker 115kV
J249	180.00	MDU	MDU Tatanka 230kV
J262	100.00	OTP	Jamestown 345
J263	100.00	OTP	Jamestown 345
J290	150.00	XEL	Tap Glenboro South - Rugby 230kV
J316	150.00	MDU	MDU 230 kV Tatanka-Ellendale line
MPC01200	44.00	OTP	Sidney 230kV
MPC02100	100.00	OTP	Sidney 230kV
PRIOR QUEUED SUBTOTAL	**3,247.81**		
GEN-2015-046	300.00	WAPA	Tande 345kV
GEN-2015-091	101.20	WAPA	Daglum 230kV
GEN-2015-096	150.00	WAPA	Tap Belfied - Rhame 230kV
GEN-2015-098	100.00	WAPA	Mingusville 230kV
CURRENT CLUSTER SUBTOTAL	**651.20**		
AREA TOTAL	**0.00**		

GROUP 17: W-SOUTH DAKOTA AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2006-001IS	10.00	XEL	Marshall 115kV
GEN-2006-002IS	51.00	WAPA	Wessington Springs 230kV
GEN-2006-006IS	10.00	XEL	Marshall 115kV
GEN-2009-006IS	90.00	WAPA	Mission 115kV
GEN-2009-007IS	100.00	WAPA	Mission 115kV
GEN-2009-020AIS	130.50	WAPA	Tripp Junction 115kV
GEN-2012-009IS	99.00	WAPA	Fort Randall 115kV
PRIOR QUEUED SUBTOTAL	**490.50**		
AREA TOTAL	**0.00**		

GROUP 18: E-NORTH DAKOTA AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2002-008IS	40.50	WAPA	Edgeley 115kV [Pomona 115kV]
GEN-2005-003IS	100.00	WAPA	Nelson 115kV
GEN-2007-020IS	16.00	WAPA	Nelson 115kV
GEN-2008-008IS	5.00	WAPA	Nelson 115kV
PRIOR QUEUED SUBTOTAL	**161.50**		
AREA TOTAL	**0.00**		

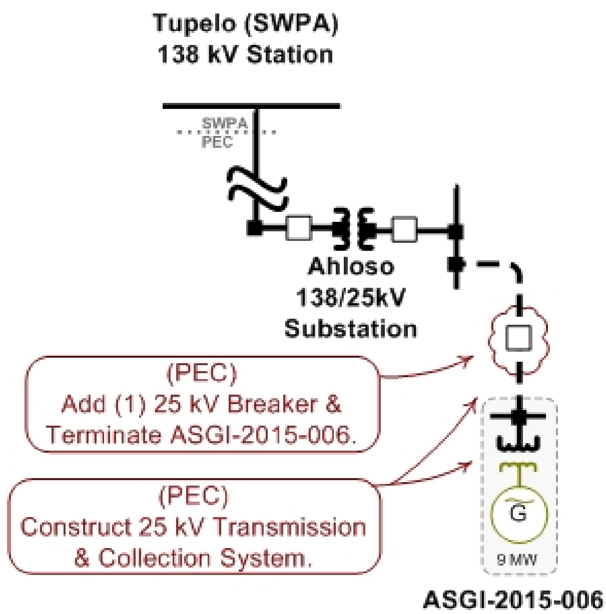
CLUSTER TOTAL (CURRENT STUDY)	**7,340.9**	MW
PQ TOTAL (PRIOR QUEUED)	**34,482.9**	MW
CLUSTER TOTAL (INCLUDING PRIOR QUEUED)	**41,823.8**	MW

11.4 D: Proposed Point of Interconnection One Line Diagrams

See next page

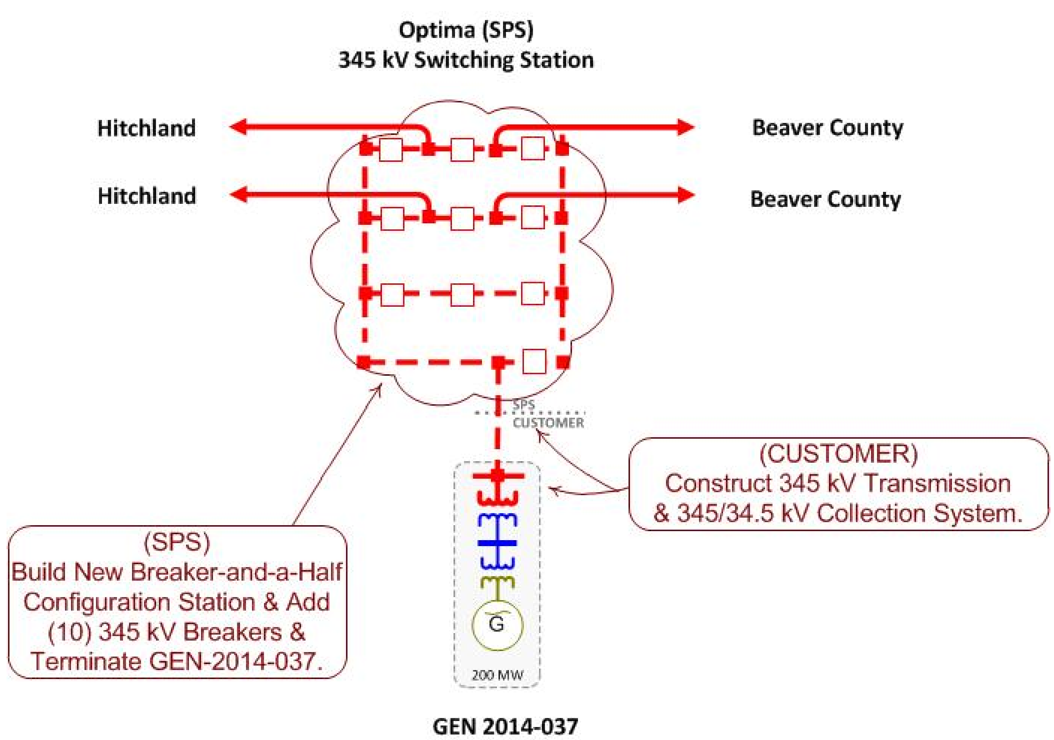
*Note: If not denoted otherwise for Affected System Generator Interconnection Requests (ASGI) interconnection cost estimate could include distribution system or third party system network upgrades and costs estimates.

ASGI-2015-006
Estimated Cluster Analysis Interconnection Cost: $0

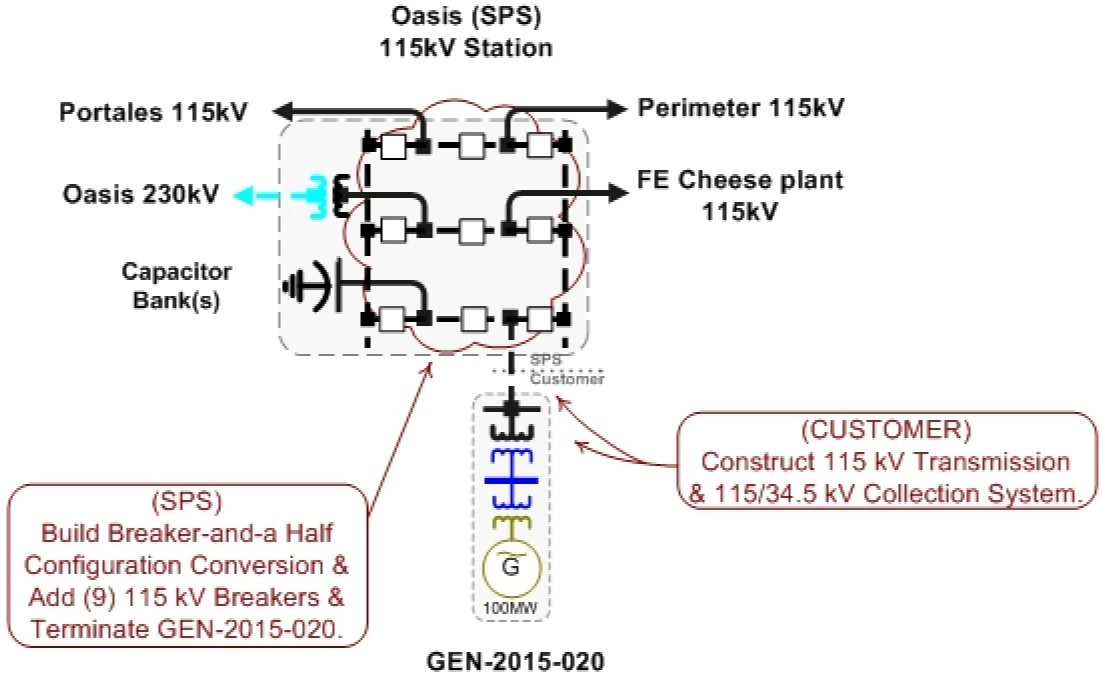


*** Interconnection Cost Estimate(s) only include Affected System Interconnection costs**

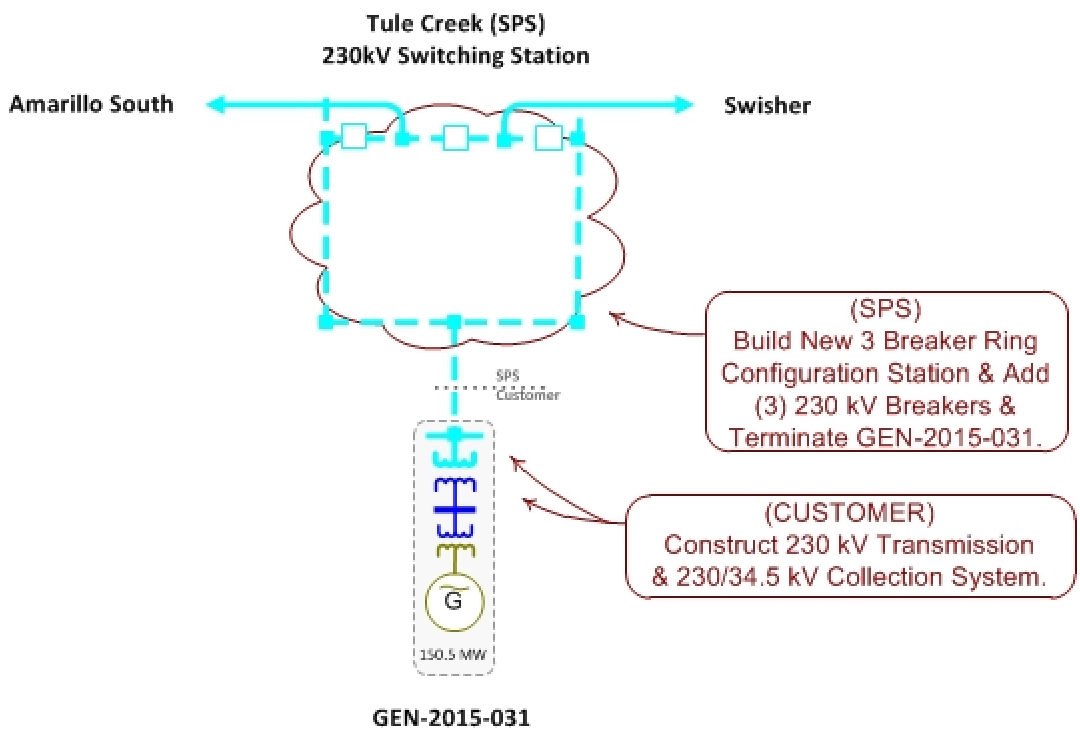
GEN-2014-037
Estimated Cluster Analysis Interconnection Cost: $20,334,923



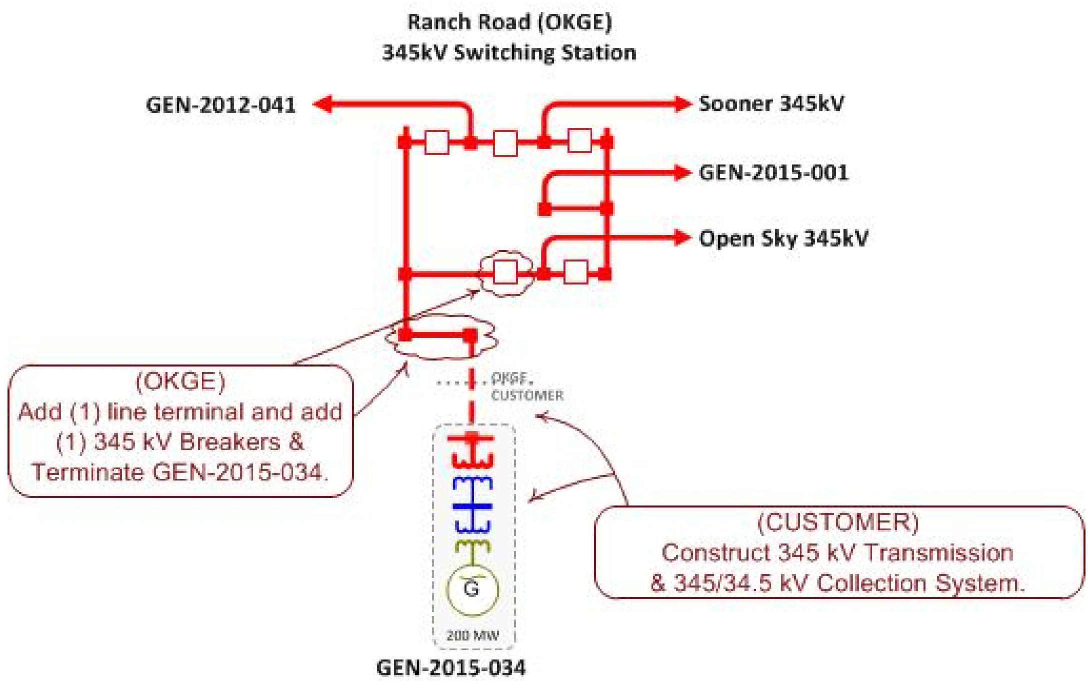
GEN-2015-020
Estimated Cluster Analysis Interconnection Cost: $9,984,058



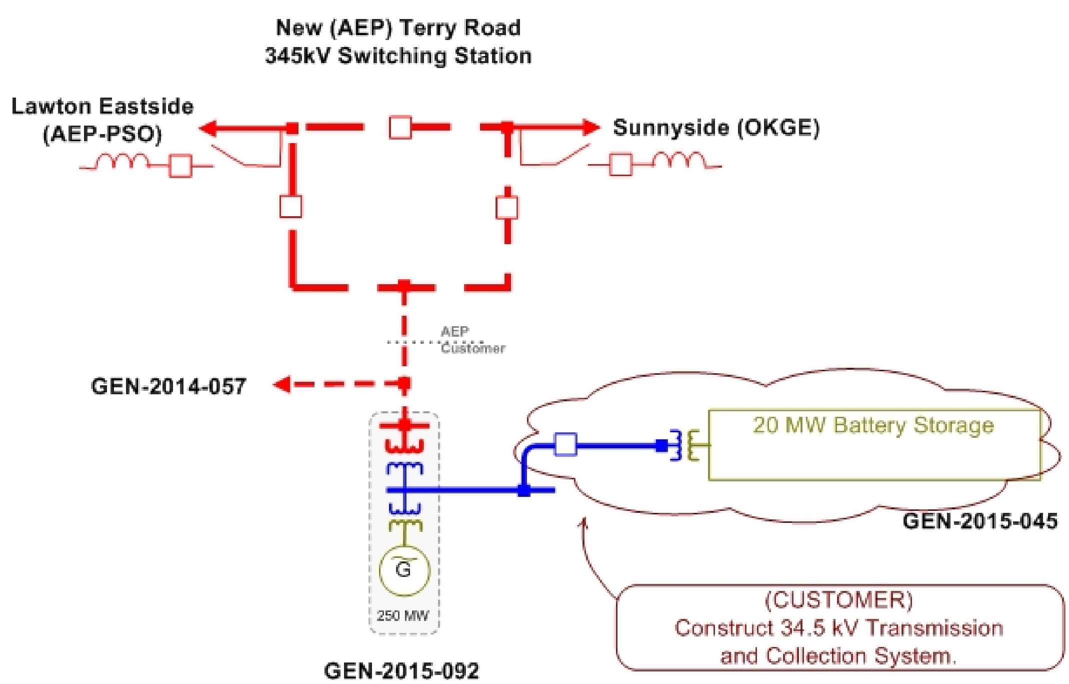
GEN-2015-031
Estimated Cluster Analysis Interconnection Cost: $7,567,148



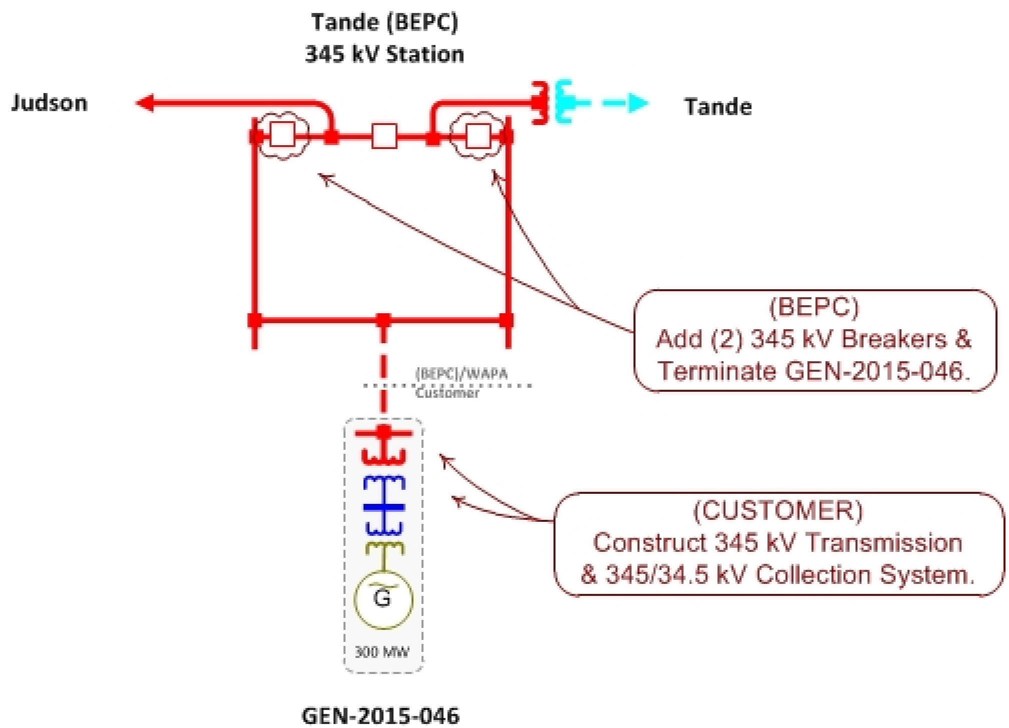
GEN-2015-034
Estimated Cluster Analysis Interconnection Cost: $2,112,500



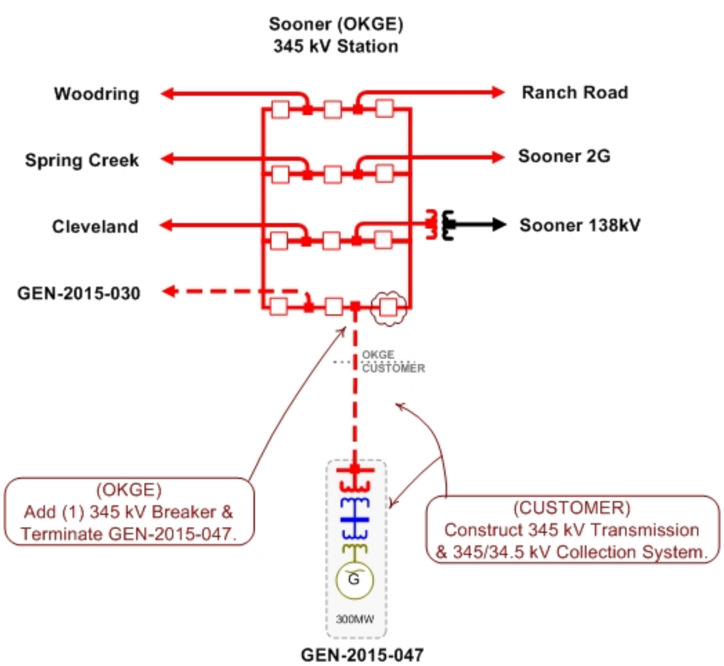
GEN-2015-045
Estimated Cluster Analysis Interconnection Cost: $0



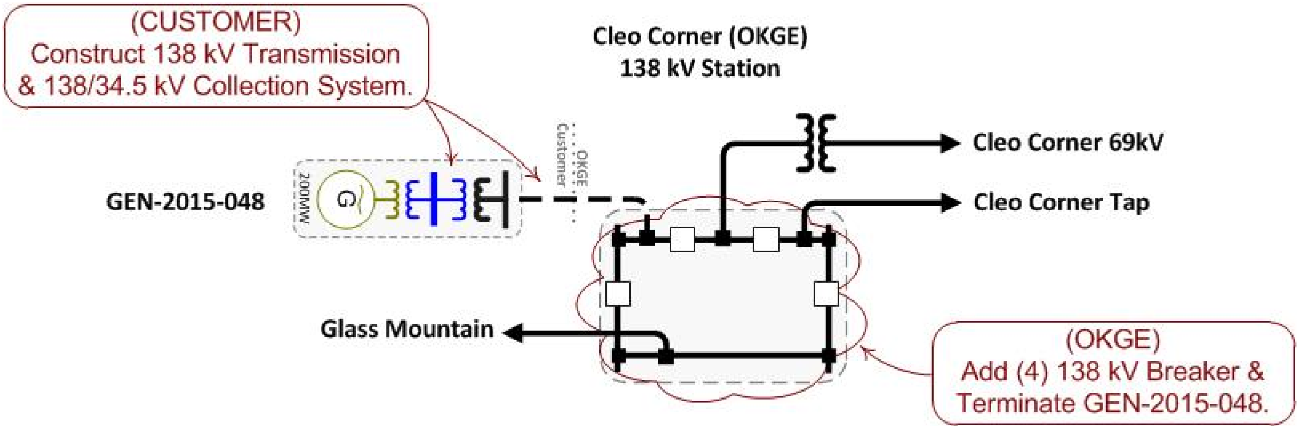
GEN-2015-046
Estimated Cluster Analysis Interconnection Cost: $3,759,097



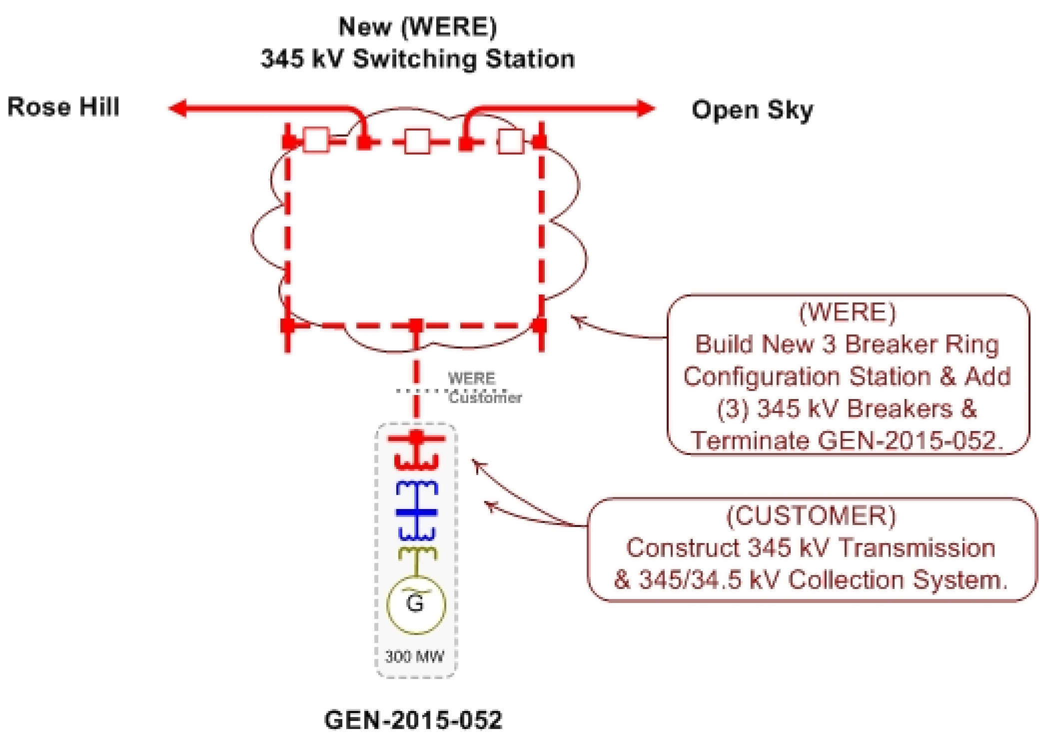
GEN-2015-047
Estimated Cluster Analysis Interconnection Cost: $2,540,000



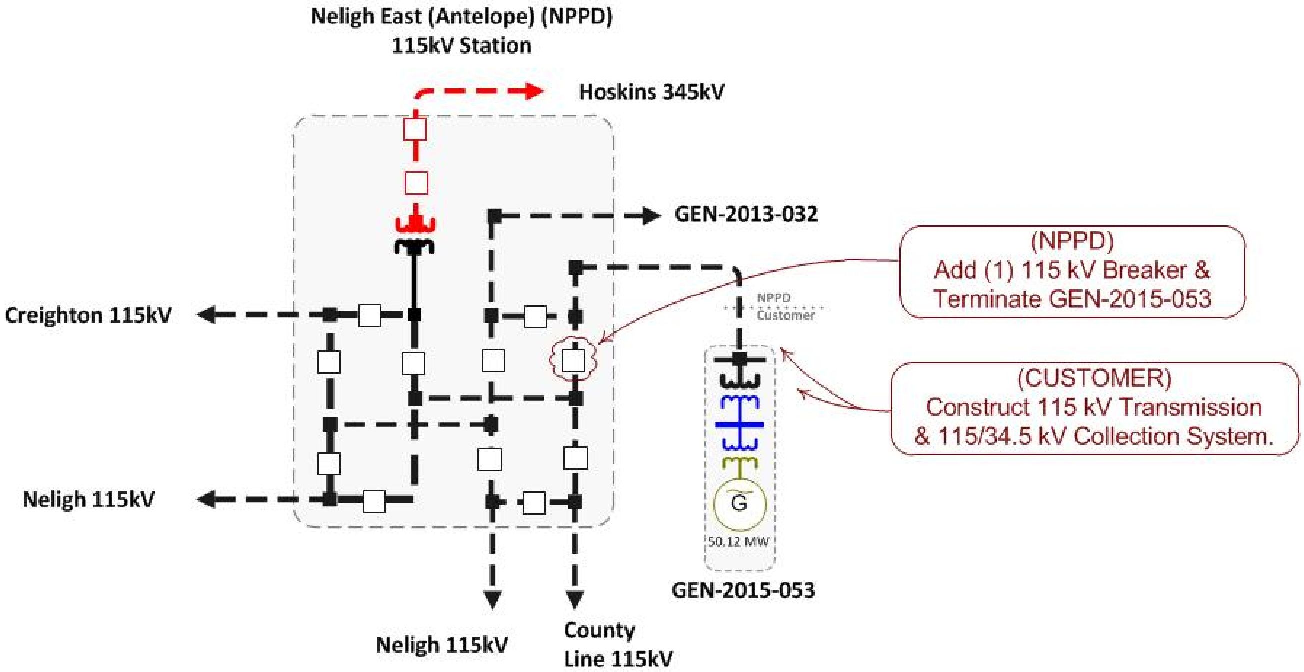
GEN-2015-048
Estimated Cluster Analysis Interconnection Cost: $2,968,000



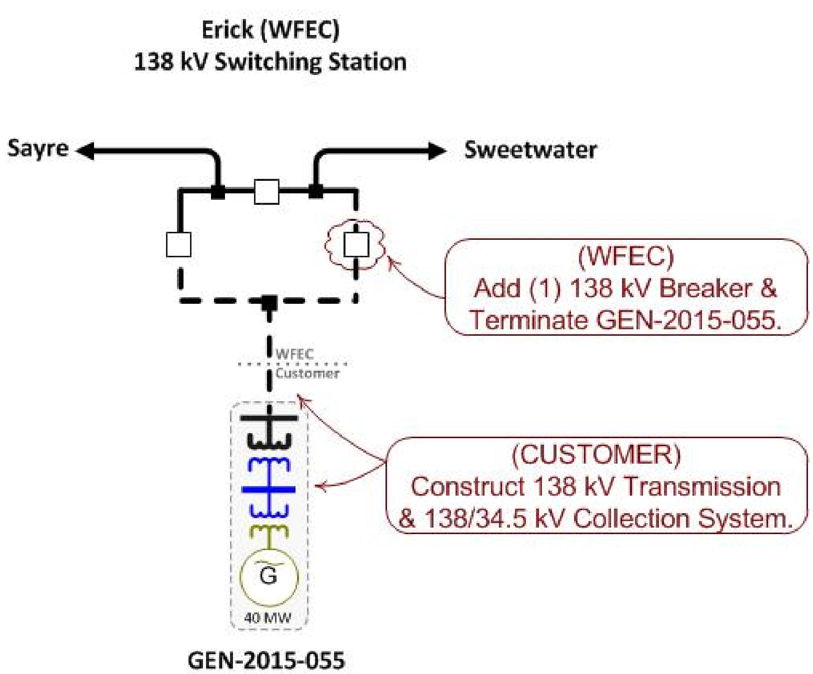
GEN-2015-052
Estimated Cluster Analysis Interconnection Cost: $15,582,434



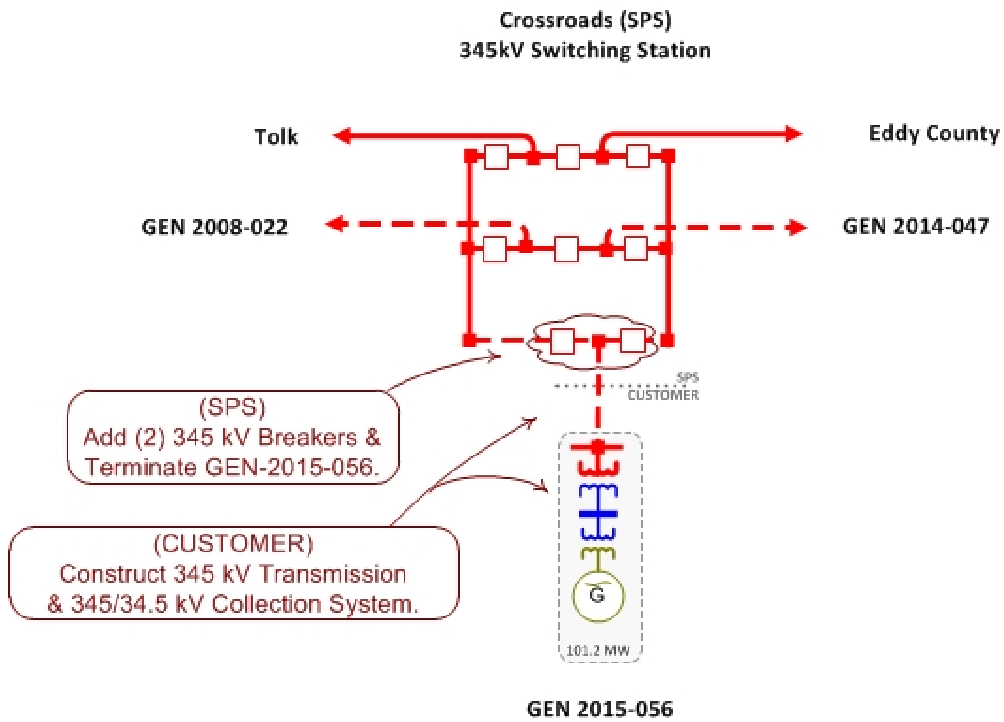
GEN-2015-053
Estimated Cluster Analysis Interconnection Cost: $1,000,000



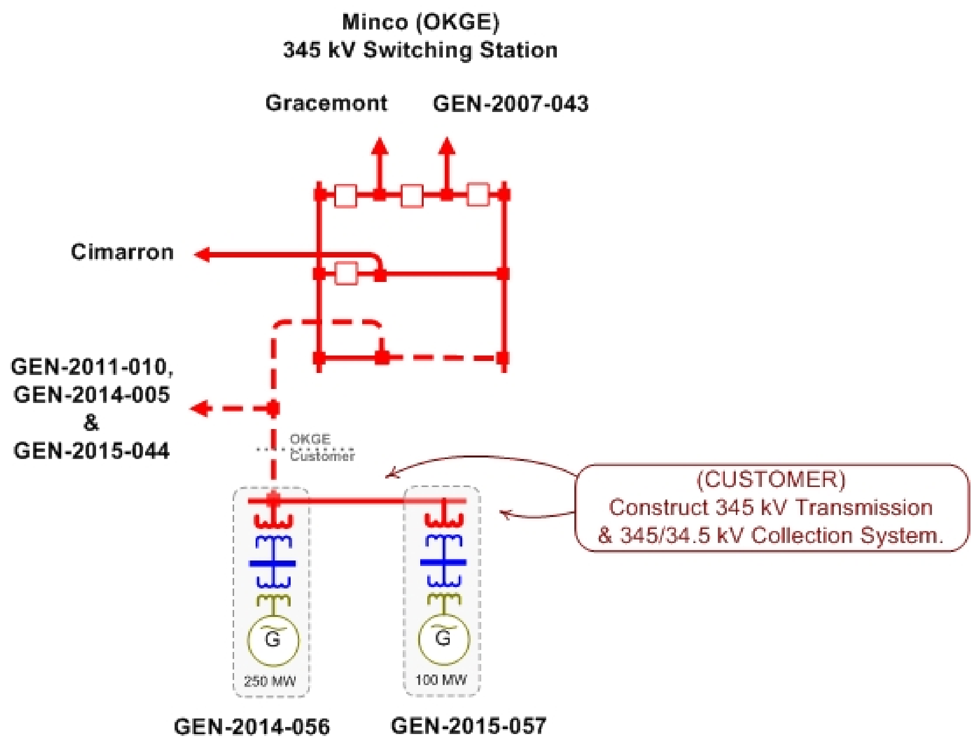
GEN-2015-055
Estimated Cluster Analysis Interconnection Cost: $1,900,000



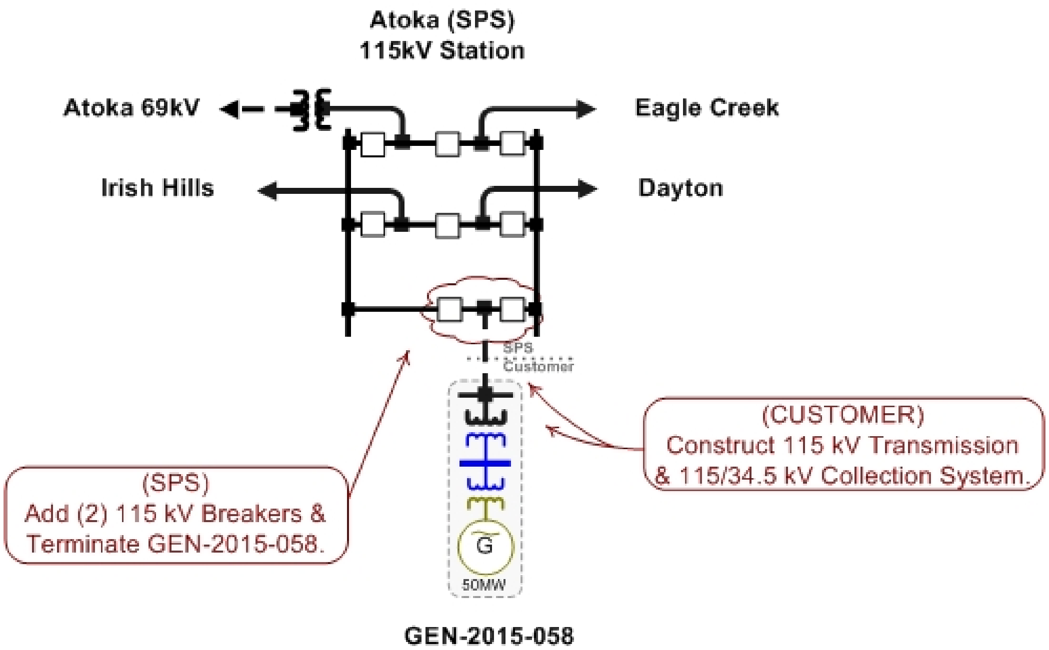
GEN-2015-056
Estimated Cluster Analysis Interconnection Cost: $5,080,273



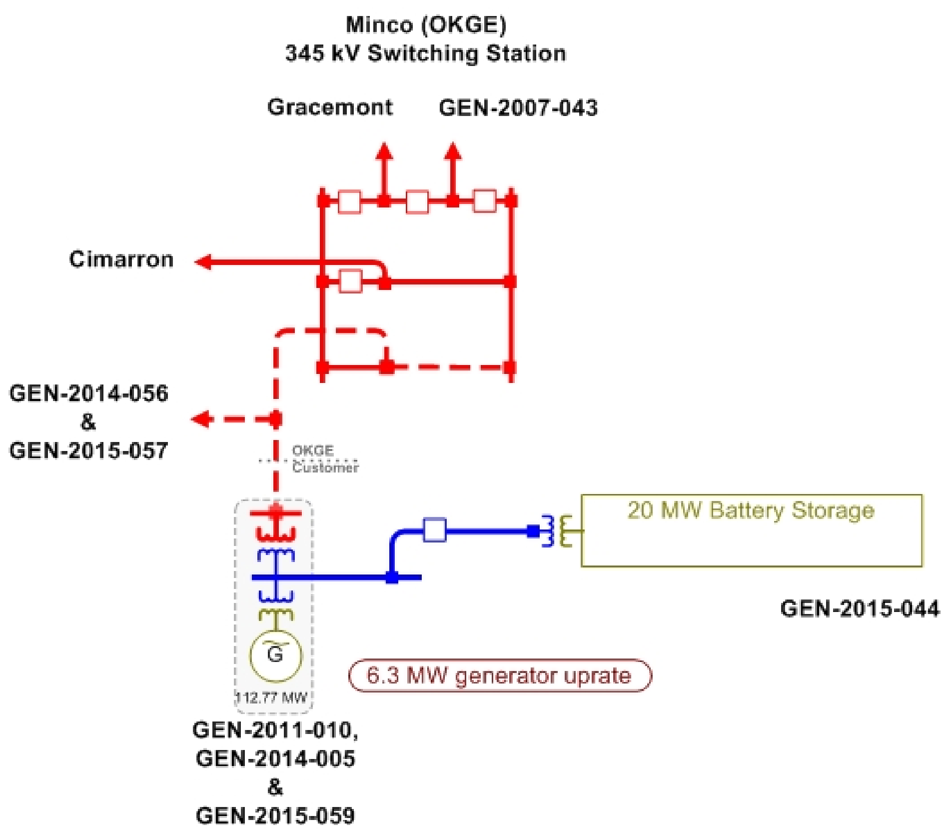
GEN-2015-057
Estimated Cluster Analysis Interconnection Cost: $20,000



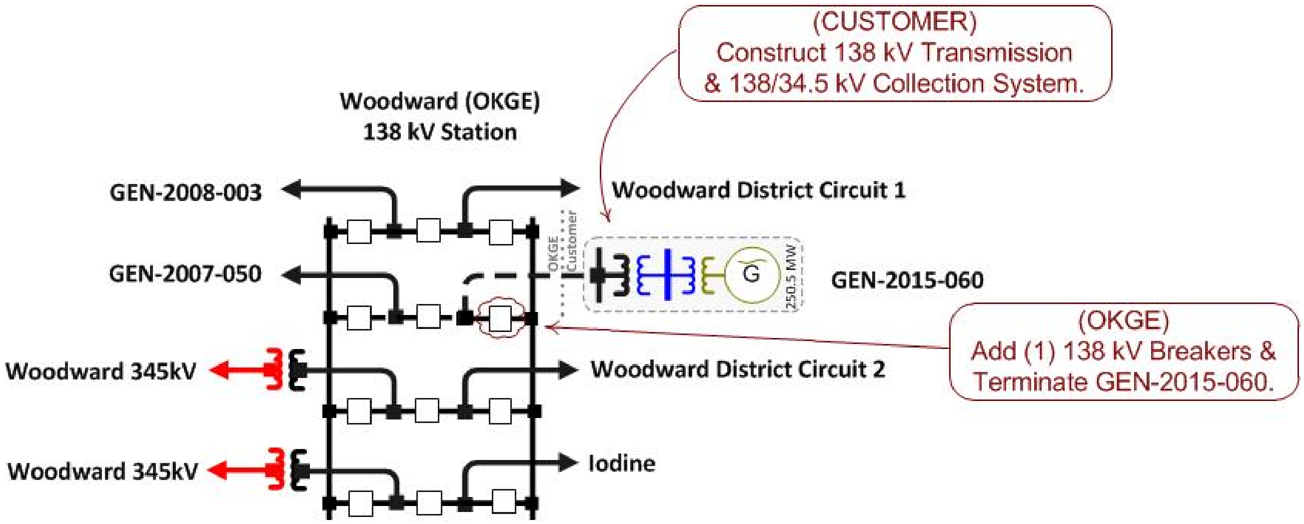
GEN-2015-058
Estimated Cluster Analysis Interconnection Cost: $2,751,641



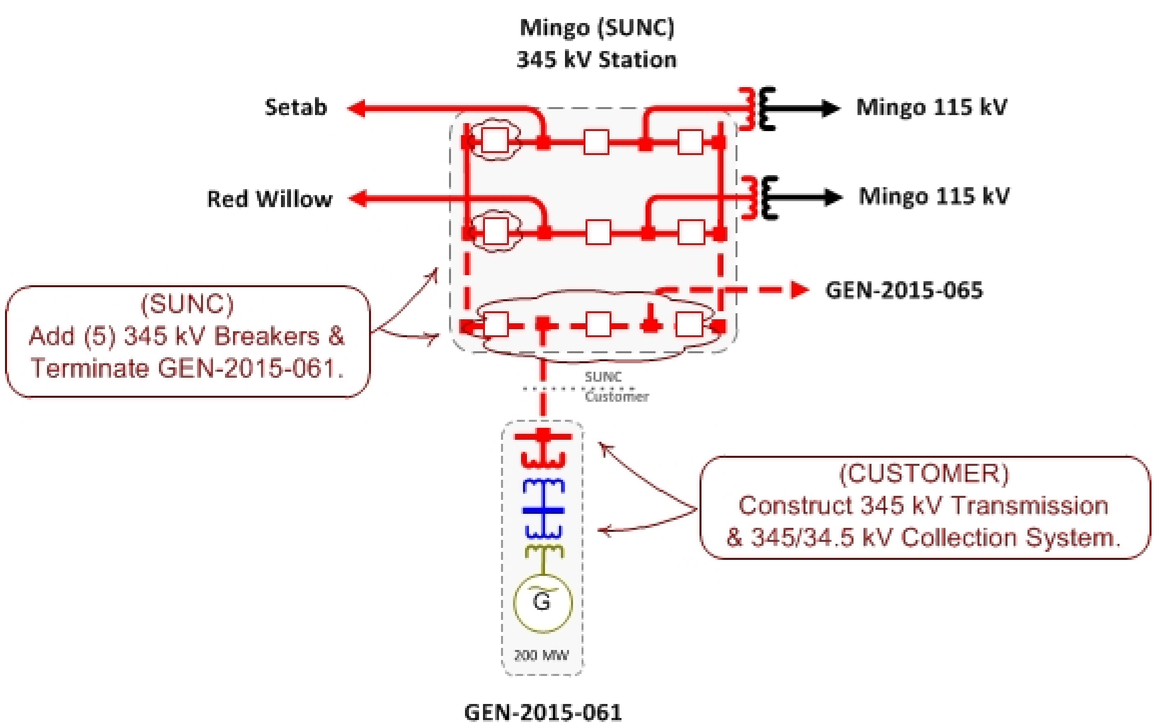
GEN-2015-059
Estimated Cluster Analysis Interconnection Cost: $0



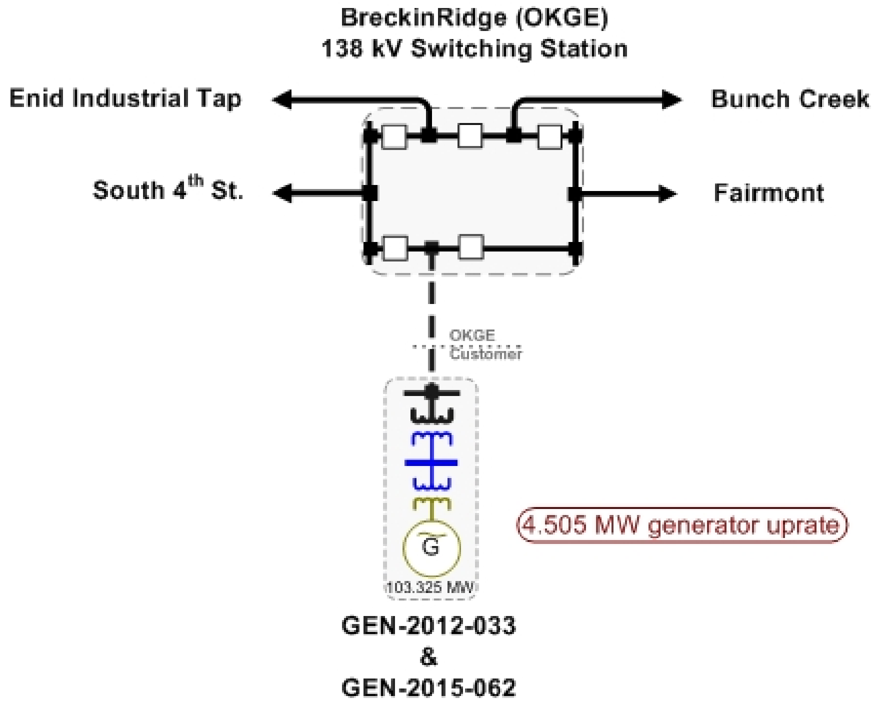
GEN-2015-060
Estimated Cluster Analysis Interconnection Cost: $943,000



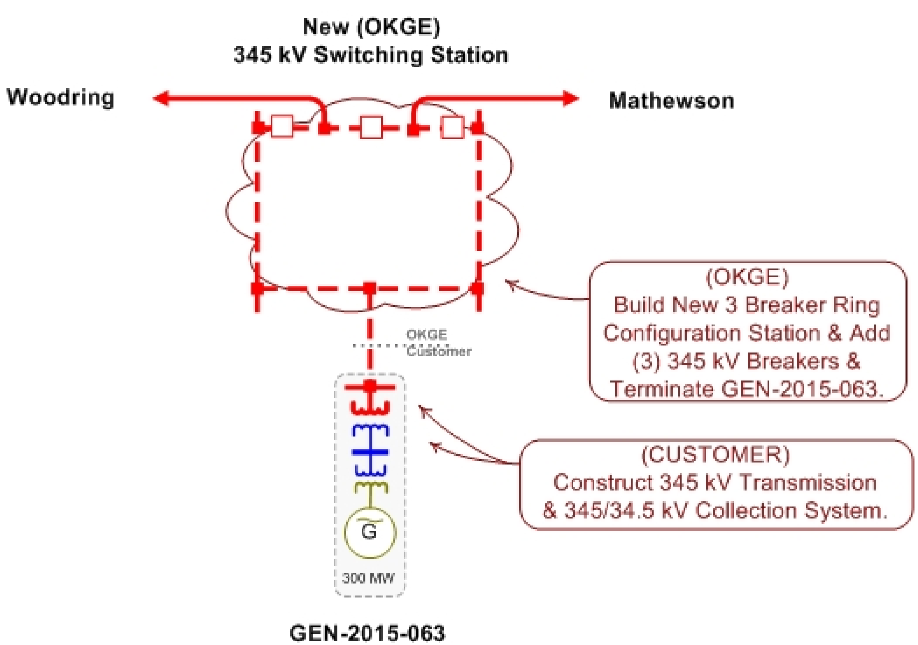
GEN-2015-061
Estimated Cluster Analysis Interconnection Cost: $6,988,986



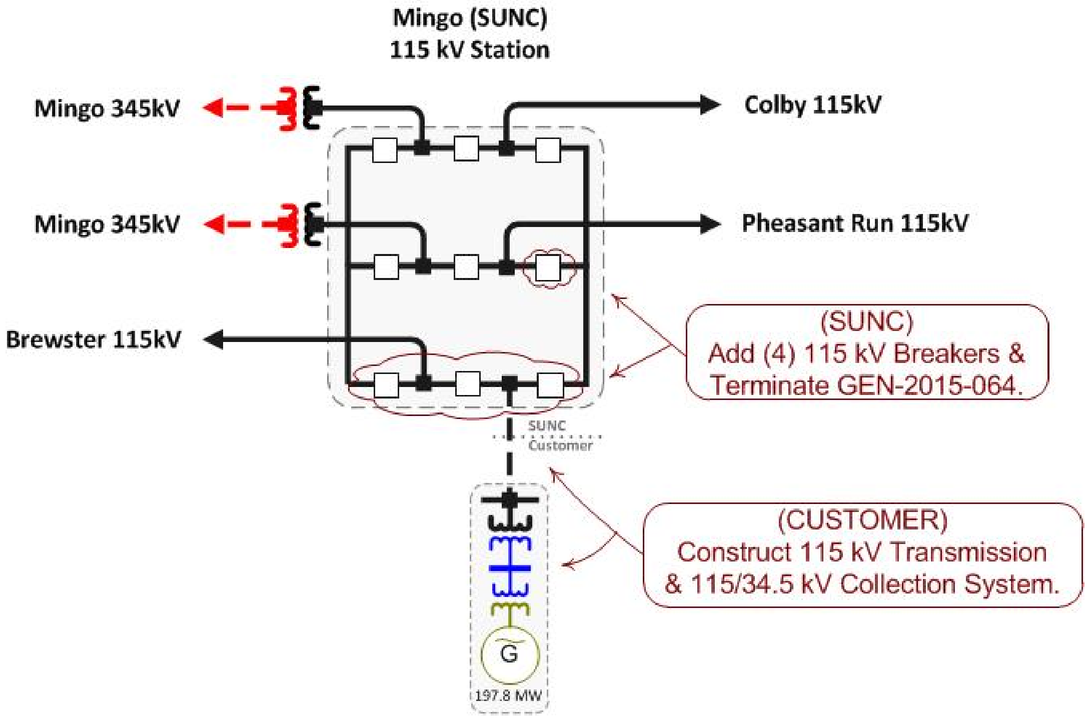
GEN-2015-062
Estimated Cluster Analysis Interconnection Cost: $0



GEN-2015-063
Estimated Cluster Analysis Interconnection Cost: $10,613,000

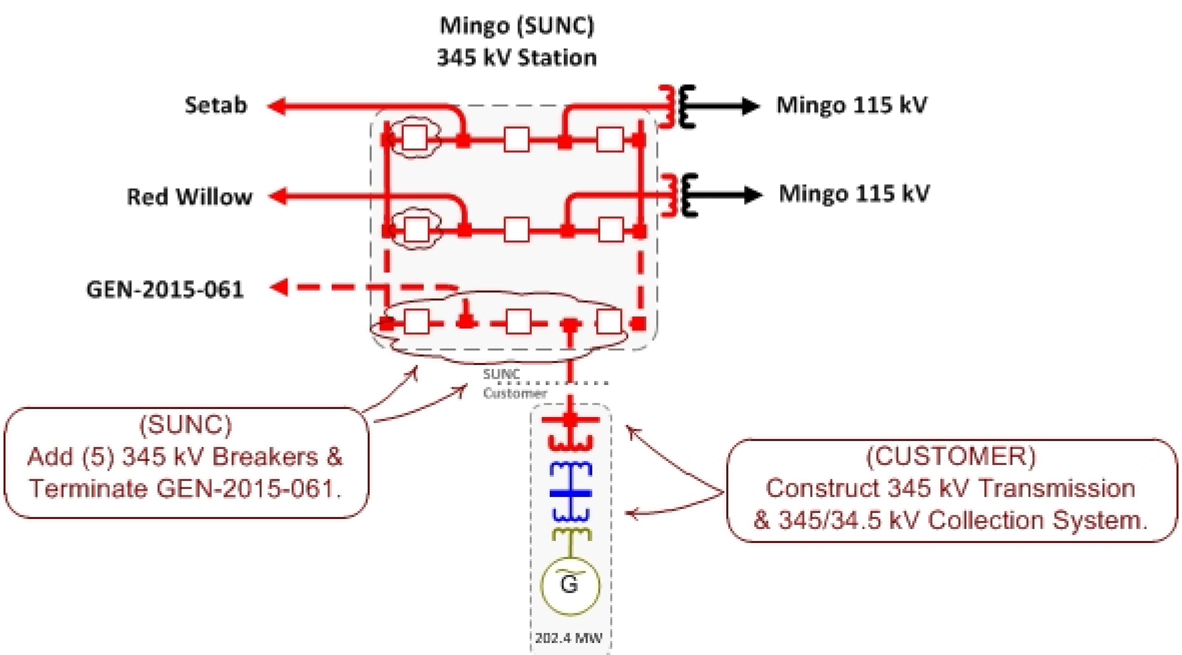


GEN-2015-064
Estimated Cluster Analysis Interconnection Cost: $4,638,823



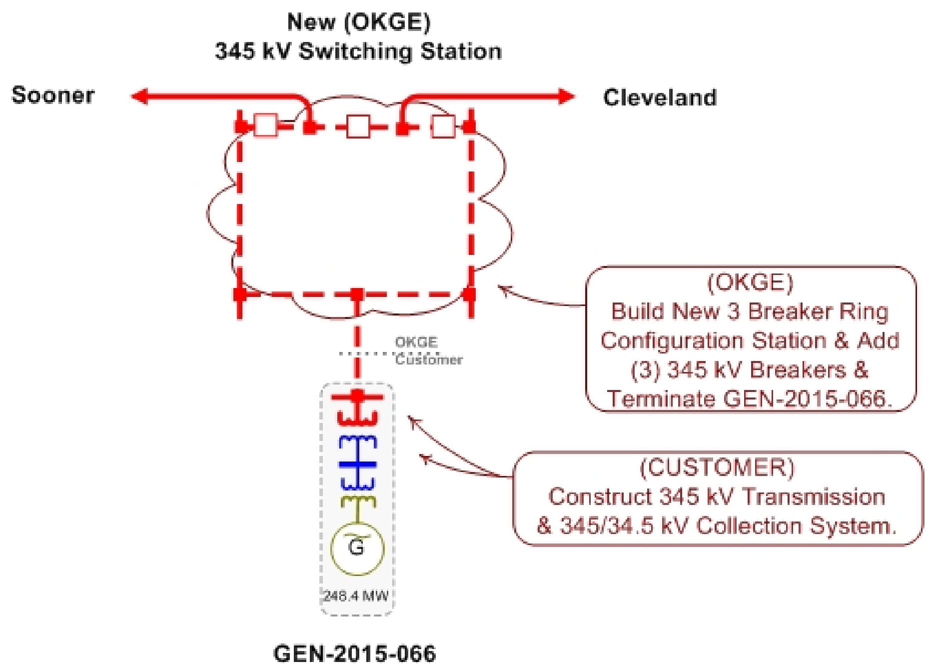
GEN-2015-064

GEN-2015-065
Estimated Cluster Analysis Interconnection Cost: $6,988,986

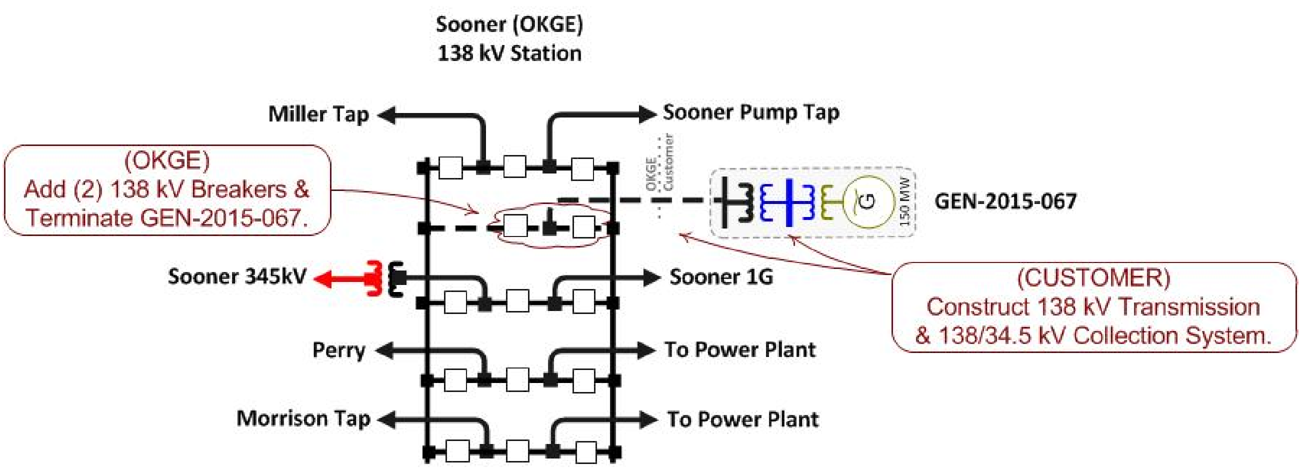


GEN-2015-065

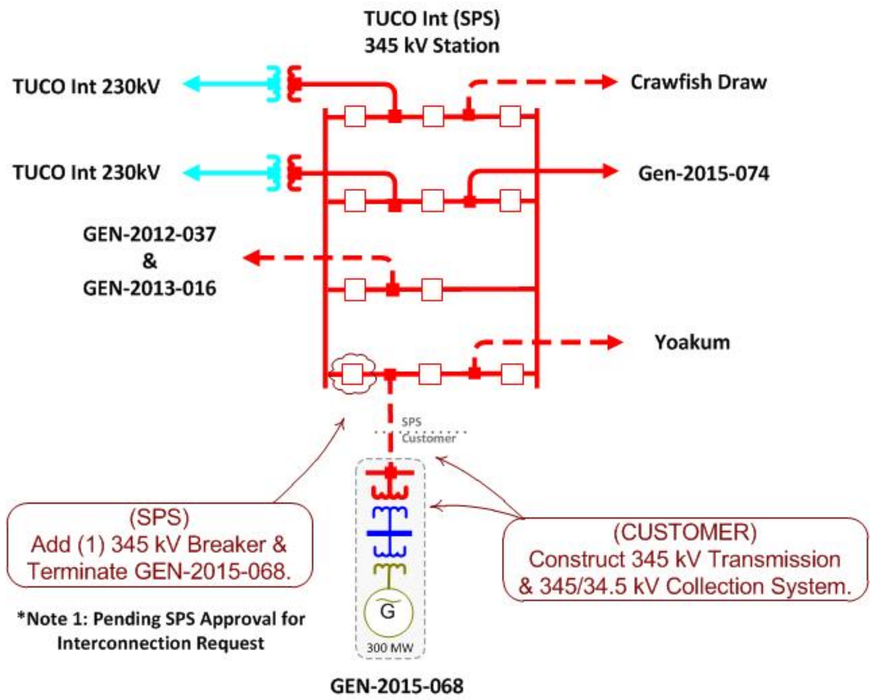
GEN-2015-066
Estimated Cluster Analysis Interconnection Cost: $10,613,000



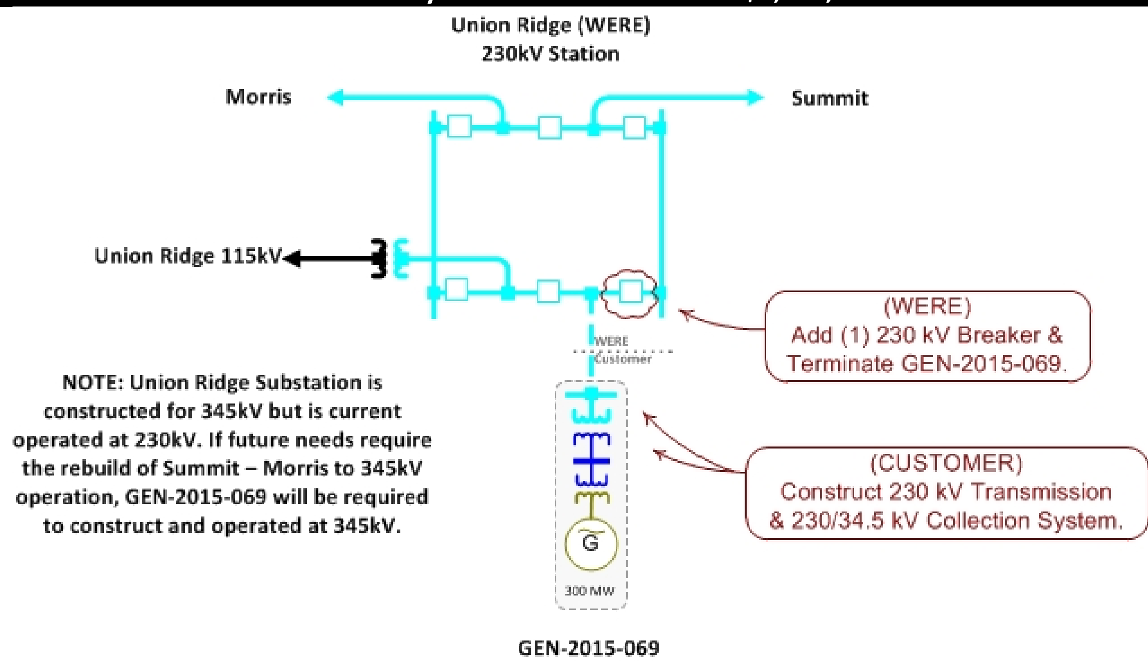
GEN-2015-067
Estimated Cluster Analysis Interconnection Cost: $3,521,000



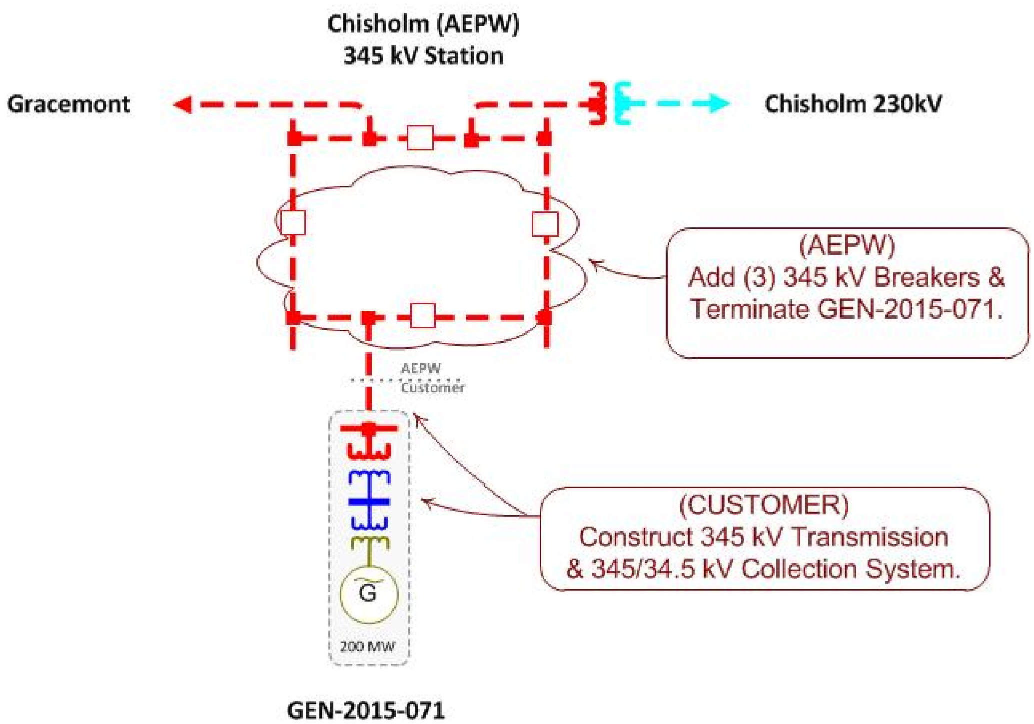
GEN-2015-068
Estimated Cluster Analysis Interconnection Cost: $3,303,965



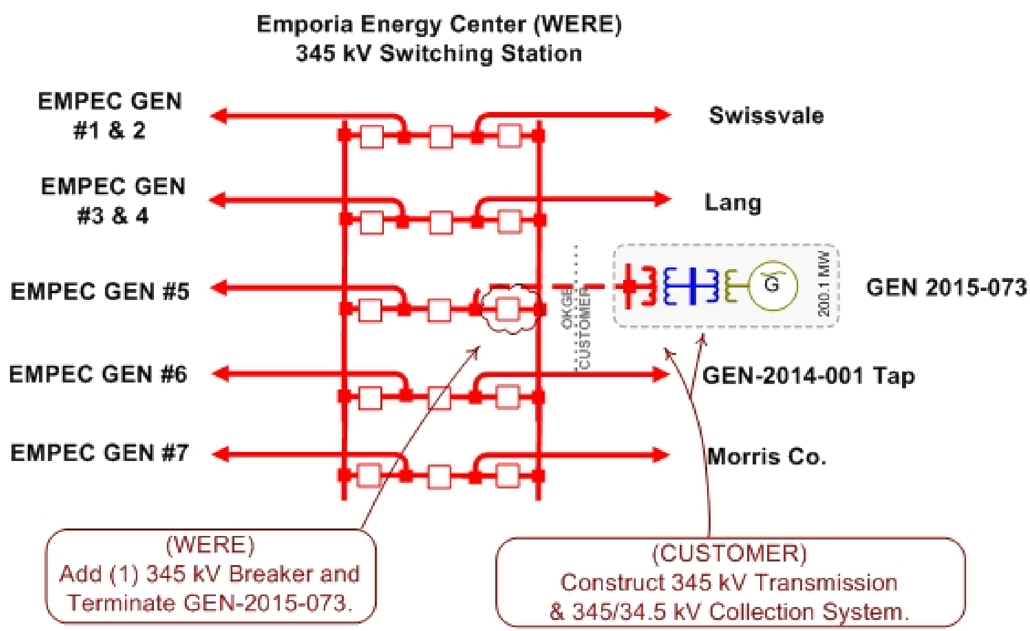
GEN-2015-069
Estimated Cluster Analysis Interconnection Cost: $2,755,752



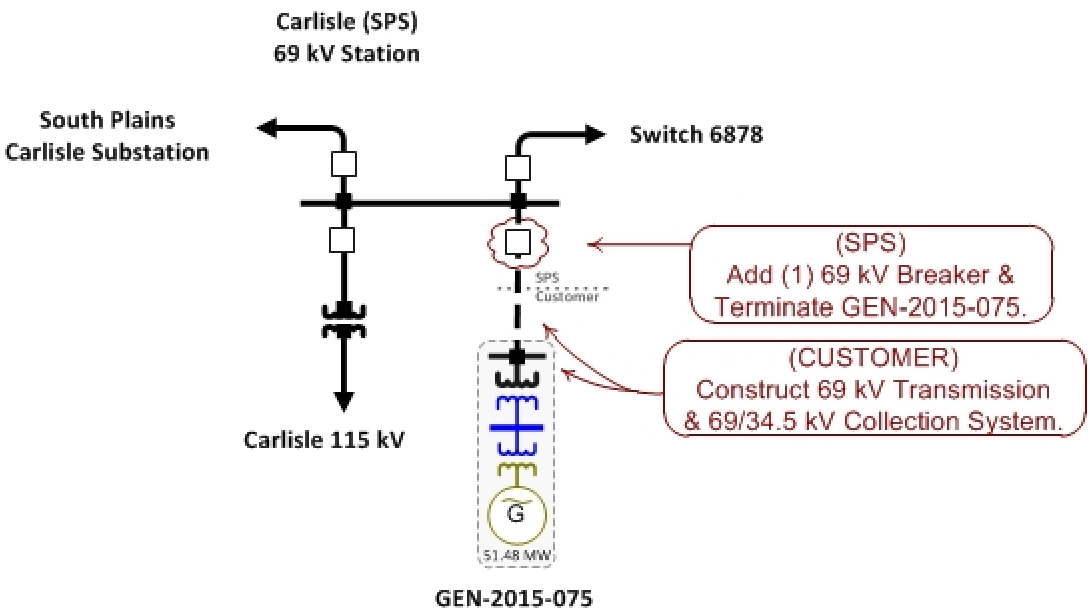
GEN-2015-071
Estimated Cluster Analysis Interconnection Cost: $14,623,541



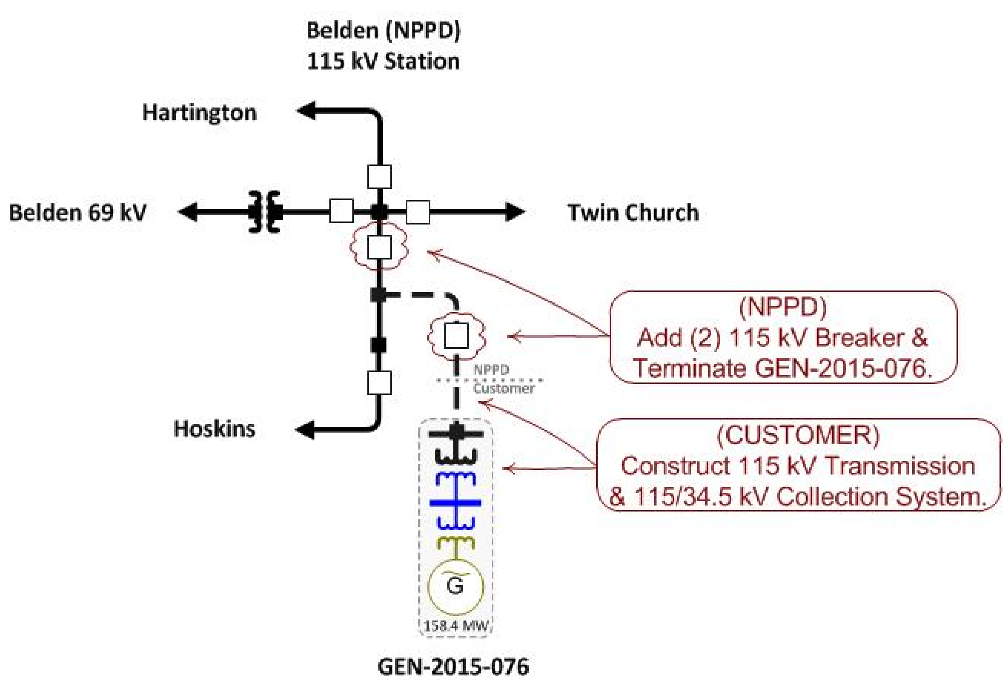
GEN-2015-073
Estimated Cluster Analysis Interconnection Cost: $2,576,628



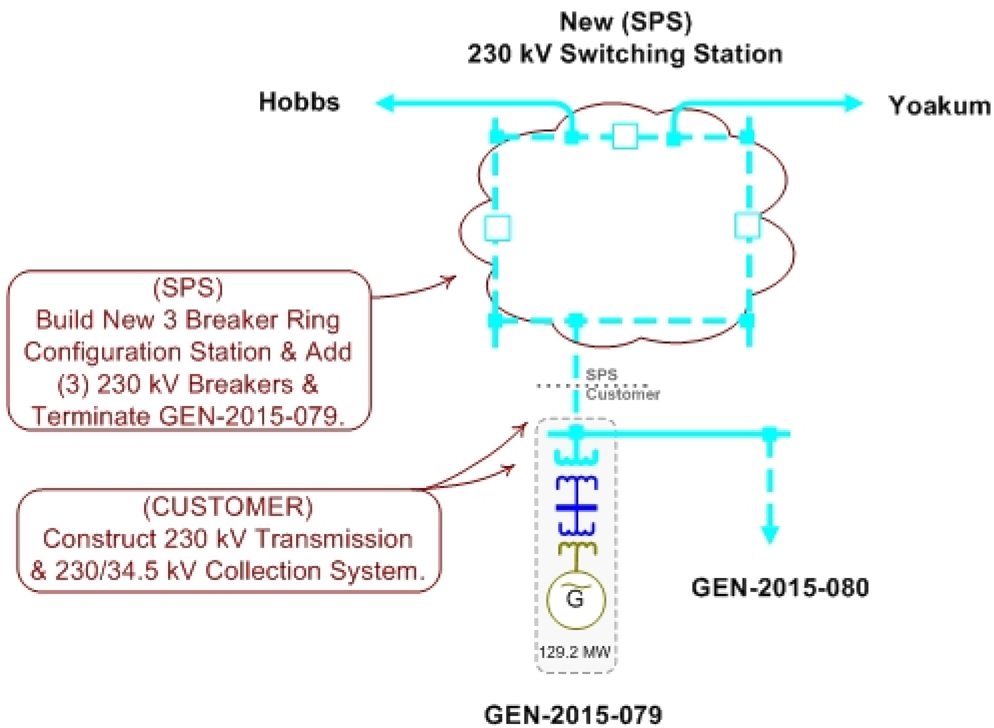
GEN-2015-075
Estimated Cluster Analysis Interconnection Cost: $5,000,000



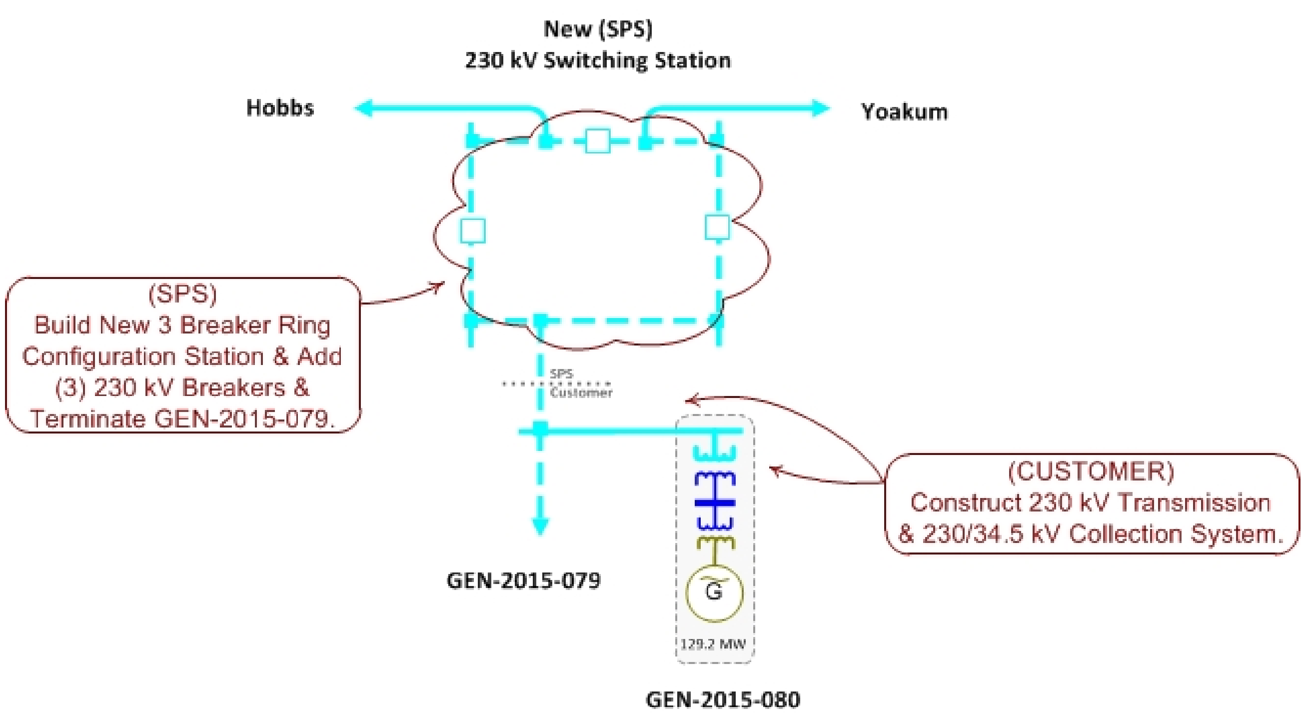
GEN-2015-076
Estimated Cluster Analysis Interconnection Cost: $2,600,000



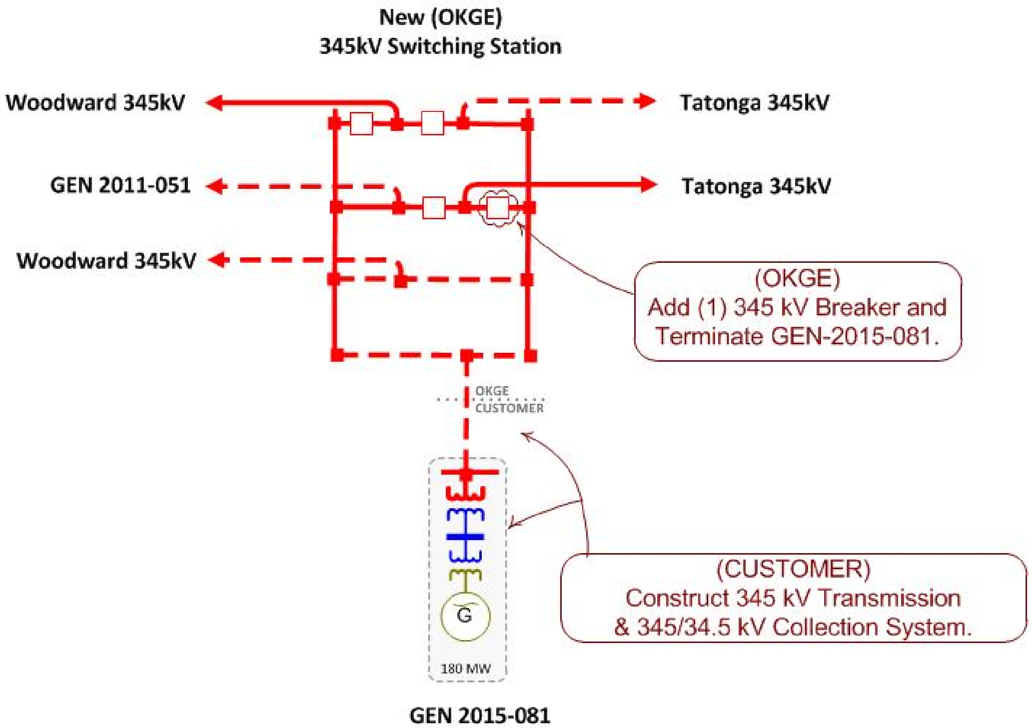
GEN-2015-079
Estimated Cluster Analysis Interconnection Cost: $3,687,384



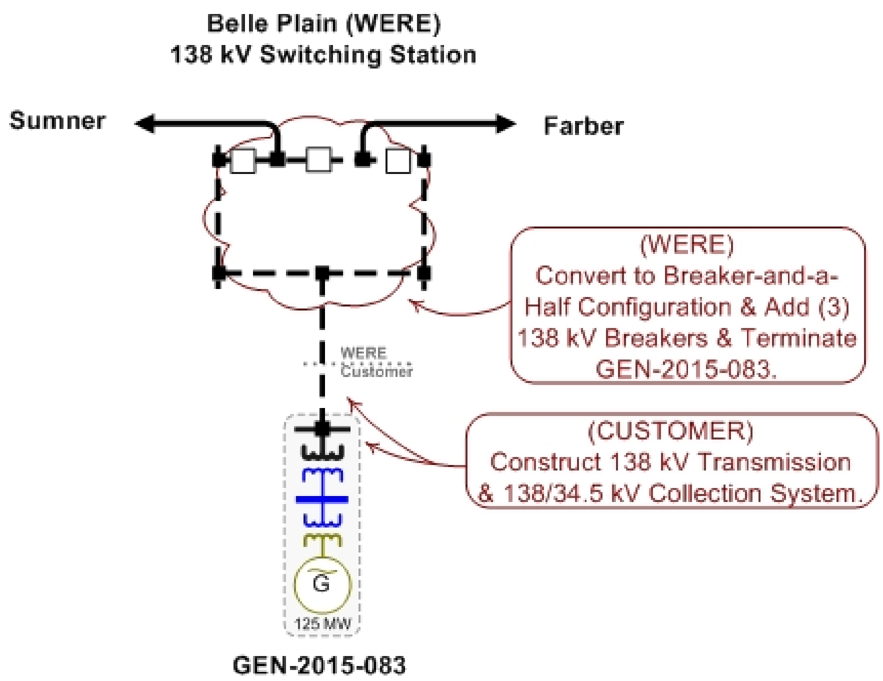
GEN-2015-080
Estimated Cluster Analysis Interconnection Cost: $3,687,384



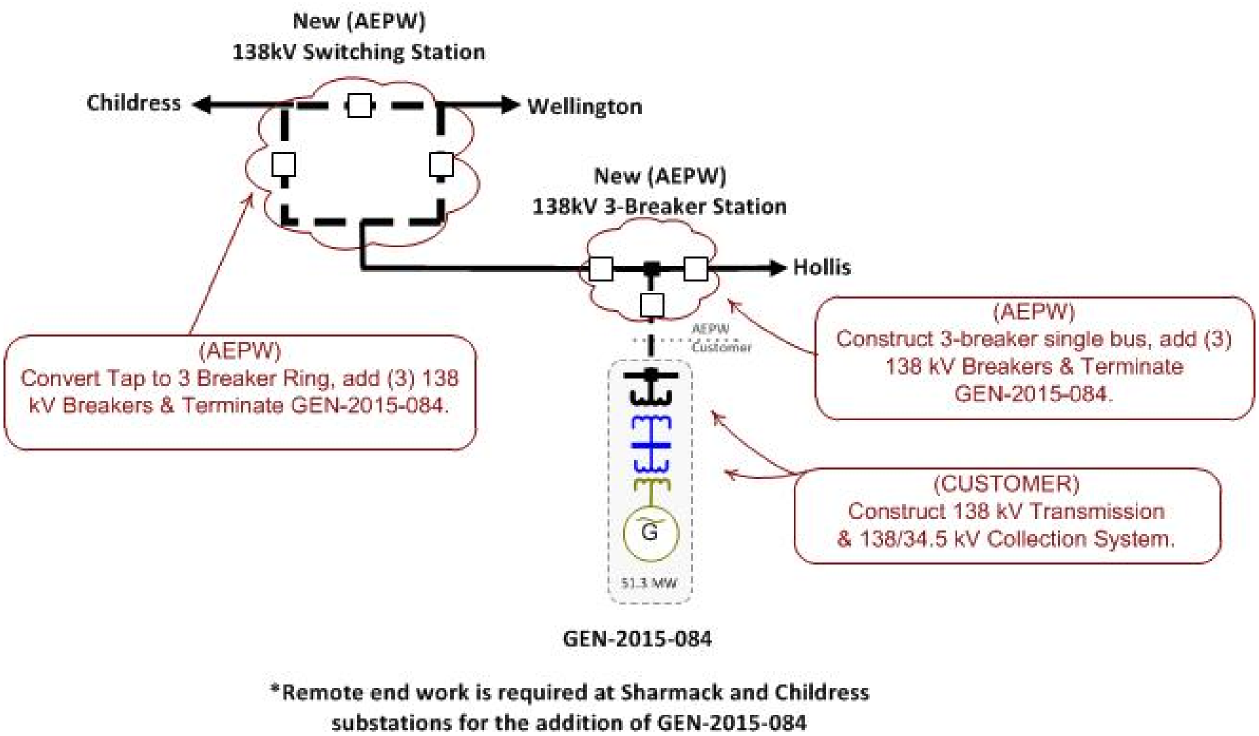
GEN-2015-081
Estimated Cluster Analysis Interconnection Cost: $3,005,000



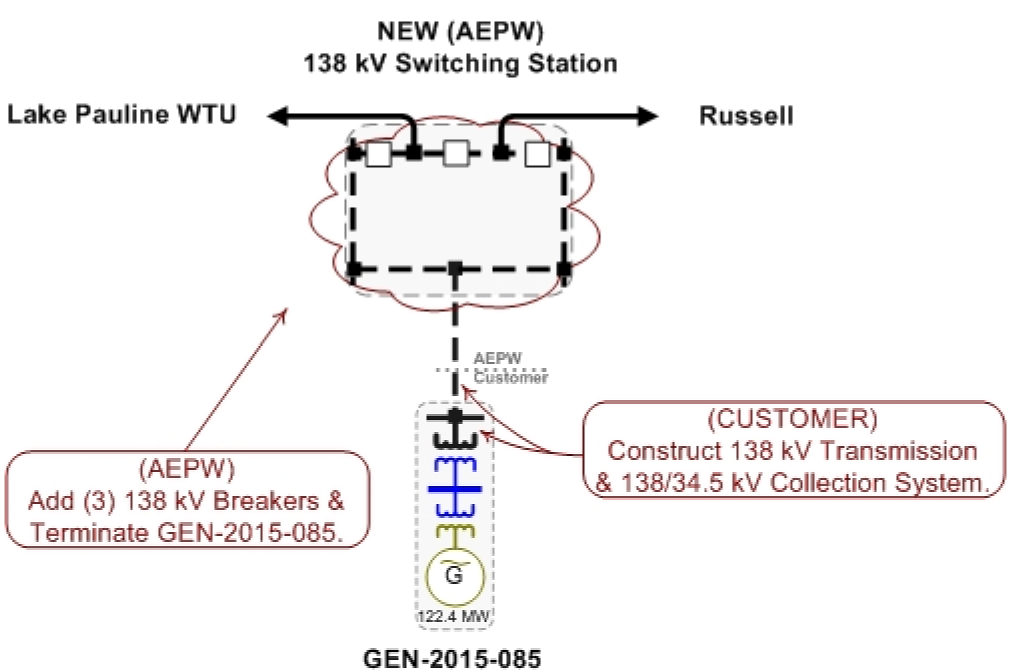
GEN-2015-083
Estimated Cluster Analysis Interconnection Cost: $6,713,963



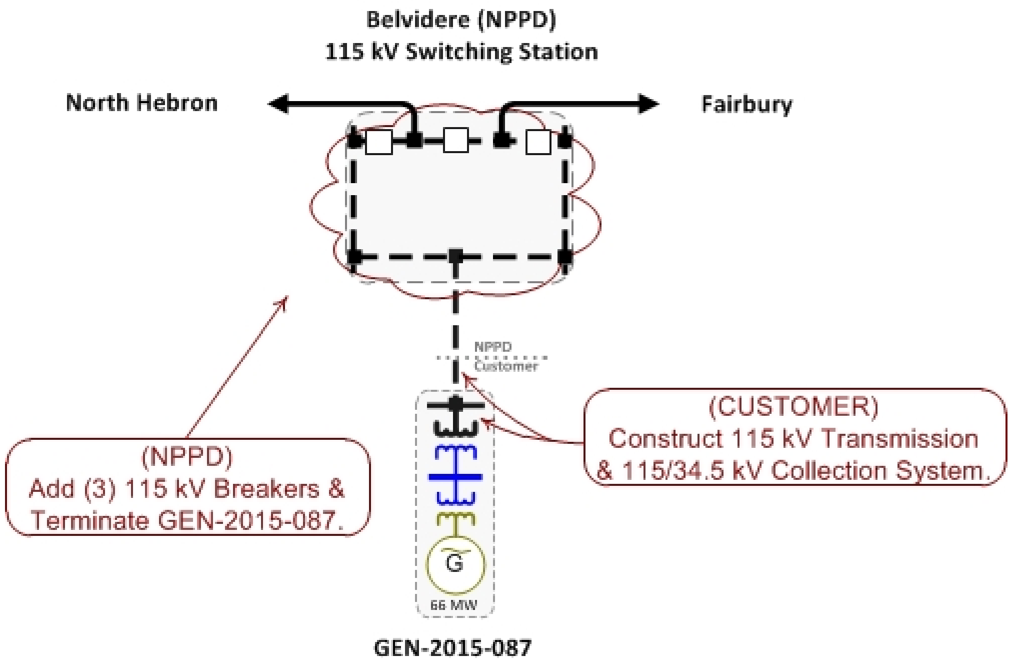
GEN-2015-084
Estimated Cluster Analysis Interconnection Cost: $14,665,056



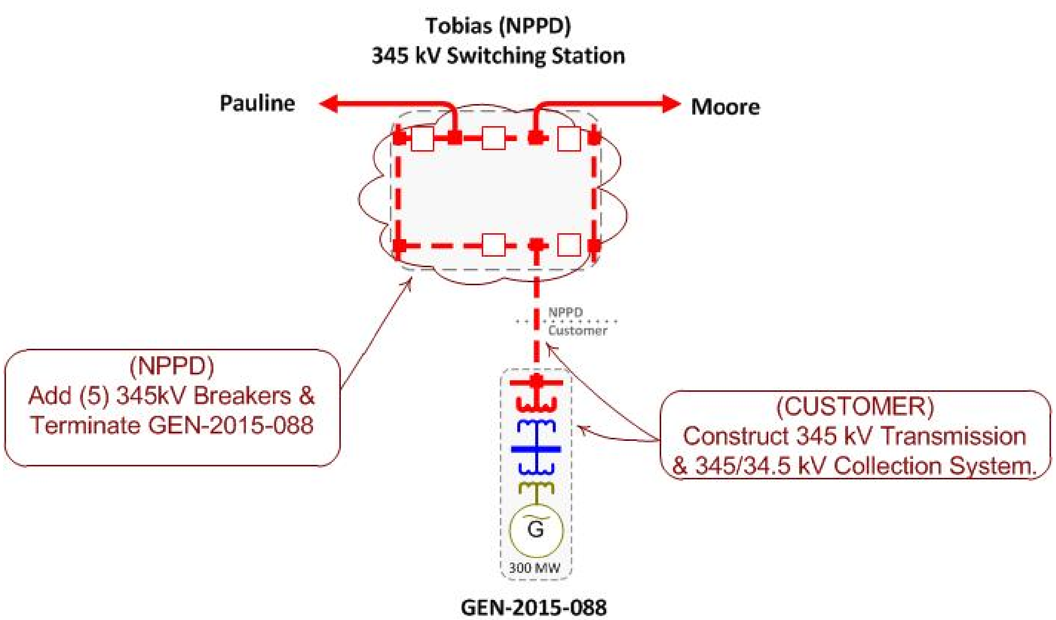
GEN-2015-085
Estimated Cluster Analysis Interconnection Cost: $8,406,414



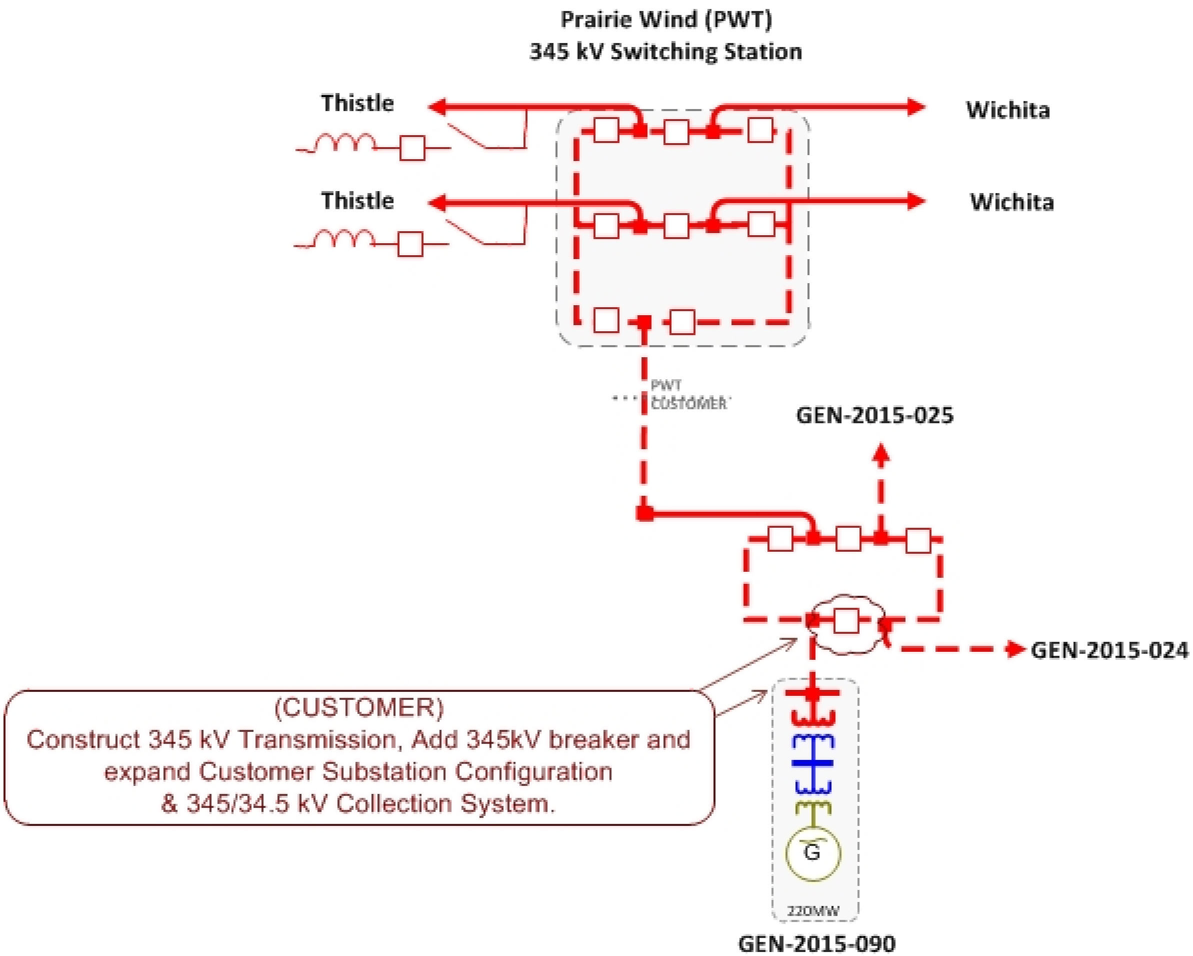
GEN-2015-087
Estimated Cluster Analysis Interconnection Cost: $5,300,000



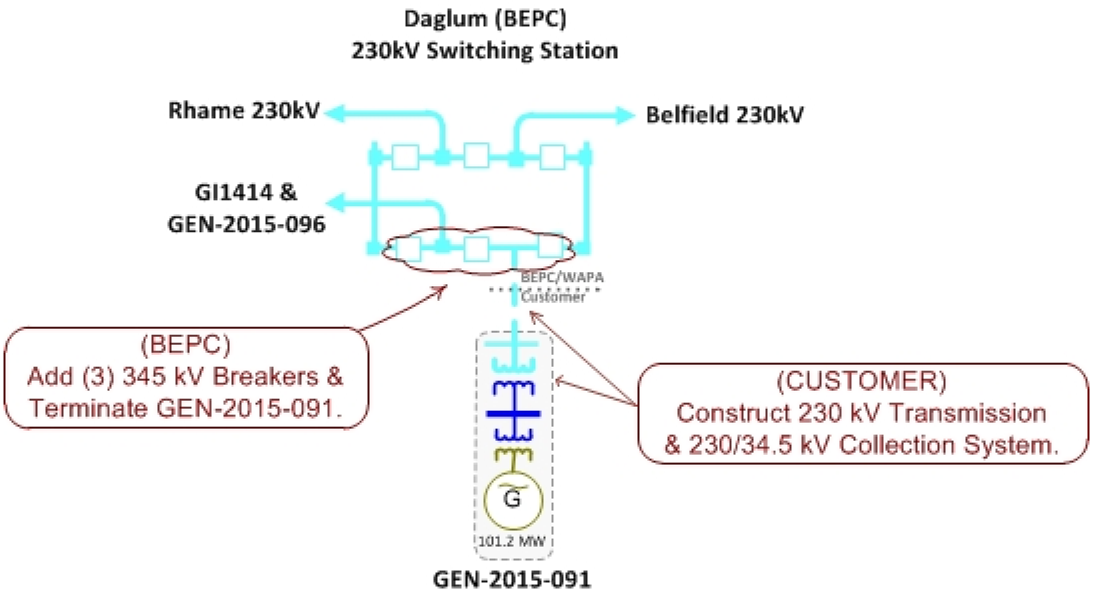
GEN-2015-088
Estimated Cluster Analysis Interconnection Cost: $15,000,000



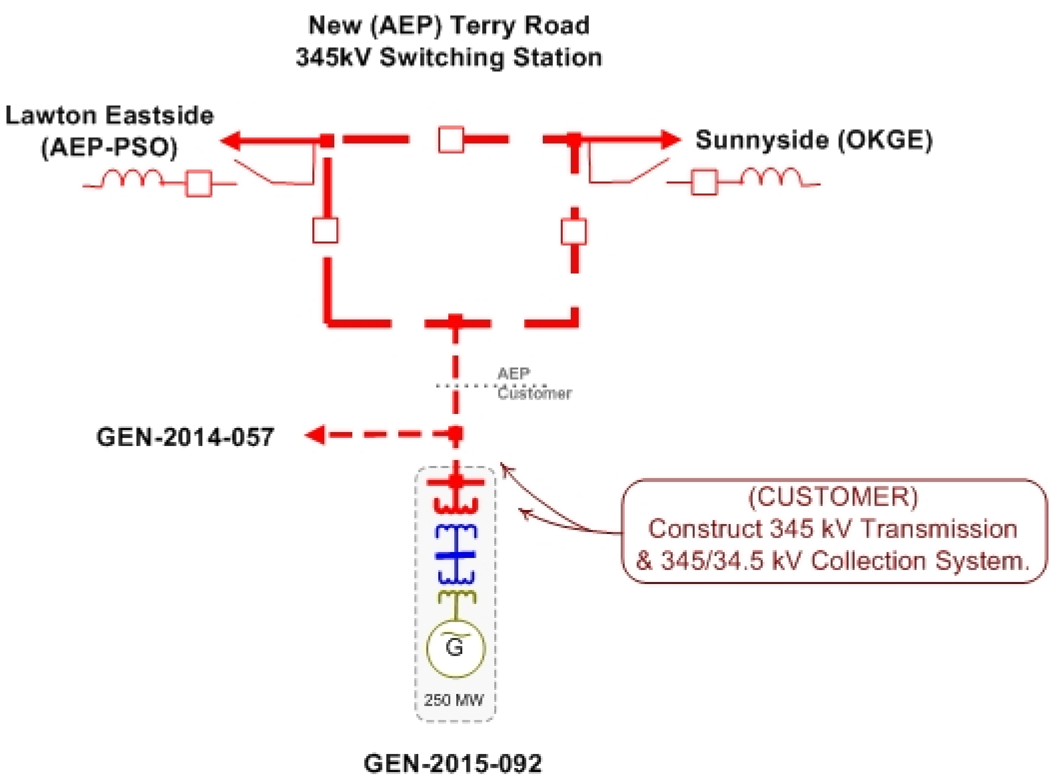
GEN-2015-090
Estimated Cluster Analysis Interconnection Cost: $16,021



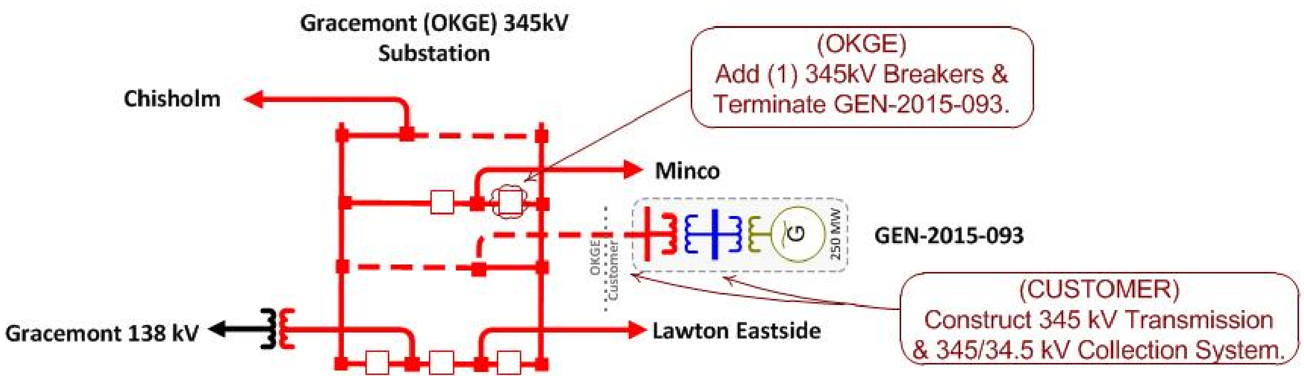
GEN-2015-091
Estimated Cluster Analysis Interconnection Cost: $3,224,682



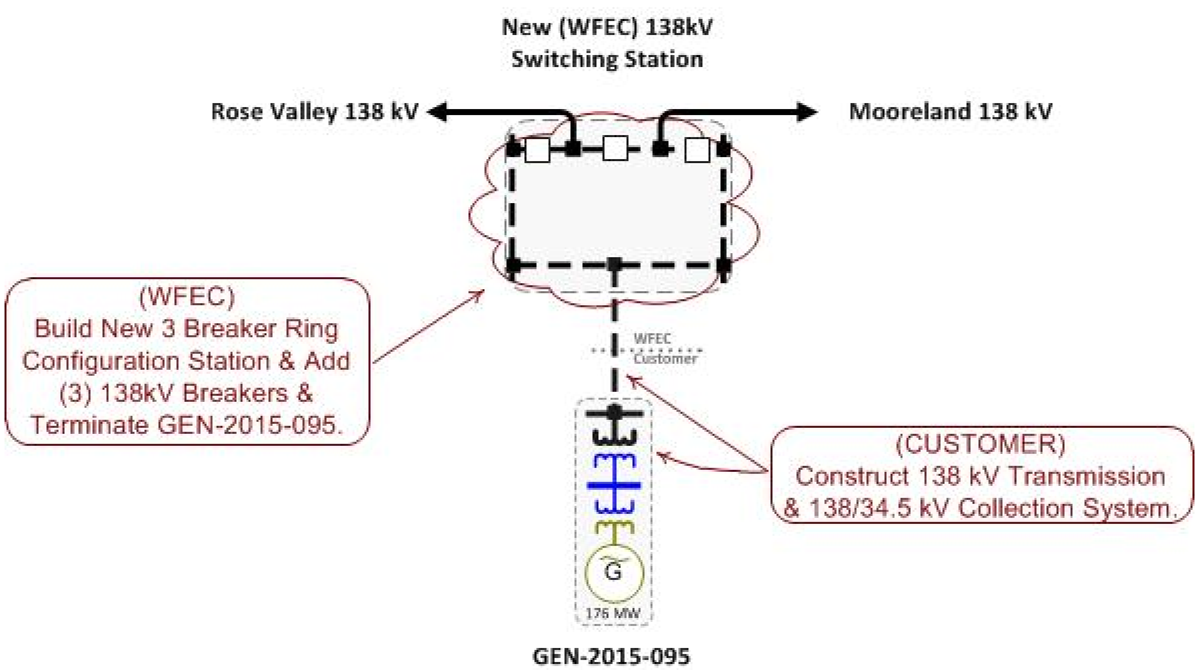
GEN-2015-092
Estimated Cluster Analysis Interconnection Cost: $1,110,612



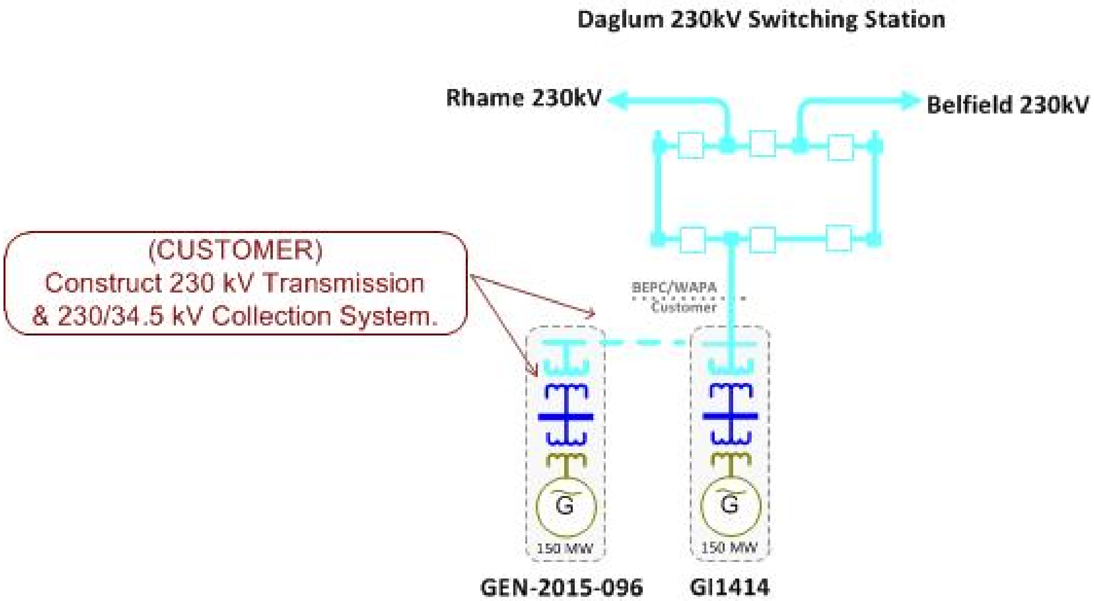
GEN-2015-093
Estimated Cluster Analysis Interconnection Cost: $2,125,000



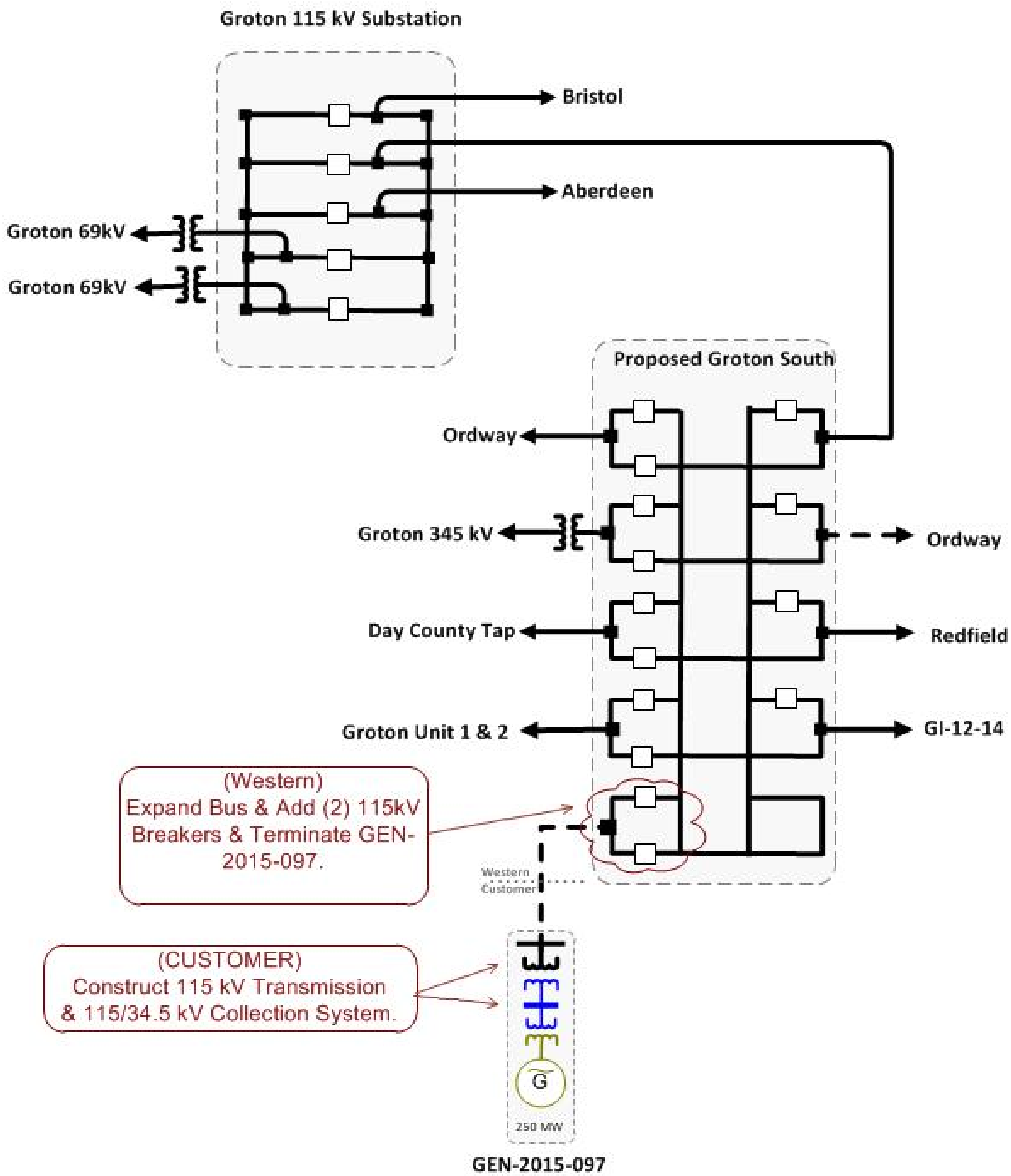
GEN-2015-095
Estimated Cluster Analysis Interconnection Cost: $4,400,000



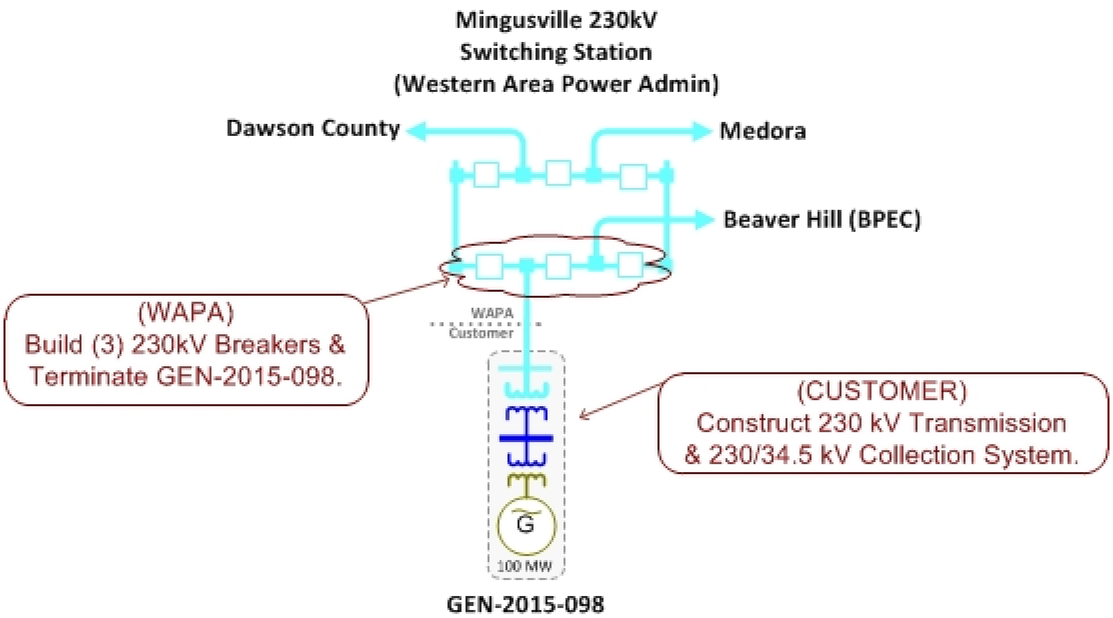
GEN-2015-096
Estimated Cluster Analysis Interconnection Cost: $0



GEN-2015-097
Estimated Cluster Analysis Interconnection Cost: $3,000,000



GEN-2015-098
Estimated Cluster Analysis Interconnection Cost: $3,000,000



11.5 E: Cost Allocation per Interconnection Request (Including Prior Queued Upgrades)

Important Note:

****WITHDRAWAL OF HIGHER QUEUED PROJECTS WILL CAUSE A RESTUDY AND MAY RESULT IN HIGHER INTERCONNECTION COSTS****

This section shows each Generation Interconnection Request Customer, their current study impacted Network Upgrades, and the previously allocated upgrades upon which they rely to accommodate their interconnection to the transmission system.

The costs associated with the current study Network Upgrades are allocated to the Customers shown in this report.

In addition should a higher queued request, defined as one this study includes as a prior queued request, withdraw, the Network Upgrades assigned to the withdrawn request may be reallocated to the remaining requests that have an impact on the Network Upgrade under a restudy. Also, should an Interconnection Request choose to go into service prior to the operation date of any necessary Network Upgrades, the costs associated with those upgrades may be reallocated to the impacted Interconnection Request. The actual costs allocated to each Generation Interconnection Request Customer will be determined at the time of a restudy.

The required interconnection costs listed do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP OATT. In addition, costs associated with a short circuit analysis will be allocated should the Interconnection Request Customer choose to execute a Facility Study Agreement.

There may be additional costs allocated to each Customer. See Appendix F for more details.

Appendix E. Cost Allocation Per Request

(Including Previously Allocated Network Upgrades*)

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
ASGI-2015-006			
ASGI-2015-006 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
	Current Study Total	$0	
GEN-2014-037			
Beaver County 345kV Reactive Power Support Install +100Mvar SVC at Beaver County Substation.	Current Study	$25,000,000	$25,000,000
GEN-2014-037 Interconnection Costs See One-Line Diagram.	Current Study	$20,334,923	$20,334,923
Mathewson - Cimarron 345kV CKT 2 Build second 345kV circuit from Matthewson - Cimarron @ 3000 amps per ITP10.	Previously Allocated		$42,903,753
Potter County Interchange 345/230/13kV Transformer CKT 2 Build second 345/230/13kV transformer at Potter County	Previously Allocated		$15,000,000
Tatonga - Mathewson 345kV CKT 2 Build second 345kV circuit from Tatonga - Matthewson @ 3000 amps per ITP10.	Previously Allocated		$104,260,473
Woodward - GEN-2011-051 Tap - Tatonga 345kV CKT 2 Build second 345kV circuit from Woodward - Tatonga @ 3000 amps per ITP10.	Previously Allocated		$71,876,622
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000
	Current Study Total	$45,334,923	
GEN-2015-020			
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$2,266,649	$25,000,000
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$3,291,609	$35,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$1,088,010	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$17,621,703	$194,000,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$282,138	$3,000,000
GEN-2015-020 Interconnection Costs See One-Line Diagram.	Current Study	$9,984,058	$9,984,058
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$51,213	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$32,133	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$1,816,670	$20,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$460,332	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Crawfish Draw Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build Crawfish Draw 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Previously Allocated		$24,764,205
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Tolk - Plant X 230kV CKT 1 & 2 Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.	Previously Allocated		$9,921,693
TUCO 345/230/13.2kV Transformer CKT 1 Replace existing TUCO 345/230/13.2kV Transformer circuit #1 with 640MVA.	Previously Allocated		$3,347,036
	Current Study Total	$36,894,515	

GEN-2015-031

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$1,943,934	$25,000,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$3,135,053	$35,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$933,104	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$16,076,755	$194,000,000
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$268,719	$3,000,000
GEN-2015-031 Interconnection Costs See One-Line Diagram.	Current Study	$7,567,148	$7,567,148
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$66,836	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$41,940	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$1,657,397	$20,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$600,726	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Crawfish Draw Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build Crawfish Draw 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Previously Allocated		$24,764,205
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000
Kress Interchange - Swisher 115kV CKT 1 Replace terminal equipment	Previously Allocated		$500,000
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
TUCO 345/230/13.2kV Transformer CKT 1 Replace existing TUCO 345/230/13.2kV Transformer circuit #1 with 640MVA.	Previously Allocated		$3,347,036
	Current Study Total	$32,291,613	
GEN-2015-034			
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD
Cleveland - Silver City 138kV CKT 1 AECI Affected System Study is required	Current Study	$TBD	$TBD
GEN-2015-034 Interconnection Costs See One-Line Diagram.	Current Study	$2,112,500	$2,112,500
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$47,200	$750,000
	Current Study Total	$2,159,700	
GEN-2015-045			
GEN-2015-045 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
	Current Study Total	$0	
GEN-2015-046			
Daglum - Dickinson 230kV CKT 1 Build new 230kV line from Daglum - Dickinson.	Current Study	$2,033,296	$28,000,000
Dickinson 230/115/13.8kV CKT 2 Build new 230/115/13.8kV Transformer circuit #2 at Dickinson.	Current Study	$948,770	$3,500,000
GEN-2015-046 Interconnection Costs See One-Line Diagram.	Current Study	$3,759,097	$3,759,097
Hanlon 69kV Reactive Support Install (1) 10Mvar Capacitor Bank at Hanlon 69kV.	Current Study	$230,666	$500,000
MISO Affected System Study See section 4 power flow analysis.	Current Study	$TBD	$TBD
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Neset - Tande 230kV CKT 1 Build new 230kV line from Neset - Tande	Previously Allocated		$3,000,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Neset 230kV Terminal Upgrade(s) Install necessary terminal equInstall necessary terminal upgrades at Neset 230kV to accommodate new 230kV line from new Tande substation	Previously Allocated		$4,000,000
Patent Gate - Kummer Ridge - Roundup Project	Previously Allocated		$TBD
Tande 345/230 Substation Construct new 345kV Tande Substation & Tande 345/230/13kV transformer Construct new 345kV Tande Substation adjacent to the existing 230kV Neset Substation and	Previously Allocated		$18,000,000
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford 345/115kV Transformer CKT 1 Install Thedford 345/115kV transformer per SPP-NTC-200277 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
	Current Study Total	$6,971,830	
GEN-2015-047			
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD
Cleveland - Silver City 138kV CKT 1 AECI Affected System Study is required	Current Study	$TBD	$TBD
GEN-2015-047 Interconnection Costs See One-Line Diagram.	Current Study	$2,540,000	$2,540,000
GEN-2015-063 Tap - Mathewson 345kV CKT 1 Replace terminal equipment to achieve conductor limit	Current Study	$165,661	$1,000,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$93,274	$750,000
	Current Study Total	$2,798,935	
GEN-2015-048			
Cleo Corner - Cleo Plant Tap 138kV CKT 1 Replace terminal equipment to at least 1200 amps	Current Study	$401,615	$500,000
GEN-2015-048 Interconnection Costs See One-Line Diagram.	Current Study	$2,968,000	$2,968,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$2,089	$750,000
Mathewson - Cimarron 345kV CKT 2 Build second 345kV circuit from Matthewson - Cimarron @ 3000 amps per ITP10.	Previously Allocated		$42,903,753

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Tatonga - Mathewson 345kV CKT 2 Build second 345kV circuit from Tatonga - Matthewson @ 3000 amps per ITP10.	Previously Allocated		$104,260,473
Woodward - GEN-2011-051 Tap - Tatonga 345kV CKT 2 Build second 345kV circuit from Woodward - Tatonga @ 3000 amps per ITP10.	Previously Allocated		$71,876,622
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000
	Current Study Total	$3,371,703	

GEN-2015-052

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD
GEN-2015-052 Interconnection Costs See One-Line Diagram.	Current Study	$15,582,434	$15,582,434
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$43,569	$750,000
	Current Study Total	$15,626,003	

GEN-2015-053

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Albion - Petersburg - North Petersburg 115kV CKT 1 Reconductor 115kV lines and replace all terminal equipment for at least a 193MVA rate.	Current Study	$3,500,000	$3,500,000
GEN-2015-053 Interconnection Costs See One-Line Diagram.	Current Study	$1,000,000	$1,000,000
Battle Creek-County Line 115kV CKT 1 Rebuild approximately 11 miles of 115kV from Battle Creek to County Line.	Previously Allocated		$4,000,000
County Line-Neligh East 115kV CKT 1 Rebuild approximately 12 miles of 115kV from County Line to Neligh East.	Previously Allocated		$8,050,000
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Hoskins - Neligh 345/115kV Projects Per SPP 2014 ITP NT and NTC 200253 for 6/1/2016 in-service.	Previously Allocated		$98,697,720
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford 345/115kV Transformer CKT 1 Install Thedford 345/115kV transformer per SPP-NTC-200277 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Twin Church - Dixon County 230kV Increase conductor clearances to accommodate 320MVA facility rating	Previously Allocated		$100,000
	Current Study Total	$4,500,000	
GEN-2015-055			
GEN-2015-055 Interconnection Costs See One-Line Diagram.	Current Study	$1,900,000	$1,900,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$20,807	$400,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$301,294	$6,000,000
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
	Current Study Total	$2,222,101	
GEN-2015-056			
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$2,402,319	$25,000,000
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$3,436,328	$35,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$1,153,133	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$18,627,649	$194,000,000
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$294,542	$3,000,000
GEN-2015-056 Interconnection Costs See One-Line Diagram.	Current Study	$5,080,273	$5,080,273
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$48,587	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$30,428	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$1,920,376	$20,000,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$435,826	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Crawfish Draw Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build Crawfish Draw 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Previously Allocated		$24,764,205
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Tolk - Plant X 230kV CKT 1 & 2 Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.	Previously Allocated		$9,921,693
TUCO 345/230/13.2kV Transformer CKT 1 Replace existing TUCO 345/230/13.2kV Transformer circuit #1 with 640MVA.	Previously Allocated		$3,347,036
	Current Study Total	$33,429,463	

GEN-2015-057

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-057 Interconnection Costs See One-Line Diagram.	Current Study	$20,000	$20,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$108,819	$750,000
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Cimarron - Draper Lake 345kV CKT 1 Replace terminal equipment to at least 2000A assigned in 2015 ITP10 per SPP-NTC-200329	Previously Allocated		$1,500,000
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
	Current Study Total	$128,819	

GEN-2015-058

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$1,243,832	$25,000,000
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$1,754,693	$35,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$597,050	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$9,626,112	$194,000,000
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$150,402	$3,000,000
GEN-2015-058 Interconnection Costs See One-Line Diagram.	Current Study	$2,751,641	$2,751,641
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$22,262	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$13,921	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$992,383	$20,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$199,353	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Crawfish Draw Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build Crawfish Draw 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Previously Allocated		$24,764,205
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Tolk - Plant X 230kV CKT 1 & 2 Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.	Previously Allocated		$9,921,693
TUCO 345/230/13.2kV Transformer CKT 1 Replace existing TUCO 345/230/13.2kV Transformer circuit #1 with 640MVA.	Previously Allocated		$3,347,036
	Current Study Total	$17,351,649	
GEN-2015-059			
GEN-2015-059 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$6,856	$750,000
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Cimarron - Draper Lake 345kV CKT 1 Replace terminal equipment to at least 2000A assigned in 2015 ITP10 per SPP-NTC-200329	Previously Allocated		$1,500,000
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000
	Current Study Total	$6,856	
GEN-2015-060			
Cleo Corner - Cleo Plant Tap 138kV CKT 1 Replace terminal equipment to at least 1200 amps	Current Study	$26,015	$500,000
GEN-2015-060 Interconnection Costs See One-Line Diagram.	Current Study	$943,000	$943,000
GEN-2015-095 Tap - Rose Valley 138kV CKT 1 Rebuild approximately 14 miles of 138kV from Rose Valley to GEN-2015-095 Tap	Current Study	$1,035,126	$10,000,000
Noel SW - Rose Valley 138kV CKT 1 Rebuild approximately 7 miles of 138kV from Noel SW to Rose Valley	Current Study	$517,563	$5,000,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$45,653	$750,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Woodward 345/138/13kV Transformer CKT 1 Replace Woodward 345/138/13kV Transformer circuit #1	Current Study	$11,629,339	$15,000,000
Woodward 345/138/13kV Transformer CKT 2 Replace Woodward 345/138/13kV Transformer circuit #2	Current Study	$11,629,289	$15,000,000
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Mathewson - Cimarron 345kV CKT 2 Build second 345kV circuit from Matthewson - Cimarron @ 3000 amps per ITP10.	Previously Allocated		$42,903,753
Tatonga - Mathewson 345kV CKT 2 Build second 345kV circuit from Tatonga - Matthewson @ 3000 amps per ITP10.	Previously Allocated		$104,260,473
Woodward - GEN-2011-051 Tap - Tatonga 345kV CKT 2 Build second 345kV circuit from Woodward - Tatonga @ 3000 amps per ITP10.	Previously Allocated		$71,876,622
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000
	Current Study Total	$25,825,986	
GEN-2015-061			
GEN-2015-061 Interconnection Costs See One-Line Diagram.	Current Study	$6,988,986	$6,988,986
	Current Study Total	$6,988,986	
GEN-2015-062			
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD
GEN-2015-062 Interconnection Costs See One-Line Diagram.	Current Study	$TBD	$TBD
GEN-2015-063 Tap - Mathewson 345kV CKT 1 Replace terminal equipment to achieve conductor limit	Current Study	$4,142	$1,000,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$428	$750,000
	Current Study Total	$4,571	
GEN-2015-063			
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-063 Interconnection Costs See One-Line Diagram.	Current Study	$10,613,000	$10,613,000
GEN-2015-063 Tap - Mathewson 345kV CKT 1 Replace terminal equipment to achieve conductor limit	Current Study	$830,196	$1,000,000
	Current Study Total	$11,443,196	
GEN-2015-064			
GEN-2015-064 Interconnection Costs See One-Line Diagram.	Current Study	$4,638,823	$4,638,823
	Current Study Total	$4,638,823	
GEN-2015-065			
GEN-2015-065 Interconnection Costs See One-Line Diagram.	Current Study	$6,988,986	$6,988,986
	Current Study Total	$6,988,986	
GEN-2015-066			
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD
Cleveland - Silver City 138kV CKT 1 AECI Affected System Study is required	Current Study	$TBD	$TBD
GEN-2015-066 Interconnection Costs See One-Line Diagram.	Current Study	$10,613,000	$10,613,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$70,168	$750,000
	Current Study Total	$10,683,168	
GEN-2015-067			
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD
GEN-2015-067 Interconnection Costs See One-Line Diagram.	Current Study	$3,521,000	$3,521,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$35,646	$750,000
	Current Study Total	$3,556,646	

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-068			
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$9,020,898	$25,000,000
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$12,103,039	$35,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$4,330,105	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$69,318,271	$194,000,000
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$1,037,403	$3,000,000
GEN-2015-068 Interconnection Costs See One-Line Diagram.	Current Study	$3,303,965	$3,303,965
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$85,608	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$52,883	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$7,146,213	$20,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$756,014	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000
Kress Interchange - Swisher 115kV CKT 1 Replace terminal equipment	Previously Allocated		$500,000
National Enrichment Plant-Targa 115kV CKT 1 Rebuild approximately 4 miles of 115kV from National Enrichment Plant to Targa per 2015 ITPNT.	Previously Allocated		$2,909,669
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Targa-Cardinal 115kV CKT 1 Rebuild approximately 3 miles of 115kV from Targa to Cardinal per 2015 ITPNT.	Previously Allocated		$2,049,062
Tolk - Plant X 230kV CKT 1 & 2 Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.	Previously Allocated		$9,921,693
	Current Study Total	$107,154,399	

GEN-2015-069

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Emporia Energy Center - Swissvale 345kV CKT 1 Replace terminal equipment to at least 1600 amps (Cost included in Swissvale - West Gardner 345kV Line Item)	Current Study	$0	$0
GEN-2015-069 Interconnection Costs See One-Line Diagram.	Current Study	$2,755,752	$2,755,752
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$3,707	$750,000
Swissvale - West Gardner 345kV CKT 1 Replace terminal equipment to at least 1600 amps	Current Study	$489,514	$1,000,000
	Current Study Total	$3,248,974	

GEN-2015-071

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-071 Interconnection Costs See One-Line Diagram.	Current Study	$14,623,541	$14,623,541
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$129,592	$400,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$1,884,339	$6,000,000
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
	Current Study Total	$16,637,472	

GEN-2015-073

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Emporia Energy Center - Swissvale 345kV CKT 1 Replace terminal equipment to at least 1600 amps (Cost included in Swissvale - West Gardner 345kV Line Item)	Current Study	$0	$0
GEN-2015-073 Interconnection Costs See One-Line Diagram.	Current Study	$2,576,628	$2,576,628
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$4,366	$750,000

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Swissvale - West Gardner 345kV CKT 1 Replace terminal equipment to at least 1600 amps	Current Study	$510,486	$1,000,000
	Current Study Total	$3,091,479	

GEN-2015-075

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$1,400,105	$25,000,000
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$1,918,364	$35,000,000
Carlisle 115/69/13kV Transformer CKT 1 Replace existing Carlisle 115/69/13kV Transformer circuit #1	Current Study	$4,000,000	$4,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$671,856	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$10,799,709	$194,000,000
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$164,431	$3,000,000
GEN-2015-075 Interconnection Costs See One-Line Diagram.	Current Study	$5,000,000	$5,000,000
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$19,412	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$12,089	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$1,113,372	$20,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$173,024	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Crawfish Draw Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build Crawfish Draw 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Previously Allocated		$24,764,205
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000
National Enrichment Plant-Targa 115kV CKT 1 Rebuild approximately 4 miles of 115kV from National Enrichment Plant to Targa per 2015 ITPNT.	Previously Allocated		$2,909,669
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000
Targa-Cardinal 115kV CKT 1 Rebuild approximately 3 miles of 115kV from Targa to Cardinal per 2015 ITPNT.	Previously Allocated		$2,049,062
Tolk - Plant X 230kV CKT 1 & 2 Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.	Previously Allocated		$9,921,693
TUCO 345/230/13.2kV Transformer CKT 1 Replace existing TUCO 345/230/13.2kV Transformer circuit #1 with 640MVA.	Previously Allocated		$3,347,036
	Current Study Total	$25,272,363	
GEN-2015-076			
Gavins Point - Yankton Junction 115kV CKT 1 Rebuild approximately 5 miles of 115kV from Gavins to Yankton	Current Study	$5,000,000	$5,000,000
GEN-2015-076 Interconnection Costs See One-Line Diagram.	Current Study	$2,600,000	$2,600,000
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Hoskins - Dixon County - Twin Church 230kV Rerate per NPPD Facility Study	Previously Allocated		$500,000
Hoskins - Neligh 345/115kV Projects Per SPP 2014 ITP NT and NTC 200253 for 6/1/2016 in-service.	Previously Allocated		$98,697,720
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford 345/115kV Transformer CKT 1 Install Thedford 345/115kV transformer per SPP-NTC-200277 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
	Current Study Total	$7,600,000	

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-079			
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$3,361,132	$25,000,000
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$4,680,457	$35,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$1,613,371	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$25,964,901	$194,000,000
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$401,182	$3,000,000
GEN-2015-079 Interconnection Costs See One-Line Diagram.	Current Study	$3,687,384	$3,687,384
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$53,040	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$33,103	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$2,676,794	$20,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$473,918	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Crawfish Draw Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build Crawfish Draw 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Previously Allocated		$24,764,205
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000
National Enrichment Plant-Targa 115kV CKT 1 Rebuild approximately 4 miles of 115kV from National Enrichment Plant to Targa per 2015 ITPNT.	Previously Allocated		$2,909,669
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Targa-Cardinal 115kV CKT 1 Rebuild approximately 3 miles of 115kV from Targa to Cardinal per 2015 ITPNT.	Previously Allocated		$2,049,062
Tolk - Plant X 230kV CKT 1 & 2 Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.	Previously Allocated		$9,921,693
TUCO 345/230/13.2kV Transformer CKT 1 Replace existing TUCO 345/230/13.2kV Transformer circuit #1 with 640MVA.	Previously Allocated		$3,347,036
	Current Study Total	$42,945,282	

GEN-2015-080

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border - Chisholm 345kV CKT 2 Build approximately 25 miles of second circuit 345kV from Border - Chisholm	Current Study	$3,361,132	$25,000,000
Border 345kV Reactive Power Support Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation	Current Study	$4,680,457	$35,000,000
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Current Study	$1,613,371	$12,000,000
Crawfish Draw - Border 345kV CKT 2 Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border	Current Study	$25,964,901	$194,000,000
GEN-2014-074 Tap Dynamic Reactive Power Support 34.5kV STATCOM at GEN-2014-074	Current Study	$401,182	$3,000,000
GEN-2015-080 Interconnection Costs See One-Line Diagram.	Current Study	$3,687,384	$3,687,384
Grapevine - Nichols 230kV CKT 1 Replace terminal equipment	Current Study	$53,040	$400,000
Grapevine - Wheeler 230kV CKT 1 Replace terminal equipment	Current Study	$33,103	$400,000
Oklaunion 345kV Reactive Power Support Incremental Upgrade Install +/-100Mvar SVC at Oklaunion	Current Study	$2,676,794	$20,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$473,918	$6,000,000
2016 ITPNT Upgrade(s) 2016 ITPNT Upgrade(s) for migitation of stability constraints near Mustang and Seminole	Previously Allocated		$0
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Crawfish Draw Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build Crawfish Draw 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Previously Allocated		$24,764,205
Elk City 230/138/13kV Transformer CKT 1 Replace terminal equipment for Elk City Transformer to achieve transformer limit of 450MVA.	Previously Allocated		$15,000,000
National Enrichment Plant-Targa 115kV CKT 1 Rebuild approximately 4 miles of 115kV from National Enrichment Plant to Targa per 2015 ITPNT.	Previously Allocated		$2,909,669
Oklaunion 345kV Reactive Power Install (2)-130Mvar Capacitor Bank(s) at Oklaunion	Previously Allocated		$10,000,000
Targa-Cardinal 115kV CKT 1 Rebuild approximately 3 miles of 115kV from Targa to Cardinal per 2015 ITPNT.	Previously Allocated		$2,049,062
Tolk - Plant X 230kV CKT 1 & 2 Rebuild circuit 1 and 2 betweek Tolk - Plant X 230kV to 1200 amps each.	Previously Allocated		$9,921,693
TUCO 345/230/13.2kV Transformer CKT 1 Replace existing TUCO 345/230/13.2kV Transformer circuit #1 with 640MVA.	Previously Allocated		$3,347,036
	Current Study Total	$42,945,282	

GEN-2015-081

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Cleo Corner - Cleo Plant Tap 138kV CKT 1 Replace terminal equipment to at least 1200 amps	Current Study	$6,912	$500,000
GEN-2015-081 Interconnection Costs See One-Line Diagram.	Current Study	$3,005,000	$3,005,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$32,519	$750,000
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Mathewson - Cimarron 345kV CKT 2 Build second 345kV circuit from Matthewson - Cimarron @ 3000 amps per ITP10.	Previously Allocated		$42,903,753
Tatonga - Mathewson 345kV CKT 2 Build second 345kV circuit from Tatonga - Matthewson @ 3000 amps per ITP10.	Previously Allocated		$104,260,473
Woodward - GEN-2011-051 Tap - Tatonga 345kV CKT 2 Build second 345kV circuit from Woodward - Tatonga @ 3000 amps per ITP10.	Previously Allocated		$71,876,622
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000
	Current Study Total	$3,044,432	

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-083			
Cleveland - Cleveland 138kV CKT Z1 AECI Affected System Study is required	Current Study	$TBD	$TBD
GEN-2015-083 Interconnection Costs See One-Line Diagram.	Current Study	$6,713,963	$6,713,963
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$10,095	$750,000
	Current Study Total	$6,724,058	
GEN-2015-084			
Cornville Tap - Naples Tap 138kV CKT 1 Rebuild approximately 11 miles of 138kV from Cornville Tap to Naples Tap	Current Study	$1,865,168	$7,700,000
GEN-2015-084 Interconnection Costs See One-Line Diagram.	Current Study	$14,665,056	$14,665,056
Naples Tap - Payne 138kV CKT 1 Rebuild approximately 8 miles of 138kV from Naples Tap to Payne	Current Study	$1,356,486	$5,600,000
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
	Current Study Total	$17,886,710	
GEN-2015-085			
Cornville Tap - Naples Tap 138kV CKT 1 Rebuild approximately 11 miles of 138kV from Cornville Tap to Naples Tap	Current Study	$5,834,832	$7,700,000
GEN-2015-085 Interconnection Costs See One-Line Diagram.	Current Study	$8,406,414	$8,406,414
Naples Tap - Payne 138kV CKT 1 Rebuild approximately 8 miles of 138kV from Naples Tap to Payne	Current Study	$4,243,514	$5,600,000
Norge - Southwest Station 138kV CKT 1 Rebuild approximately 23 miles of 138kV from Norge to Southwest Station	Current Study	$23,000,000	$23,000,000
Wheeler - Sweetwater 230kV CKT 1 Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion	Current Study	$241,254	$6,000,000
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
	Current Study Total	$41,726,014	

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-087			
GEN-2015-087 Interconnection Costs See One-Line Diagram.	Current Study	$5,300,000	$5,300,000
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Twin Church - Dixon County 230kV Increase conductor clearances to accommodate 320MVA facility rating	Previously Allocated		$100,000
	Current Study Total	$5,300,000	
GEN-2015-088			
GEN-2015-088 Interconnection Costs See One-Line Diagram.	Current Study	$15,000,000	$15,000,000
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Twin Church - Dixon County 230kV Increase conductor clearances to accommodate 320MVA facility rating	Previously Allocated		$100,000
	Current Study Total	$15,000,000	
GEN-2015-090			
GEN-2015-090 Interconnection Costs See One-Line Diagram.	Current Study	$16,021	$16,021

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$1,877	$750,000
	Current Study Total	$17,898	

GEN-2015-091

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Daglum - Dickinson 230kV CKT 1 Build new 230kV line from Daglum - Dickinson.	Current Study	$9,471,433	$28,000,000
Dickinson 230/115/13.8kV CKT 2 Build new 230/115/13.8kV Transformer circuit #2 at Dickinson.	Current Study	$794,317	$3,500,000
GEN-2015-091 Interconnection Costs See One-Line Diagram.	Current Study	$3,224,682	$3,224,682
Hanlon 69kV Reactive Support Install (1) 10Mvar Capacitor Bank at Hanlon 69kV.	Current Study	$77,492	$500,000
MISO Affected System Study See section 4 power flow analysis.	Current Study	$TBD	$TBD
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Neset - Tande 230kV CKT 1 Build new 230kV line from Neset - Tande	Previously Allocated		$3,000,000
Neset 230kV Terminal Upgrade(s) Install necessary terminal equInstall necessary terminal upgrades at Neset 230kV to accommodate new 230kV line from new Tande substation	Previously Allocated		$4,000,000
Patent Gate - Kummer Ridge - Roundup Project	Previously Allocated		$TBD
Tande 345/230 Substation Construct new 345kV Tande Substation & Tande 345/230/13kV transformer Construct new 345kV Tande Substation adjacent to the existing 230kV Neset Substation and	Previously Allocated		$18,000,000
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford 345/115kV Transformer CKT 1 Install Thedford 345/115kV transformer per SPP-NTC-200277 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
	Current Study Total	$13,567,924	

GEN-2015-092

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2015-092 Interconnection Costs See One-Line Diagram.	Current Study	$1,110,612	$1,110,612

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
	Current Study Total	$1,110,612	
GEN-2015-093			
GEN-2015-093 Interconnection Costs See One-Line Diagram.	Current Study	$2,125,000	$2,125,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$220,608	$750,000
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000
	Current Study Total	$2,345,608	
GEN-2015-095			
Cleo Corner - Cleo Plant Tap 138kV CKT 1 Replace terminal equipment to at least 1200 amps	Current Study	$65,458	$500,000
GEN-2015-095 Interconnection Costs See One-Line Diagram.	Current Study	$4,400,000	$4,400,000
GEN-2015-095 Tap - Rose Valley 138kV CKT 1 Rebuild approximately 14 miles of 138kV from Rose Valley to GEN-2015-095 Tap	Current Study	$8,964,874	$10,000,000
Noel SW - Rose Valley 138kV CKT 1 Rebuild approximately 7 miles of 138kV from Noel SW to Rose Valley	Current Study	$4,482,437	$5,000,000
Northwest 138kV Circuit Breaker Replace Northwest 138kV Circuit Breaker for short circuit requirements	Current Study	$23,126	$750,000
Woodward 345/138/13kV Transformer CKT 1 Replace Woodward 345/138/13kV Transformer circuit #1	Current Study	$3,370,661	$15,000,000
Woodward 345/138/13kV Transformer CKT 2 Replace Woodward 345/138/13kV Transformer circuit #2	Current Study	$3,370,711	$15,000,000
Mathewson - Cimarron 345kV CKT 2 Build second 345kV circuit from Matthewson - Cimarron @ 3000 amps per ITP10.	Previously Allocated		$42,903,753
Tatonga - Mathewson 345kV CKT 2 Build second 345kV circuit from Tatonga - Matthewson @ 3000 amps per ITP10.	Previously Allocated		$104,260,473
Woodward - GEN-2011-051 Tap - Tatonga 345kV CKT 2 Build second 345kV circuit from Woodward - Tatonga @ 3000 amps per ITP10.	Previously Allocated		$71,876,622

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Woodward EHV Phase Shifting Transformer CKT 1 Install one phase shifting transformer at Woodward	Previously Allocated		$7,200,000
	Current Study Total	$24,677,267	
GEN-2015-096			
Daglum - Dickinson 230kV CKT 1 Build new 230kV line from Daglum - Dickinson.	Current Study	$14,038,685	$28,000,000
Dickinson 230/115/13.8kV CKT 2 Build new 230/115/13.8kV Transformer circuit #2 at Dickinson.	Current Study	$1,177,348	$3,500,000
GEN-2015-096 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
Hanlon 69kV Reactive Support Install (1) 10Mvar Capacitor Bank at Hanlon 69kV.	Current Study	$114,859	$500,000
MISO Affected System Study See section 4 power flow analysis.	Current Study	$TBD	$TBD
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Neset - Tande 230kV CKT 1 Build new 230kV line from Neset - Tande	Previously Allocated		$3,000,000
Neset 230kV Terminal Upgrade(s) Install necessary terminal equInstall necessary terminal upgrades at Neset 230kV to accommodate new 230kV line from new Tande substation	Previously Allocated		$4,000,000
Patent Gate - Kummer Ridge - Roundup Project	Previously Allocated		$TBD
Tande 345/230 Substation Construct new 345kV Tande Substation & Tande 345/230/13kV transformer Construct new 345kV Tande Substation adjacent to the existing 230kV Neset Substation and	Previously Allocated		$18,000,000
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford 345/115kV Transformer CKT 1 Install Thedford 345/115kV transformer per SPP-NTC-200277 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
	Current Study Total	$15,330,892	
GEN-2015-097			
GEN-2015-097 Interconnection Costs See One-Line Diagram.	Current Study	$3,000,000	$3,000,000

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
MISO Affected System Study See section 4 power flow analysis.	Current Study	$TBD	$TBD
	Current Study Total	$3,000,000	
GEN-2015-098			
Daglum - Dickinson 230kV CKT 1 Build new 230kV line from Daglum - Dickinson.	Current Study	$2,456,586	$28,000,000
Dickinson 230/115/13.8kV CKT 2 Build new 230/115/13.8kV Transformer circuit #2 at Dickinson.	Current Study	$579,565	$3,500,000
GEN-2015-098 Interconnection Costs See One-Line Diagram.	Current Study	$3,000,000	$3,000,000
Hanlon 69kV Reactive Support Install (1) 10Mvar Capacitor Bank at Hanlon 69kV.	Current Study	$76,983	$500,000
MISO Affected System Study See section 4 power flow analysis.	Current Study	$TBD	$TBD
Gentleman - Thedford 345kV CKT 1 Build approximately 76 Miles of 345kV from Gentleman to Thedford per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Neset - Tande 230kV CKT 1 Build new 230kV line from Neset - Tande	Previously Allocated		$3,000,000
Neset 230kV Terminal Upgrade(s) Install necessary terminal equInstall necessary terminal upgrades at Neset 230kV to accommodate new 230kV line from new Tande substation	Previously Allocated		$4,000,000
Patent Gate - Kummer Ridge - Roundup Project	Previously Allocated		$TBD
Tande 345/230 Substation Construct new 345kV Tande Substation & Tande 345/230/13kV transformer Construct new 345kV Tande Substation adjacent to the existing 230kV Neset Substation and	Previously Allocated		$18,000,000
Thedford - Holt County 345kV CKT 1 Build approximately 146 Miles of 345kV from Thedford to Holt County per SPP-NTC-200220 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
Thedford 345/115kV Transformer CKT 1 Install Thedford 345/115kV transformer per SPP-NTC-200277 (Total Project E&C Cost Shown).	Previously Allocated		$311,717,040
	Current Study Total	$6,113,133	
	TOTAL CURRENT STUDY COSTS:	**$677,958,271***	

* Does not include cost to mitigate possible AECI, MISO, and/or MPC Affected System Upgrade(s) or cost estimate(s)

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

11.6 F: Cost Allocation per Proposed Study Network Upgrade

Important Note:

****WITHDRAWAL OF HIGHER QUEUED PROJECTS WILL CAUSE A RESTUDY AND MAY RESULT IN HIGHER INTERCONNECTION COSTS****

This section shows each Direct Assigned Facility and Network Upgrade and the Generation Interconnection Request Customer(s) which have an impact in this study assuming all higher queued projects remain in the queue and achieve commercial operation.

The required interconnection costs listed do not include all costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer submits a Transmission Service Request through SPP's Open Access Same Time Information System (OASIS) as required by Attachment Z1 of the SPP OATT. In addition, costs associated with a short circuit analysis will be allocated should the Interconnection Request Customer choose to execute a Facility Study Agreement.

There may be additional costs allocated to each Customer. See Appendix E for more details.

Appendix F. Cost Allocation by Upgrade

ASGI-2015-006 Interconnection Costs			**$0**
See One-Line Diagram.			
	ASGI-2015-006	$0	
	Total Allocated Costs	**$0**	

Beaver County 345kV Reactive Power Support			**$25,000,000**
Install +100Mvar SVC at Beaver County Substation.			
	GEN-2014-037	$25,000,000	
	Total Allocated Costs	**$25,000,000**	

Border - Chisholm 345kV CKT 2			**$25,000,000**
Build approximately 25 miles of second circuit 345kV from Border - Chisholm			
	GEN-2015-020	$2,266,649	
	GEN-2015-031	$1,943,934	
	GEN-2015-056	$2,402,319	
	GEN-2015-058	$1,243,832	
	GEN-2015-068	$9,020,898	
	GEN-2015-075	$1,400,105	
	GEN-2015-079	$3,361,132	
	GEN-2015-080	$3,361,132	
	Total Allocated Costs	**$25,000,000**	

Border 345kV Reactive Power Support			**$35,000,000**
Install (6)Steps of 50Mvar Capacitor Bank(s) and +300Mvar SVC at Border Substation			
	GEN-2015-020	$3,291,609	
	GEN-2015-031	$3,135,053	
	GEN-2015-056	$3,436,328	
	GEN-2015-058	$1,754,693	
	GEN-2015-068	$12,103,039	
	GEN-2015-075	$1,918,364	
	GEN-2015-079	$4,680,457	
	GEN-2015-080	$4,680,457	
	Total Allocated Costs	**$35,000,000**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Carlisle 115/69/13kV Transformer CKT 1		**$4,000,000**
Replace existing Carlisle 115/69/13kV Transformer circuit #1		
GEN-2015-075	$4,000,000	
Total Allocated Costs	**$4,000,000**	
Chisholm Substation Upgrade 345kV		**$12,000,000**
Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation		
GEN-2015-020	$1,088,010	
GEN-2015-031	$933,104	
GEN-2015-056	$1,153,133	
GEN-2015-058	$597,050	
GEN-2015-068	$4,330,105	
GEN-2015-075	$671,856	
GEN-2015-079	$1,613,371	
GEN-2015-080	$1,613,371	
Total Allocated Costs	**$12,000,000**	
Cleo Corner - Cleo Plant Tap 138kV CKT 1		**$500,000**
Replace terminal equipment to at least 1200 amps		
GEN-2015-048	$401,615	
GEN-2015-060	$26,015	
GEN-2015-081	$6,912	
GEN-2015-095	$65,458	
Total Allocated Costs	**$500,000**	
Cleveland - Cleveland 138kV CKT Z1		**$TBD**
AECI Affected System Study is required		
GEN-2015-034	$TBD	
GEN-2015-047	$TBD	
GEN-2015-052	$TBD	
GEN-2015-062	$TBD	
GEN-2015-063	$TBD	
GEN-2015-066	$TBD	
GEN-2015-067	$TBD	
GEN-2015-083	$TBD	
Total Allocated Costs	**$TBD**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Cleveland - Silver City 138kV CKT 1			**$TBD**
AECI Affected System Study is required			
	GEN-2015-034	$TBD	
	GEN-2015-047	$TBD	
	GEN-2015-066	$TBD	
	Total Allocated Costs	**$TBD**	
Cornville Tap - Naples Tap 138kV CKT 1			**$7,700,000**
Rebuild approximately 11 miles of 138kV from Cornville Tap to Naples Tap			
	GEN-2015-084	$1,865,168	
	GEN-2015-085	$5,834,832	
	Total Allocated Costs	**$7,700,000**	
Crawfish Draw - Border 345kV CKT 2			**$194,000,000**
Build approximately 194 miles of second circuit 345kV from TUCO 2 - Border			
	GEN-2015-020	$17,621,703	
	GEN-2015-031	$16,076,755	
	GEN-2015-056	$18,627,649	
	GEN-2015-058	$9,626,112	
	GEN-2015-068	$69,318,271	
	GEN-2015-075	$10,799,709	
	GEN-2015-079	$25,964,901	
	GEN-2015-080	$25,964,901	
	Total Allocated Costs	**$194,000,000**	
Daglum - Dickinson 230kV CKT 1			**$28,000,000**
Build new 230kV line from Daglum - Dickinson.			
	GEN-2015-046	$2,033,296	
	GEN-2015-091	$9,471,433	
	GEN-2015-096	$14,038,685	
	GEN-2015-098	$2,456,586	
	Total Allocated Costs	**$28,000,000**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Dickinson 230/115/13.8kV CKT 2 — **$3,500,000**

Build new 230/115/13.8kV Transformer circuit #2 at Dickinson.

GEN-2015-046	$948,770
GEN-2015-091	$794,317
GEN-2015-096	$1,177,348
GEN-2015-098	$579,565
Total Allocated Costs	**$3,500,000**

Emporia Energy Center - Swissvale 345kV CKT 1 — **$0**

Replace terminal equipment to at least 1600 amps (Cost included in Swissvale - West Gardner 345kV Line Item)

GEN-2015-069	$0
GEN-2015-073	$0
Total Allocated Costs	**$0**

Gavins Point - Yankton Junction 115kV CKT 1 — **$5,000,000**

Rebuild approximately 5 miles of 115kV from Gavins to Yankton

GEN-2015-076	$5,000,000
Total Allocated Costs	**$5,000,000**

GEN-2014-037 Interconnection Costs — **$20,334,923**

See One-Line Diagram.

GEN-2014-037	$20,334,923
Total Allocated Costs	**$20,334,923**

GEN-2014-074 Tap Dynamic Reactive Power Support — **$3,000,000**

34.5kV STATCOM at GEN-2014-074

GEN-2015-020	$282,138
GEN-2015-031	$268,719
GEN-2015-056	$294,542
GEN-2015-058	$150,402
GEN-2015-068	$1,037,403
GEN-2015-075	$164,431
GEN-2015-079	$401,182
GEN-2015-080	$401,182
Total Allocated Costs	**$3,000,000**

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

GEN-2015-020 Interconnection Costs			**$9,984,058**
See One-Line Diagram.			
	GEN-2015-020	$9,984,058	
	Total Allocated Costs	**$9,984,058**	
GEN-2015-031 Interconnection Costs			**$7,567,148**
See One-Line Diagram.			
	GEN-2015-031	$7,567,148	
	Total Allocated Costs	**$7,567,148**	
GEN-2015-034 Interconnection Costs			**$2,112,500**
See One-Line Diagram.			
	GEN-2015-034	$2,112,500	
	Total Allocated Costs	**$2,112,500**	
GEN-2015-045 Interconnection Costs			**$0**
See One-Line Diagram.			
	GEN-2015-045	$0	
	Total Allocated Costs	**$0**	
GEN-2015-046 Interconnection Costs			**$3,759,097**
See One-Line Diagram.			
	GEN-2015-046	$3,759,097	
	Total Allocated Costs	**$3,759,097**	
GEN-2015-047 Interconnection Costs			**$2,540,000**
See One-Line Diagram.			
	GEN-2015-047	$2,540,000	
	Total Allocated Costs	**$2,540,000**	
GEN-2015-048 Interconnection Costs			**$2,968,000**
See One-Line Diagram.			
	GEN-2015-048	$2,968,000	
	Total Allocated Costs	**$2,968,000**	
GEN-2015-052 Interconnection Costs			**$15,582,434**
See One-Line Diagram.			
	GEN-2015-052	$15,582,434	
	Total Allocated Costs	**$15,582,434**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

GEN-2015-053 Interconnection Costs			**$1,000,000**
See One-Line Diagram.			
	GEN-2015-053	$1,000,000	
	Total Allocated Costs	**$1,000,000**	
GEN-2015-055 Interconnection Costs			**$1,900,000**
See One-Line Diagram.			
	GEN-2015-055	$1,900,000	
	Total Allocated Costs	**$1,900,000**	
GEN-2015-056 Interconnection Costs			**$5,080,273**
See One-Line Diagram.			
	GEN-2015-056	$5,080,273	
	Total Allocated Costs	**$5,080,273**	
GEN-2015-057 Interconnection Costs			**$20,000**
See One-Line Diagram.			
	GEN-2015-057	$20,000	
	Total Allocated Costs	**$20,000**	
GEN-2015-058 Interconnection Costs			**$2,751,641**
See One-Line Diagram.			
	GEN-2015-058	$2,751,641	
	Total Allocated Costs	**$2,751,641**	
GEN-2015-059 Interconnection Costs			**$0**
See One-Line Diagram.			
	GEN-2015-059	$0	
	Total Allocated Costs	**$0**	
GEN-2015-060 Interconnection Costs			**$943,000**
See One-Line Diagram.			
	GEN-2015-060	$943,000	
	Total Allocated Costs	**$943,000**	
GEN-2015-061 Interconnection Costs			**$6,988,986**
See One-Line Diagram.			
	GEN-2015-061	$6,988,986	
	Total Allocated Costs	**$6,988,986**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

GEN-2015-062 Interconnection Costs			**$0**
See One-Line Diagram.			
	GEN-2015-062	$0	
	Total Allocated Costs	**$0**	
GEN-2015-063 Interconnection Costs			**$10,613,000**
See One-Line Diagram.			
	GEN-2015-063	$10,613,000	
	Total Allocated Costs	**$10,613,000**	
GEN-2015-063 Tap - Mathewson 345kV CKT 1			**$1,000,000**
Replace terminal equipment to achieve conductor limit			
	GEN-2015-047	$165,661	
	GEN-2015-062	$4,142	
	GEN-2015-063	$830,196	
	Total Allocated Costs	**$1,000,000**	
GEN-2015-064 Interconnection Costs			**$4,638,823**
See One-Line Diagram.			
	GEN-2015-064	$4,638,823	
	Total Allocated Costs	**$4,638,823**	
GEN-2015-065 Interconnection Costs			**$6,988,986**
See One-Line Diagram.			
	GEN-2015-065	$6,988,986	
	Total Allocated Costs	**$6,988,986**	
GEN-2015-066 Interconnection Costs			**$10,613,000**
See One-Line Diagram.			
	GEN-2015-066	$10,613,000	
	Total Allocated Costs	**$10,613,000**	
GEN-2015-067 Interconnection Costs			**$3,521,000**
See One-Line Diagram.			
	GEN-2015-067	$3,521,000	
	Total Allocated Costs	**$3,521,000**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

GEN-2015-068 Interconnection Costs		**$3,303,965**
See One-Line Diagram.		
GEN-2015-068	$3,303,965	
Total Allocated Costs	**$3,303,965**	
GEN-2015-069 Interconnection Costs		**$2,755,752**
See One-Line Diagram.		
GEN-2015-069	$2,755,752	
Total Allocated Costs	**$2,755,752**	
GEN-2015-071 Interconnection Costs		**$14,623,541**
See One-Line Diagram.		
GEN-2015-071	$14,623,541	
Total Allocated Costs	**$14,623,541**	
GEN-2015-073 Interconnection Costs		**$2,576,628**
See One-Line Diagram.		
GEN-2015-073	$2,576,628	
Total Allocated Costs	**$2,576,628**	
GEN-2015-075 Interconnection Costs		**$5,000,000**
See One-Line Diagram.		
GEN-2015-075	$5,000,000	
Total Allocated Costs	**$5,000,000**	
GEN-2015-076 Interconnection Costs		**$2,600,000**
See One-Line Diagram.		
GEN-2015-076	$2,600,000	
Total Allocated Costs	**$2,600,000**	
GEN-2015-079 Interconnection Costs		**$3,687,384**
See One-Line Diagram.		
GEN-2015-079	$3,687,384	
Total Allocated Costs	**$3,687,384**	
GEN-2015-080 Interconnection Costs		**$3,687,384**
See One-Line Diagram.		
GEN-2015-080	$3,687,384	
Total Allocated Costs	**$3,687,384**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

GEN-2015-081 Interconnection Costs			**$3,005,000**
See One-Line Diagram.			
	GEN-2015-081	$3,005,000	
	Total Allocated Costs	**$3,005,000**	
GEN-2015-083 Interconnection Costs			**$6,713,963**
See One-Line Diagram.			
	GEN-2015-083	$6,713,963	
	Total Allocated Costs	**$6,713,963**	
GEN-2015-084 Interconnection Costs			**$14,665,056**
See One-Line Diagram.			
	GEN-2015-084	$14,665,056	
	Total Allocated Costs	**$14,665,056**	
GEN-2015-085 Interconnection Costs			**$8,406,414**
See One-Line Diagram.			
	GEN-2015-085	$8,406,414	
	Total Allocated Costs	**$8,406,414**	
GEN-2015-087 Interconnection Costs			**$5,300,000**
See One-Line Diagram.			
	GEN-2015-087	$5,300,000	
	Total Allocated Costs	**$5,300,000**	
GEN-2015-088 Interconnection Costs			**$15,000,000**
See One-Line Diagram.			
	GEN-2015-088	$15,000,000	
	Total Allocated Costs	**$15,000,000**	
GEN-2015-090 Interconnection Costs			**$16,021**
See One-Line Diagram.			
	GEN-2015-090	$16,021	
	Total Allocated Costs	**$16,021**	
GEN-2015-091 Interconnection Costs			**$3,224,682**
See One-Line Diagram.			
	GEN-2015-091	$3,224,682	
	Total Allocated Costs	**$3,224,682**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

GEN-2015-092 Interconnection Costs			**$1,110,612**
See One-Line Diagram.			
	GEN-2015-092	$1,110,612	
	Total Allocated Costs	**$1,110,612**	
GEN-2015-093 Interconnection Costs			**$2,125,000**
See One-Line Diagram.			
	GEN-2015-093	$2,125,000	
	Total Allocated Costs	**$2,125,000**	
GEN-2015-095 Interconnection Costs			**$4,400,000**
See One-Line Diagram.			
	GEN-2015-095	$4,400,000	
	Total Allocated Costs	**$4,400,000**	
GEN-2015-095 Tap - Rose Valley 138kV CKT 1			**$10,000,000**
Rebuild approximately 14 miles of 138kV from Rose Valley to GEN-2015-095 Tap			
	GEN-2015-060	$1,035,126	
	GEN-2015-095	$8,964,874	
	Total Allocated Costs	**$10,000,000**	
GEN-2015-096 Interconnection Costs			**$0**
See One-Line Diagram.			
	GEN-2015-096	$0	
	Total Allocated Costs	**$0**	
GEN-2015-097 Interconnection Costs			**$3,000,000**
See One-Line Diagram.			
	GEN-2015-097	$3,000,000	
	Total Allocated Costs	**$3,000,000**	
GEN-2015-098 Interconnection Costs			**$3,000,000**
See One-Line Diagram.			
	GEN-2015-098	$3,000,000	
	Total Allocated Costs	**$3,000,000**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Grapevine - Nichols 230kV CKT 1 **$400,000**

Replace terminal equipment

GEN-2015-020	$51,213
GEN-2015-031	$66,836
GEN-2015-056	$48,587
GEN-2015-058	$22,262
GEN-2015-068	$85,608
GEN-2015-075	$19,412
GEN-2015-079	$53,040
GEN-2015-080	$53,040
Total Allocated Costs	**$400,000**

Grapevine - Wheeler 230kV CKT 1 **$400,000**

Replace terminal equipment

GEN-2015-020	$32,133
GEN-2015-031	$41,940
GEN-2015-055	$20,807
GEN-2015-056	$30,428
GEN-2015-058	$13,921
GEN-2015-068	$52,883
GEN-2015-071	$129,592
GEN-2015-075	$12,089
GEN-2015-079	$33,103
GEN-2015-080	$33,103
Total Allocated Costs	**$400,000**

Hanlon 69kV Reactive Support **$500,000**

Install (1) 10Mvar Capacitor Bank at Hanlon 69kV.

GEN-2015-046	$230,666
GEN-2015-091	$77,492
GEN-2015-096	$114,859
GEN-2015-098	$76,983
Total Allocated Costs	**$500,000**

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

MISO Affected System Study			**$TBD**
See section 4 power flow analysis.			
	GEN-2015-046	$TBD	
	GEN-2015-091	$TBD	
	GEN-2015-096	$TBD	
	GEN-2015-097	$TBD	
	GEN-2015-098	$TBD	
	Total Allocated Costs	**$TBD**	
Naples Tap - Payne 138kV CKT 1			**$5,600,000**
Rebuild approximately 8 miles of 138kV from Naples Tap to Payne			
	GEN-2015-084	$1,356,486	
	GEN-2015-085	$4,243,514	
	Total Allocated Costs	**$5,600,000**	
Noel SW - Rose Valley 138kV CKT 1			**$5,000,000**
Rebuild approximately 7 miles of 138kV from Noel SW to Rose Valley			
	GEN-2015-060	$517,563	
	GEN-2015-095	$4,482,437	
	Total Allocated Costs	**$5,000,000**	
Norge - Southwest Station 138kV CKT 1			**$23,000,000**
Rebuild approximately 23 miles of 138kV from Norge to Southwest Station			
	GEN-2015-085	$23,000,000	
	Total Allocated Costs	**$23,000,000**	

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Northwest 138kV Circuit Breaker **$750,000**

Replace Northwest 138kV Circuit Breaker for short circuit requirements

GEN-2015-034	$47,200
GEN-2015-047	$93,274
GEN-2015-048	$2,089
GEN-2015-052	$43,569
GEN-2015-057	$108,819
GEN-2015-059	$6,856
GEN-2015-060	$45,653
GEN-2015-062	$428
GEN-2015-066	$70,168
GEN-2015-067	$35,646
GEN-2015-069	$3,707
GEN-2015-073	$4,366
GEN-2015-081	$32,519
GEN-2015-083	$10,095
GEN-2015-090	$1,877
GEN-2015-093	$220,608
GEN-2015-095	$23,126
Total Allocated Costs	**$750,000**

Oklaunion 345kV Reactive Power Support Incremental Upgrade **$20,000,000**

Install +/-100Mvar SVC at Oklaunion

GEN-2015-020	$1,816,670
GEN-2015-031	$1,657,397
GEN-2015-056	$1,920,376
GEN-2015-058	$992,383
GEN-2015-068	$7,146,213
GEN-2015-075	$1,113,372
GEN-2015-079	$2,676,794
GEN-2015-080	$2,676,794
Total Allocated Costs	**$20,000,000**

Albion - Petersburg - North Petersburg 115kV CKT 1 **$3,500,000**

Reconductor 115kV lines and replace all terminal equipment for at least a 193MVA rate.

GEN-2015-053	$3,500,000
Total Allocated Costs	**$3,500,000**

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

Swissvale - West Gardner 345kV CKT 1 **$1,000,000**

Replace terminal equipment to at least 1600 amps

GEN-2015-069	$489,514
GEN-2015-073	$510,486
Total Allocated Costs	**$1,000,000**

Wheeler - Sweetwater 230kV CKT 1 **$6,000,000**

Rebuild AEP's portion of the circuit and replace terminal equipment on SPS portion

GEN-2015-020	$460,332
GEN-2015-031	$600,726
GEN-2015-055	$301,294
GEN-2015-056	$435,826
GEN-2015-058	$199,353
GEN-2015-068	$756,014
GEN-2015-071	$1,884,339
GEN-2015-075	$173,024
GEN-2015-079	$473,918
GEN-2015-080	$473,918
GEN-2015-085	$241,254
Total Allocated Costs	**$6,000,000**

Woodward 345/138/13kV Transformer CKT 1 **$15,000,000**

Replace Woodward 345/138/13kV Transformer circuit #1

GEN-2015-060	$11,629,339
GEN-2015-095	$3,370,661
Total Allocated Costs	**$15,000,000**

Woodward 345/138/13kV Transformer CKT 2 **$15,000,000**

Replace Woodward 345/138/13kV Transformer circuit #2

GEN-2015-060	$11,629,289
GEN-2015-095	$3,370,711
Total Allocated Costs	**$15,000,000**

* Withdrawal of higher queued projects will cause a restudy and may result in higher costs

11.7 G-T: Thermal Power Flow Analysis (Constraints Requiring Transmission Reinforcement)

See next page.

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	02ALL	0	17G	G14_037		Non-Converged Contingency	956.09	1051.7	0.24796	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	02ALL	0	17G	G14_037		Non-Converged Contingency	956.09	1051.7	0.24796	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	02ALL	2	17G	G14_037		Non-Converged Contingency	956.09	1051.7	0.24796	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	02ALL	2	17G	G14_037		Non-Converged Contingency	956.09	1051.7	0.24796	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	02ALL	3	17G	G14_037		Non-Converged Contingency	956.09	1051.7	0.24796	-	FINNEY SWITCHING STATION - WALKTAP7 345.00 345KV CKT 1
FDNS	02ALL	0	25SP	G14_037	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.11111	113.5155	System Intact
FDNS	02ALL	0	25SP	G14_037	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.11111	116.6448	System Intact
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	1792	1972	0.18031	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	1792	1792	0.18031	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	1022	1124	0.24122	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	1022	1124	0.24122	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	987.2	1082.8	0.19496	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	987.16	1082.77	0.1568	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	956.09	1051.7	0.1568	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	560	560	0.19496	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	435.02	457.73	0.11867	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	439	439	0.11867	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	439	439	0.11867	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_020		Non-Converged Contingency	329.05	360.92	0.09669	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.39994	101.7566	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.39994	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32270	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39994	110.605	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39994	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32270	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_020	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.10037	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_020	FROM->TO	BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1	329.05	360.92	0.21753	100.1938	NEWHART 230 - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	16WP	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.09669	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_020		Non-Converged Contingency	0	0	0.15281	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_020		Non-Converged Contingency	0	0	0.22916	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.38749	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.38749	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.38749	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.38749	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.31493	102.5642	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.31493	105.1317	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.31493	102.5642	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.31493	105.1317	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.31495	102.7136	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.31495	105.0661	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.31495	102.7136	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.31495	105.0661	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.31495	102.6492	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.31495	105.032	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.31495	102.6492	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.31495	105.032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_020	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.11458	113.2775	System Intact
FDNS	06ALL	0	17G	G15_020	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.11458	111.4968	System Intact
FDNS	06ALL	0	17G	G15_020	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.09692	117.5205	System Intact
FDNS	06ALL	0	17G	G15_020	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.11458	103.2013	System Intact
FDNS	06ALL	0	17G	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.09343	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_020		Non-Converged Contingency	1792	1792	0.17971	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	06ALL	0	17SP	G15_020		Non-Converged Contingency	956	1042	0.23927	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_020		Non-Converged Contingency	956	1042	0.23927	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.09478	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	1792	1972	0.16545	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	1792	1972	0.16545	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	1792	1792	0.16545	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	1022	1124	0.20374	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	1022	1124	0.20374	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	956.1	1051.7	0.15379	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	956.1	1051.7	0.15379	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	956.09	1051.7	0.12693	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	956.09	1051.7	0.12693	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	560	560	0.15379	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	560	560	0.15379	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	421	439	0.08476	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	348.58	381.24	0.08476	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	353	353	0.08476	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	318.7	350.57	0.0688	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	318.7	350.57	0.0688	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	0	0	0.11437	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	0	0	0.16952	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_020		Non-Converged Contingency	0	0	0.23764	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29022	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29022	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20L	G15_020	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.08476	109.5807	System Intact
FDNS	06ALL	0	20L	G15_020	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.08476	107.8845	System Intact
FDNS	06ALL	0	20L	G15_020	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.07166	112.5437	System Intact
FDNS	06ALL	0	20L	G15_020	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.08476	105.6208	System Intact
FDNS	06ALL	0	20L	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.0688	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_020		Non-Converged Contingency	1792	1792	0.19282	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_020		Non-Converged Contingency	956	1042	0.24111	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08717	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	1792	1972	0.18879	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	1792	1792	0.18879	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	1022	1124	0.23568	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	1022	1124	0.23568	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	987.2	1082.8	0.18241	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	987.16	1082.77	0.14785	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	560	560	0.18241	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	435.02	457.73	0.10345	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	439	439	0.10345	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	421	439	0.10345	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_020		Non-Converged Contingency	329.05	360.92	0.08445	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32115	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32115	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32115	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32115	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.32117	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.25598	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.25598	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.25598	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.25598	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32115	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32115	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32115	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32115	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_020	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32117	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.1995	107.6543	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.1995	107.6543	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.1995	109.8194	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.1995	109.8194	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20209	105.7221	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20209	105.7221	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20209	107.1929	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20209	107.1929	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.21313	106.5608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.21313	106.5608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.21313	107.9608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.21313	107.9608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.08753	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_020	FROM->TO	BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1	329.05	360.92	0.19795	100.6422	NEWHART 230 - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_020	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.10345	105.3667	System Intact
FDNS	06ALL	0	20WP	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.08445	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.06900	100.0	System Intact
FDNS	06ALL	3	20WP	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.06900	99.9	System Intact
FDNS	06ALL	4	20WP	G15_020	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.06900	100.0	System Intact
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	1792	1972	0.16143	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	1792	1792	0.16143	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	1022	1124	0.22107	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	1022	1124	0.22107	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	987.2	1082.8	0.20591	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	987.16	1082.77	0.16251	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	956.09	1051.7	0.16251	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	560	560	0.20591	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	435.02	457.73	0.1309	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	439	439	0.1309	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	439	439	0.1309	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_031		Non-Converged Contingency	329.05	360.92	0.10704	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.36291	101.7566	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.36291	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.36785	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.36291	110.605	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.36291	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36785	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_031	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.11077	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.10704	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_031		Non-Converged Contingency	0	0	0.1686	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_031		Non-Converged Contingency	0	0	0.25362	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.35047	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.35047	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.35047	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.35047	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36009	102.5642	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36009	105.1317	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.36009	102.5642	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.36009	105.1317	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36010	102.7136	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36010	105.0661	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.36010	102.7136	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.36010	105.0661	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36010	102.6492	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.36010	105.032	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.36010	102.6492	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.36010	105.032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_031	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.12681	113.2775	System Intact
FDNS	06ALL	0	17G	G15_031	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.12681	111.4968	System Intact
FDNS	06ALL	0	17G	G15_031	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.10732	117.5205	System Intact
FDNS	06ALL	0	17G	G15_031	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.12681	103.2013	System Intact
FDNS	06ALL	0	17G	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.10378	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_031		Non-Converged Contingency	1792	1792	0.15969	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_031		Non-Converged Contingency	956	1042	0.21792	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_031		Non-Converged Contingency	956	1042	0.21792	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.10557	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	1792	1972	0.13817	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	1792	1972	0.13817	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	1792	1792	0.13817	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	1022	1124	0.17462	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	1022	1124	0.17462	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	956.1	1051.7	0.17183	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	956.1	1051.7	0.17183	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	956.09	1051.7	0.13576	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	956.09	1051.7	0.13576	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	560	560	0.17183	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	560	560	0.17183	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	421	439	0.10104	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	348.58	381.24	0.10104	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	353	353	0.10104	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	318.7	350.57	0.08249	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	318.7	350.57	0.08249	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	0	0	0.13539	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	0	0	0.20208	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_031		Non-Converged Contingency	0	0	0.2542	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.32834	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.32834	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20L	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20104	99.9	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20L	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20104	99.9	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20L	G15_031	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.10104	109.5807	System Intact
FDNS	06ALL	0	20L	G15_031	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.10104	107.8845	System Intact
FDNS	06ALL	0	20L	G15_031	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.08549	112.5437	System Intact
FDNS	06ALL	0	20L	G15_031	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.10104	105.6208	System Intact
FDNS	06ALL	0	20L	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08249	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_031		Non-Converged Contingency	1792	1792	0.16554	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_031		Non-Converged Contingency	956	1042	0.212	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.10086	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	1792	1972	0.16151	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	1792	1792	0.16151	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	1022	1124	0.20657	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	1022	1124	0.20657	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	987.2	1082.8	0.20045	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	987.16	1082.77	0.15669	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	560	560	0.20045	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	435.02	457.73	0.11973	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	439	439	0.11973	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	421	439	0.11973	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_031		Non-Converged Contingency	329.05	360.92	0.09814	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35927	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35927	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35927	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35927	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.35929	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.30436	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.30436	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.30436	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.30436	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35927	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35927	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35927	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35927	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_031	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.35929	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22024	107.6543	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22024	107.6543	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22024	109.8194	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22024	109.8194	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22153	105.7221	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22153	105.7221	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22153	107.1929	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.22153	107.1929	MOORE COUNTY INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.23454	106.5608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.23454	106.5608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.23454	107.9608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.23454	107.9608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_031	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.10136	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_031	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.11973	105.3667	System Intact
FDNS	06ALL	0	20WP	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.09814	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.08616	100.0	System Intact
FDNS	06ALL	3	20WP	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.08616	99.9	System Intact
FDNS	06ALL	4	20WP	G15_031	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.08616	100.0	System Intact
FDNS	08ALL	0	17G	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.08635	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08635	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08635	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0854	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0854	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	08ALL	2	17SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08540	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08540	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08540	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08540	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_034	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174	174	0.0302	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_034	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174	174	0.0302	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_034	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.03020	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_034	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.03020	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_034	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.03019	118.4937	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_034	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.03019	118.4937	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.07057	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.07057	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.07057	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.07057	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.07056	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.07056	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.08479	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.08479	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08479	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08479	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08479	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08479	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0857	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0857	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08570	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08570	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08571	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_034	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.08571	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNSLock-Blown up	09ALL	0	16WP	G15_046		Non-Converged Contingency	720	720	0.11874	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	16WP	G15_046		Non-Converged Contingency	720	720	0.11874	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNS	16ALL	0	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.37257	104.0325	NESET 4 230.00 () 230/115/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	0	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.37892	117.2053	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	0	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.37892	117.2058	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	0	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90393	122.0297	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	0	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90393	122.0629	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	0	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90393	122.0629	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	2	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37248	103.8066	NESET 4 230.00 () 230/115/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	2	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37887	117.0328	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	2	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37887	117.0335	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	2	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90394	122.0462	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	2	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90394	122.0781	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	2	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90394	122.0781	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	3	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37236	103.6024	NESET 4 230.00 () 230/115/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	3	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37876	116.8354	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	3	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37876	116.8359	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	3	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90395	122.0682	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	3	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90395	122.0996	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	3	16WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90395	122.0996	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	0	16WP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.02965	102.9357	System Intact
FDNS	16ALL	0	16WP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.02965	103.8937	System Intact
FDNS	16ALL	2	16WP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.03095	108.8239	System Intact
FDNS	16ALL	2	16WP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.03095	109.822	System Intact
FDNSLock-Blown up	09ALL	0	17G	G15_046		Non-Converged Contingency	720	720	0.12227	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17G	G15_046		Non-Converged Contingency	720	720	0.12227	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNS	16ALL	0	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.37856	118.8694	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	0	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.37856	118.8699	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	0	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90391	127.875	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	0	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90391	128.0071	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	0	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90391	128.0071	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	2	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37851	118.6912	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	2	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37851	118.6917	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	2	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90391	127.885	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	2	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90391	128.0161	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	2	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90391	128.0161	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	3	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37840	118.5027	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	3	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37840	118.5033	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	3	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90393	127.8968	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	3	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90393	128.0266	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	3	17G	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90393	128.0266	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNSLock-Blown up	09ALL	0	17SP	G15_046		Non-Converged Contingency	720	720	0.12266	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17SP	G15_046		Non-Converged Contingency	720	720	0.12266	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_046		Non-Converged Contingency	720	792	0.13951	-	WATERTN-LNX3345.00 - WATERTOWN 345KV CKT Z
FDNSLock-Blown up	16ALL	0	17SP	G15_046		Non-Converged Contingency	720	792	0.13951	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_046		Non-Converged Contingency	720.0	792.0	0.13951	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	16ALL	0	17SP	G15_046		Non-Converged Contingency	717	789	0.11898	-	G09_001IST 345.00 - GROTON 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_046		Non-Converged Contingency	717	789	0.11898	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_046		Non-Converged Contingency	717.0	789.0	0.11897	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	3	17SP	G15_046		Non-Converged Contingency	717.0	789.0	0.11841	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	4	17SP	G15_046		Non-Converged Contingency	717.0	789.0	0.11916	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNS	09ALL	0	17SP	G15_046	FROM->TO	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z	720	720	0.1284	95.3	KELLY - MEADOWGROVE4230.00 230KV CKT 1
FDNS	16ALL	0	17SP	G15_046	FROM->TO	BROADLAND - HURON 230KV CKT 1	400	480	0.13637	101.3771	System Intact
FDNS	16ALL	2	17SP	G15_046	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.13630	101.3206	System Intact
FDNS	16ALL	3	17SP	G15_046	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.13640	101.1661	System Intact
FDNS	16ALL	0	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.37894	105.5018	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	0	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.37894	105.5073	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	0	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90397	130.908	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	0	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90397	130.9983	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	0	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90397	130.9983	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	2	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37889	105.3143	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	2	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37889	105.3198	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	2	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90397	130.9217	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	2	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90397	131.0096	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	2	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90397	131.0096	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	3	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37878	105.081	JUDSON 4230.00 - WILLISTON 230KV CKT 1
FDNS	16ALL	3	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.37878	105.0949	JUDSON 3345.00 (JUDSON KU1A) 345/230/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	3	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90399	130.9475	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	3	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90399	131.0347	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	3	17SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90399	131.0347	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	0	17SP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.02974	103.7908	System Intact
FDNS	16ALL	0	17SP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.02974	104.4544	System Intact
FDNS	16ALL	2	17SP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.03105	110.005	System Intact
FDNS	16ALL	2	17SP	G15_046	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.03105	110.7028	System Intact
FDNS	16ALL	0	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90607	137.0158	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	0	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90607	137.0458	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	0	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90607	137.0458	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	2	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	137.0294	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	2	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	137.0469	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	2	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	137.0469	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	3	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90609	137.0459	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	3	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90609	137.0638	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	3	20L	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90609	137.0638	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	0	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.9061	125.8607	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	0	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.9061	125.8787	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	0	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.9061	125.8787	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	2	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90610	125.8752	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	2	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90610	125.8928	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	2	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90610	125.8928	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	3	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90611	125.8967	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	3	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90611	125.9141	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	3	20SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90611	125.9141	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	0	20SP	G15_046	TO->FROM	BISMARK - HILKEN 4 230.00 230KV CKT 1	319	351	0.03682	107.6143	System Intact
FDNS	16ALL	2	20SP	G15_046	TO->FROM	BISMARK - HILKEN 4 230.00 230KV CKT 1	319.0	351.0	0.03660	107.3131	System Intact
FDNS	16ALL	3	20SP	G15_046	TO->FROM	BISMARK - HILKEN 4 230.00 230KV CKT 1	319.0	351.0	0.03665	107.3591	System Intact
FDNS	16ALL	0	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.35051	103.5969	NESET 4 230.00 () 230/115/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	0	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90607	114.8913	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	0	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90607	114.8913	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	0	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.90607	114.9119	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	2	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.35043	103.3976	NESET 4 230.00 () 230/115/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	2	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	114.9072	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	2	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	114.9072	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	2	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	114.9282	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	3	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.35033	103.2004	NESET 4 230.00 () 230/115/13.8KV TRANSFORMER CKT 1
FDNS	16ALL	3	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	114.9278	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	3	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	114.9278	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	3	20WP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90608	114.949	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	0	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.9061	120.4442	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	0	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.9061	120.4442	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	0	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200	200	0.9061	120.4548	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	2	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90610	120.4599	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	2	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90610	120.4599	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	2	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90610	120.4705	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	3	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90611	120.4839	JUDSON 3345.00 - TANDE-LNX 345.00 345KV CKT 1
FDNS	16ALL	3	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90611	120.4839	JUDSON-TANDE-TLINE-REACTORS-CKT1
FDNS	16ALL	3	25SP	G15_046	FROM->TO	NESET 4 230.00 - TIOGA 230KV CKT 1	200.0	200.0	0.90611	120.4945	TANDE 3345.00 - TANDE-LNX 345.00 345KV CKT Z
FDNS	16ALL	0	25SP	G15_046	TO->FROM	BISMARK - HILKEN 4 230.00 230KV CKT 1	319	351	0.03709	107.4484	System Intact
FDNS	16ALL	2	25SP	G15_046	TO->FROM	BISMARK - HILKEN 4 230.00 230KV CKT 1	319.0	351.0	0.03687	107.156	System Intact
FDNS	16ALL	3	25SP	G15_046	TO->FROM	BISMARK - HILKEN 4 230.00 230KV CKT 1	319.0	351.0	0.03692	107.1971	System Intact
FDNS	08ALL	0	16WP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.19712	121.8649	NORTHWEST - SPRING CREEK 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	08ALL	0	16WP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.19712	121.9421	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.19904	117.7802	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.19904	117.8392	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.11175	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11175	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11175	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20155	117.3912	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20226	109.8071	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.1108	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.1108	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11080	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11080	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11080	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11080	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_047	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174	174	0.04043	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_047	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174	174	0.04043	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_047	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.04043	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_047	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.04043	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_047	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.04042	118.4937	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_047	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.04042	118.4937	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.09578	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.09578	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.09578	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.09578	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.09578	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.09578	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.2044	104.7146	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.11001	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.11001	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11001	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11001	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11001	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11001	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20WP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20124	109.6471	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20WP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20124	109.7423	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	2	25SP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	1192.0	1192.0	0.20284	100.4184	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	3	25SP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	1192.0	1192.0	0.20279	100.0	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20284	125.2078	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_047	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20352	117.6504	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.11091	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.11091	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11091	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11091	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11092	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_047	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.11092	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.51648	110.0571	IMO TAP - SOUTH 4TH ST 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.53825	120.4657	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56328	116.0328	GLENWOOD - IMO TAP 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56328	116.2663	GLENWOOD - NE ENID4 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56523	116.2313	BRECKNR4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56786	119.999	G15063_T 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5691	115.5521	P12:069:OKGE:3TERM4
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56996	115.8669	HUNTERS7 345.00 - RENFROW7 345.00 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57032	115.9215	G15052_T 345.00 - ROSE HILL 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57064	121.5514	CIMARRON - MINCO 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57093	122.6233	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57093	122.7938	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	108.0404	GEN563292 1-G15095_3 0.6900
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	109.8861	GEN520997 1-MORLND2
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	110.764	GEN520998 1-MORLND3
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	111.802	GEN515787 1-OKLA WIND ENERGY CENTER
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	112.4184	GEN520922 1-SLEEPING BEAR
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	113.4319	GEN515365 1-CENT 21 0.7000
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	114.0884	GEN515389 1-TLGWND-WTG1 0.7000
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	114.9276	GEN562023 1-G11_020_3 0.6900
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	114.9276	GEN562026 1-G11_019_3 0.6900
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.3137	GEN515393 1-OGEWND2G
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.3336	GEN525562 1-TOLK GEN #2 24 KV
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.3361	GEN525561 1-TOLK GEN #1 24 KV
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.7557	GEN562973 1-G15060_4 0.6900
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.7812	GEN562974 1-G15060_5 0.6900
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.8759	GEN515611 1-NBUFFRG1 0.6900
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.8759	GEN560217 1-G07_062_6 0.6900
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	115.8759	GEN560218 1-G07_062_7 0.6900

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	117.8972	System Intact
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	119.9669	GEN514806 1-SOONER UNIT 2
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57101	121.2369	GEN514805 1-SOONER UNIT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57114	120.3767	G1524G1525 345.00 - THISTLE7 345.00 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57114	120.3767	G1524G1525 345.00 - THISTLE7 345.00 345KV CKT 2
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57128	119.6565	CZYCRVT2 69.000 - SALINE 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57128	120.3219	CZYCRVT2 69.000 - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57133	120.0147	G14-057T 345.00 - LAWTON EASTSIDE 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57133	120.4953	G14-057T 345.00 - SUNNYSIDE 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57147	123.3971	G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57147	142.716	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57157	120.5469	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57157	120.9411	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57157	120.9411	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57176	123.3638	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57176	123.3638	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57176	123.3638	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57176	123.3638	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57211	116.0179	FAIRVIEW - OKEENE 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57261	115.8687	IODINE - WOODWARD EHV 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57261	116.0251	DEWEY - IODINE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57338	124.1574	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57338	124.5537	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57348	120.833	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57361	120.9883	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57379	115.4859	KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57379	115.4882	KNOBHILL - NOEL_SW 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57395	126.6172	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57466	120.653	CUSTER4 138.00 - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57466	120.7648	CUSTER4 138.00 - ELLIS 4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57466	121.2968	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57466	122.0071	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57466	122.0071	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5747	127.2353	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5747	127.4232	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5747	127.4906	P12:138:WFEC:MSL12
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5747	127.5164	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57538	122.2179	BYRON_138 138.00 - SANDY_CN_138138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57538	123.8971	BYRON_138 138.00 - C_CITY_138 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57538	124.2001	C_CITY_138 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57538	125.7879	NOEL_SW 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57538	126.8546	P12:138:WFEC:MSL15
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57626	116.4538	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5772	116.0694	DEWEY - TALOGA 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57849	126.6019	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57849	127.2293	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57849	127.6959	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57849	127.7263	P12:138:WFEC:MSL14
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58123	114.3461	ALVA - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58582	110.1817	FPL SWITCH - MOORELAND 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59343	121.5547	RENFROW4 138.00 - RENFROW4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59343	122.2023	RENFROW4 138.00 - WAKITAS4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59449	119.8332	WOODWARD EHV - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59449	119.8333	WOODWARD - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59909	121.1603	NSAH - WAKITA 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59909	122.7302	NSAH - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59909	124.8763	CLEO JCT - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59909	124.8781	CLEO CORNER - CLEO JCT 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59909	121.1	WAKITAS4 138.00 (WAKITA_XMER) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60242	121.3557	ALINETP2 69.000 - ALVA 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60242	121.4545	ALINETP2 69.000 - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60242	121.6775	CLEO CORNER - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	16WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.64083	130.3533	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.51722	104.4723	IMO TAP - SOUTH 4TH ST 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.53912	114.0868	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5641	110.0058	GLENWOOD - IMO TAP 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56604	109.9782	BRECKNR4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56604	110.1653	BLLNGTP4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56862	113.9234	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56862	114.6044	G15063_T 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.571	108.5813	HUNTERS7 345.00 - RENFROW7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.571	109.5911	HUNTERS7 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57125	109.3416	G15052_T 345.00 - ROSE HILL 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57125	109.6829	G15052_T 345.00 - OPENSKY7 345.00 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57125	110.0558	OPENSKY7 345.00 - RANCHRD7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5715	115.3191	CIMARRON - MINCO 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57178	116.5092	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57178	116.9412	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	102.0186	GEN563292 1-G15095_3 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	105.7336	GEN515787 1-OKLA WIND ENERGY CENTER
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	106.3519	GEN520922 1-SLEEPING BEAR
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	106.9928	GEN520997 1-MORLND2
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	106.995	GEN520998 1-MORLND3
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	107.3978	GEN515365 1-CENT 21 0.7000
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	108.0365	GEN515389 1-TLGWND-WTG1 0.7000
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	108.9887	GEN562023 1-G11_020_3 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	108.9887	GEN562026 1-G11_019_3 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	109.2919	GEN515393 1-OGEWND2G
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	109.4354	GEN525561 1-TOLK GEN #1 24 KV
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	109.7238	GEN562973 1-G15060_4 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	109.7484	GEN562974 1-G15060_5 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	109.8789	GEN515611 1-NBUFFRG1 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	109.8789	GEN560217 1-G07_062_6 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	109.8789	GEN560218 1-G07_062_7 0.6900
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	111.7985	System Intact
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	114.3994	GEN514806 1-SOONER UNIT 2
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57184	115.873	GEN514805 1-SOONER UNIT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57197	114.3777	G1524G1525 345.00 - THISTLE7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57197	114.3777	G1524G1525 345.00 - THISTLE7 345.00 345KV CKT 2
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57209	113.7466	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57215	113.895	G14-057T 345.00 - LAWTON EASTSIDE 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57215	114.3577	G14-057T 345.00 - SUNNYSIDE 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57216	114.0651	CZYCRVT2 69.000 - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57232	114.2366	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57232	114.6278	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57248	116.0443	G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57248	134.6206	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57255	117.2741	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57255	117.2741	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57295	110.0856	FAIRVIEW - OKEENE 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57343	109.9092	IODINE - WOODWARD EHV 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57427	117.4826	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57427	117.9016	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57431	114.7039	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57444	114.8518	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57461	109.7168	KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57461	109.7185	KNOBHILL - NOEL_SW 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57491	119.7462	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57554	113.693	CUSTER4 138.00 - ELLIS 4 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57554	114.2311	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57554	117.2743	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57565	120.2909	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57565	120.47	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57565	120.5629	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57624	115.9485	BYRON_138 138.00 - SANDY_CN_138138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57624	117.681	BYRON_138 138.00 - C_CITY_138 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57624	117.8899	C_CITY_138 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57624	119.4917	NOEL_SW 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57807	109.5968	DEWEY - TALOGA 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57942	118.6212	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57942	119.3787	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57942	119.8438	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58205	108.8595	ALVA - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58669	103.4146	FPL SWITCH - MOORELAND 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58669	109.3192	FPL SWITCH - WOODWARD 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59433	114.4019	RENFROW4 138.00 - RENFROW4 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59433	115.4413	RENFROW4 138.00 - WAKITAS4 138.00 138KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59991	114.5995	NSAH - WAKITA 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59991	116.7539	NSAH - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59991	118.8968	CLEO JCT - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59991	118.8987	CLEO CORNER - CLEO JCT 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59991	114.8	WAKITAS4 138.00 (WAKITA_XMER) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60323	115.2669	ALINETP2 69.000 - ALVA 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60323	115.3577	ALINETP2 69.000 - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60323	115.5678	CLEO CORNER - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	17G	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.64162	124.4027	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17G	G15_048	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133	153	0.03212	106.4715	System Intact
FDNS	01ALL	2	17G	G15_048	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.03212	106.284	System Intact

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.51656	111.0533	IMO TAP - SOUTH 4TH ST 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.53825	123.7503	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56338	115.5393	GLENWOOD - IMO TAP 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56338	115.9059	GLENWOOD - NE ENID4 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56536	115.6319	BRECKNR4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56536	115.9405	BLLNGTP4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56789	120.044	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56789	120.7442	G15063_T 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56919	114.308	P12:069:OKGE:3TERM4
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56997	114.9526	HUNTERS7 345.00 - RENFROW7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57036	115.1795	G15052_T 345.00 - ROSE HILL 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57036	115.5542	G15052_T 345.00 - OPENSKY7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57074	121.2114	CIMARRON - MINCO 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57104	122.5681	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57104	122.8537	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	107.7611	GEN563292 1-G15095_3 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	109.0683	GEN520998 1-MORLND3
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	109.5579	GEN520997 1-MORLND2
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	111.4574	GEN515787 1-OKLA WIND ENERGY CENTER
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	112.1021	GEN520922 1-SLEEPING BEAR
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	113.1141	GEN515365 1-CENT 21 0.7000
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	113.7727	GEN515389 1-TLGWND-WTG1 0.7000
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	114.6664	GEN562023 1-G11_020_3 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	114.6664	GEN562026 1-G11_019_3 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	114.8842	GEN525562 1-TOLK GEN #2 24 KV
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	114.966	GEN525561 1-TOLK GEN #1 24 KV
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	115.013	GEN515393 1-OGEWND2G
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	115.4494	GEN562973 1-G15060_4 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	115.4745	GEN562974 1-G15060_5 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	115.5883	GEN515611 1-NBUFFRG1 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	115.5883	GEN560217 1-G07_062_6 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	115.5883	GEN560218 1-G07_062_7 0.6900
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	117.5578	System Intact
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	119.7373	GEN514806 1-SOONER UNIT 2
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57111	121.1297	GEN514805 1-SOONER UNIT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57124	119.7284	G1524G1525 345.00 - THISTLE7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57124	119.7284	G1524G1525 345.00 - THISTLE7 345.00 345KV CKT 2
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57138	119.5243	CZYCRVT2 69.000 - SALINE 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57138	120.1926	CZYCRVT2 69.000 - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57141	119.6188	G14-057T 345.00 - SUNNYSIDE 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57152	121.3075	G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57152	139.7914	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57169	119.7019	P12:345:SPS:J07.1.FINN.HITCH
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57169	119.7105	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57169	119.7105	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57185	122.7197	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57185	122.7197	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57185	122.7197	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57185	122.7197	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57221	116.1949	FAIRVIEW - OKEENE 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57273	115.6755	IODINE - WOODWARD EHV 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5735	123.1744	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5735	123.7791	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57361	120.526	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57373	120.678	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57389	115.3112	KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57389	115.3131	KNOBHILL - NOEL_SW 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57407	125.904	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5748	120.3099	CUSTER4 138.00 - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5748	120.4212	CUSTER4 138.00 - ELLIS 4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5748	120.9514	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5748	121.6555	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5748	121.6555	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57484	126.7872	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57484	126.961	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57484	127.036	P12:138:WFEC:MSL12
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57484	127.0531	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57549	121.555	BYRON_138 138.00 - SANDY_CN_138138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57549	123.294	BYRON_138 138.00 - C_CITY_138 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57549	123.7002	C_CITY_138 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57549	125.4819	NOEL_SW 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57549	126.3272	P12:138:WFEC:MSL15
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57641	114.8002	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57737	115.6465	DEWEY - TALOGA 138KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57867	126.0279	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57867	126.7836	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57867	127.2471	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57867	127.2753	P12:138:WFEC:MSL14
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58133	114.2514	ALVA - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58609	110.4648	FPL SWITCH - MOORELAND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59358	120.8443	RENFROW4 138.00 - WAKITAS4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59485	119.6412	WOODWARD EHV - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59485	119.6413	WOODWARD - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5992	119.9093	NSAH - WAKITA 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5992	122.2691	NSAH - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5992	124.9981	CLEO JCT - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5992	124.9999	CLEO CORNER - CLEO JCT 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60253	120.9642	ALINETP2 69.000 - ALVA 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60253	121.1172	ALINETP2 69.000 - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60253	121.4699	CLEO CORNER - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	17SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.64096	130.7273	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17SP	G15_048	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133	153	0.03172	106.118	System Intact
FDNS	01ALL	2	17SP	G15_048	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.03172	105.9209	System Intact
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57072	102.5229	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57072	103.2411	G15063_T 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57353	102.0698	CIMARRON - MINCO 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57366	99.8	System Intact
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57366	101.8376	GEN514806 1-SOONER UNIT 2
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57366	103.0932	GEN514805 1-SOONER UNIT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57366	103.4987	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57366	103.6433	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57383	105.4131	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57383	105.4131	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 2
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57388	101.7137	G14-057T 345.00 - LAWTON EASTSIDE 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57388	102.1684	G14-057T 345.00 - SUNNYSIDE 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57399	101.5298	CZYCRVT2 69.000 - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57412	101.7586	P12:345:SPS:J07.1.FINN.HITCH
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57412	101.7689	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57412	101.7689	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57419	103.116	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57419	103.116	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57419	103.116	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57419	103.116	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57592	104.2058	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57592	104.4422	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5763	103.0605	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57643	103.2285	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5769	106.2533	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57728	101.5595	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57728	104.5071	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57728	104.5071	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57757	106.2076	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57757	106.3096	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57757	106.3904	P12:138:WFEC:MSL12
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57757	106.4023	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	103.0929	BYRON_138 138.00 - SANDY_CN_138138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	104.6608	BYRON_138 138.00 - C_CITY_138 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	104.8031	C_CITY_138 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	106.5016	NOEL_SW 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	107.3605	P12:138:WFEC:MSL15
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58106	104.5759	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58106	105.3148	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58106	105.7638	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58106	105.7886	P12:138:WFEC:MSL14
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59643	101.8439	RENFROW4 138.00 - WAKITAS4 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59816	102.4704	WOODWARD - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59816	102.4704	WOODWARD EHV - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60174	103.0025	NSAH - WAKITA 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60174	104.5542	NSAH - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60174	106.076	CLEO JCT - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60174	106.0782	CLEO CORNER - CLEO JCT 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60508	103.0814	ALINETP2 69.000 - ALVA 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60508	103.1299	ALINETP2 69.000 - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60508	103.2252	CLEO CORNER - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.64354	111.005	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNSLock	01ALL	0	20L	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60174	101.6826	WAKITAS4 138.00 (WAKITA_XMER) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.51645	102.0568	IMO TAP - SOUTH 4TH ST 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.53824	114.5495	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56337	105.5519	GLENWOOD - IMO TAP 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56538	105.4713	BRECKNR4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56538	105.811	BLLNGTP4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56782	112.0369	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56782	112.7955	G15063_T 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5692	104.0926	P12:069:OKGE:3TERM4
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56989	102.8213	HUNTERS7 345.00 - RENFROW7 345.00 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56989	103.709	HUNTERS7 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57053	105.2419	G15052_T 345.00 - ROSE HILL 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57053	105.5419	G15052_T 345.00 - OPENSKY7 345.00 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5708	110.3947	CIMARRON - MINCO 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57105	111.9864	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57105	112.5408	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	101.465	GEN515787 1-OKLA WIND ENERGY CENTER
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	101.6199	GEN520998 1-MORLND3
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	101.9572	GEN520997 1-MORLND2
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	102.1131	GEN520922 1-SLEEPING BEAR
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	103.2188	GEN515365 1-CENT 21 0.7000
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	103.8238	GEN515389 1-TLGWND-WTG1 0.7000
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	105.2719	GEN515393 1-OGEWND2G
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	105.3544	GEN562023 1-G11_020_3 0.6900
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	105.3544	GEN562026 1-G11_019_3 0.6900
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	105.3703	GEN520996 1-MORLND1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	105.3807	GEN525562 1-TOLK GEN #2 24 KV
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	105.5438	GEN525561 1-TOLK GEN #1 24 KV
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	107.4428	System Intact
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	109.566	GEN514806 1-SOONER UNIT 2
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57112	110.949	GEN514805 1-SOONER UNIT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57124	112.4822	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57124	112.4822	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 2
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57132	109.6907	CZYCRVT2 69.000 - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5714	109.2779	G14-057T 345.00 - SUNNYSIDE 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57168	111.0563	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57168	111.0563	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57168	111.0563	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57168	111.0563	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5722	106.1114	FAIRVIEW - RINGWOOD JCT 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5722	106.112	EAGLE CHIEF - RINGWOOD JCT 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5722	109.7174	ALVA - CHEROKEE SW 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57337	111.7429	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57337	112.3196	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57373	110.6849	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57386	110.8526	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57399	105.113	KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57404	114.1311	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57476	109.2965	CUSTER4 138.00 - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57476	109.4077	CUSTER4 138.00 - ELLIS 4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57476	109.9308	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57476	110.6278	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57476	110.6278	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57482	115.3974	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57482	115.597	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57482	115.6624	P12:138:WFEC:MSL12
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57482	115.6872	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57552	110.7642	BYRON_138 138.00 - SANDY_CN_138138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57552	112.6037	BYRON_138 138.00 - C_CITY_138 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57552	113.1581	C_CITY_138 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57552	114.7224	NOEL_SW 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57552	115.7095	P12:138:WFEC:MSL15
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57643	104.6609	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57747	105.154	DEWEY - TALOGA 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57856	114.2017	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57856	114.9332	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57856	115.3825	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57856	115.414	P12:138:WFEC:MSL14
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58142	103.4846	ALVA - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58648	100.8458	FPL SWITCH - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59535	110.4733	WOODWARD EHV - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59535	110.4734	WOODWARD - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59919	112.0015	NSAH - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59919	115.651	CLEO CORNER - CLEO JCT 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59919	115.6522	CLEO JCT - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60264	111.3443	ALINETP2 69.000 - ALVA 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60264	111.4954	ALINETP2 69.000 - CLEOTP 2 69.000 69KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.60264	111.8484	CLEO CORNER - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	20SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.64111	122.1299	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.51614	102.8837	IMO TAP - SOUTH 4TH ST 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.53795	113.8293	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56303	108.0748	GLENWOOD - IMO TAP 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56502	107.9966	BRECKNR4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56502	108.2141	BLLNGTP4 138.00 - BUNCH CREEK 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56752	113.2926	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56752	114.0234	G15063_T 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56886	107.4786	P12:069:OKGE:3TERM4
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5696	106.2883	HUNTERS7 345.00 - RENFROW7 345.00 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5696	107.1982	HUNTERS7 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57021	108.1844	G15052_T 345.00 - ROSE HILL 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57041	113.1345	CIMARRON - MINCO 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57069	114.3056	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57069	114.704	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	100.1787	GEN563292 1-G15095_3 0.6900
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	103.8849	GEN515787 1-OKLA WIND ENERGY CENTER
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	104.5154	GEN520922 1-SLEEPING BEAR
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	104.7113	GEN520998 1-MORLND3
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	105.0095	GEN520997 1-MORLND2
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	105.6251	GEN515365 1-CENT 21 0.7000
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	106.206	GEN515389 1-TLGWND-WTG1 0.7000
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	107.6456	GEN515393 1-OGEWND2G
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	107.6724	GEN562023 1-G11_020_3 0.6900
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	107.6724	GEN562026 1-G11_019_3 0.6900
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	107.8893	GEN525562 1-TOLK GEN #2 24 KV
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	108.0279	GEN520996 1-MORLND1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	109.8581	System Intact
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	111.8532	GEN514806 1-SOONER UNIT 2
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57078	113.1185	GEN514805 1-SOONER UNIT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57086	115.9629	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57086	115.9629	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 2
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57096	112.0292	CZYCRVT2 69.000 - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57104	112.1581	G14-057T 345.00 - LAWTON EASTSIDE 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57104	112.6197	G14-057T 345.00 - SUNNYSIDE 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57122	111.9495	P12:345:SPS:J07.1.FINN.HITCH
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57122	111.962	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57122	111.962	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57131	113.6317	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57131	113.6317	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57131	113.6317	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57131	113.6317	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57185	107.8206	FAIRVIEW - OKEENE 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57255	108.0197	IODINE - WOODWARD EHV 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57297	114.891	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57297	115.2584	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57338	112.9877	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57351	113.1472	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57363	117.2643	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57365	107.4299	KNOBHILL (KNOBHIL4) 138/69/13.2KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5744	111.7586	CUSTER4 138.00 - ELLIS 4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5744	112.2837	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5744	112.989	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5744	112.989	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57441	118.246	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57441	118.4454	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57441	118.5102	P12:138:WFEC:MSL12
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57441	118.536	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57513	113.5687	BYRON_138 138.00 - SANDY_CN_138138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57513	115.2886	BYRON_138 138.00 - C_CITY_138 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57513	115.6951	C_CITY_138 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57513	117.2493	NOEL_SW 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57513	118.2849	P12:138:WFEC:MSL15
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57605	107.9055	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57708	107.6729	DEWEY - TALOGA 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	116.5914	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	117.3261	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	117.778	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57819	117.8035	P12:138:WFEC:MSL14
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58107	105.7088	ALVA - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.58608	102.3567	FPL SWITCH - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59314	111.8211	RENFROW4 138.00 - RENFROW4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59314	112.5489	RENFROW4 138.00 - WAKITAS4 138.00 138KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59493	112.339	WOODWARD EHV - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59493	112.3391	WOODWARD - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59883	112.4959	NSAH - WAKITA 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59883	114.5809	NSAH - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59883	117.4501	CLEO JCT - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59883	117.4521	CLEO CORNER - CLEO JCT 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59883	112.3	WAKITAS4 138.00 (WAKITA_XMER) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.6023	113.7719	ALINETP2 69.000 - ALVA 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.6023	113.869	ALINETP2 69.000 - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.6023	114.0931	CLEO CORNER - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	20WP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.64075	123.5758	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.53849	106.2062	WOODRING (WOODRNG2) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56812	101.3108	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.56812	102.0623	G15063_T 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57132	102.8246	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57132	103.3152	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57138	100.9426	GEN514806 1-SOONER UNIT 2
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57138	102.3349	GEN514805 1-SOONER UNIT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57153	102.6389	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57153	102.6389	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 2
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5716	100.6517	CZYCRVT2 69.000 - KNOBHILL 69KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57196	101.2199	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57196	101.2199	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57196	101.2199	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57196	101.2199	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57364	102.6811	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57364	103.2844	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57399	102.3677	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57412	102.5556	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57434	104.0266	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57501	101.4993	CUSTER4 138.00 - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57501	101.6081	CUSTER4 138.00 - ELLIS 4 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57501	102.1258	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57501	102.8149	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57501	102.8149	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5751	105.7207	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5751	105.9128	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5751	105.98	P12:138:WFEC:MSL12
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5751	106.0042	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5758	101.2558	BYRON_138 138.00 - SANDY_CN_138138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5758	103.0187	BYRON_138 138.00 - C_CITY_138 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5758	103.5168	C_CITY_138 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5758	105.0668	NOEL_SW 138.00 - SALT_PLAINS 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.5758	106.1181	P12:138:WFEC:MSL15
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57879	107.2816	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57879	108.021	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57879	108.471	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.57879	108.494	P12:138:WFEC:MSL14
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59557	104.4209	WOODWARD - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59557	104.4209	WOODWARD EHV - WWPAR4 138.00 138KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59947	102.7512	NSAH - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59947	106.0634	CLEO JCT - RINGWOOD 69KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.59947	106.0657	CLEO CORNER - CLEO JCT 69KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.6029	102.6822	ALINETP2 69.000 - ALVA 69KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.6029	102.8403	ALINETP2 69.000 - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.6029	103.2162	CLEO CORNER - CLEOTP 2 69.000 69KV CKT 1
FDNS	01ALL	0	25SP	G15_048	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.64137	112.5653	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	08ALL	0	17G	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05558	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05558	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05558	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05462	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05462	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05462	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05462	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05462	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05462	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.04002	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.04002	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04002	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04002	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04002	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04002	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05424	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05424	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	08ALL	2	20SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05424	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05424	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05424	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05424	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05515	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05515	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05515	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05515	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05516	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_052	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05516	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	09ALL	0	17SP	G15_053	FROM->TO	PETERSBRG.N7115.00 - PETERSBURG 115KV CKT Z1	137	137	0.22059	101.715	ANTELOPE 3345.00 - HOSKINS 345KV CKT 1
FDNS	09ALL	0	17SP	G15_053	FROM->TO	PETERSBRG.N7115.00 - PETERSBURG 115KV CKT Z1	137	137	0.22059	101.7543	ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1
FDNS	09ALL	2	17SP	G15_053	FROM->TO	PETERSBRG.N7115.00 - PETERSBURG 115KV CKT Z1	137	137	0.2192	102.2592	ANTELOPE 3345.00 - HOSKINS 345KV CKT 1
FDNS	09ALL	2	17SP	G15_053	FROM->TO	PETERSBRG.N7115.00 - PETERSBURG 115KV CKT Z1	137	137	0.2192	102.2948	ANTELOPE 3345.00 (ANTELOPE T1) 345/115/13.8KV TRANSFORMER CKT 1
FDNS	07ALL	0	25SP	G15_055	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.13275	120.2549	System Intact
FDNS	07ALL	0	25SP	G15_055	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.25266	106.1201	CHISHOLM7 345.00 () 345/230/13.2KV TRANSFORMER CKT 1
FDNS	07ALL	0	25SP	G15_055	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.25266	127.0248	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
FDNS	07ALL	0	25SP	G15_055	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.13275	118.7492	System Intact
FDNS	07ALL	0	25SP	G15_055	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.25266	114.6098	CHISHOLM7 345.00 () 345/230/13.2KV TRANSFORMER CKT 1
FDNS	07ALL	0	25SP	G15_055	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.25266	137.1842	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
FDNS	07ALL	0	25SP	G15_055	TO->FROM	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.21098	99.5	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	1792	1972	0.18592	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	1792	1792	0.18592	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	1022	1124	0.24703	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	1022	1124	0.24703	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	987.2	1082.8	0.19041	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	987.16	1082.77	0.15487	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	956.09	1051.7	0.15487	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	560	560	0.19041	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	435.02	457.73	0.1159	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	439	439	0.1159	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	439	439	0.1159	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_056		Non-Converged Contingency	329.05	360.92	0.09446	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.41078	101.7566	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.41078	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.30302	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41078	110.605	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41078	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.30302	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_056	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.09803	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_056	FROM->TO	BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1	329.05	360.92	0.20477	100.1938	NEWHART 230 - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	16WP	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.09446	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_056		Non-Converged Contingency	0	0	0.14927	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_056		Non-Converged Contingency	0	0	0.22362	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39833	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39833	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.39833	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.39833	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29525	102.5642	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29525	105.1317	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29525	102.5642	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29525	105.1317	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	3	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29527	102.7136	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29527	105.0661	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29527	102.7136	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29527	105.0661	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29527	102.6492	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29527	105.032	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29527	102.6492	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.29527	105.032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_056	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.11181	113.2775	System Intact
FDNS	06ALL	0	17G	G15_056	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.11181	111.4968	System Intact
FDNS	06ALL	0	17G	G15_056	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.09458	117.5205	System Intact
FDNS	06ALL	0	17G	G15_056	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.11181	103.2013	System Intact
FDNS	06ALL	0	17G	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.0912	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_056		Non-Converged Contingency	1792	1792	0.18555	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_056		Non-Converged Contingency	956	1042	0.24532	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_056		Non-Converged Contingency	956	1042	0.24532	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.09247	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	1792	1972	0.17431	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	1792	1972	0.17431	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	1792	1792	0.17431	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	1022	1124	0.21303	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	1022	1124	0.21303	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	956.1	1051.7	0.14655	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	956.1	1051.7	0.14655	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	956.09	1051.7	0.12381	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	956.09	1051.7	0.12381	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	560	560	0.14655	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	560	560	0.14655	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	421	439	0.08039	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	348.58	381.24	0.08039	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	353	353	0.08039	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	318.7	350.57	0.06526	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	318.7	350.57	0.06526	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	0	0	0.10877	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	0	0	0.16078	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_056		Non-Converged Contingency	0	0	0.2318	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.26832	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.26832	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20L	G15_056	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.08039	109.5807	System Intact
FDNS	06ALL	0	20L	G15_056	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.08039	107.8845	System Intact
FDNS	06ALL	0	20L	G15_056	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.06797	112.5437	System Intact
FDNS	06ALL	0	20L	G15_056	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.08039	105.6208	System Intact
FDNS	06ALL	0	20L	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.06526	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_056		Non-Converged Contingency	1792	1792	0.20168	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_056		Non-Converged Contingency	956	1042	0.25041	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_056	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	318.7	350.6	0.19576	102.0399	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	20SP	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08364	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	1792	1972	0.19765	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	1792	1792	0.19765	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	1022	1124	0.24498	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	1022	1124	0.24498	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	987.2	1082.8	0.17517	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	987.16	1082.77	0.14474	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	560	560	0.17517	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	435.02	457.73	0.09908	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	439	439	0.09908	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	421	439	0.09908	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_056		Non-Converged Contingency	329.05	360.92	0.08091	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29926	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29926	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29926	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29926	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.29927	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.23072	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.23072	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.23072	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.23072	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29926	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29926	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29926	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29926	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_056	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.29927	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_056	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20467	106.5608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_056	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20467	106.5608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_056	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20467	107.9608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_056	FROM->TO	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.20467	107.9608	HITCHLAND INTERCHANGE - MOORE COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	20WP	G15_056	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.08384	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_056	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.09908	105.3667	System Intact
FDNS	06ALL	0	20WP	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.08091	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.06446	100.0	System Intact
FDNS	06ALL	3	20WP	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.06447	99.9	System Intact
FDNS	06ALL	4	20WP	G15_056	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.06447	100.0	System Intact
FDNS	01ALL	3	16WP	G15_057	FROM->TO	CIMARRON - DRAPER LAKE 345KV CKT 1	717.0	717.0	0.20083	103.6296	GRACEMONT - MINCO 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	1792	1972	0.18908	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	1792	1792	0.18908	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	1022	1124	0.2503	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	1022	1124	0.2503	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	987.2	1082.8	0.1878	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	987.16	1082.77	0.15378	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	956.09	1051.7	0.15378	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	560	560	0.1878	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	435.02	457.73	0.11436	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	439	439	0.11436	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	439	439	0.11436	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_058		Non-Converged Contingency	329.05	360.92	0.0932	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.41688	101.7566	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.41688	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.24161	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41688	110.605	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41688	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.24161	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_058	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.09673	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_058	FROM->TO	BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1	329.05	360.92	0.19992	100.1938	NEWHART 230 - POTTER COUNTY INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	16WP	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.0932	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_058		Non-Converged Contingency	0	0	0.14732	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_058		Non-Converged Contingency	0	0	0.22054	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.40443	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.40443	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40443	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40443	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.23385	102.5642	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.23385	105.1317	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.23385	102.5642	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.23385	105.1317	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.23387	102.7136	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.23387	105.0661	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.23387	102.7136	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.23387	105.0661	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.23387	102.6492	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.23387	105.032	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.23387	102.6492	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.23387	105.032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_058	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.11027	113.2775	System Intact
FDNS	06ALL	0	17G	G15_058	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.11027	111.4968	System Intact
FDNS	06ALL	0	17G	G15_058	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.09328	117.5205	System Intact
FDNS	06ALL	0	17G	G15_058	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.11027	103.2013	System Intact
FDNS	06ALL	0	17G	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08994	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_058		Non-Converged Contingency	1792	1792	0.18915	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_058		Non-Converged Contingency	956	1042	0.24905	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_058		Non-Converged Contingency	956	1042	0.24905	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.09104	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	1792	1972	0.18555	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	1792	1972	0.18555	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	1792	1792	0.18555	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	1022	1124	0.22482	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	1022	1124	0.22482	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	956.1	1051.7	0.1373	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	956.1	1051.7	0.1373	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	956.09	1051.7	0.11985	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	956.09	1051.7	0.11985	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	560	560	0.1373	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	560	560	0.1373	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	421	439	0.07488	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	348.58	381.24	0.07488	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	353	353	0.07488	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	318.7	350.57	0.06074	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	318.7	350.57	0.06074	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	0	0	0.1017	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	0	0	0.14975	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_058		Non-Converged Contingency	0	0	0.22438	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19688	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.19688	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20L	G15_058	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.07488	109.5807	System Intact
FDNS	06ALL	0	20L	G15_058	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.07488	107.8845	System Intact
FDNS	06ALL	0	20L	G15_058	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.0633	112.5437	System Intact
FDNS	06ALL	0	20L	G15_058	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.07488	105.6208	System Intact
FDNS	06ALL	0	20L	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.06074	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_058		Non-Converged Contingency	1792	1792	0.21293	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_058		Non-Converged Contingency	956	1042	0.2622	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.07912	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	1792	1972	0.20889	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	1792	1792	0.20889	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	1022	1124	0.25677	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	1022	1124	0.25677	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	987.2	1082.8	0.16592	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	987.16	1082.77	0.14078	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	560	560	0.16592	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	435.02	457.73	0.09357	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	439	439	0.09357	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	421	439	0.09357	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_058		Non-Converged Contingency	329.05	360.92	0.07639	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22782	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22782	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22782	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22782	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.22784	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22782	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22782	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22782	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22782	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_058	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.22784	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_058	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.07917	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_058	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.09357	105.3667	System Intact
FDNS	06ALL	0	20WP	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.07639	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05869	100.0	System Intact
FDNS	06ALL	3	20WP	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05869	99.9	System Intact
FDNS	06ALL	4	20WP	G15_058	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05869	100.0	System Intact
FDNS	01ALL	3	16WP	G15_059	FROM->TO	CIMARRON - DRAPER LAKE 345KV CKT 1	717.0	717.0	0.20083	103.6296	GRACEMONT - MINCO 345KV CKT 1
FDNS	01ALL	0	16WP	G15_060	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.03259	117.8972	System Intact
FDNS	01ALL	0	17G	G15_060	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.02986	114.036	System Intact
FDNS	01ALL	0	17G	G15_060	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.03342	111.7985	System Intact
FDNS	01ALL	0	17G	G15_060	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.02986	108.0387	System Intact
FDNS	01ALL	0	17G	G15_060	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133	153	0.0492	106.4715	System Intact
FDNS	01ALL	2	17G	G15_060	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.04916	106.284	System Intact
FDNS	01ALL	0	17SP	G15_060	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.02954	120.4845	System Intact
FDNS	01ALL	0	17SP	G15_060	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.03264	117.5578	System Intact
FDNS	01ALL	0	17SP	G15_060	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.02954	113.4116	System Intact
FDNS	01ALL	0	17SP	G15_060	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133	153	0.04876	106.118	System Intact
FDNS	01ALL	2	17SP	G15_060	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.04871	105.9209	System Intact
FDNS	01ALL	0	20L	G15_060	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.03157	99.8	System Intact
FDNS	01ALL	0	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1	493	493	0.74734	99.5	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493	493	0.75077	99.6	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493	493	0.75077	100	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	2	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.75051	99.7	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	3	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.75051	99.7	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	4	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1	493.0	493.0	0.75560	102.6172	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	4	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1	493.0	493.0	0.75560	103.523	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	4	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.75915	103.0825	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	4	25SP	G15_060	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.75915	103.9633	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.19572	100.2451	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.1998	100.2015	MORISNT4 138.00 - STILLWATER 138KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20084	100.1579	P12:138:OKGE:3TERM2
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20362	121.8649	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20362	121.9421	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20789	103.2273	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20789	103.2273	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21303	104.9344	G15066_T 345.00 - SOONER 345KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21303	109.3441	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.24216	114.4247	VIOLA 7 345.00 - WICHITA 345KV CKT 1
FDNS	08ALL	0	17G	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20554	117.7802	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20554	117.8392	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20938	100.7373	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17G	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21446	102.5154	G15066_T 345.00 - SOONER 345KV CKT 1
FDNS	08ALL	0	17G	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21446	106.8931	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	17G	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.2423	111.9483	VIOLA 7 345.00 - WICHITA 345KV CKT 1
FDNS	08ALL	0	17G	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03817	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03817	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03817	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20815	117.3912	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20885	109.8071	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21554	101.0864	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	17SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.24659	104.6493	VIOLA 7 345.00 - WICHITA 345KV CKT 1
FDNS	08ALL	0	17SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03722	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03722	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03722	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03722	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03722	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03722	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21043	104.7146	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03629	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03629	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03629	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03629	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03629	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03629	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20727	109.6471	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20727	109.7423	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20WP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21465	100.5721	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	2	25SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	1192.0	1192.0	0.20888	100.4184	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	3	25SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	1192.0	1192.0	0.20883	100.0	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20888	125.2078	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.20956	117.6504	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_062	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.21607	103.7341	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	25SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0372	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0372	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03720	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03720	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03721	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_062	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03721	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.55814	100.2329	G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.55814	105.5175	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.56499	121.8649	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.56499	121.9421	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.58501	100.2015	MORISNT4 138.00 - STILLWATER 138KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.58517	100.1579	P12:138:OKGE:3TERM2
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.5857	100.2451	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.59663	103.2273	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.59663	103.2273	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.60318	104.9344	G15066_T 345.00 - SOONER 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.60318	109.3441	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.63105	114.4247	VIOLA 7 345.00 - WICHITA 345KV CKT 1
FDNS	08ALL	0	17G	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.56087	101.6025	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	08ALL	0	17G	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.5669	117.7802	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.5669	117.8392	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.59812	100.7373	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17G	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.60461	102.5154	G15066_T 345.00 - SOONER 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	08ALL	0	17G	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.60461	106.8931	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	17G	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.63119	111.9483	VIOLA 7 345.00 - WICHITA 345KV CKT 1
FDNS	08ALL	0	17G	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.04596	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04596	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04596	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.56956	117.3912	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.57027	109.8071	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.60571	101.0864	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	17SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.63549	104.6493	VIOLA 7 345.00 - WICHITA 345KV CKT 1
FDNS	08ALL	0	17SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.045	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.045	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04500	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04500	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04500	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04500	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.55933	113.2171	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20L	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.55933	113.352	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20L	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.58876	102.3948	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.58876	102.3948	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.59298	104.9767	G15066_T 345.00 - SOONER 345KV CKT 1
FDNS	08ALL	0	20L	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.59298	109.5415	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	20SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.58287	104.7146	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.04345	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.04345	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04345	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04345	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04345	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04345	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.57971	109.6471	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.57971	109.7423	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	20WP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.61265	100.5721	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	2	25SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	1192.0	1192.0	0.58159	100.4184	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	3	25SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	1192.0	1192.0	0.58155	100.0	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.58159	125.2078	NORTHWEST - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.58228	117.6504	SOONER - SPRING CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_063	FROM->TO	G15063_T 345.00 - MATHWSN7 345.00 345KV CKT 1	956	956	0.61435	103.7341	CLEVELAND - G15066_T 345.00 345KV CKT 1
FDNS	08ALL	0	25SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.04432	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.04432	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04432	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04432	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04433	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_063	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.04433	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17G	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.15397	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15397	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15397	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.15302	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.15302	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15302	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15302	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15302	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15302	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_066	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174	174	0.05612	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_066	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174	174	0.05612	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_066	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.05612	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_066	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.05612	118.7603	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_066	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.05612	118.4937	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_066	FROM->TO	CLEAVELAND - SILVER CITY 138KV CKT 1	174.0	174.0	0.05612	118.4937	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.13812	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.13812	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.13812	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.13812	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.13812	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.13812	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.15234	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.15234	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15234	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15234	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15234	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15234	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.15325	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.15325	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15325	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15325	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15326	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	08ALL	3	25SP	G15_066	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.15326	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17G	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05507	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05507	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05507	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05412	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05412	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05412	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05412	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05412	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05412	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03948	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20L	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03948	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03948	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20L	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03948	120.3301	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03948	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20L	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03948	120.1206	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0537	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.0537	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05370	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05370	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05370	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05370	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05462	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.05462	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05462	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05462	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05463	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_067	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.05463	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	1792	1972	0.26284	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	1792	1792	0.26284	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	1022	1124	0.32673	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	1022	1124	0.32673	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	987.2	1082.8	0.12803	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	987.16	1082.77	0.12845	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	956.09	1051.7	0.12845	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	560	560	0.12803	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	435.02	457.73	0.07778	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	439	439	0.07778	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	439	439	0.07778	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_068		Non-Converged Contingency	329.05	360.92	0.06326	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	16WP	G15_068	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.06577	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.06326	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_068		Non-Converged Contingency	0	0	0.10064	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_068		Non-Converged Contingency	0	0	0.14737	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_068	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.07369	113.2775	System Intact
FDNS	06ALL	0	17G	G15_068	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.07369	111.4968	System Intact
FDNS	06ALL	0	17G	G15_068	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.06232	117.5205	System Intact
FDNS	06ALL	0	17G	G15_068	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.07369	103.2013	System Intact
FDNS	06ALL	0	17G	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.06	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_068		Non-Converged Contingency	1792	1792	0.26025	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_068		Non-Converged Contingency	956	1042	0.3228	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_068		Non-Converged Contingency	956	1042	0.3228	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.06227	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	1792	1972	0.22992	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	1792	1972	0.22992	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	1792	1792	0.22992	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	1022	1124	0.27138	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	1022	1124	0.27138	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	956.1	1051.7	0.10099	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	956.1	1051.7	0.10099	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	956.09	1051.7	0.10426	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	956.09	1051.7	0.10426	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	560	560	0.10099	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	560	560	0.10099	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	421	439	0.05298	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	348.58	381.24	0.05298	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	353	353	0.05298	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	318.7	350.57	0.04283	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	318.7	350.57	0.04283	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	0	0	0.07365	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	0	0	0.10597	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_068		Non-Converged Contingency	0	0	0.19515	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	0	20L	G15_068	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.05298	109.5807	System Intact
FDNS	06ALL	0	20L	G15_068	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.05298	107.8845	System Intact

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	0	20L	G15_068	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.04478	112.5437	System Intact
FDNS	06ALL	0	20L	G15_068	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.05298	105.6208	System Intact
FDNS	06ALL	0	20L	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.04283	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_068		Non-Converged Contingency	1792	1792	0.25731	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_068		Non-Converged Contingency	956	1042	0.30877	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.0612	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	1792	1972	0.25327	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	1792	1792	0.25327	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	1022	1124	0.30334	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	1022	1124	0.30334	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	987.2	1082.8	0.1296	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	987.16	1082.77	0.12518	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	560	560	0.1296	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	435.02	457.73	0.07167	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	439	439	0.07167	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	421	439	0.07167	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_068		Non-Converged Contingency	329.05	360.92	0.05847	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	20WP	G15_068	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.06064	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_068	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.07167	105.3667	System Intact
FDNS	06ALL	0	20WP	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05847	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.03577	100.0	System Intact
FDNS	06ALL	3	20WP	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.03577	99.9	System Intact
FDNS	06ALL	4	20WP	G15_068	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.03577	100.0	System Intact
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.29988	100	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.29988	100	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.29988	101.6287	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.29988	101.6287	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.29988	100	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.29988	100	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.29988	101.6287	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	0	0	25SP	G15_068	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.29988	101.6287	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	08ALL	0	16WP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.19846	103.8355	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.24081	102.9837	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	16WP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.25703	105.4782	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	17G	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.23354	108.0148	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	17G	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.2491	111.817	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.23285	118.6866	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	17SP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.24824	121.2614	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	20SP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.23138	107.8953	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	20SP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.24702	109.3373	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	20WP	G15_069	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.25093	101.1626	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.16629	120.2549	System Intact
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.19885	114.6045	GRACEMONT - MINCO 345KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.19885	117.6017	CIMARRON - MINCO 345KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.2225	112.0392	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.2225	112.0392	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.2225	112.0471	CHISHOLM6 230.00 - ELK CITY 230KV 230KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.41266	127.0248	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.16629	118.7492	System Intact
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.19885	123.7728	GRACEMONT - MINCO 345KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.19885	127.0096	CIMARRON - MINCO 345KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.2225	121.0015	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.2225	121.0015	ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.2225	121.0101	CHISHOLM6 230.00 - ELK CITY 230KV 230KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.41266	137.1842	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
FDNS	07ALL	0	25SP	G15_071	TO->FROM	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.3437	99.5	CHISHOLM7 345.00 - GRACEMONT 345KV CKT 1
FDNS	08ALL	0	16WP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.30317	103.8355	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	16WP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.3372	102.9837	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	16WP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.35274	105.4782	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	16WP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.40618	100.1228	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	17G	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.29731	107.0623	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	17G	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.32992	108.0148	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	17G	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.34481	111.817	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08NR	0	17G	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717.0	717.0	0.08663	100.7418	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.29527	111.8642	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	17SP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.32883	118.6866	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	17SP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.34359	121.2614	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.37494	108.005	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	17SP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.39953	107.1159	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	17SP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.40387	119.2027	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	20SP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.29349	101.3957	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	20SP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.32768	107.8953	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	20SP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.34276	109.3373	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	20SP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.3742	101.3698	LACYGNE - WAVERLY7 345.00 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	08ALL	0	20SP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.39913	100	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	20SP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.40351	111.7784	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNS	08ALL	0	20WP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.29681	100.5666	LACYGNE - WAVERLY7 345.00 345KV CKT 1
FDNS	08ALL	0	20WP	G15_073	FROM->TO	SWISSVALE - WEST GARDNER 345KV CKT 1	717	717	0.34667	101.1626	HOYT - STRANGER CREEK 345KV CKT 1
FDNS	08ALL	0	25SP	G15_073	FROM->TO	EMPORIA ENERGY CENTER - SWISSVALE 345KV CKT 1	717	717	0.40405	102.547	HOYT - JEFFREY ENERGY CENTER 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	1792	1972	0.22163	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	1792	1792	0.22163	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	1022	1124	0.28398	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	1022	1124	0.28398	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	987.2	1082.8	0.16101	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	987.16	1082.77	0.14253	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	956.09	1051.7	0.14253	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	560	560	0.16101	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	435.02	457.73	0.09848	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	439	439	0.09848	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	439	439	0.09848	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_075		Non-Converged Contingency	329.05	360.92	0.08021	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	0	0	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE - LP-DOUD_TP 3115.00 115KV CKT 1	165	177	0.24869	100.2975	LUBBOCK SOUTH INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	0	0	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE - LP-DOUD_TP 3115.00 115KV CKT 1	165	177	0.24869	100.2975	LUBBOCK SOUTH INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	00	2	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE - LP-DOUD_TP 3115.00 115KV CKT 1	165.0	177.0	0.24870	100.2966	LUBBOCK SOUTH INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	00	2	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE - LP-DOUD_TP 3115.00 115KV CKT 1	165.0	177.0	0.24870	100.2966	LUBBOCK SOUTH INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.47972	101.7566	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.47972	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	107.868	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	109.6833	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	108.0801	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	109.7267	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	107.7709	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.48319	109.5653	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.47972	110.605	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.47972	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	117.2478	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	119.2209	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	117.4783	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	119.2681	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	117.1423	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	16WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.48319	119.0927	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_075	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.08329	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	106.1556	System Intact
FDNS	06ALL	0	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	107.7303	System Intact
FDNS	06ALL	2	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	106.3056	System Intact
FDNS	06ALL	2	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	108.0994	System Intact
FDNS	06ALL	3	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	106.3201	System Intact
FDNS	06ALL	3	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	108.1331	System Intact
FDNS	06ALL	4	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	106.3084	System Intact
FDNS	06ALL	4	16WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	108.106	System Intact
FDNS	06ALL	0	16WP	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.08021	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_075		Non-Converged Contingency	0	0	0.12707	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_075		Non-Converged Contingency	0	0	0.18877	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.46727	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.46727	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.46727	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.46727	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47543	102.5642	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47543	105.1317	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.47543	102.5642	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.47543	105.1317	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47545	102.7136	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47545	105.0661	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.47545	102.7136	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.47545	105.0661	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47545	102.6492	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	4	17G	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47545	105.032	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.47545	102.6492	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	17G	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.47545	105.032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_075	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.09439	113.2775	System Intact
FDNS	06ALL	0	17G	G15_075	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.09439	111.4968	System Intact
FDNS	06ALL	0	17G	G15_075	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.07984	117.5205	System Intact
FDNS	06ALL	0	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	102.1212	System Intact
FDNS	06ALL	0	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	103.7811	System Intact
FDNS	06ALL	2	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	102.3166	System Intact
FDNS	06ALL	2	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	104.2107	System Intact
FDNS	06ALL	3	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	102.3366	System Intact
FDNS	06ALL	3	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	104.2526	System Intact
FDNS	06ALL	4	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	102.3352	System Intact
FDNS	06ALL	4	17G	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	104.2498	System Intact
FDNS	06ALL	0	17G	G15_075	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.09439	103.2013	System Intact
FDNS	06ALL	0	17G	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.07695	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_075		Non-Converged Contingency	1792	1792	0.21905	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_075		Non-Converged Contingency	956	1042	0.28002	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_075		Non-Converged Contingency	956	1042	0.28002	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	99.7	System Intact
FDNS	06ALL	2	17SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	99.6	System Intact
FDNS	06ALL	3	17SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	99.6	System Intact
FDNS	06ALL	4	17SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	99.5	System Intact
FDNS	06ALL	0	17SP	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.07915	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	1792	1972	0.19848	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	1792	1972	0.19848	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	1792	1792	0.19848	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	1022	1124	0.23834	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	1022	1124	0.23834	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	956.1	1051.7	0.12634	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	956.1	1051.7	0.12634	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	956.09	1051.7	0.11524	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	956.09	1051.7	0.11524	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	560	560	0.12634	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	560	560	0.12634	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	421	439	0.06875	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	348.58	381.24	0.06875	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	353	353	0.06875	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	318.7	350.57	0.05574	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	318.7	350.57	0.05574	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	0	0	0.09386	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	0	0	0.13749	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_075		Non-Converged Contingency	0	0	0.21574	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	124.5568	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	126.1974	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	124.5568	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	126.1974	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	124.7887	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	126.2595	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	124.7887	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	126.2595	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	124.5715	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.44099	126.1329	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	124.5715	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20L	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560.0	644.0	0.44099	126.1329	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20L	G15_075	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.06875	109.5807	System Intact
FDNS	06ALL	0	20L	G15_075	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.06875	107.8845	System Intact
FDNS	06ALL	0	20L	G15_075	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.05812	112.5437	System Intact
FDNS	06ALL	0	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	109.7696	System Intact
FDNS	06ALL	0	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	111.692	System Intact
FDNS	06ALL	2	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	109.8168	System Intact
FDNS	06ALL	2	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	111.8092	System Intact

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	3	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	109.8264	System Intact
FDNS	06ALL	3	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	111.8326	System Intact
FDNS	06ALL	4	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	109.8223	System Intact
FDNS	06ALL	4	20L	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	111.8225	System Intact
FDNS	06ALL	0	20L	G15_075	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.06875	105.6208	System Intact
FDNS	06ALL	0	20L	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.05574	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_075		Non-Converged Contingency	1792	1792	0.22582	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_075		Non-Converged Contingency	956	1042	0.27569	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	99.6	System Intact
FDNS	06ALL	2	20SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	99.7	System Intact
FDNS	06ALL	3	20SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	99.6	System Intact
FDNS	06ALL	4	20SP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	99.6	System Intact
FDNS	06ALL	0	20SP	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.07413	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	1792	1972	0.22178	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	1792	1792	0.22178	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	1022	1124	0.27026	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	1022	1124	0.27026	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	987.2	1082.8	0.15498	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	987.16	1082.77	0.13618	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	560	560	0.15498	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	435.02	457.73	0.08746	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	439	439	0.08746	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	421	439	0.08746	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_075		Non-Converged Contingency	329.05	360.92	0.0714	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47182	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47182	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47182	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47182	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.47183	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39595	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39595	103.3651	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39595	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.39595	107.5535	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47182	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47182	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47182	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47182	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_075	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.47183	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_075	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.074	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	105.7037	System Intact
FDNS	06ALL	0	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1	107.6194	System Intact
FDNS	06ALL	2	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	105.7468	System Intact
FDNS	06ALL	2	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	107.7169	System Intact
FDNS	06ALL	3	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	105.7597	System Intact
FDNS	06ALL	3	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	107.7458	System Intact
FDNS	06ALL	4	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	105.7537	System Intact
FDNS	06ALL	4	20WP	G15_075	FROM->TO	CARLISLE INTERCHANGE (WH RLP38371) 115/69/13.2KV TRANSFORMER CKT 1	44.37	44.4	1.00000	107.7325	System Intact
FDNS	06ALL	0	20WP	G15_075	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.08746	105.3667	System Intact
FDNS	06ALL	0	20WP	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.0714	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05227	100.0	System Intact
FDNS	06ALL	3	20WP	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05228	99.9	System Intact
FDNS	06ALL	4	20WP	G15_075	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05228	100.0	System Intact
FDNS	09ALL	0	16WP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21653	106.426	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	2	16WP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21678	106.5505	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	0	17G	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21542	103.2626	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	2	17G	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21567	103.673	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.20497	103.1197	SIOUX CITY - TWIN CHURCH 230KV CKT 1
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	100.2637	BERSFORD - SIOUX FALLS 115KV CKT 1
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	107.5992	BERSFORD - MANNING 115KV CKT 1
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	111.0021	MANNING - SPIRIT MOUND 115KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	118.2407	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21237	100.7949	BLOOMFIELD - CREIGHTON 115KV CKT 1
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.25751	102.1569	BELDEN - TWIN CHURCH 115KV CKT 1
FDNS	09ALL	0	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.30216	102.5652	BELDEN - HOSKINS 115KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.20497	103.1197	SIOUX CITY - TWIN CHURCH 230KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	100.2637	BERSFORD - SIOUX FALLS 115KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	107.5992	BERSFORD - MANNING 115KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	111.0021	MANNING - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21135	118.2407	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21237	100.7949	BLOOMFIELD - CREIGHTON 115KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.25751	102.1569	BELDEN - TWIN CHURCH 115KV CKT 1
FDNS	09ALL	2	20L	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.30216	102.5653	BELDEN - HOSKINS 115KV CKT 1
FDNS	09ALL	0	20SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2157	100.5815	BERSFORD - MANNING 115KV CKT 1
FDNS	09ALL	0	20SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2157	105.1321	MANNING - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	0	20SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21776	105.854	BLOOMFIELD - CREIGHTON 115KV CKT 1
FDNS	09ALL	2	20SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2157	100.5815	BERSFORD - MANNING 115KV CKT 1
FDNS	09ALL	2	20SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2157	105.1321	MANNING - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	2	20SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21776	105.854	BLOOMFIELD - CREIGHTON 115KV CKT 1
FDNS	09ALL	0	20WP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21687	107.5067	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	2	20WP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.21687	107.5067	GAVINS POINT - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	0	25SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2157	103.8743	MANNING - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	0	25SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2178	106.1762	BLOOMFIELD - CREIGHTON 115KV CKT 1
FDNS	09ALL	2	25SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2157	103.8743	MANNING - SPIRIT MOUND 115KV CKT 1
FDNS	09ALL	2	25SP	G15_076	FROM->TO	GAVINS POINT - YANKON JCT 115KV CKT 1	120	120	0.2178	106.1762	BLOOMFIELD - CREIGHTON 115KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	1792	1972	0.19306	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	1792	1792	0.19306	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	1022	1124	0.25442	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	1022	1124	0.25442	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	987.2	1082.8	0.18453	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	987.16	1082.77	0.1524	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	956.09	1051.7	0.1524	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	560	560	0.18453	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	435.02	457.73	0.11242	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	439	439	0.11242	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	439	439	0.11242	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_079		Non-Converged Contingency	329.05	360.92	0.09161	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	16WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.42456	101.7566	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.42456	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.42456	110.605	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.42456	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_079	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.09509	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.09161	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_079		Non-Converged Contingency	0	0	0.14484	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_079		Non-Converged Contingency	0	0	0.21666	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41211	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41211	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41211	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41211	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_079	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.10833	113.2775	System Intact
FDNS	06ALL	0	17G	G15_079	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.10833	111.4968	System Intact
FDNS	06ALL	0	17G	G15_079	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.09164	117.5205	System Intact
FDNS	06ALL	0	17G	G15_079	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.10833	103.2013	System Intact
FDNS	06ALL	0	17G	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08835	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_079		Non-Converged Contingency	1792	1792	0.19362	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_079		Non-Converged Contingency	956	1042	0.25368	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_079		Non-Converged Contingency	956	1042	0.25368	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08926	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	1792	1972	0.19277	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	1792	1972	0.19277	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	1792	1792	0.19277	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	1022	1124	0.23239	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	1022	1124	0.23239	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	956.1	1051.7	0.13135	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	956.1	1051.7	0.13135	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	956.09	1051.7	0.11731	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	956.09	1051.7	0.11731	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	560	560	0.13135	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	560	560	0.13135	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	421	439	0.07134	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	348.58	381.24	0.07134	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	353	353	0.07134	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	318.7	350.57	0.05785	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	318.7	350.57	0.05785	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	0	0	0.09717	-	P12:230:AEPW:ELKCITY6:SWEETWT6

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	0	0	0.14268	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_079		Non-Converged Contingency	0	0	0.21961	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	0	20L	G15_079	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.07134	109.5807	System Intact
FDNS	06ALL	0	20L	G15_079	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.07134	107.8845	System Intact
FDNS	06ALL	0	20L	G15_079	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.06031	112.5437	System Intact
FDNS	06ALL	0	20L	G15_079	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.07134	105.6208	System Intact
FDNS	06ALL	0	20L	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.05785	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_079		Non-Converged Contingency	1792	1792	0.22015	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_079		Non-Converged Contingency	956	1042	0.26977	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.07623	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	1792	1972	0.21611	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	1792	1792	0.21611	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	1022	1124	0.26434	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	1022	1124	0.26434	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	987.2	1082.8	0.15997	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	987.16	1082.77	0.13823	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	560	560	0.15997	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	435.02	457.73	0.09003	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	439	439	0.09003	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	421	439	0.09003	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_079		Non-Converged Contingency	329.05	360.92	0.0735	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_079	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_079	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.07618	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_079	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.09003	105.3667	System Intact
FDNS	06ALL	0	20WP	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.0735	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05498	100.0	System Intact
FDNS	06ALL	3	20WP	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05499	99.9	System Intact
FDNS	06ALL	4	20WP	G15_079	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05499	100.0	System Intact
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	1792	1972	0.19306	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	1792	1792	0.19306	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	1022	1124	0.25442	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	1022	1124	0.25442	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	987.2	1082.8	0.18453	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	987.16	1082.77	0.1524	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	956.09	1051.7	0.1524	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	560	560	0.18453	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	435.02	457.73	0.11242	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	439	439	0.11242	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	439	439	0.11242	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	16WP	G15_080		Non-Converged Contingency	329.05	360.92	0.09161	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	0	16WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.42456	101.7566	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616	700	0.42456	106.3032	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	16WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.42456	110.605	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.42456	115.547	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	16WP	G15_080	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.09509	105.8464	System Intact
FDNS	06ALL	0	16WP	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.09161	119.5011	System Intact
FDNSLock-Blown up	06ALL	0	17G	G15_080		Non-Converged Contingency	0	0	0.14484	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	17G	G15_080		Non-Converged Contingency	0	0	0.21666	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNS	06ALL	0	17G	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41211	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	644	0.41211	100.1714	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	17G	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41211	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	0	17G	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41211	100.1713	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	17G	G15_080	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.10833	113.2775	System Intact
FDNS	06ALL	0	17G	G15_080	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.10833	111.4968	System Intact
FDNS	06ALL	0	17G	G15_080	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.09164	117.5205	System Intact
FDNS	06ALL	0	17G	G15_080	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	439	439	0.10833	103.2013	System Intact
FDNS	06ALL	0	17G	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08835	130.5235	System Intact
FDNSLock-Blown up	06ALL	0	17SP	G15_080		Non-Converged Contingency	1792	1792	0.19362	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_080		Non-Converged Contingency	956	1042	0.25368	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	17SP	G15_080		Non-Converged Contingency	956	1042	0.25368	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	17SP	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.08926	113.0163	System Intact
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	1792	1972	0.19277	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	1792	1972	0.19277	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	1792	1792	0.19277	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	1022	1124	0.23239	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	1022	1124	0.23239	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	956.1	1051.7	0.13135	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	956.1	1051.7	0.13135	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	956.09	1051.7	0.11731	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	956.09	1051.7	0.11731	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	560	560	0.13135	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	560	560	0.13135	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	421	439	0.07134	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	348.58	381.24	0.07134	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	353	353	0.07134	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	318.7	350.57	0.05785	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	318.7	350.57	0.05785	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	0	0	0.09717	-	P12:230:AEPW:ELKCITY6:SWEETWT6
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	0	0	0.14268	-	P12:230:AEPW-SPS:SWEETWT6:WHEELER 6
FDNSLock-Blown up	06ALL	0	20L	G15_080		Non-Converged Contingency	0	0	0.21961	-	P12:345:SPS:J07.1.FINN.HITCH
FDNS	06ALL	0	20L	G15_080	FROM->TO	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.07134	109.5807	System Intact
FDNS	06ALL	0	20L	G15_080	FROM->TO	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.07134	107.8845	System Intact
FDNS	06ALL	0	20L	G15_080	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	318.7	350.57	0.06031	112.5437	System Intact
FDNS	06ALL	0	20L	G15_080	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.07134	105.6208	System Intact
FDNS	06ALL	0	20L	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.05785	119.8088	System Intact
FDNSLock-Blown up	06ALL	0	20SP	G15_080		Non-Converged Contingency	1792	1792	0.22015	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20SP	G15_080		Non-Converged Contingency	956	1042	0.26977	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNS	06ALL	0	20SP	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	318.7	350.57	0.07623	105.913	System Intact
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	1792	1972	0.21611	-	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	1792	1792	0.21611	-	BORDER 7345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	1022	1124	0.26434	-	G14-074T 345.00 - OKLAUNION 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	1022	1124	0.26434	-	G14-074T 345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	987.2	1082.8	0.15997	-	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	987.16	1082.77	0.13823	-	Hitchland Interchange - WALKTAP7 345.00 345KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	560	560	0.15997	-	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	435.02	457.73	0.09003	-	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	439	439	0.09003	-	STLN-DEMARC6 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	421	439	0.09003	-	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1
FDNSLock-Blown up	06ALL	0	20WP	G15_080		Non-Converged Contingency	329.05	360.92	0.0735	-	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	123.1875	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19669	125.4351	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.3712	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.4088	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	123.0816	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	616.0	700.0	0.19671	125.2246	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	133.8994	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19669	136.3425	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	134.0991	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	3	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.3139	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	133.7844	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	4	20WP	G15_080	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560.0	644.0	0.19671	136.1137	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G15_080	FROM->TO	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1	329.05	360.92	0.07618	113.3624	System Intact
FDNS	06ALL	0	20WP	G15_080	TO->FROM	CHISHOLM6 230.00 - SWEETWATER 230KV CKT 1	421	439	0.09003	105.3667	System Intact

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	0	20WP	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.0735	128.5448	System Intact
FDNS	06ALL	2	20WP	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05498	100.0	System Intact
FDNS	06ALL	3	20WP	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05499	99.9	System Intact
FDNS	06ALL	4	20WP	G15_080	TO->FROM	GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1	329.05	360.92	0.05499	100.0	System Intact
FDNS	00NR	0	16WP	G15_081	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	171.0	185.0	0.10306	103.1564	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01NR	0	17G	G15_081	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191.0	191.0	0.03610	110.5718	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01NR	0	17G	G15_081	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.05383	122.0403	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01NR	0	17G	G15_081	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133.0	153.0	0.10307	117.112	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01NR	2	17G	G15_081	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.05379	121.9486	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01NR	2	17G	G15_081	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133.0	153.0	0.10323	118.1529	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	00NR	0	17SP	G15_081	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110.0	110.0	0.03033	101.4557	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	08ALL	0	17G	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03161	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17G	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03161	104.1008	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17G	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03161	103.9839	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03065	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	17SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03065	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03065	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	17SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03065	115.6132	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03065	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	17SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03065	115.5486	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03132	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	20SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03132	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03132	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	20SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03132	116.3733	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03132	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	20SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03132	116.3151	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03222	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	0	25SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305	371	0.03222	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03222	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	2	25SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03222	101.705	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03223	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	08ALL	3	25SP	G15_083	TO->FROM	CLEAVELAND - CLEVLND 4 138.00 138KV CKT Z1	305.0	371.0	0.03223	101.453	CLEVELAND - TULSA NORTH 345KV CKT 1
FDNS	07ALL	0	16WP	G15_084	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.0312	120.9895	System Intact
FDNS	07ALL	0	16WP	G15_084	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.0312	117.7635	System Intact
FDNS	07ALL	0	17G	G15_084	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.0314	102.6428	System Intact
FDNS	07ALL	0	17SP	G15_084	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.03201	115.5962	System Intact
FDNS	07ALL	0	17SP	G15_084	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.03201	112.3563	System Intact
FDNS	07ALL	0	20SP	G15_084	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.03187	116.194	System Intact
FDNS	07ALL	0	20SP	G15_084	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.03187	112.9333	System Intact
FDNS	0	0	20WP	G15_084	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.03139	100.5885	System Intact
FDNS	07ALL	0	20WP	G15_084	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.03129	124.6348	System Intact
FDNS	07ALL	0	20WP	G15_084	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.03129	121.388	System Intact
FDNS	07ALL	0	25SP	G15_084	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.03223	100.2054	System Intact
FDNS	07ALL	0	16WP	G15_085	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.04097	120.9895	System Intact
FDNS	07ALL	0	16WP	G15_085	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.04097	117.7635	System Intact
FDNS	07ALL	0	17G	G15_085	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.04117	102.6428	System Intact
FDNS	07ALL	0	17SP	G15_085	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.04209	115.5962	System Intact
FDNS	07ALL	0	17SP	G15_085	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.04209	112.3563	System Intact
FDNS	07ALL	0	17SP	G15_085	TO->FROM	CORN TAP - SEQUOYAHJ4 138.00 138KV CKT 1	132	143	0.03459	106.8338	System Intact
FDNS	07ALL	0	17SP	G15_085	TO->FROM	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1	136	136	0.03477	99.5	System Intact
FDNS	07ALL	0	20SP	G15_085	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.04204	116.194	System Intact
FDNS	07ALL	0	20SP	G15_085	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.04204	112.9333	System Intact
FDNS	07ALL	0	20SP	G15_085	TO->FROM	CORN TAP - SEQUOYAHJ4 138.00 138KV CKT 1	132	143	0.03452	105.0447	System Intact
FDNS	07ALL	0	20SP	G15_085	TO->FROM	NORGE ROAD - SOUTHWESTERN STATION 138KV CKT 1	136	136	0.0348	100.904	System Intact
FDNS	0	0	20WP	G15_085	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.04156	100.5885	System Intact
FDNS	07ALL	0	20WP	G15_085	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.04146	124.6348	System Intact
FDNS	07ALL	0	20WP	G15_085	FROM->TO	NAPLESTP 138.00 - PAYNE 138.00 138KV CKT 1	132	143	0.04146	121.388	System Intact
FDNS	07ALL	0	25SP	G15_085	FROM->TO	CORN TAP - NAPLESTP 138.00 138KV CKT 1	132	143	0.0424	100.2054	System Intact
FDNS	07ALL	0	25SP	G15_085	TO->FROM	STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1	348.58	381.24	0.03138	120.2549	System Intact
FDNS	07ALL	0	25SP	G15_085	TO->FROM	STLN-DEMARC6 - SWEETWATER 230KV CKT 1	353	353	0.03138	118.7492	System Intact
FDNS	07ALL	0	25SP	G15_085	TO->FROM	CORN TAP - SEQUOYAHJ4 138.00 138KV CKT 1	132	143	0.0348	102.5111	System Intact
FDNSLock-Blown up	09ALL	0	16WP	G15_091		Non-Converged Contingency	720	720	0.11621	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	16WP	G15_091		Non-Converged Contingency	720	720	0.11621	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	16WP	G15_091		Non-Converged Contingency	460	460	0.80636	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL_B10T_DCTIE	0	16WP	G15_091		Non-Converged Contingency	460	460	0.80638	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	16WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05771	102.9357	System Intact
FDNS	16ALL	0	16WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05771	103.8937	System Intact
FDNS	16ALL	2	16WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07672	108.8239	System Intact
FDNS	16ALL	2	16WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07672	109.822	System Intact
FDNSLock-Blown up	09ALL	0	17G	G15_091		Non-Converged Contingency	720	720	0.11978	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17G	G15_091		Non-Converged Contingency	720	720	0.11978	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17G	G15_091		Non-Converged Contingency	460	460	0.80665	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	09ALL	0	17SP	G15_091		Non-Converged Contingency	720	720	0.12012	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17SP	G15_091		Non-Converged Contingency	720	720	0.12012	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	16ALL	0	17SP	G15_091		Non-Converged Contingency	720	792	0.13178	-	WATERTN-LNX3345.00 - WATERTOWN 345KV CKT Z
FDNSLock-Blown up	16ALL	0	17SP	G15_091		Non-Converged Contingency	720	792	0.13178	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_091		Non-Converged Contingency	720.0	792.0	0.13172	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_091		Non-Converged Contingency	717	789	0.10813	-	G09_001IST 345.00 - GROTON 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_091		Non-Converged Contingency	717	789	0.10813	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_091		Non-Converged Contingency	717.0	789.0	0.10804	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	3	17SP	G15_091		Non-Converged Contingency	717.0	789.0	0.10738	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	4	17SP	G15_091		Non-Converged Contingency	717.0	789.0	0.10747	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_091		Non-Converged Contingency	460	460	0.80634	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL_B10T_DCTIE	0	17SP	G15_091		Non-Converged Contingency	460	460	0.80631	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	09ALL	0	17SP	G15_091	FROM->TO	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z	720	720	0.12586	95.3	KELLY - MEADOWGROVE4230.00 230KV CKT 1
FDNS	16ALL	0	17SP	G15_091	FROM->TO	BROADLAND - HURON 230KV CKT 1	400	480	0.12029	101.3771	System Intact
FDNS	16ALL	2	17SP	G15_091	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.11918	101.3206	System Intact
FDNS	16ALL	3	17SP	G15_091	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.11902	101.1661	System Intact
FDNS	16ALL	0	17SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05781	103.7908	System Intact
FDNS	16ALL	0	17SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05781	104.4544	System Intact
FDNS	16ALL	2	17SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07683	110.005	System Intact
FDNS	16ALL	2	17SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07683	110.7028	System Intact
FDNSLock-Blown up	16ALL	0	20L	G15_091		Non-Converged Contingency	460	460	0.80717	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL	0	20SP	G15_091		Non-Converged Contingency	460	460	0.8078	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	20SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05717	105.6005	System Intact
FDNS	16ALL	0	20SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05717	106.7149	System Intact
FDNS	16ALL	2	20SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07628	111.2513	System Intact
FDNS	16ALL	2	20SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07628	112.4108	System Intact
FDNSLock-Blown up	16ALL	0	20WP	G15_091		Non-Converged Contingency	460	460	0.80792	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	20WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05697	104.2487	System Intact
FDNS	16ALL	0	20WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05697	104.5453	System Intact
FDNS	16ALL	2	20WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07607	109.8008	System Intact
FDNS	16ALL	2	20WP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07607	110.0761	System Intact
FDNSLock-Blown up	16ALL	0	25SP	G15_091		Non-Converged Contingency	460	460	0.80754	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	25SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05726	115.0089	System Intact
FDNS	16ALL	0	25SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05726	115.754	System Intact
FDNS	16ALL	2	25SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07636	120.5287	System Intact
FDNS	16ALL	2	25SP	G15_091	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07636	121.2902	System Intact
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.30273	100.7002	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32342	100.3246	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32477	100.7277	FAIRVIEW - OKEENE 69KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32888	100.2472	FREEDOM - WEST 69KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32888	100.8548	BUFFALO - WEST 69KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32888	101.7659	BUFBEAR2 - BUFFALO 69KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33284	118.7348	System Intact
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33426	101.2397	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33426	101.2397	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33426	101.2397	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33426	101.2397	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33477	113.7538	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33679	100.3137	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33679	100.6341	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33742	101.0751	IMO TAP - MEN TAP 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33742	101.1789	CLEOPLT4 138.00 - MEN TAP 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33742	101.3065	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34417	103.7112	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34417	103.8817	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34417	103.9343	P12:138:WFEC:MSL12
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34417	103.9681	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34565	102.6911	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34565	103.3276	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34565	103.7163	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34565	103.7392	P12:138:WFEC:MSL14
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34798	100.6456	CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34798	100.8874	GLASS MOUNTAIN - MOORELAND 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.10656	117.8972	System Intact
FDNS	01ALL	0	16WP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33284	113.2141	System Intact
FDNS	01ALL	0	16WP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33477	109.1245	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	16WP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34417	99.5	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	16WP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34417	99.5	P12:138:WFEC:MSL12
FDNS	01ALL	0	17G	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33335	114.036	System Intact
FDNS	01ALL	0	17G	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33542	108.4167	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_095	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.10739	111.7985	System Intact
FDNS	01ALL	0	17G	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33335	108.0387	System Intact
FDNS	01ALL	0	17G	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33542	103.4035	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17G	G15_095	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133	153	0.06083	106.4715	System Intact
FDNS	01ALL	2	17G	G15_095	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.06036	106.284	System Intact
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.30279	106.7315	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32365	102.071	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32498	100.4136	EAGLE CHIEF - RINGWOOD JCT 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32498	100.4148	FAIRVIEW - RINGWOOD JCT 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32498	104.9492	FAIRVIEW - OKEENE 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3291	99.5	FT SUPPLY - STOCKHOLM2 69.000 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3291	99.7	ALVA - WINCH_TAP 69.000 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3291	100.8207	FREEDOM - WINCH_TAP 69.000 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3291	101.3603	FREEDOM - WEST 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3291	102.1615	BUFFALO - WEST 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3291	103.2086	BUFBEAR2 - BUFFALO 69KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33041	99.7	HUNTERS7 345.00 - RENFROW7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33305	120.4845	System Intact
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33447	102.2167	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33447	102.2167	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33447	102.2167	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33447	102.2167	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33494	112.9711	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33703	101.2164	ROMAN NOSE - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33703	101.7019	DEWEY - SOUTHARD 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33764	102.556	IMO TAP - MEN TAP 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33764	102.7137	CLEOPLT4 138.00 - MEN TAP 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33764	102.8463	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33935	99.6	ELLIS 4 138.00 - MOREWOOD SW 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33935	100.1712	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33935	100.1712	ELK CITY - RED HILLS WIND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33957	100.1795	DOVER SW - OKEENE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34442	105.0044	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34442	105.1618	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34442	105.224	P12:138:WFEC:MSL12
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34442	105.2477	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34596	103.9031	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34596	104.5564	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34596	104.9431	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34596	104.9642	P12:138:WFEC:MSL14
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34822	102.0923	CLEO CORNER - GLASS MOUNTAIN 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34822	102.492	GLASS MOUNTAIN - MOORELAND 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.10663	117.5578	System Intact
FDNS	01ALL	0	17SP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.30279	100.7175	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	17SP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33305	113.4116	System Intact
FDNS	01ALL	0	17SP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33494	107.0666	MATHWSN7 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL	0	17SP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34442	99.5	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	17SP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34442	99.5	P12:138:WFEC:MSL12
FDNS	01ALL	0	17SP	G15_095	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133	153	0.06041	106.118	System Intact
FDNS	01ALL	2	17SP	G15_095	TO->FROM	ROMAN NOSE - SOUTHARD 138KV CKT 1	133.0	153.0	0.05994	105.9209	System Intact
FDNS	01ALL	0	20L	G15_095	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.10839	99.8	System Intact
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.30392	105.6898	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32431	101.3095	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32556	101.3008	FAIRVIEW - RINGWOOD JCT 69KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32556	101.3061	EAGLE CHIEF - RINGWOOD JCT 69KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3297	99.5	FREEDOM - WEST 69KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3297	100.6253	BUFFALO - WEST 69KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3297	101.8922	BUFBEAR2 - BUFFALO 69KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33196	99.6	HUNTERS7 345.00 - WOODRING 345KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33196	100.7309	HUNTERS7 345.00 - RENFROW7 345.00 345KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33391	118.3696	System Intact
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33822	100	IMO TAP - MEN TAP 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33822	100.1244	CLEOPLT4 138.00 - MEN TAP 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33822	100.2791	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34505	102.1618	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34505	102.3372	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34505	102.3926	P12:138:WFEC:MSL12
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34505	102.4201	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34656	100.7373	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34656	101.3645	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34656	101.7386	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34656	101.7589	P12:138:WFEC:MSL14
FDNS	01ALL	0	20SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34876	99.5	GLASS MOUNTAIN - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20SP	G15_095	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.10586	107.4428	System Intact
FDNS	01ALL	0	20SP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33391	110.3566	System Intact
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.30362	100.6208	RENFROW7 345.00 (BANK 1) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32389	99.6	CLEO CORNER (CLEOCOR1) 138/69/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32516	101.6098	FAIRVIEW - OKEENE 69KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32927	99.8	BUFFALO - WEST 69KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.32927	100.7592	BUFBEAR2 - BUFFALO 69KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3335	117.0576	System Intact
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34458	101.4726	CEDARDALE - OKEENE 138KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34458	101.6509	CEDARDALE - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34458	101.7029	P12:138:WFEC:MSL12
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34458	101.7343	MOORELAND - PIC4 138.00 138KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34612	99.7	MOREWOOD SW - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34612	100.298	BEARCAT 138.00 - NINE MILE 138KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34612	100.6741	BEARCAT 138.00 - MOORELAND 138KV CKT 1
FDNS	01ALL	0	20WP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.34612	100.6937	P12:138:WFEC:MSL14
FDNS	01ALL	0	20WP	G15_095	FROM->TO	CLEO CORNER - CLEOPLT4 138.00 138KV CKT 1	191	191	0.10551	109.8581	System Intact
FDNS	01ALL	0	20WP	G15_095	TO->FROM	NOEL_SW 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.3335	111.2334	System Intact
FDNS	01ALL	0	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1	493	493	0.3112	99.5	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	0	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493	493	0.31263	99.6	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493	493	0.31263	100	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	2	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.31020	99.7	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	3	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.31020	99.7	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	4	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1	493.0	493.0	0.30837	102.6172	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	4	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1	493.0	493.0	0.30837	103.523	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2
FDNS	01ALL	4	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.30982	103.0825	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	4	25SP	G15_095	FROM->TO	WOODWARD DISTRICT EHV (WWDEHV-T2) 345/138/13.8KV TRANSFORMER CKT 2	493.0	493.0	0.30982	103.9633	WOODWARD DISTRICT EHV (WWDEHV) 345/138/13.8KV TRANSFORMER CKT 1
FDNS	01ALL	0	25SP	G15_095	FROM->TO	G15095_T 138.00 - ROSE_VALLEY 138.00 138KV CKT 1	183	228	0.33419	106.2212	System Intact
FDNSLock-Blown up	09ALL	0	16WP	G15_096		Non-Converged Contingency	720	720	0.11621	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	16WP	G15_096		Non-Converged Contingency	720	720	0.11621	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	16WP	G15_096		Non-Converged Contingency	460	460	0.80636	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL_B10T_DCTIE	0	16WP	G15_096		Non-Converged Contingency	460	460	0.80638	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	16WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05771	102.9357	System Intact
FDNS	16ALL	0	16WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05771	103.8937	System Intact
FDNS	16ALL	2	16WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07672	108.8239	System Intact
FDNS	16ALL	2	16WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07672	109.822	System Intact
FDNSLock-Blown up	09ALL	0	17G	G15_096		Non-Converged Contingency	720	720	0.11978	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17G	G15_096		Non-Converged Contingency	720	720	0.11978	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17G	G15_096		Non-Converged Contingency	460	460	0.80665	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	09ALL	0	17SP	G15_096		Non-Converged Contingency	720	720	0.12012	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17SP	G15_096		Non-Converged Contingency	720	720	0.12012	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_096		Non-Converged Contingency	720	792	0.13178	-	WATERTN-LNX3345.00 - WATERTOWN 345KV CKT Z
FDNSLock-Blown up	16ALL	0	17SP	G15_096		Non-Converged Contingency	720	792	0.13178	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_096		Non-Converged Contingency	720.0	792.0	0.13172	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_096		Non-Converged Contingency	717	789	0.10813	-	G09_001IST 345.00 - GROTON 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_096		Non-Converged Contingency	717	789	0.10813	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_096		Non-Converged Contingency	717.0	789.0	0.10804	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	3	17SP	G15_096		Non-Converged Contingency	717.0	789.0	0.10738	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	4	17SP	G15_096		Non-Converged Contingency	717.0	789.0	0.10747	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_096		Non-Converged Contingency	460	460	0.80634	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL_B10T_DCTIE	0	17SP	G15_096		Non-Converged Contingency	460	460	0.80631	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	09ALL	0	17SP	G15_096	FROM->TO	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z	720	720	0.12586	95.3	KELLY - MEADOWGROVE4230.00 230KV CKT 1
FDNS	16ALL	0	17SP	G15_096	FROM->TO	BROADLAND - HURON 230KV CKT 1	400	480	0.12029	101.3771	System Intact
FDNS	16ALL	2	17SP	G15_096	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.11918	101.3206	System Intact
FDNS	16ALL	3	17SP	G15_096	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.11902	101.1661	System Intact
FDNS	16ALL	0	17SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05781	103.7908	System Intact
FDNS	16ALL	0	17SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05781	104.4544	System Intact
FDNS	16ALL	2	17SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07683	110.005	System Intact
FDNS	16ALL	2	17SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07683	110.7028	System Intact
FDNSLock-Blown up	16ALL	0	20L	G15_096		Non-Converged Contingency	460	460	0.80717	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL	0	20SP	G15_096		Non-Converged Contingency	460	460	0.8078	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	20SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05717	105.6005	System Intact
FDNS	16ALL	0	20SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05717	106.7149	System Intact
FDNS	16ALL	2	20SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07628	111.2513	System Intact
FDNS	16ALL	2	20SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07628	112.4108	System Intact
FDNSLock-Blown up	16ALL	0	20WP	G15_096		Non-Converged Contingency	460	460	0.80792	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	20WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05697	104.2487	System Intact
FDNS	16ALL	0	20WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05697	104.5453	System Intact
FDNS	16ALL	2	20WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07607	109.8008	System Intact
FDNS	16ALL	2	20WP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07607	110.0761	System Intact
FDNSLock-Blown up	16ALL	0	25SP	G15_096		Non-Converged Contingency	460	460	0.80754	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	25SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05726	115.0089	System Intact
FDNS	16ALL	0	25SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05726	115.754	System Intact
FDNS	16ALL	2	25SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07636	120.5287	System Intact
FDNS	16ALL	2	25SP	G15_096	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.07636	121.2902	System Intact
FDNSLock-Blown up	09ALL	0	16WP	G15_097		Non-Converged Contingency	720	720	0.09982	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	16WP	G15_097		Non-Converged Contingency	720	720	0.09982	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	09ALL	0	17G	G15_097		Non-Converged Contingency	720	720	0.10324	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17G	G15_097		Non-Converged Contingency	720	720	0.10324	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNS	15ALL	0	17G	G15_097	FROM->TO	G13_001IST 115.00 - WATERTOWN 115KV CKT 1	120	121	0.19656	106.2058	GROTON (GROTON KU2A) 345/115/13.8KV TRANSFORMER CKT 1
FDNSLock-Blown up	09ALL	0	17SP	G15_097		Non-Converged Contingency	720	720	0.10368	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB(MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	09ALL	0	17SP	G15_097		Non-Converged Contingency	720	720	0.10368	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNS	09ALL	0	17SP	G15_097	FROM->TO	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z	720	720	0.10912	95.3	KELLY - MEADOWGROVE4230.00 230KV CKT 1
FDNS	15ALL	0	17SP	G15_097	FROM->TO	G13_001IST 115.00 - WATERTOWN 115KV CKT 1	120	121	0.19657	110.4503	GROTON (GROTON KU2A) 345/115/13.8KV TRANSFORMER CKT 1
FDNS	15ALL	0	20SP	G15_097	TO->FROM	SPLIT ROCK - WHITE 345KV CKT 1	717	717	0.24257	99.9	BROOKING COUNTY - LYON COUNTY 345KV CKT 1
FDNSLock-Blown up	09ALL	0	16WP	G15_098		Non-Converged Contingency	720	720	0.11649	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	16WP	G15_098		Non-Converged Contingency	720	720	0.11649	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	16WP	G15_098		Non-Converged Contingency	460	460	0.03826	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL_B10T_DCTIE	0	16WP	G15_098		Non-Converged Contingency	460	460	0.03828	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	16WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05177	102.9357	System Intact
FDNS	16ALL	0	16WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05177	103.8937	System Intact
FDNS	16ALL	2	16WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05665	108.8239	System Intact
FDNS	16ALL	2	16WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05665	109.822	System Intact
FDNSLock-Blown up	09ALL	0	17G	G15_098		Non-Converged Contingency	720	720	0.12006	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17G	G15_098		Non-Converged Contingency	720	720	0.12006	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17G	G15_098		Non-Converged Contingency	460	460	0.03855	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	09ALL	0	17SP	G15_098		Non-Converged Contingency	720	720	0.1204	-	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z
FDNSLock-Blown up	09ALL	0	17SP	G15_098		Non-Converged Contingency	720	720	0.1204	-	GR ISLD-LNX3345.00 - HOLT.CO3 345.00 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_098		Non-Converged Contingency	720	792	0.13253	-	WATERTN-LNX3345.00 - WATERTOWN 345KV CKT Z
FDNSLock-Blown up	16ALL	0	17SP	G15_098		Non-Converged Contingency	720	792	0.13253	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_098		Non-Converged Contingency	720.0	792.0	0.13251	-	WATERTN-LNX3345.00 - WHITE 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_098		Non-Converged Contingency	717	789	0.10919	-	G09_001IST 345.00 - GROTON 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_098		Non-Converged Contingency	717	789	0.10919	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	2	17SP	G15_098		Non-Converged Contingency	717.0	789.0	0.10916	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	3	17SP	G15_098		Non-Converged Contingency	717.0	789.0	0.10857	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	4	17SP	G15_098		Non-Converged Contingency	717.0	789.0	0.10873	-	G09_001IST 345.00 - WATERTOWN 345KV CKT 1
FDNSLock-Blown up	16ALL	0	17SP	G15_098		Non-Converged Contingency	460	460	0.03824	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL_B10T_DCTIE	0	17SP	G15_098		Non-Converged Contingency	460	460	0.0382	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	09ALL	0	17SP	G15_098	FROM->TO	GR ISLD-LNX3345.00 - GRAND ISLAND 345KV CKT Z	720	720	0.12615	95.3	KELLY - MEADOWGROVE4230.00 230KV CKT 1
FDNS	16ALL	0	17SP	G15_098	FROM->TO	BROADLAND - HURON 230KV CKT 1	400	480	0.12198	101.3771	System Intact
FDNS	16ALL	2	17SP	G15_098	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.12169	101.3206	System Intact
FDNS	16ALL	3	17SP	G15_098	FROM->TO	BROADLAND - HURON 230KV CKT 1	400.0	480.0	0.12164	101.1661	System Intact
FDNS	16ALL	0	17SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05186	103.7908	System Intact
FDNS	16ALL	0	17SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05186	104.4544	System Intact
FDNS	16ALL	2	17SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05676	110.005	System Intact
FDNS	16ALL	2	17SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05676	110.7028	System Intact
FDNSLock-Blown up	16ALL	0	20L	G15_098		Non-Converged Contingency	460	460	0.03901	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNSLock-Blown up	16ALL	0	20SP	G15_098		Non-Converged Contingency	460	460	0.03964	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	20SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05121	105.6005	System Intact
FDNS	16ALL	0	20SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05121	106.7149	System Intact
FDNS	16ALL	2	20SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05617	111.2513	System Intact
FDNS	16ALL	2	20SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05617	112.4108	System Intact
FDNSLock-Blown up	16ALL	0	20WP	G15_098		Non-Converged Contingency	460	460	0.03977	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	20WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05101	104.2487	System Intact
FDNS	16ALL	0	20WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.05101	104.5453	System Intact
FDNS	16ALL	2	20WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05595	109.8008	System Intact
FDNS	16ALL	2	20WP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05595	110.0761	System Intact
FDNSLock-Blown up	16ALL	0	25SP	G15_098		Non-Converged Contingency	460	460	0.0394	-	BELFIELD - DAGLUM 4230.00 230KV CKT 1
FDNS	16ALL	0	25SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.0513	115.0089	System Intact
FDNS	16ALL	0	25SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100	125	0.0513	115.754	System Intact
FDNS	16ALL	2	25SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05625	120.5287	System Intact
FDNS	16ALL	2	25SP	G15_098	FROM->TO	DICKINSON (KW1A 100) 230/115/13.8KV TRANSFORMER CKT 1	100.0	125.0	0.05625	121.2902	System Intact

11.8 G-V: Voltage Power Flow Analysis (Constraints Requiring Transmission Reinforcement)

Available upon request. Contact SPP Generation Interconnection Studies for details.

11.9 H-T: Thermal Power Flow Analysis (Other Constraints Not Requiring Transmission Reinforcement)

Available upon request. Contact SPP Generation Interconnection Studies for details.

11.10 H-T-AS: Affected System Thermal Power Flow Analysis (Constraints for Potential Upgrades)

Available upon request. Contact SPP Generation Interconnection Studies for details.

11.11 H-V-AS: Affected System Voltage Power Flow Analysis(Constraints for Potential Upgrades)

Available upon request. Contact SPP Generation Interconnection Studies for details.

11.12 I: Power Flow Analysis (Constraints from Multi-Contingencies)

Available upon request. Contact SPP Generation Interconnection Studies for details.

11.13 J: Group 1 Dynamic Stability Analysis Report

See next page

S&C ELECTRIC COMPANY
Excellence Through Innovation

DISIS-2015-002-1 (GROUP 1)

LITTLE ROCK, AR

SOUTHWEST POWER POOL

DEFINITIVE INTERCONNECTION SYSTEM IMPACT RE-STUDY

S&C PROJECT NUMBER: 10627

DOCUMENT NUMBER: E-857

REVISION: 0

FINAL REPORT

CONFIDENTIAL

JULY 6, 2016

S&C ELECTRIC COMPANY
Excellence Through Innovation

REPORT REVISION HISTORY:

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A	06/21/2016	MA	SK	SK	Preliminary report issued
0	07/05/2016	MA	SK	SK	Final report issued

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1. Executive Summary

S&C Electric Company (S&C) has performed a Definitive Interconnection System Impact Re-Study, DISIS-2015-002-1 (Group 1), in response to a request through Southwest Power Pool (SPP) Tariff. Group 1 now consists of seven (7) new interconnection requests (GEN-2015-048, GEN-2015-057, GEN-2015-059, GEN-2015-060, GEN-2015-081, GEN-2015-093, and GEN-2015-095). All seven (7) interconnection requests consist of wind farm projects.

S&C has performed dynamic stability analysis for Group 1 only under the Cluster scenario. The cluster studies were performed using three (3) cluster base cases (2016 Winter Peak, 2017 Summer Peak, and 2025 Summer Peak) provided by SPP. In the cluster studies, all seven new interconnection requests and prior-queued projects in Group 1 were studied at 100% of nameplate MW capacity. The dynamic stability studies revealed that Group 1 projects met the SPP transient voltage requirements, with the solutions illustrated in the dynamic stability results section of this report.

S&C has performed power factor analysis on Group 1 Cluster scenarios. Power factor analysis reported the power factors at the study projects point of interconnection (POI) for all N-1 three-phase contingences and marked the contingency at which the required power factor at the POI of study projects to maintain the voltages at the desired level is beyond the normal required capability (from 0.95 lagging to 0.95 leading) of the studied projects. The power factor requirement for GEN-2015-048, GEN-2015-057, GEN-2015-059, GEN-2015-060, GEN-2015-081, GEN-2015-093, and GEN-2015-095 interconnection requests is from 0.95 lagging to 0.95 leading power factor at the POIs.

S&C has performed an analysis of low wind condition for all the interconnection requests. The low wind analysis was performed under the cluster cases by taking the interconnection generation out of service and determining the Mvar size of a shunt reactor to offset the reactive power that comes from the capacitance of the project's transmission lines and collector cables. The shunt reactor Mvars are given in Section 8.

S&C has performed a short-circuit analysis for the 2017 Summer Peak and 2025 Summer Peak under Group 1 Cluster and reported short-circuit results at all buses up to five (5) levels away from the POI of the study projects.

2. Introduction

S&C has performed a Definitive Interconnection System Impact Re-Study, DISIS-2015-002-1 (Group 1), in response to a request through the SPP Tariff. Group 1 consists of seven (7) new interconnection requests listed in

Table 1 and twenty-five (25) prior-queued projects listed in Table 2.

Table 1: Group 1 Generation Interconnection Requests

Project	Size (MW)	Generator Model	Generator Bus(es)	Point of Interconnection (POI)	POI Bus
GEN-2015-048	200	Vestas V110 (wind)	584893	Cleo Corner 138 kV	514778
GEN-2015-057	100	GE 2.3 MW (wind)	584953	Minco 345 kV	514801
GEN-2015-059	6.3	GE 1.79 MW (wind)	599117	Minco 345 kV	514801
GEN-2015-060	250	GE 1.79 MW (wind)	584983 & 584986	Woodward EHV District 138 kV	515376
GEN-2015-081	180	Vestas V110 (wind)	585183	Tap on the Woodward - Tatonga 345 kV line (G11_051-TAP)	562075
GEN-2015-093	250	GE 2 MW (wind)	585273 & 585274	Gracemont 345 kV	515800
GEN-2015-095	176	Vestas V110 (wind)	585303	Tap on Mooreland-Noel Switch 138 kV	560066

Table 2: Prior-Queued Projects

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2001-014	94.5	Suzlon 2.1 MW (599002)	Fort Supply 138 kV (520920)
GEN-2001-037	102	GE 1.5 MW (599012)	Moorland – Woodward 138 kV (515785)
GEN-2005-008	120	GE 1.5 MW (579353)	Woodward 138 kV (514785)
GEN-2006-024S	18.9	Suzlon 2.1 MW (599057)	Buffalo Bear 69 kV (521120)
GEN-2006-046	132	Mitsubishi 2.4 MW (599053)	Dewey 138 kV (514787)
GEN-2007-021	200	GE 1.6 MW (599136)	Tatonga 345 kV (515407)
GEN-2007-043	200	GE 1.6 MW (599062)	Minco 345 kV (514801)
GEN-2007-044	299.2	GE 1.6 MW (599059 & 579275)	Tatonga 345 kV (515407)
GEN-2007-050	170.2	Siemens 2.3 MW (599064 & 599065)	Woodward 138 kV (515376)
GEN-2007-062	765	GE 1.5 MW (599070, 599073, 599077 & 599080)	Woodward 345 kV (515375)
GEN-2008-003	101.2	Siemens 2.3 MW (599081)	Woodward 138 kV (515376)
GEN-2008-044	197.8	Siemens SWT 2.3 MW (599101, 599103 & 599099)	Tatonga 345 kV (515407)

GEN-2010-011	29.7	Siemens SWT 2.3 MW (599101 & 599103)	Tatonga 345 kV (515407) (Addition to Gen-2008-044 34.5kV bus (515450)
GEN-2010-040	298.5	RePower 2.05MW (599114 & 599116)	Cimarron 345 kV (514901)
GEN-2011-010	100.8	GE 1.6 MW (599117)	Minco 345 kV (514801)
GEN-2011-019	299	Siemens 2.3 MW (582319)	Woodward 345 kV (515375)
GEN-2011-020	299	Siemens 2.3 MW (582320)	Woodward 345 kV (515375)
GEN-2011-051	104.4	Vestas V90 1.8 MW (583113)	Tap on the Woodward - Tatonga 345 kV line (G11_051-TAP, 562075)
GEN-2011-054	298	Vestas V100 2.0 MW (599122 & 599124)	Cimarron 345 kV (514901)
GEN-2014-002	10.53 increase (Pmax=209.4)	GE 97.4m 1.79 MW (599136)	Tatonga 345 kV (515407)
GEN-2014-003	15.84 increase (Pmax=315)	GE 97.4m 1.79 MW (599059,579275)	Tatonga 345 kV (515407)
GEN-2014-005	5.67 increase (Pmax=106.5)	GE 97.4m 1.79 MW (599117)	Minco 345 kV (514801)
GEN-2014-020	100.0	Vestas V110 2.0 MW (583903)	Tuttle 138 kV (511501)
GEN-2014-056	250.0	GE 2.0 MW (584063)	Minco 345 kV (514801)
GEN-2015-029	161.0	GE 2.3 MW (584703)	Tatonga 345 kV (515407)

3. Transmission System and Study Area

The interconnection requests in Group 1 will interconnect into Oklahoma Gas & Electric (OKGE, Area #524) and Western Farmers Electric Cooperative (WFEC, Area #525). In addition to Areas #524 and #525, the following areas were monitored also:

- American Electric Power West (AEPW, Area #520)
- Southwestern Public Service (SPS, Area #526)
- Midwest Energy (MIDW, Area #531)
- Sunflower Electric Power Corporation (SUNC, Area #534)
- Westar Energy, Inc. (WERE, Area #536)

4. Power Flow Base Cases

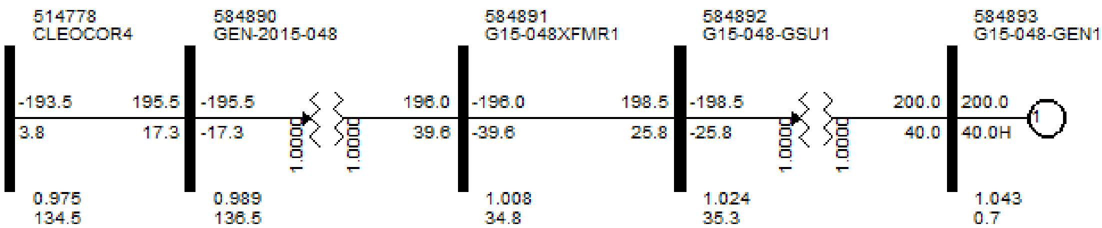
DISIS-2015-002-1 (Group 1) and prior-queued projects were modeled as aggregated generating units in the base cases from SPP.

Cluster Scenario Base Cases

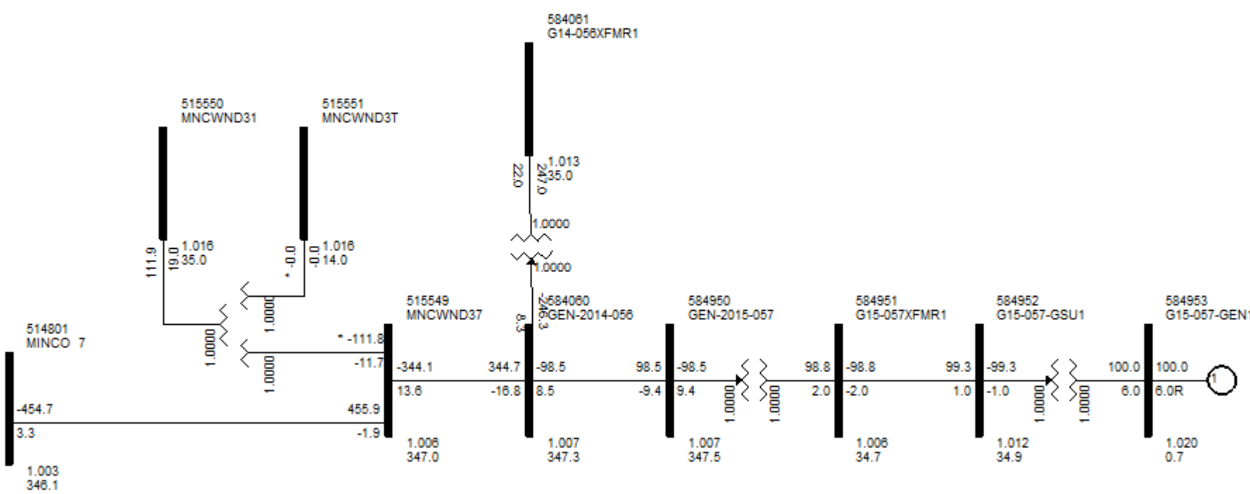
- **MDWG15-16WP_DIS15021_G01.sav** – 2016 Winter Peak Cluster Base Case for Group 1. New interconnection requests and prior-queued projects at 100% output power.
- **MDWG15-17SP_DIS15021_G01.sav** – 2017 Summer Peak Cluster Base Case for Group 1. New interconnection requests and prior-queued projects at 100% output power.
- **MDWG15-25SP_DIS15021_G01.sav** – 2025 Summer Peak Cluster Base Case for Group 1. New interconnection requests and prior-queued projects at 100% output power.

5. Power Flow Model

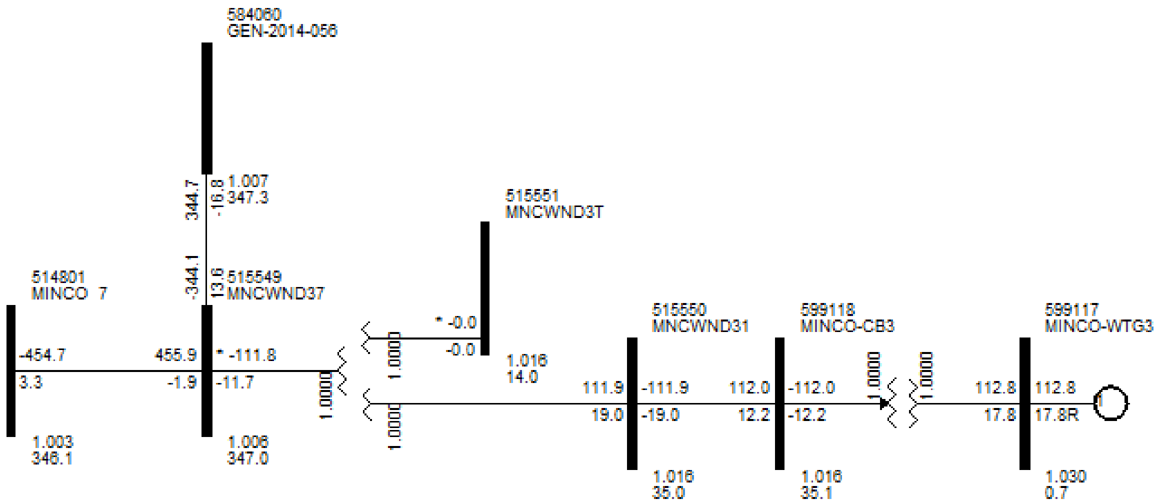
SPP's base case power flow models were built in PSS/E 32.2.1. In PSS/E of the same version, S&C created one-line diagrams depicted in Figure 1 for each interconnection request.



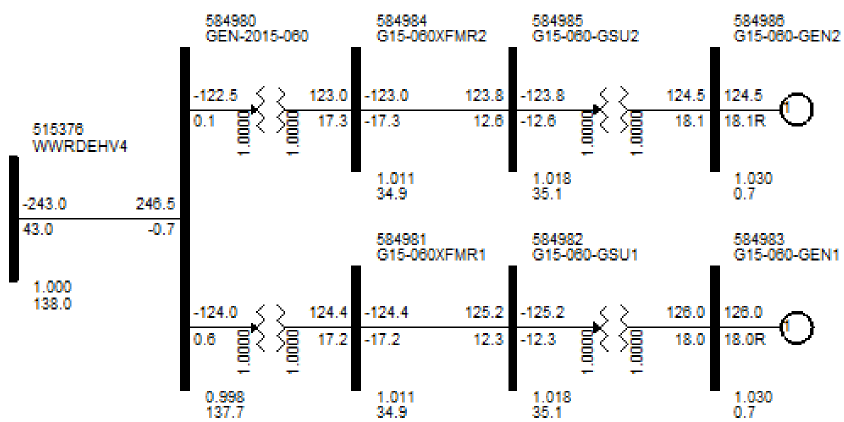
(a) Interconnection request GEN-2015-048



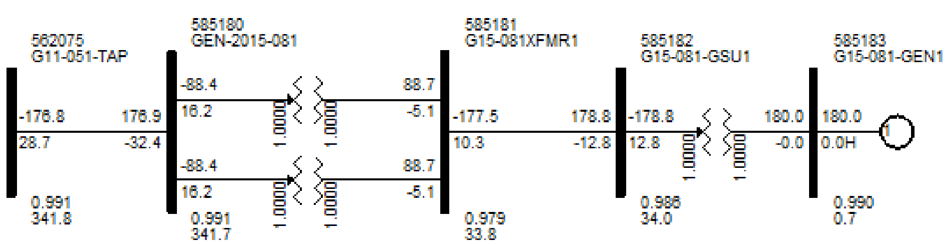
(b) Interconnection request GEN-2015-057



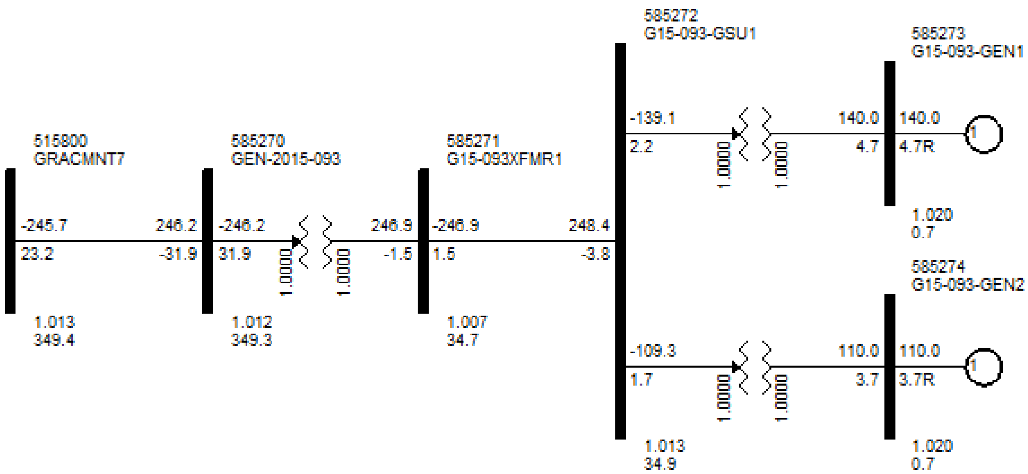
(c) Interconnection request GEN-2015-059



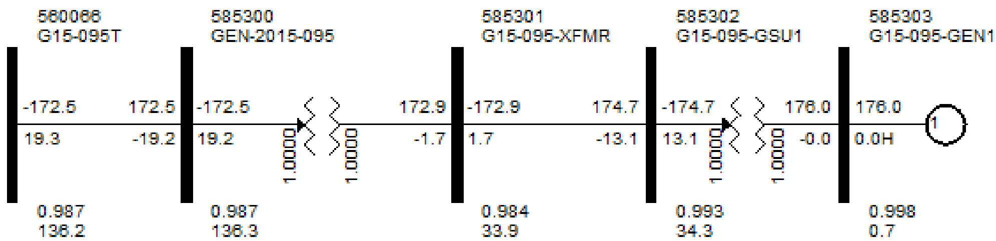
(d) Interconnection request GEN-2015-060



(e) Interconnection request GEN-2015-081



(f) Interconnection request GEN-2015-093



(g) Interconnection request GEN-2015-095

Figure 1: One-line Diagrams of the Interconnection Request Projects

6. Dynamic Stability Analysis

6.1. Assumptions

Dynamic stability analysis was performed for all the SPP contingencies listed in Appendix A. Three-phase faults were simulated as bolted faults, while single line-to-ground faults were simulated under the assumption that a single line-to-ground fault will cause a 60% drop in the positive-sequence voltage at the fault location.

6.2. Stability Criteria

Dynamic stability studies were performed to ensure system stability following critical faults on the system. The system is considered stable if the following conditions are met:

(1) Disturbances including three-phase and single-phase to ground faults, should not cause synchronous and asynchronous plants to disconnect from the transmission grid.

(2) The angular positions of synchronous machine rotor become constant following an aperiodic system disturbance.

(3) Voltage magnitudes and frequencies at terminals of asynchronous generators should not exceed magnitudes and durations that will cause protection elements to operate. Furthermore, the response after the disturbance needs to be studied at the terminals of the machine to ensure that there are no sustained oscillations in power output, speed, frequency, etc.

(4) Voltage magnitudes and angles after the disturbance should settle to a constant and acceptable operating level. Frequencies should settle to the acceptable range within nominal 60 Hz power frequency.

In addition, performance of the transmission system is measured against the SPP Disturbance Criteria Requirements on Angular oscillations and Transient Voltage Recovery, detailed in Appendix B.

6.3. Dynamic Stability Results

Multiple concerns surfaced during preliminary dynamic stability simulations. These issues were also addressed in the DISIS-2015-002 study report issued on March 11, 2016. A summary list of such concerns and how they were addressed is shown below.

- The prior outage for FLT40 caused the power flow simulation to "blow up" in 25SP case
  - Per SPP recommendation from the original Group 1 study, GEN-2015-048 was curtailed from 200 MW to 100 MW to resolve the issue.
- Gamesa WTGs at bus 599049 and 599050 tripped due to under-voltage protection.
  - This issue was resolved using the SPP provided IDV file from the original Group 1 study (GEN-2006-035_UV_Protection_Modification.idv).

Dynamic stability simulations were performed once again after implementing the solutions described above. Table 3 below summarizes the dynamic stability results for each contingency and each season.

Table 3: Group 1 Dynamic Stability Results
(YES = STABLE, NO = UNSTABLE, '-' Not applicable)

Cont. No.	Cont. Name	16WP: Cluster	17SP: Cluster	25SP: Cluster
1	FLT01-3PH	YES	YES	YES [1]
2	FLT02-3PH	YES	YES	YES [1]
3	FLT03-3PH	YES	YES	YES [1]
4	FLT04-3PH	YES	YES	YES [1]
5	FLT05-3PH 2025SP Only	-	-	YES [1]
6	FLT06-3PH	YES	YES	YES [1]
7	FLT07-3PH	YES	YES	YES [1]
8	FLT08-3PH	YES	YES	YES [1]
9	FLT09-3PH	-	-	-
10	FLT10-3PH	YES	YES	YES [1]
11	FLT11-3PH	YES	YES	YES [1]
12	FLT12-3PH	YES	YES	YES [1]
13	FLT13-3PH	YES	YES	YES [1]
14	FLT14-3PH	YES	YES	YES [1]
15	FLT15-3PH 2025SP Only	-	-	YES [1]
16	FLT16-3PH	YES	YES	YES [1]
17	FLT17-3PH	YES	YES	YES [1]
18	FLT18-3PH	YES	YES	YES [1]
19	FLT19-3PH	YES	YES	YES [1]
20	FLT20-3PH	YES	YES	YES [1]
21	FLT21-3PH	YES	YES	YES [1]
22	FLT22-SB	YES	YES	YES [1]
23	FLT23-SB	YES	YES	YES [1]
24	FLT24-PO	YES	YES	YES [1]
25	FLT25-PO	YES	YES	YES [1]
26	FLT26-PO	YES	YES	YES [1]
27	FLT27-3PH	YES	YES	YES [1, 2]
28	FLT28-3PH 2025SP Only	-	-	YES [1, 2]
29	FLT29-3PH	-	-	-
30	FLT30-SB	YES	YES	YES [1]

[1] Machine power kept at P=200 MW and react. power set to Q=40 Mvar at Bus #584893 (Gen Inter Req GEN-2015-048)
[2] Relay SLNOS #1 protecting line #523779-511451 was taken out of service to prevent tripping

Cont. No.	Cont. Name	16WP: Cluster	17SP: Cluster	25SP: Cluster
31	FLT31-SB	YES	YES	YES [1]
32	FLT32-PO	YES	YES	YES [1]
33	FLT33-3PH	YES	YES	YES [1]
34	FLT34-3PH	YES	YES	YES [1]
35	FLT35-3PH	YES [3]	YES	YES [1]
36	FLT36-3PH	YES	YES	YES [1]
37	FLT37-3PH	YES [3]	YES	YES [1]
38	FLT38-3PH	YES	YES	YES [1]
39	FLT39-3PH	YES	YES	YES [1]
40	FLT40-PO	YES [3]	YES [4]	YES [4]
41	FLT41-PO	YES [5]	YES [5]	YES [5]
42	FLT42-3PH	YES	YES	YES [1]
43	FLT43-3PH	YES	YES	YES [1]
44	FLT44-3PH	YES	YES	YES [1]
45	FLT45-3PH	YES	YES	YES [1]
46	FLT46-3PH	YES	YES	YES [1]
47	FLT47-3PH	YES	YES	YES [1]
48	FLT48-3PH	YES	YES	YES [1]
49	FLT49-3PH	YES	YES	YES [1]
50	FLT50-3PH	YES	YES	YES [1]
51	FLT51-3PH	YES	YES	YES [1]
52	FLT52-3PH	YES	YES	YES [1]
53	FLT53-SB	YES	YES	YES [1]
54	FLT54-SB	YES	YES	YES [1]
55	FLT55-PO	YES	YES	YES [1]
56	FLT56-PO	YES	YES	YES [1]
57	FLT57-3PH	YES	YES	YES [1]
58	FLT58-3PH 2025SP Only	-	-	YES [1]
59	FLT59-3PH 2025SP Only	-	-	YES [1]
60	FLT60-3PH 2025SP Only	-	-	YES [1]
61	FLT61-SB 2025SP Only	-	-	YES [1]

[3] Machine power kept at P=200 MW and react. power set to Q=10 Mvar at Bus #584893 (Gen Inter Req GEN-2015-048)
[4] Machine power curtailed to P=100 MW and react. power set to Q=0 Mvar at Bus #584983 (Gen Inter Req GEN-2015-048)
[5] Machine power curtailed to P=100 MW and react. power set to Q= -15 Mvar at Bus #584893 (Gen Inter Req GEN-2015-048)

Cont. No.	Cont. Name	16WP: Cluster	17SP: Cluster	25SP: Cluster
62	FLT62-PO 2025SP Only	-	-	YES [1]
63	FLT63-3PH	-	-	-
64	FLT64-3PH	-	-	-
65	FLT65-3PH	-	-	-
66	FLT66-3PH	YES	YES	YES [1]
67	FLT67-3PH	YES	YES	YES [1]
68	FLT68-3PH	YES	YES[6]	YES [1, 6]
69	FLT69-3PH	YES	YES	YES [1]
70	FLT70-3PH	YES	YES	YES [1]
71	FLT71-3PH	YES	YES	YES [1]
72	FLT72-3PH	YES	YES	YES [1]
73	FLT73-3PH	YES	YES	YES [1]
74	FLT74-3PH	-	-	-
75	FLT75-3PH	YES	YES	YES [1]
76	FLT76-3PH	YES	YES	YES [1]
77	FLT77-3PH	YES	YES	YES [1]
78	FLT78-3PH	YES	YES	YES [1]
79	FLT79-3PH	YES	YES	YES [1]
80	FLT80-3PH	YES	YES	YES [1]
81	FLT81-SB	-	-	-
82	FLT82-SB	-	-	-
83	FLT83-SB	YES	YES	YES [1]
84	FLT84-SB	YES	YES	YES [1]
85	FLT85-SB	-	-	-
86	FLT86-SB	YES	YES	YES [1]
87	FLT87-SB	-	-	-
88	FLT88-SB	-	-	-
89	FLT89-SB	-	-	-

[6] Machine power kept at P=176 MW and react. power set to Q=10 Mvar at Bus #585303 (Gen Inter Req GEN-2015-095)

As shown in Table 3, the real power (P) and reactive power (Q) of the machine at bus #584893 (Generation Interconnection Request GEN-2015-048) were changed for various faults. These changes were made to resolve various issues, including generator tripping on overvoltage, and sustained power oscillations. It should be noted, however, that this interconnection project exhibited various abnormalities prior to dynamic simulations. A brief list of these abnormalities is shown below:

- Prior outage for FLT40 caused power flow to "blow up" in 25SP case (mentioned above)
- Prior outage for FLT40 resulted in high voltages at POI bus #514778 in 16WP/17SP cases
- Low voltage witnessed at POI bus #514778 in 25SP base case and prior outage cases

Furthermore, interconnection request project GEN-2015-048 (bus #584893) occasionally exhibited slight post-transient voltages greater than 1.1 p.u. during certain fault contingencies. An example of this situation is shown using Figure 2 below and was observed for FLT35 (17SP/25SP), FLT37 (17SP/25SP), and FLT40 (17SP/25SP).

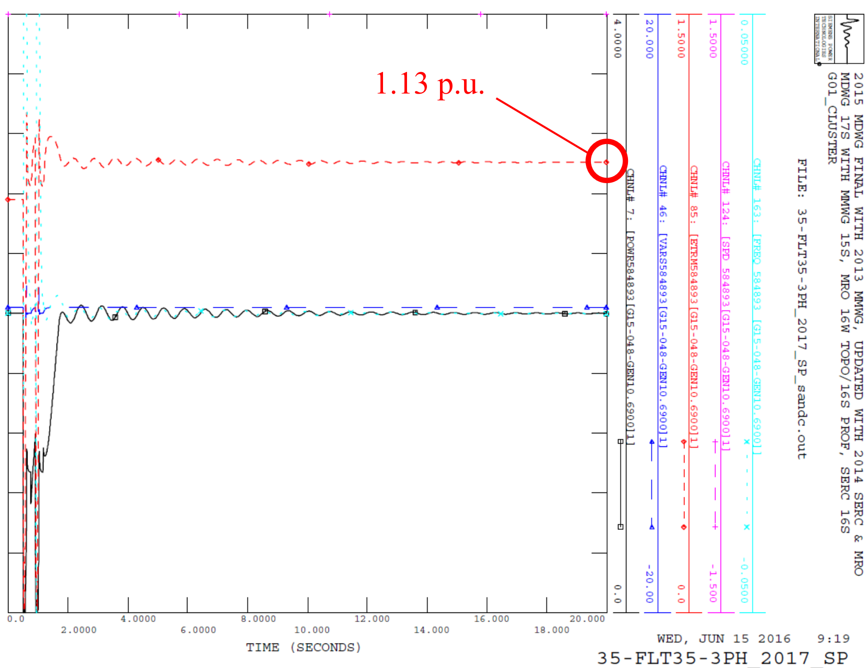


Figure 2: Post-Transient Voltage at Bus #584893 (GEN-2015-048)

In addition to bus #584893, a slight post-transient voltage also surfaced at prior-queued project GEN-2001-014 (bus #599002). However, this situation was only observed during FLT77 (16WP) and is illustrated in Figure 3 below. In this case since the voltage does not appear to be fully settled by 20 seconds we also considered an extended simulation for 40 seconds and observed that no tripping occurs and also the voltage does not exceed 1.16 p.u. level.

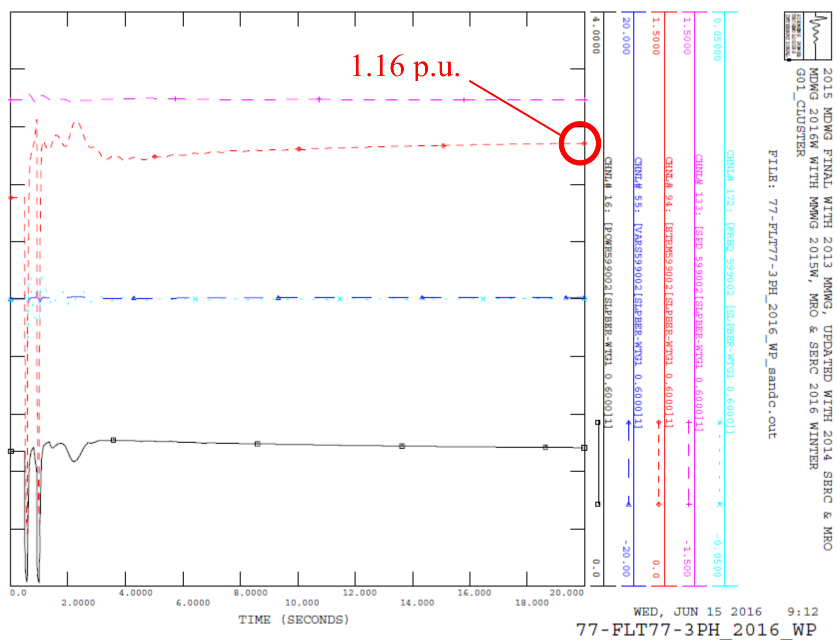


Figure 3: Post-Transient Voltage at Bus #599002 (GEN-2001-014)

With the exception of the aforementioned slight post-transient overvoltages, dynamic stability analysis thus concluded that Group 1 is expected to successfully ride-through all contingencies specified by SPP given the changes described up to this point. Detailed plots of cluster dynamic stability results for each contingency and each peak season, are given in Appendix C.

7. Power Factor Analysis

The power factor analysis was performed under the cluster bases and for all N-1 three-phase contingencies shown in the Fault Definition table in Appendix A. Single-phase contingencies, N-1-1 contingencies and N-2 contingencies were excluded from the study. Prior to the run, the cluster base cases were altered, by turning off the reactive capability of the renewable energy projects and by placing a new var generator at each renewable energy high voltage bus for supporting the reactive power. The var generators were set to hold the voltage schedule at the interconnection project consistent with the voltage schedules in the provided base case or 1.0 p.u. voltage (whichever is higher).

Table 4 gives the voltage schedule at each interconnection request location in the original cluster base cases. Note that the base case voltage for the GEN-2015-048's 138-kV POI bus #514778 falls below the recommended 0.95 p.u. value in 2025 summer peak case.

Table 4: Base Case Voltages at the Interconnection Request POI Bus

Request	POI	2016 Winter Peak (p.u.)	2017 Summer Peak (p.u.)	2025 Summer Peak (p.u.)
GEN-2015-048	514778	0.975	0.968	0.932
GEN-2015-057/059	514801	1.003	1.008	1.010
GEN-2015-060	515376	1.000	0.987	0.994
GEN-2015-081	562075	0.991	0.992	1.006
GEN-2015-093	515800	1.013	1.015	1.016
GEN-2015-095	560066	0.987	0.978	0.979

The power factor analysis results for Group 1 interconnection requests for each N-1 three phase contingency were presented in Appendix D. We marked in pink color the contingencies at which the required power factor at the POI of the study project is beyond the normal required capability (from 0.95 lagging to 0.95 leading) of the studied renewable energy project. We also provided a summary Table 5 of the maximum leading/lagging reactive power demand and power factor found by the power factor analysis at the POIs.

The power factor requirement for GEN-2015-048, GEN-2015-057, GEN-2015-059, GEN-2015-060, GEN-2015-081, GEN-2015-093, and GEN-2015-095 interconnection requests is from 0.95 lagging to 0.95 leading power factor at the POIs.

Table 5: Summary of Power Factor Analysis at the POI

Request	Capacity	POI	Reactive Power/Power Factor at POI	
			Leading (absorbing vars)	Lagging (providing vars)
GEN-2015-048	200 MW	514778	-33.6 Mvar / 0.986	48.7 Mvar / 0.971
GEN-2015-057/059	106.3 MW	514801	-138.5 Mvar / 0.958*	102.5 Mvar / 0.976*
GEN-2015-060	250 MW	515376	-73.8 Mvar / 0.958	94.7 Mvar / 0.934
GEN-2015-081	180 MW	562075	-59.5 Mvar / 0.949	104.2 Mvar / 0.865
GEN-2015-093	250 MW	515800	-122.9 Mvar / 0.897	81.3 Mvar / 0.951
GEN-2015-095	176 MW	560066	-39.5 Mvar / 0.976	32.6 Mvar / 0.983

***** Note that two (2) interconnection requests GEN-2015-057 and GEN-2015-059 have the same POI bus (514801) as the prior-queued project Gen-2014-056. The aggregated MW of these three (3) generators is 462.8 MW at the high-side bus downstream of the POI.***

NOTE: Per the SPP Tariff as reactive power is required for all projects, the final requirement in the GIA will be the pro-forma 95% lagging to 95% leading at the point of interconnection.

8. Low Wind/Low irradiance Conditions Analysis

S&C has performed an analysis of low wind condition for the interconnection requests. The low wind analysis was performed under the Cluster scenarios by taking the interconnection renewable energy project out of service and placing a shunt reactor at the project substation high side bus to offset the reactive power that comes from the capacitance of the project's transmission lines and collector cables. The size of the shunt reactor was adjusted such that the net Mvar flow into the POI from the studied renewable energy project was approximately zero. Table 6 gives the shunt reactor Mvars for the studied projects.

Table 6: Shunt Reactor Mvar Determined by Low Wind/Low Irradiance Study

Request	POI	2016 Winter Peak	2017 Summer Peak	2025 Summer Peak
GEN-2015-048	514778	20.3	20.3	20.3
GEN-2015-057/059	514801	35.8	35.8	35.8
GEN-2015-060	515376	13.9	13.9	13.9
GEN-2015-081	562075	8.4	8.4	8.4
GEN-2015-093	515800	16.6	16.6	16.6
GEN-2015-095	560066	14.6	14.6	14.6

9. Short-Circuit Study

A short-circuit study has been performed on the power flow models for the 2017 Summer Peak and 2025 Summer Peak Seasons for each generator using the Cluster Scenario model. Short-circuit analysis includes applying a 3-phase fault on buses up to 5 levels away from the POI of each interconnection request project. PSS/E "Automatic Sequence Fault Calculation (ASCC)" fault analysis module was used for the purpose of short-circuit analysis. The results of the short-circuit analysis have been recorded for all the buses up to five levels away from the point of interconnection of each interconnection request project. Detailed results of the short-circuit study are provided in Appendix E.

10. Conclusions and Recommendations

With the adjustments mentioned in Section 6, Group 1's dynamic results (Cluster) indicated that the interconnection request projects are expected to successfully ride through all N-1 and N-2 fault contingencies specified by SPP, retaining angular, frequency and voltage stability at the nearby areas and meeting the transient voltage recovery requirement by SPP, with the solutions illustrated in the dynamic stability results section of this report. With the implementation of these solutions or similar alternatives, it is thus concluded that Group 1 study projects are expected to successfully interconnect into the transmission system at their desired locations for 100% power outputs.

The results of power factor analysis indicate that all interconnection requests are required to maintain a power factor of 0.95 lagging to 0.95 leading at the POI to meet SPP's requirements.

The low wind study suggested that to offset the reactive power from the capacitance of the project's transmission lines and collector cables during the low wind conditions, GEN-2015-048 project requires a 20.3 Mvar shunt reactor, GEN-2015-057/059 projects require a 35.8 Mvar shunt reactor, GEN-2015-060 project requires a 13.9 Mvar shunt reactor, GEN-2015-081 project requires a 8.4 Mvar shunt reactor, GEN-2015-093 project requires a 16.6 Mvar shunt reactor, and GEN-2015-095 project requires a 14.6 Mvar shunt reactor.

A short-circuit study has been performed on the power flow models for the 2017 Summer Peak Season and 2025 Summer Peak Season for each generator using the Cluster Scenario model. A 3-phase fault is applied on buses up to 5 levels away from the POI of each interconnection request project and the results of the study have been presented.

APPENDIX A

SPP GROUP 1 FAULT DEFINITIONS (SUBMITTED IN A SEPARATE FILE)

APPENDIX B

SOUTHWEST POWER POOL DISTURBANCE PERFORMANCE REQUIREMENTS (SUBMITTED IN A SEPARATE FILE)

APPENDIX C

DYNAMIC STABILITY PLOTS FOR CLUSTER SCENARIO (SUBMITTED IN SEPARATE FILES FROM APPENDIX C-1 TO C-3)

C-1 Group 1 Cluster Dynamic Stability Plots For 2016 Winter Peak Case

C-2 Group 1 Cluster Dynamic Stability Plots For 2017 Summer Peak Case

C-3 Group 1 Cluster Dynamic Stability Plots For 2025 Summer Peak Case

Each contingency consists of (48) subplots:

- Subplot #1 shows the system phase angle channels
- Subplot #2 to Subplot #40 are results for (39) generators in the scope of study.
- Subplots #41 to Subplot #44 are voltages at the POI buses in the scope of study.
- Subplots #45 to Subplot #48 are frequencies at the POI buses in the scope of study.

APPENDIX D

POWER FACTOR ANALYSIS RESULTS (SUBMITTED IN SEPARATE FILE FROM APPENDIX D-1 TO D-6)

D-1 Group 1 Power Factor Results for Interconnection Request GEN-2015-048 (#514778)

D-2 Group 1 Power Factor Results for Interconnection Request GEN-2015-057/59 (#514801)

D-3 Group 1 Power Factor Results for Interconnection Request GEN-2015-060 (#515376)

D-4 Group 1 Power Factor Results for Interconnection Request GEN-2015-081 (#562075)

D-5 Group 1 Power Factor Results for Interconnection Request GEN-2015-093 (#515800)

D-6 Group 1 Power Factor Results for Interconnection Request GEN-2015-095 (#560066)

APPENDIX E

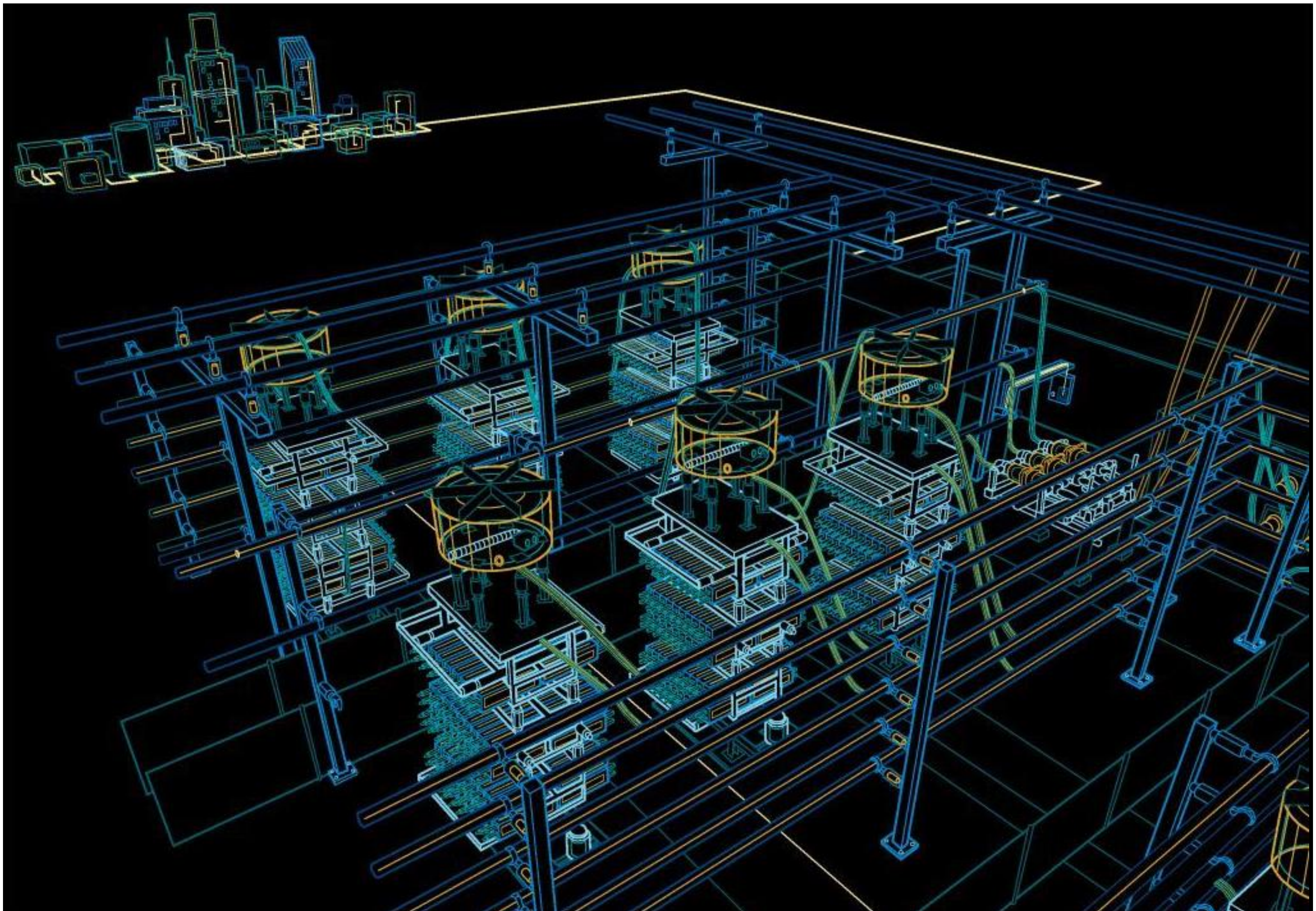
SHORT-CIRCUIT STUDY RESULTS (SUBMITTED IN A SEPARATE FILE FROM APPENDIX E-1 TO E-2)

E-1 GROUP 1 17SP Short-Circuit Study Results

E-2 GROUP 1 25SP Short-Circuit Study Results

11.14 K: Group 2 Dynamic Stability Analysis Report

See ABB report next page



Southwest Power Pool

DEFINITIVE IMPACT STUDY DISIS-2015-002-1 (GROUP 02)

Final Report

Report No. r00

23 June 2016

CONFIDENTIAL

Contains Proprietary Information

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Report No.: r00
Date: 23 June 2016
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Rev No.	***Revision Description***	***Date***	***Authored by***	***Reviewed by***	***Approved by***

SUMMARY

Southwest Power Pool (SPP) has commissioned ABB Inc., to perform a Definitive Impact Study for DISIS-2015-002_1 (Group 02) which includes generation interconnection request GEN-2014-037 (200 MW wind farm connected on the tap from Hitchland to Beaver County 345kV line).

Request	Size (MW)	Generator Model	POI
GEN-2014-037	200.0	Vestas V110 2.0MW	Tap on Hitchland to Beaver County 345kV (Optima 345kV – 560010)

The objective of this study is to evaluate the impact of project GEN-2014-037 on the existing and future planning system. The study is performed on three system scenarios provided by SPP:

- 2016 Winter Peak Case
- 2017 Summer Peak Case
- 2025 Summer Peak Case

Fault FLT08-3PH in all three seasons showed high voltage violations. Those bus voltages have little spike right after fault clearing and the peak values are slightly over 1.2 p.u. Pre-project case was created for the 2016 Winter Peak case which presents the most the voltage violations. The simulation results show no over voltage violations for the pre-project case; therefore, it can be concluded that this high voltage violations are caused by the studied generators.

For FLT04-3PH and FLT06-3PH, the studied generators and several pre-queued projects showed undamped oscillations. And a couple of bus voltages and machine responses also showed wiggling response following these two faults for all three seasons. Pre-project cases were created for all three study season to simulate the above two faults. For FLT06-3PH, undamped oscillations were observed for all the pre-project study cases. For FLT04-3PH, only 2016 winter peak pre-project case presents undamped oscillation. In discussions with SPP since FLT04-3PH, FLT06-3PH, and FLT 08-3PH are double circuit faults, the mitigation will be the curtailment of generation in the area.

For the rest of the studied faults, the simulation results showed no instability problems and no voltage violations for all three seasons. All the simulation results were summarized in Table 2-2.

System short-circuit current levels at up to five buses away from the point of interconnection were calculated and tabulated for SPP's reference.

Power Factor Analysis was performed to ensure the studied project meets FERC and SPP power factor requirements for wind farm interconnections. The results show significant need for reactive power from the study project following the critical contingencies. The proposed GEN-

2014-037 need to design their facility to meet the SPP pro-forma 95% lagging (providing vars) and 95% leading (absorbing vars) power factor requirements at the Point of Interconnection.

The Low/No Wind analysis shows that a 13.55 MVAr shunt reactor is required to bring the MVAr flow in the POI down to approximate zero under low/no wind conditions. The reactor bank size is approximate and the final size will be determined in the final facility and collector system design.

The results of this analysis are based on available data and assumptions made at the time of conducting this study. If any of the data and/or assumptions made in developing the study model change, the results provided in this report may not apply.

Contents

1 Introduction

Southwest Power Pool (SPP) has commissioned ABB Inc., to perform a Definitive Impact Study for DISIS-2015-002_1 (Group 02) which includes generation interconnection request GEN-2014-037 (200 MW wind farm connected on the tap from Hitchland to Beaver County 345kV line) as shown in Table 1-1.

Table 1-1: Group 02 Generation Interconnection Requests

Request	Size (MW)	Generator Model	POI
GEN-2014-037	200.0	Vestas V110 2.0MW	Tap on Hitchland to Beaver County 345kV (Optima 345kV – 560010)

The objective of this study is to evaluate the impact of project GEN-2014-037 on the existing and future planning system. The study is performed on three system scenarios provided by SPP:

- 2016 Winter Peak Case
- 2017 Summer Peak Case
- 2025 Summer Peak Case

In the process of the study, SPP provided following changes to the fault and system conditions:

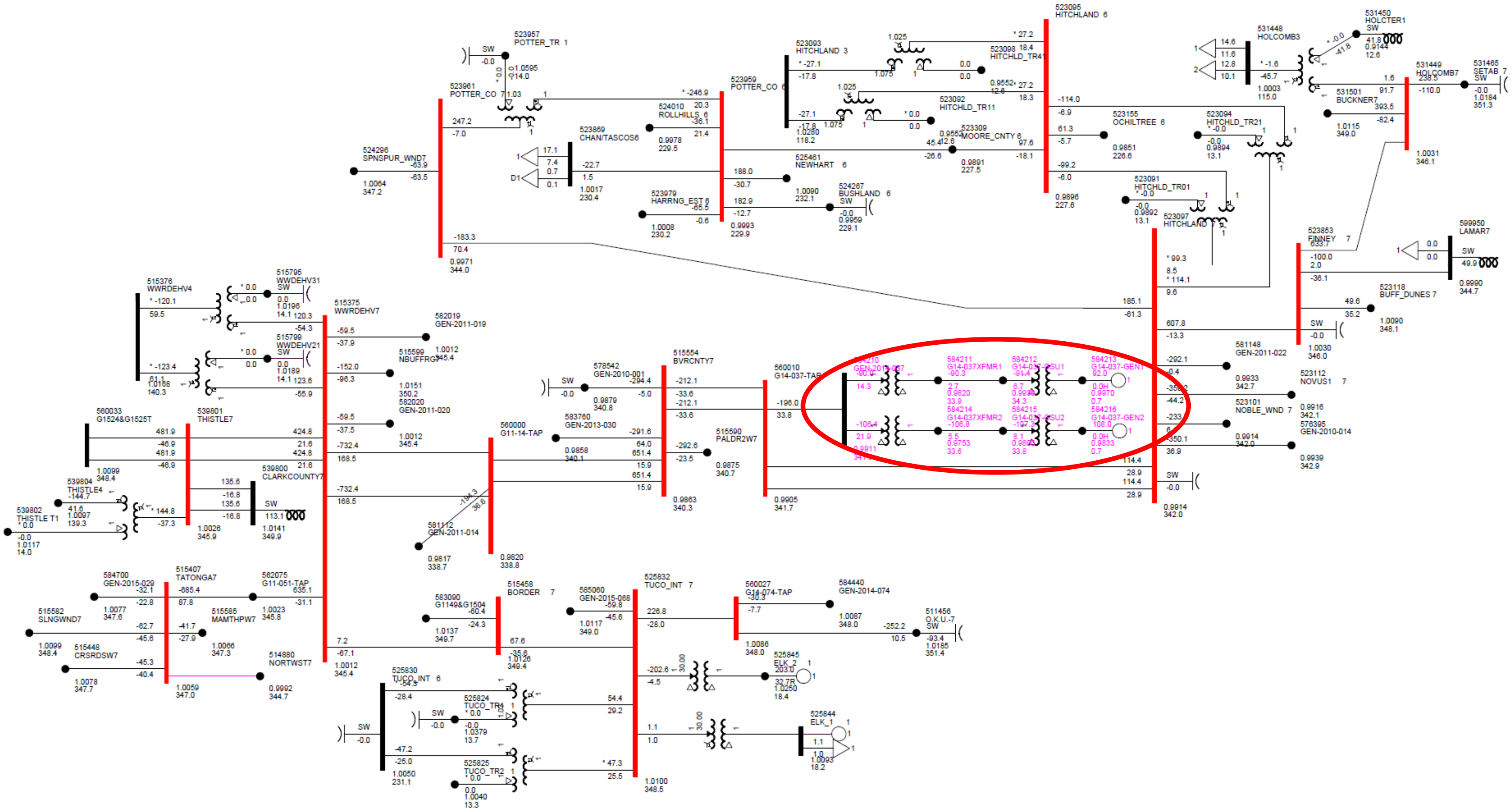
- The definitions of FLT31-3PH, FLT32-3PH, FLT39-PO, FLT40-PO, FLT42-PO and FLT43-PO were changed. The updated information are shown as in Table 2-1.
- The dispatch of GEN-2002-022 and GEN-2008-051 are down to 20% for all three seasons.

SPP provided the study cases for all three system scenarios with GEN-2014-037 included. One line diagrams of the local area for all three seasons are shown in Figure 1-1. The studied generator is circled red.

The three system scenarios supplied by SPP included the following prior queued projects for Group 02:

Table 1-2: Group 02 Prior Queued Projects

Request	Size (MW)	Wind Turbine Model	Point of Interconnection
Llano Estacado (White Deer)	80.0	CIMTR1	Tap on Kingsmill (523712) to MIDSTRM Tap (523817) (523815)
GEN-2002-008	240	GE 1.5MW	Hitchland 345kV (523097)
GEN-2002-009	79.8	Suzlon 2.1MW	Hansford 115kV (523195)
GEN-2003-020	159.1	GE 1.5/1.6 MW	Carson Co. 115kV (523928)
GEN-2006-020S	20	D8.2 2.0MW	Frisco Wind 115kV (523160)
GEN-2006-044	370	DeWind D9.2 2.0MW	Hitchland 345kV (523097)
GEN-2007-046	200.0	Vestas V100/V110 2.0MW	Hitchland 115kV (523093)
GEN-2008-047	300	GE 1.7MW	Beaver County 345kV (515554)
GEN-2010-001	300	GE 1.85MW	Beaver County 345kV (515554)
GEN-2010-014	358.8	Siemens SWT 2.3MW	Hitchland 345kV (523097)
ASGI-2011-002	20	DeWind D8.2 2.0MW	Herring 115kV (523359)
GEN-2011-014	198	Vestas V117 3.3MW	Beaver County 345kV (515554)
GEN-2011-022	299	Siemens 2.3MW	Hitchland 345kV (523097)
ASGI-2013-001	11.5	Siemens 2.3	PanTex South 115kV(523945)
GEN-2013-030	300	Vestas 2.0 MW VCSS (583763, 583766)	Beaver County 345kV (515554)



523957 POTTER_TR 1
523961 POTTER_CO 7
524296 SPNSPUR_WND7
523869 CHAN/TASCOS6
524010 ROLLHILLS 6
523979 HARRNG_EST 6
523959 POTTER_CO 6
523093 HITCHLAND 3
523095 HITCHLAND 6
523098 HITCHLD_TR41
523092 HITCHLD_TR11
523309 MOORE_CNTY 6
525461 NEWHART 6
524267 BUSHLAND 6
523155 OCHILTREE 6
523094 HITCHLD_TR21
523091 HITCHLD_TR01
523097 HITCHLAND 7
531448 HOLCOMB3
531450 HOLCTER1
531449 HOLCOMB7
531465 SETAB 7
531501 BUCKNER7
523853 FINNEY 7
599950 LAMAR7
523118 BUFF_DUNES 7
581148 GEN-2011-022
523112 NOVUS1 7
523101 NOBLE_WND 7
576395 GEN-2010-014
515376 WWRDEHV4
515795 WWRDEHV31
515799 WWRDEHV21
515375 WWRDEHV7
582019 GEN-2011-019
515599 NBUFFRG7
582020 GEN-2011-020
560033 G1524&G1525T
539801 THISTLE7
539800 CLARKCOUNTY7
539804 THISTLE4
539802 THISTLE T1
578542 GEN-2010-001
515554 BVRCNTY7
583760 GEN-2013-030
560000 G11-14-TAP
515590 PALDR2W7
560010 G14-037-TAP
584211 G14-037XFMR1
584213 G14-037-GEN1
584214 G14-037XFMR2
584216 G14-037-GEN2
581112 GEN-2011-014
584700 GEN-2015-029
515407 TATONGA7
562075 G11-051-TAP
515582 SLNGWND7
515585 MAMTHPW7
515448 CRSRDSW7
514880 NORTWST7
583090 G1149&G1504
515458 BORDER 7
585060 GEN-2015-068
525832 TUCO_INT 7
560027 G14-074-TAP
584440 GEN-2014-074
511456 O.K.U.-7
525830 TUCO_INT 6
525824 TUCO_TR1
525825 TUCO_TR2
525845 ELK_2
525844 ELK_1

Figure 1-2 (b): One Line Diagram of Group 02 Area for 2017 Summer Peak Case

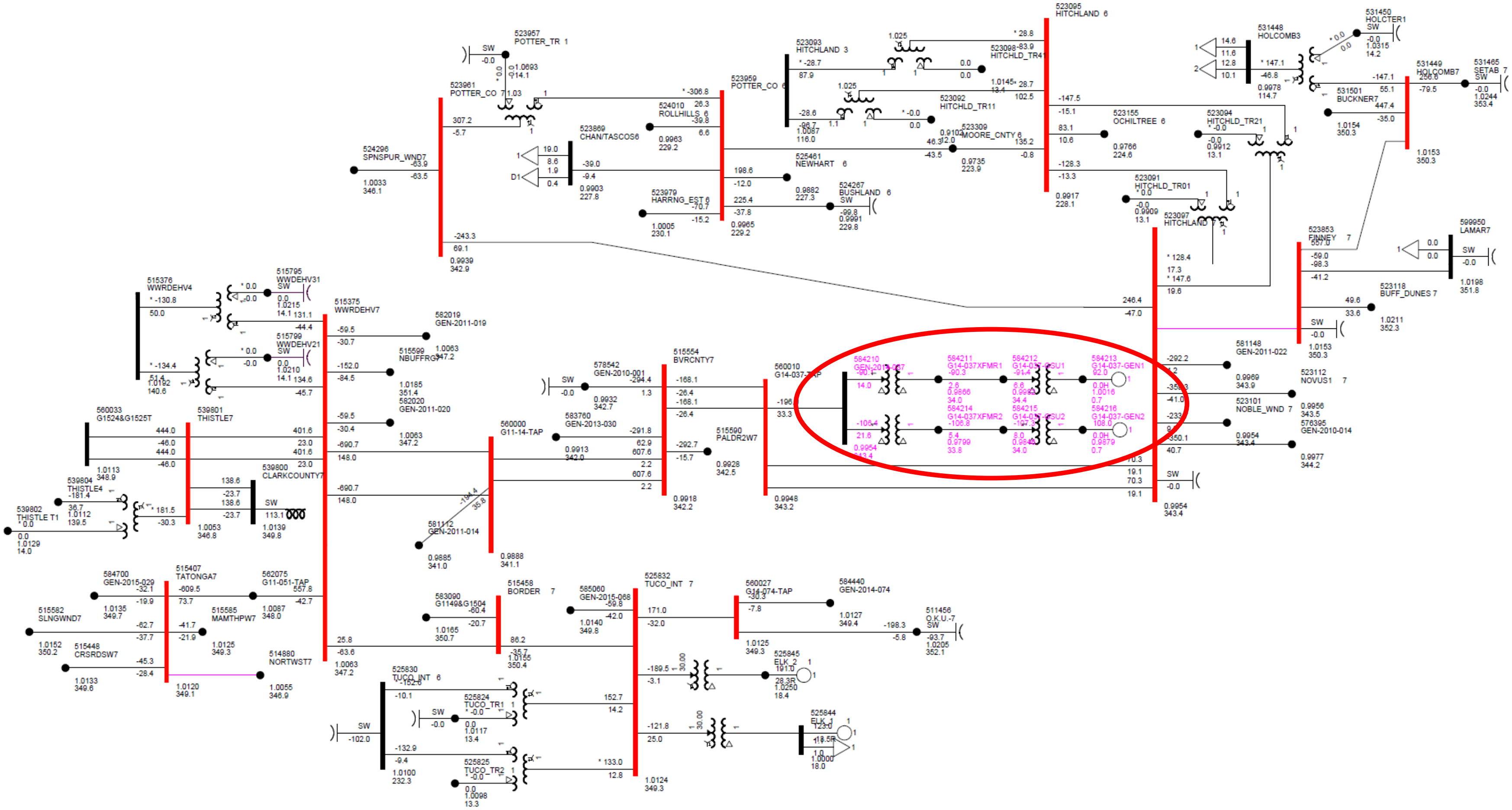
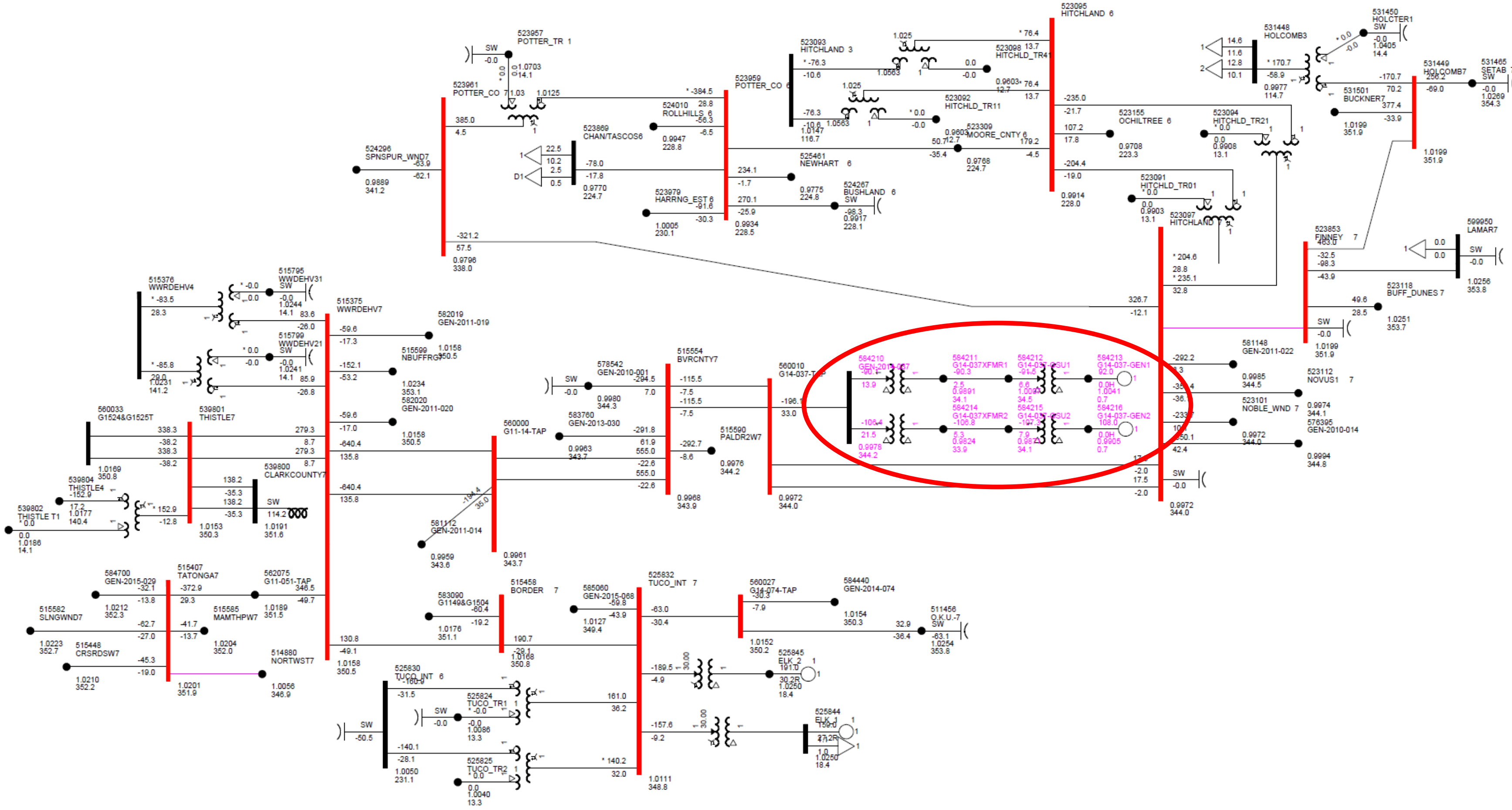


Figure 1-3 (c): One Line Diagram of Group 02 Area for 2025 Summer Peak Case



2 STABILITY ANALYSIS

In this study, ABB investigated the stability of the system for faults in the vicinity of the proposed plant as defined by SPP. The studied faults involve three-phase transformer faults with normal clearing, three-phase line faults with normal clearing and re-closing test, and single-line-to-ground (SLG) faults with stuck breaker.

2.1 Stability Analysis Methodology

Stability analysis is performed to determine whether the electric system would meet stability criteria following the addition of the GEN-2014-037 project.

According to the latest version of Disturbance Performance Requirements, the electric system shall meet the following voltage criteria:
After a disturbance is cleared; bus voltages on the Bulk Electric System shall recover above 0.70 per unit, 2.5 seconds after the fault is cleared. Bus voltages shall not swing above 1.20 per unit after the fault is cleared, unless affected transmission system elements are designed to handle the rise above 1.2 per unit.

Stability analysis was performed using Siemens-PTI's PSS/E dynamics program V32.2.0.

All the faults listed in Table 2-1 were simulated for 20 seconds.

Table 2-1: List of Faults for Stability Analysis

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on Optima 345kV (560010) to Beaver County 345kV (515554) CKT 1, near Optima. a. Apply fault at the Optima 345kV bus. b. Clear fault after 5 cycles and trip 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 Optima 345kV (560010) to Hitchland 345kV (523097) CKT 1, near G14-037 Tap. a. Apply fault at the Optima 345kV bus. b. Clear fault after 5 cycles and trip 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 Beaver County 345kV (515554) to G11-14-Tap 345kV (560000) CKT 1, near Beaver County. a. Apply fault at the Beaver County 345kV bus. b. Clear fault after 5 cycles and trip 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.
4	FLT04-3PH	3 phase fault on the Beaver County 345kV (515554) to G11-014-Tap 345kV (560000) CKT 1 & 2, near Beaver County.

Cont. No.	Cont. Name	Description
		a. Apply fault at the Beaver County 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
5	FLT05-3PH	3 phase fault on the G11-014-Tap 345kV (560000) to Woodward 345kV (515375) CKT 1, near G11-014-Tap. a. Apply fault at the G11-014-Tap 345kV bus. b. Clear fault after 5 cycles and trip 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 G11-014-Tap 345kV (560000) to Woodward 345kV (515375) CKT 1 & 2, near G11-014-Tap. a. Apply fault at the G11-014-Tap 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
7	FLT07-3PH	3 phase fault on the Optima 345kV (560010) to Beaver County 345kV (515554) CKT 1 and 2, near Optima. a. Apply fault at the Optima 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
8	FLT08-3PH	3 phase fault on the Optima 345kV (560010) to Hitchland 345kV (523097) CKT 1 and 2, near Optima. a. Apply fault at the Optima 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
9	FLT09-3PH	3 phase fault on the Thistle 345kV (539801) to Woodward 345kV (515375) CKT 1, near Thistle. a. Apply fault at the Thistle 345kV bus. b. Clear fault after 5 cycles and trip 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 Thistle 345kV (539801) to Woodward 345kV (515375) CKT 1 and 2, near Thistle. a. Apply fault at the Thistle 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
11	FLT11-3PH	3 phase fault on the Woodward 345kV (515375) to Border 345kV (515458) CKT 1, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles and trip 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	FLT12-3PH	3 phase fault on the Woodward 345kV (515375) to G11-051 Tap 345kV (562075) CKT 1, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles and trip 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
13	FLT13-3PH (25SP Only)	3 phase fault on the Woodward 345kV (515375) to G11-051-Tap 345kV (562075) CKT 1 and 2, near Woodward. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
14	FLT14-3PH	3 phase fault on the Woodward 345kV (515375) to Woodward 138kV (515376) Woodward 13.8kV (515799) XFMR CKT 2, near Woodward 345kV. a. Apply fault at the Woodward 345kV bus. b. Clear fault after 5 cycles and trip the faulted transformer.
15	FLT15-3PH	3 phase fault on the Border 345kV (515458) to Tuco 345kV (525832) CKT 1, near Border. a. Apply fault at the Border 345kV bus. b. Clear fault after 5 cycles and trip 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.
16	FLT16-3PH	3 phase fault on the Tuco 345kV (525832) to G14-074-Tap 345kV (560027) CKT 1, near Tuco. a. Apply fault at the Tuco 345kV bus. b. Clear fault after 5 cycles and trip 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.
17	FLT17-3PH	3 phase fault on the G14-074-Tap 345kV (560027) to OKU 345kV (511456) CKT 1, near G14-074-Tap. a. Apply fault at the G14-074-Tap 345kV bus. b. Clear fault after 5 cycles and trip 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.
18		DELETED
19	FLT19-3PH	3 phase fault on the Thistle 345kV (539801) to G1524&G1525T 345kV (560033) CKT 1, near Thistle. a. Apply fault at the Thistle 345kV bus. b. Clear fault after 5 cycles and trip 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.
20	FLT20-3PH	3 phase fault on the Thistle 345kV (539801) to G1524&G1525T 345kV (560033) CKT 1 and 2, near Thistle. a. Apply fault at the Thistle 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
21	FLT21-3PH	3 phase fault on the Thistle 345kV (539801) to Clark County 345kV (539800) CKT 1, near Thistle. a. Apply fault at the Thistle 345kV bus.

Cont. No.	Cont. Name	Description
		b. Clear fault after 5 cycles and trip 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 Thistle 345kV (539801) to Clark County 345kV (539800) CKT 1 and 2, near Thistle. a. Apply fault at the Thistle 345kV bus. b. Clear fault after 5 cycles and trip the faulted lines (CKT 1 and 2).
23	FLT23-3PH	3 phase fault on the Thistle 345kV (539801) to Thistle 138kV (539804) Thistle 13.8kV (539802) XFMR CKT 1, near Thistle 345kV. a. Apply fault at the Thistle 345kV bus. b. Clear fault after 5 cycles and trip the faulted transformer.
24	FLT24-3PH (16WP Only)	3 phase fault on the Hitchland 345kV (523097) to Finney 345kV (523853) CKT 1, near Hitchland. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles and trip 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.
25	FLT25-3PH	3 phase fault on the Hitchland 345kV (523097) to Hitchland 230kV (523095) Hitchland 13.2kV (523091) XFMR CKT 1, near Hitchland 345kV. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles and trip the faulted transformer.
26	FLT26-3PH	3 phase fault on the Potter County 345kV (523961) to Potter County 230kV (523959) Potter County 13.2kV (523957) XFMR CKT 1, near Potter County 345kV. a. Apply fault at the Potter County 345kV bus. b. Clear fault after 5 cycles and trip the faulted transformer.
27	FLT27-3PH	3 phase fault on the Hitchland 230kV (523095) to Ochiltree 230kV (523155) CKT 1, near Hitchland. a. Apply fault at the Hitchland 230kV bus. b. Clear fault after 5 cycles and trip 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	FLT28-3PH	3 phase fault on the Hitchland 230kV (523095) to Moore County 230kV (523309) CKT 1, near Hitchland. a. Apply fault at the Hitchland 230kV bus. b. Clear fault after 5 cycles and trip 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	FLT29-3PH	3 phase fault on the Finney 345kV (523853) to Holcomb 345kV (531449) CKT 1, near Finney. a. Apply fault at the Finney 345kV bus. b. Clear fault after 5 cycles and trip the faulted line.

Cont. No.	Cont. Name	Description
		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	FLT30-3PH	3 phase fault on the Holcomb 345kV (531449) to Buckner 345kV (531501) CKT 1, near Holcomb. a. Apply fault at the Holcomb 345kV bus. b. Clear fault after 5 cycles and trip 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	FLT31-3PH	3 phase fault on Hitchland 345kV (523097) to Potter 345kV (523961) CKT 1, near Hitchland. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles and trip 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		DELETED
33	FLT33-3PH	3 phase fault on Potter County 230kV (523959) to Moore County 230kV (523309) CKT 1, near Potter County. a. Apply fault at the Potter County 230kV bus. b. Clear fault after 5 cycles and trip 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	FLT34-3PH	3 phase fault on Potter County 230kV (523959) to Harrington East 230kV (523979) CKT 1, near Potter County. a. Apply fault at the Potter County 230kV bus. b. Clear fault after 5 cycles and trip 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.
35	FLT35-3PH	3 phase fault on Potter County 230kV (523959) to Rolling Hills 230kV (524010) CKT 1, near Potter County. a. Apply fault at the Potter County 230kV bus. b. Clear fault after 5 cycles and trip 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.
36	FLT36-3PH	3 phase fault on Potter County 230kV (523959) to Bushland 230kV (524267) CKT 1, near Potter County. a. Apply fault at the Potter County 230kV bus. b. Clear fault after 5 cycles and trip 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.
37	FLT37-3PH	3 phase fault on Potter County 230kV (523959) to Newhart 230kV (525461) CKT 1, near Potter County. a. Apply fault at the Potter County 230kV bus.

Cont. No.	Cont. Name	Description
		b. Clear fault after 5 cycles and trip 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.
38	FLT38-3PH	3 phase fault on the Finney 345kV (523853) to Lamar 345kV (599950) CKT 1, near Finney. a. Apply fault at the Finney 345kV bus. b. Clear fault after 5 cycles and trip the faulted line.
39	FLT39-PO (16WP Only)	**Prior outage on the Hitchland (523097) - Finney (523853)** 3 phase fault on Potter County 345kV (523961) to Hitchland 345kV (523097) CKT 1, near Potter County. a. Apply fault at the Potter County 345kV bus. b. Clear fault after 5 cycles and trip 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	FLT40-PO (17SP and 25SP Only)	**Prior outage on the Hitchland (523097) – Walk Tap (531512)** 3 phase fault on Potter County 345kV (523961) to Hitchland 345kV (523097) CKT 1, near Potter County. a. Apply fault at the Potter County 345kV bus. b. Clear fault after 5 cycles and trip 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	FLT41-PO (17SP and 25SP Only)	**Prior outage on the Hitchland (523097) - Walk Tap (531512)** 3 phase fault on Hitchland 345kV (523097) to G14-037-Tap 345kV (560010) CKT 1, near G14-037 Tap. a. Apply fault at the G14-037-Tap 345kV bus. b. Clear fault after 5 cycles and trip 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.
42		DELETED
43	FLT43-PO (17SP and 25SP Only)	**Prior outage on the Hitchland 345kV (523097) to Potter 345kV (523961)** 3 phase fault on Hitchland (523097) – Walk Tap (531512) CKT 1, near Hitchland. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles and trip 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	FLT44-PO	**Prior outage on the Woodward 345kV (515375) to Thistle (539801) 345kV line** 3 phase fault on Tatonga (515407) to G11-051-Tap (562075) a. Apply fault on the Tatonga (515407) 345kV to G11-051-Tap (562075) near Tatonga b. Clear fault after 5 cycles and trip the faulted line.

Cont. No.	Cont. Name	Description
		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	FLT45-SB	**Woodward 345kV Stuck Breaker** a. Apply single phase fault at the Woodward (515375) 345kV bus on the Woodward – G11-051-Tap (562075) 345kV line b. Wait 16 cycles, and then drop Woodward (515375) 345kV to Thistle (539801) 345kV ckt 1 c. Trip Woodward to G11-051-Tap 345kV and remove the fault
46	FLT46-SB	**Hitchland 345kV Stuck Breaker** a. Apply single phase fault at the Hitchland (523097) 345kV bus b. Wait 16 cycles, and then drop Hitchland – Optima (560010) 345kV circuit 1 and remove fault
47	FLT47-SB (16WP Only)	**Hitchland 345kV Stuck Breaker** a. Apply single phase fault at the Hitchland (523097) 345kV bus b. Wait 16 cycles, and then drop Hitchland – Finney (523853) 345kV circuit 1 and remove fault
48	FLT48-PO	**Prior outage on the Woodward 345kV (515375) to Thistle (539801) 345kV line** 3 phase fault on Tatonga (515407) to Mathewson (515497) a. Apply 3 phase fault on the Tatonga (515407) 345kV to Mathewson (515497) line near Tatonga b. Clear fault after 5 cycles and trip 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.
49	FLT49-SB	**Beaver 345kV Stuck Breaker** a. Apply single phase fault at the Beaver County (515554) 345kV bus b. Wait 16 cycles, and then drop Beaver County – G11-14-Tap (560000) 345kV circuit 1 and remove fault
50	FLT50-SB	**G11-14-Tap 345kV Stuck Breaker** a. Apply single phase fault at the G11-14-Tap (560000) 345kV bus b. Wait 16 cycles, and then drop G11-14-Tap (560000) – Woodward (515375) 345kV circuit 1 and remove fault
51	FLT51-SB	**Woodward 345kV Stuck Breaker** a. Apply single phase fault at the Woodward (515375) 345kV bus b. Wait 16 cycles, and then drop Woodward (515375) – Border (515458) 345kV circuit 1 and remove fault
52	FLT52-SB	Additional stuck breaker contingency determined by Consultant (with review from SPP) for GEN-2014-037
53	FLT53-SB	Additional stuck breaker contingency determined by Consultant (with review from SPP) for GEN-2014-038
54	FLT54-SB	Additional stuck breaker contingency determined by Consultant (with review from SPP) for GEN-2015-082

Single- line-to-ground faults were simulated with the standard method of applying fault impedance to the positive sequence network to represent the effect of the negative and zero sequence networks on the positive sequence network. The SLG fault impedance was computed by using PSS/E function “SCMU” as suggested by SPP.

The Southwest Power Pool Disturbance Performance Criteria Requirements in Appendix A were used to evaluate the system response during the initial transient period following a disturbance on the system. Generator response and bus voltages (115 kV and above) in Areas 520, 524, 525, 526, 531, 534, and 536 were monitored to ensure the system performance meets criteria requirements. Rotor angles of the nearby synchronous machines were investigated to make sure they maintained synchronism and had adequate damping following system faults.

Any wind generator must comply with FERC Order 661A on low voltage ride through requirements for wind farms. Therefore, the wind generators should not be tripped off line for faults by under voltage relay actuation. Generator speed of pre-queued projects was also monitored to ensure they stay online under system contingencies. For contingencies that result in a prior queued project tripping off-line; the contingency shall be re-run with the prior queued project’s voltage and frequency tripping disabled.

2.2 Study Results

All fault results are summarized in Table 2-2. The “Low Voltage Violation” in the table refers to bus voltages are lower than 0.7 pu. 2.5 second after the fault clearing and the “High Voltage” refers to bus voltage are higher than 1.2 pu. right after fault clearing. All violations are highlighted with **red**.

Table 2-2 Study Results Summary

Fault File Name	16WP Case			Fault File Name	17SP Case			Fault File Name	25SP Case		
	Stable?	Low Voltage Violation	High Voltage Violation		Stable?	Low Voltage Violation	High Voltage Violation		Stable?	Low Voltage Violation	High Voltage Violation
FLT01-3PH	Stable	No	No	FLT01-3PH	Stable	No	No	FLT01-3PH	Stable	No	No
FLT02-3PH	Stable	No	No	FLT02-3PH	Stable	No	No	FLT02-3PH	Stable	No	No
FLT03-3PH	Stable	No	No	FLT03-3PH	Stable	No	No	FLT03-3PH	Stable	No	No
FLT04-3PH	**Undamped Oscillation**	No	No	FLT04-3PH	**Undamped Oscillation**	No	No	FLT04-3PH	**Undamped Oscillation**	No	No
FLT05-3PH	Stable	No	No	FLT05-3PH	Stable	No	No	FLT05-3PH	Stable	No	No
FLT06-3PH	**Undamped Oscillation**	No	No	FLT06-3PH	**Undamped Oscillation**	No	No	FLT06-3PH	**Undamped Oscillation**	No	No
FLT07-3PH	Stable	No	No	FLT07-3PH	Stable	No	No	FLT07-3PH	Stable	No	No
FLT08-3PH	Stable	No	**Yes**	FLT08-3PH	Stable	No	**Yes**	FLT08-3PH	Stable	No	**Yes**
FLT09-3PH	Stable	No	No	FLT09-3PH	Stable	No	No	FLT09-3PH	Stable	No	No
FLT10-3PH	Stable	No	No	FLT10-3PH	Stable	No	No	FLT10-3PH	Stable	No	No
FLT11-3PH	Stable	No	No	FLT11-3PH	Stable	No	No	FLT11-3PH	Stable	No	No
FLT12-3PH	Stable	No	No	FLT12-3PH	Stable	No	No	FLT12-3PH	Stable	No	No
FLT14-3PH	Stable	No	No	FLT14-3PH	Stable	No	No	FLT13-3PH	Stable	No	No
FLT15-3PH	Stable	No	No	FLT15-3PH	Stable	No	No	FLT14-3PH	Stable	No	No
FLT16-3PH	Stable	No	No	FLT16-3PH	Stable	No	No	FLT15-3PH	Stable	No	No
FLT17-3PH	Stable	No	No	FLT17-3PH	Stable	No	No	FLT16-3PH	Stable	No	No
FLT19-3PH	Stable	No	No	FLT19-3PH	Stable	No	No	FLT17-3PH	Stable	No	No
FLT20-3PH	Stable	No	No	FLT20-3PH	Stable	No	No	FLT19-3PH	Stable	No	No
FLT21-3PH	Stable	No	No	FLT21-3PH	Stable	No	No	FLT20-3PH	Stable	No	No
FLT22-3PH	Stable	No	No	FLT22-3PH	Stable	No	No	FLT21-3PH	Stable	No	No
FLT23-3PH	Stable	No	No	FLT23-3PH	Stable	No	No	FLT22-3PH	Stable	No	No
FLT24-3PH	Stable	No	No	FLT25-3PH	Stable	No	No	FLT23-3PH	Stable	No	No
FLT25-3PH	Stable	No	No	FLT26-3PH	Stable	No	No	FLT25-3PH	Stable	No	No
FLT26-3PH	Stable	No	No	FLT27-3PH	Stable	No	No	FLT26-3PH	Stable	No	No
FLT27-3PH	Stable	No	No	FLT28-3PH	Stable	No	No	FLT27-3PH	Stable	No	No
FLT28-3PH	Stable	No	No	FLT29-3PH	Stable	No	No	FLT28-3PH	Stable	No	No
FLT29-3PH	Stable	No	No	FLT30-3PH	Stable	No	No	FLT29-3PH	Stable	No	No
FLT30-3PH	Stable	No	No	FLT31-3PH	Stable	No	No	FLT30-3PH	Stable	No	No

Fault File Name	16WP Case			Fault File Name	17SP Case			Fault File Name	25SP Case		
	Stable?	Low Voltage Violation	High Voltage Violation		Stable?	Low Voltage Violation	High Voltage Violation		Stable?	Low Voltage Violation	High Voltage Violation
FLT31-3PH	Stable	No	No	FLT33-3PH	Stable	No	No	FLT31-3PH	Stable	No	No
FLT33-3PH	Stable	No	No	FLT34-3PH	Stable	No	No	FLT33-3PH	Stable	No	No
FLT34-3PH	Stable	No	No	FLT35-3PH	Stable	No	No	FLT34-3PH	Stable	No	No
FLT35-3PH	Stable	No	No	FLT36-3PH	Stable	No	No	FLT35-3PH	Stable	No	No
FLT36-3PH	Stable	No	No	FLT37-3PH	Stable	No	No	FLT36-3PH	Stable	No	No
FLT37-3PH	Stable	No	No	FLT38-3PH	Stable	No	No	FLT37-3PH	Stable	No	No
FLT38-3PH	Stable	No	No	FLT40-PO	Stable	No	No	FLT38-3PH	Stable	No	No
FLT39-PO	Stable	No	No	FLT41-PO	Stable	No	No	FLT40-PO	Stable	No	No
FLT44-PO	Stable	No	No	FLT43-PO	Stable	No	No	FLT41-PO	Stable	No	No
FLT45-SB	Stable	No	No	FLT44-PO	Stable	No	No	FLT43-PO	Stable	No	No
FLT46-SB	Stable	No	No	FLT45-SB	Stable	No	No	FLT44-PO	Stable	No	No
FLT47-SB	Stable	No	No	FLT46-SB	Stable	No	No	FLT45-SB	Stable	No	No
FLT48-PO	Stable	No	No	FLT48-PO	Stable	No	No	FLT46-SB	Stable	No	No
FLT49-SB	Stable	No	No	FLT49-SB	Stable	No	No	FLT48-PO	Stable	No	No
FLT50-SB	Stable	No	No	FLT50-SB	Stable	No	No	FLT49-SB	Stable	No	No
FLT51-SB	Stable	No	No	FLT51-SB	Stable	No	No	FLT50-SB	Stable	No	No
								FLT51-SB	Stable	No	No

Figure 2-1 shows an example for the response of one studied generator following fault FLT01-3PH for 2016 Winter Peak case. The machine speed, active and reactive power output and terminal voltage are plotted to show the generator response.

All the simulation plots are included in Appendix B.

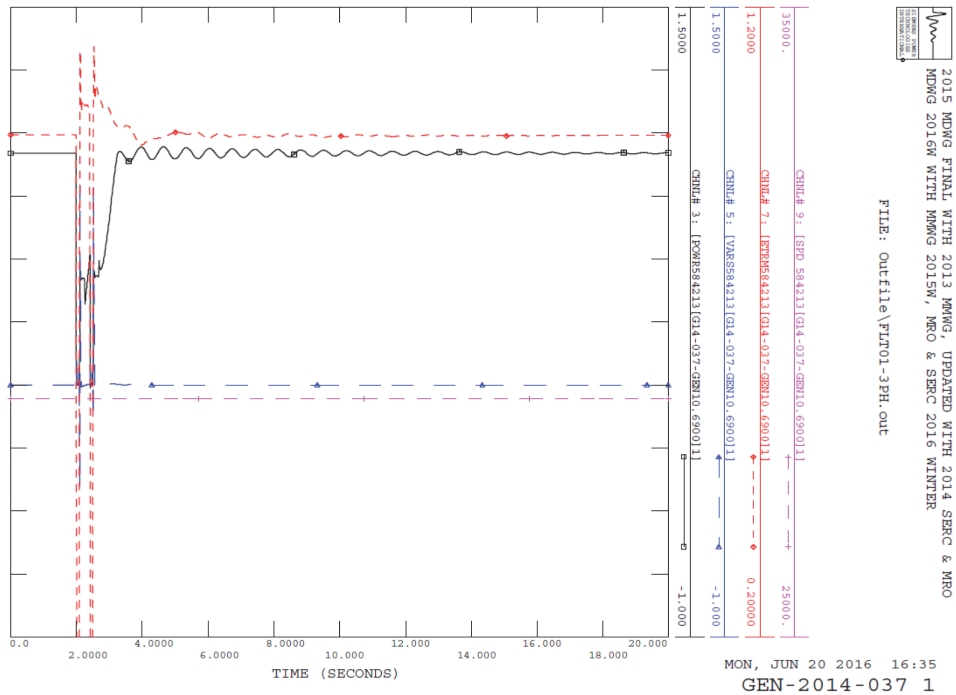


Figure 2-1: GEN-2014-037 Response Following Fault FLT01-3PH for 2016 Winter Peak Case

As shown in the results summary table, fault FLT08-3PH in all three seasons showed high voltage violations. Figure 2-2 shows the plots. Those bus voltages have little spike right after fault clearing and the peak values are slightly over 1.2 p.u. Pre-project case was created for the 2016 Winter Peak case which presents the most voltage violations. The simulation results show no over voltage violations for the pre-project case; therefore, it can be concluded that this high voltage violations are caused by the studied generators.

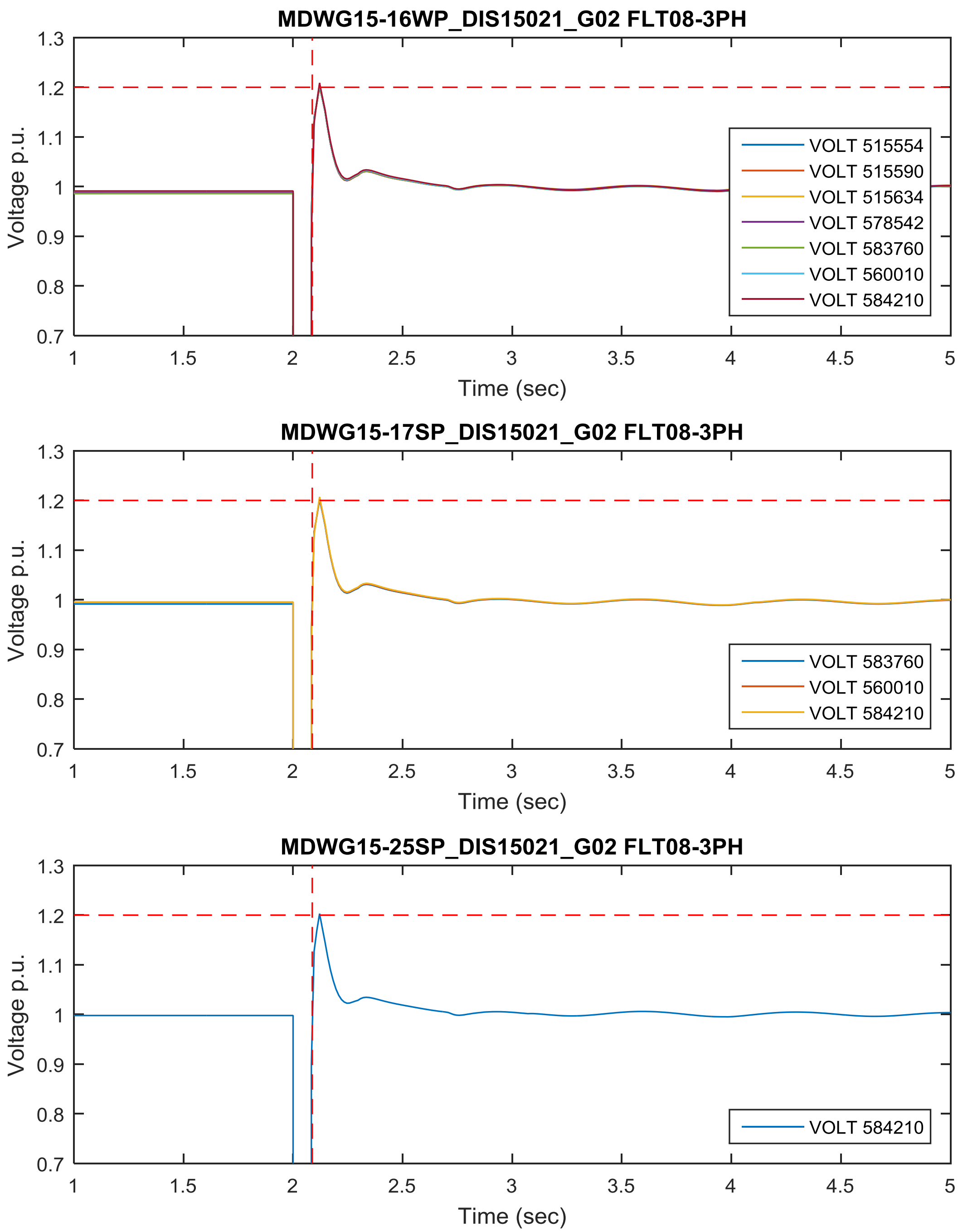


Figure 2-2 High Voltage Violation Plots

For FLT04-3PH and FLT06-3PH, the studied generators showed undamped oscillations as plotted in Figure 2-3. Several pre-queued projects also showed undamped oscillations similar to the studied generators. A couple of bus voltages and machine responses also showed wiggling response following these two faults for all three seasons. Figure 2-4 presents an example for bus voltage.

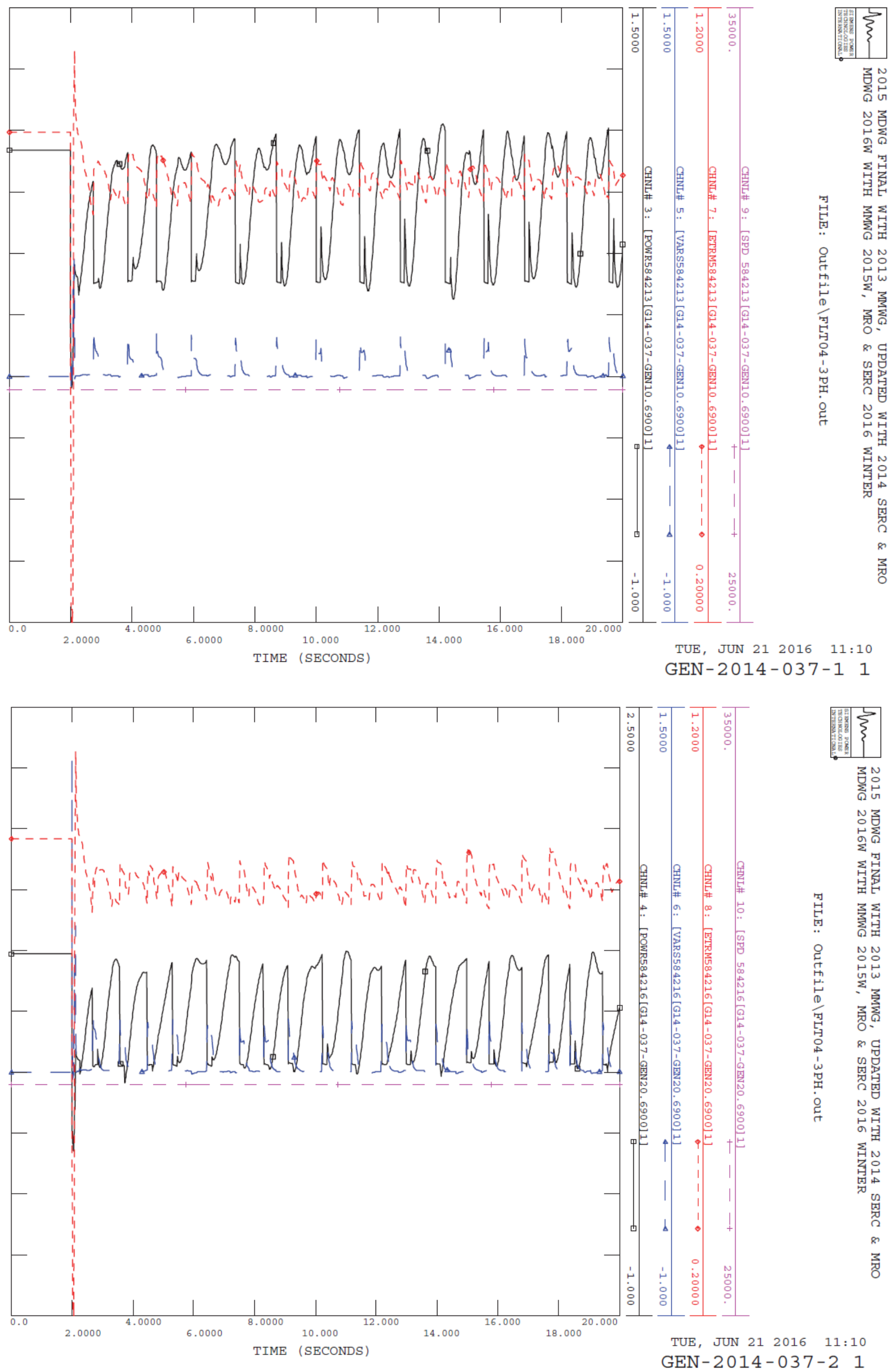


Figure 2-3 GEN-2014-037 Response for FLT04-3PH 2016 Winter Peak

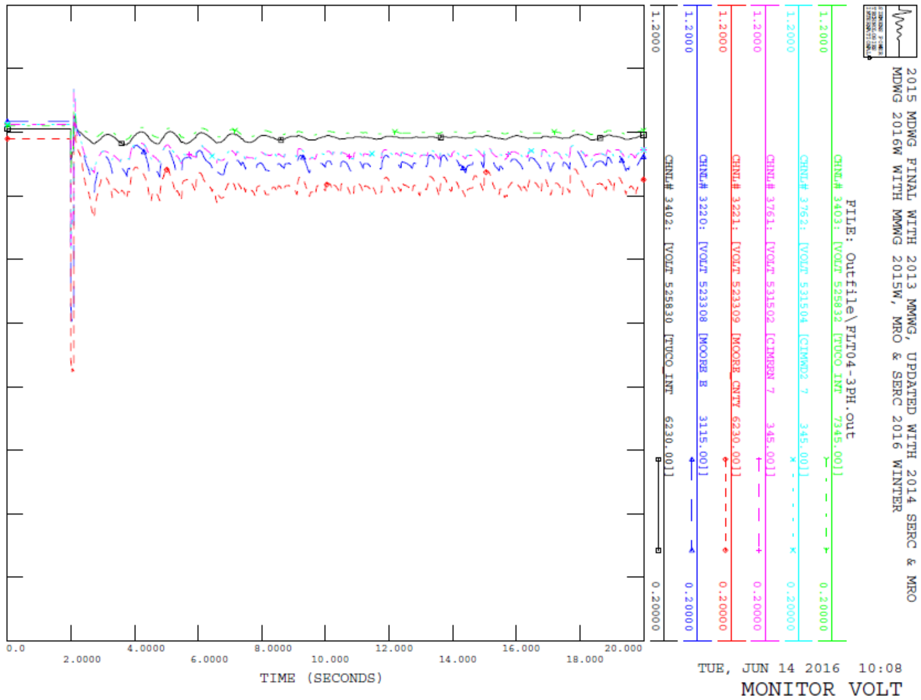


Figure 2-4 Bus Voltage and Machine Speed Wiggling Example

Pre-project cases were created for all three study season to simulate the above two faults. The simulation results are shown in Table 2-3. For FLT06-3PH, undamped oscillations were observed for all the pre-project study cases. For FLT04-3PH, only 2016 winter peak pre-project case presents undamped oscillation.

Table 2-3 Pre-Project Cases Simulation Results

	2016 WP Pre-Project	2017 SP Pre-Project	2025SP Pre-Project
FLT04-3PH	Undamped Oscillation	Stable	Stable
FLT06-3PH	Undamped Oscillation	Undamped Oscillation	Undamped Oscillation

In discussions with SPP since FLT04-3PH, FLT06-3PH, and FLT 08-3PH are double circuit faults, the mitigation will be the curtailment of generation in the area.

For the rest of the studied faults, the simulation results showed no instability problems and no voltage violations for all three seasons.

3 SHORT CIRCUIT ANALYSIS

Short circuit analysis was performed on the 2017 Summer Peak and 2025 Summer Peak power flow cases using the PSS/E program. Only three-phase symmetrical fault current levels were calculated at up to five buses away from the point of interconnection.

Table 3-1 tabulates all the three-phase fault current levels, and the calculated values were listed here for SPP's reference.

Table 3-1: Three-Phase Fault Currents

2017 SP			2025 SP		
Number	Name	3PH(Amp)	Number	Name	3PH(Amp)
599041	DEWIND-HV 115.00	6953.8	599041	DEWIND-HV 115.00	6926.2
524290	WILDOR2_JUS6230.00	6546.3	524290	WILDOR2_JUS6230.00	6520.6
523267	PRINGLE 6230.00	4301.9	523267	PRINGLE 6230.00	4310.4
515590	PALDR2W7 345.00	11765.0	515590	PALDR2W7 345.00	12025.0
524295	SPNSPUR_WND134.500	14590.4	524295	SPNSPUR_WND134.500	14414.3
515592	PALDRW21 34.500	8079.7	515592	PALDRW21 34.500	8103.8
515593	PALDRWT1 13.200	62352.1	515593	PALDRWT1 13.200	62616.5
515594	PALDRWT2 13.800	13911.7	515594	PALDRWT2 13.800	13945.9
523277	VALERO 3115.00	9706.0	523277	VALERO 3115.00	9738.2
515599	NBUFFRG7 345.00	8163.9	515599	NBUFFRG7 345.00	8628.6
584210	GEN-2014-037345.00	10690.0	584210	GEN-2014-037345.00	10823.7
584211	G14-037XFMR134.500	15970.5	584211	G14-037XFMR134.500	16025.2
584212	G14-037-GSU134.500	15230.7	584212	G14-037-GSU134.500	15279.8
584213	G14-037-GEN10.6900	717591.2	584213	G14-037-GEN10.6900	719673.4
584214	G14-037XFMR234.500	17072.8	584214	G14-037XFMR234.500	17131.2
584215	G14-037-GSU234.500	16916.3	584215	G14-037-GSU234.500	16973.0
584216	G14-037-GEN20.6900	813607.2	584216	G14-037-GEN20.6900	816052.4
531481	HUGOTON3 115.00	5941.1	531481	HUGOTON3 115.00	5956.9
581148	GEN-2011-022345.00	9121.3	581148	GEN-2011-022345.00	9209.1
581149	G11-022XFMR134.500	18249.4	581149	G11-022XFMR134.500	18280.2
581150	G11-022XFMR234.500	18142.2	581150	G11-022XFMR234.500	18173.4
581151	G11-022-GSU134.500	17453.9	581151	G11-022-GSU134.500	17479.4
581152	G11-022-GSU234.500	17036.4	581152	G11-022-GSU234.500	17060.5
581153	G11-022-GEN10.6900	754003.9	581153	G11-022-GEN10.6900	754593.8
581154	G11-022-GEN20.6900	740239.3	581154	G11-022-GEN20.6900	740801.1
523301	MOORE_E 113.200	12874.3	523301	MOORE_E 113.200	12670.2
523302	MOORE_TR1 113.200	20042.4	523302	MOORE_TR1 113.200	20261.1
523304	MOORE_W 3115.00	10665.9	523304	MOORE_W 3115.00	10716.2
515591	PALDRW11 34.500	32240.2	515591	PALDRW11 34.500	32417.0
523308	MOORE_E 3115.00	10665.9	523308	MOORE_E 3115.00	10716.2
523309	MOORE_CNTY 6230.00	6672.9	523309	MOORE_CNTY 6230.00	6640.2
524296	SPNSPUR_WND7345.00	4427.3	524296	SPNSPUR_WND7345.00	4389.5
515634	PALDR1W7 345.00	10132.3	515634	PALDR1W7 345.00	10328.0

2017 SP			2025 SP		
Number	Name	3PH(Amp)	Number	Name	3PH(Amp)
531510	WALKTAP3 115.00	10290.3	531510	WALKTAP3 115.00	10360.3
531511	WALKETP-T 13.800	26693.4	531511	WALKETP-T 13.800	26725.7
531512	WALKTAP7 345.00	7717.2	531512	WALKTAP7 345.00	7815.1
599105	SPNSPUR-CB1 34.500	13396.6	599105	SPNSPUR-CB1 34.500	13233.8
573509	G08-047-GSU234.500	6838.8	573509	G08-047-GSU234.500	6853.0
573510	G08-047-GEN20.6900	271080.4	573510	G08-047-GEN20.6900	271230.4
523853	FINNEY 7345.00	10409.7	523853	FINNEY 7345.00	10524.0
583760	GEN-2013-030345.00	10799.3	583760	GEN-2013-030345.00	11017.8
583761	G13-030XFMR134.500	22204.6	583761	G13-030XFMR134.500	22356.8
583762	G13-030-GSU134.500	22042.4	583762	G13-030-GSU134.500	22189.8
583763	G13-030-GEN10.5750	1314338.0	583763	G13-030-GEN10.5750	1322335.4
583764	G13-030XFMR234.500	21956.3	583764	G13-030XFMR234.500	22107.6
583765	G13-030-GSU234.500	21610.5	583765	G13-030-GSU234.500	21753.0
583766	G13-030-GEN20.5750	1303725.0	583766	G13-030-GEN20.5750	1311586.1
523866	CHANNING 134.500	6178.2	523866	CHANNING 134.500	6107.1
523869	CHAN/TASCOS6230.00	3843.9	523869	CHAN/TASCOS6230.00	3814.9
523115	BUFF_DN_TR2113.200	513957.3	523115	BUFF_DN_TR2113.200	520329.2
525458	NEWHART_TR2113.200	16867.6	525458	NEWHART_TR2113.200	16709.8
525459	NEWHART_TR1113.200	16867.6	525459	NEWHART_TR1113.200	16709.8
525460	NEWHART 3115.00	14722.7	525460	NEWHART 3115.00	14707.5
525461	NEWHART 6230.00	10814.7	525461	NEWHART 6230.00	10866.0
539800	CLARKCOUNTY7345.00	11517.4	539800	CLARKCOUNTY7345.00	11667.6
539801	THISTLE7 345.00	14952.6	539801	THISTLE7 345.00	15476.2
539802	THISTLE T1 13.800	7898.3	539802	THISTLE T1 13.800	7947.7
539804	THISTLE4 138.00	16229.7	539804	THISTLE4 138.00	16626.0
599068	NTHBUF_XFMR134.500	20330.2	599068	NTHBUF_XFMR134.500	20680.1
523957	POTTER_TR 113.200	6637.3	523957	POTTER_TR 113.200	6655.4
523959	POTTER_CO 6230.00	20146.9	523959	POTTER_CO 6230.00	20171.2
523961	POTTER_CO 7345.00	7361.7	523961	POTTER_CO 7345.00	7330.8
599071	NTHBUF_XFMR234.500	20290.9	599071	NTHBUF_XFMR234.500	20638.7
523186	SPEARMAN 3115.00	8930.1	523186	SPEARMAN 3115.00	8958.2
523973	HARRNGTON3 124.000	112694.2	523973	HARRNGTON3 124.000	113803.8
523977	HARRNG_WST 6230.00	26083.1	523977	HARRNG_WST 6230.00	26300.0
523978	HARRNG_MID 6230.00	26083.1	523978	HARRNG_MID 6230.00	26300.0
523979	HARRNG_EST 6230.00	26083.1	523979	HARRNG_EST 6230.00	26300.0
599074	NTHBUF_EHV2 345.00	6332.1	599074	NTHBUF_EHV2 345.00	6604.4
515795	WWDEHV31 13.800	61117.3	515795	WWDEHV31 13.800	61898.0
515799	WWDEHV21 13.800	60747.4	515799	WWDEHV21 13.800	61545.1
579296	G07-046-XF-134.500	13866.9	579296	G07-046-XF-134.500	13950.6
514785	WOODWRD4 138.00	20111.0	514785	WOODWRD4 138.00	20792.2
579299	G07-046-XF-234.500	11210.5	579299	G07-046-XF-234.500	11276.5
524007	ROLLHILLS 3115.00	19015.1	524007	ROLLHILLS 3115.00	19065.4
524008	ROLHILLS_TR113.200	17095.9	524008	ROLHILLS_TR113.200	17048.0

2017 SP			2025 SP		
Number	Name	3PH(Amp)	Number	Name	3PH(Amp)
524010	ROLLHILLS 6230.00	19266.9	524010	ROLLHILLS 6230.00	19343.7
514796	IODINE-4 138.00	7313.2	514796	IODINE-4 138.00	7406.0
576398	G10-014XFMR134.500	16603.8	576398	G10-014XFMR134.500	16622.4
531465	SETAB 7 345.00	7186.0	531465	SETAB 7 345.00	7262.0
531501	BUCKNER7 345.00	9678.3	531501	BUCKNER7 345.00	9762.4
539654	CIM-PLT3 115.00	7250.9	539654	CIM-PLT3 115.00	7269.7
584980	GEN-2015-060138.00	5765.7	584980	GEN-2015-060138.00	5817.5
523140	TXFARMS 3115.00	5108.7	523140	TXFARMS 3115.00	5104.4
579375	G06-044GSU2A34.500	17167.9	579375	G06-044GSU2A34.500	17217.1
523087	TC-TXCOUNTY134.500	4627.9	523087	TC-TXCOUNTY134.500	4628.1
525832	TUCO_INT 7345.00	10160.2	525832	TUCO_INT 7345.00	12469.4
579369	G06-044GSU1B34.500	17972.7	579369	G06-044GSU1B34.500	17990.5
579370	G06-044-MV1A115.00	8311.3	579370	G06-044-MV1A115.00	8328.8
579371	G06-044-XF1A34.500	14231.2	579371	G06-044-XF1A34.500	14240.7
579374	G06-044-XF2A34.500	17376.5	579374	G06-044-XF2A34.500	17407.8
515375	WWRDEHV7 345.00	17556.9	515375	WWRDEHV7 345.00	20066.1
515376	WWRDEHV4 138.00	24267.7	515376	WWRDEHV4 138.00	25444.1
579377	G06-044-MV2B115.00	10350.6	579377	G06-044-MV2B115.00	10374.8
579378	G06-044-XF2B34.500	22774.0	579378	G06-044-XF2B34.500	22790.0
531252	WALKMYR1 13.800	16033.9	531252	WALKMYR1 13.800	16025.2
515394	KEENAN 4 138.00	8279.5	515394	KEENAN 4 138.00	8425.6
523147	WADE 3115.00	3569.8	523147	WADE 3115.00	3567.0
515398	OUSPRT 4 138.00	9107.5	515398	OUSPRT 4 138.00	9284.2
523085	TC-TXCN_TR1113.200	5755.0	523085	TC-TXCN_TR1113.200	5758.7
523086	TC-TXCN_TR2113.200	5756.0	523086	TC-TXCN_TR2113.200	5759.8
515407	TATONGA7 345.00	10659.2	515407	TATONGA7 345.00	16336.8
523089	TC-TXCOUNTY269.000	8196.7	523089	TC-TXCOUNTY269.000	8325.2
523090	TEXAS_CNTY 3115.00	8724.8	523090	TEXAS_CNTY 3115.00	8713.2
523091	HITCHLD_TR0113.200	32988.4	523091	HITCHLD_TR0113.200	33011.3
523092	HITCHLD_TR1113.200	20460.4	523092	HITCHLD_TR1113.200	21289.1
523093	HITCHLAND 3115.00	17430.1	523093	HITCHLAND 3115.00	17390.5
523094	HITCHLD_TR2113.200	22554.6	523094	HITCHLD_TR2113.200	22565.5
523095	HITCHLAND 6230.00	14683.8	523095	HITCHLAND 6230.00	14808.3
523097	HITCHLAND 7345.00	15018.9	523097	HITCHLAND 7345.00	15255.4
523098	HITCHLD_TR4113.200	22108.3	523098	HITCHLD_TR4113.200	21289.1
523099	TC-WHITING 3115.00	2202.4	523099	TC-WHITING 3115.00	2208.5
523101	NOBLE_WND 7345.00	14957.0	523101	NOBLE_WND 7345.00	15191.7
523102	NOBLE_TR 113.800	32327.6	523102	NOBLE_TR 113.800	32403.5
523103	NOBLE_WND 3115.00	10526.2	523103	NOBLE_WND 3115.00	10569.4
523106	TXPHSF 3115.00	3954.2	523106	TXPHSF 3115.00	3978.4
523107	NOVUS_WND 14.1600	171592.4	523107	NOVUS_WND 14.1600	171723.0
523109	NOVUS1 134.500	17972.7	523109	NOVUS1 134.500	17990.5
523110	NOVUS1_TR1 113.800	535233.4	523110	NOVUS1_TR1 113.800	544750.5

2017 SP			2025 SP		
Number	Name	3PH(Amp)	Number	Name	3PH(Amp)
523111	NOVUS1 3115.00	19407.0	523111	NOVUS1 3115.00	19504.8
523112	NOVUS1 7345.00	14752.3	523112	NOVUS1 7345.00	14980.0
523113	TC-MCMURRY 3115.00	6629.6	523113	TC-MCMURRY 3115.00	6629.7
523114	BUFF_DN_TR1113.200	518520.3	523114	BUFF_DN_TR1113.200	524991.8
524263	BSHLND_TR1 113.200	20292.5	524263	BSHLND_TR1 113.200	20310.3
523116	BUFF_DUNES1134.500	26495.0	523116	BUFF_DUNES1134.500	26549.6
523118	BUFF_DUNES 7345.00	6299.3	523118	BUFF_DUNES 7345.00	6345.4
523120	COLE 3115.00	4104.5	523120	COLE 3115.00	4108.5
523125	NBLWND-CB2 134.500	8116.9	523125	NBLWND-CB2 134.500	8123.6
523127	NBLWND-LV1 134.500	8355.3	523127	NBLWND-LV1 134.500	8363.8
523128	NBLWND-LV2 134.500	10006.5	523128	NBLWND-LV2 134.500	10020.0
523129	NBLWND-LV3 134.500	9500.2	523129	NBLWND-LV3 134.500	9511.3
523130	NBLWND-HV2 3115.00	5145.3	523130	NBLWND-HV2 3115.00	5157.3
523131	NBLWND-HV3 3115.00	7943.6	523131	NBLWND-HV3 3115.00	7969.7
560000	G11-14-TAP 345.00	12639.2	560000	G11-14-TAP 345.00	13091.7
515458	BORDER 7345.00	5040.1	515458	BORDER 7345.00	5167.4
582019	GEN-2011-019345.00	17556.9	582019	GEN-2011-019345.00	20066.1
582020	GEN-2011-020345.00	17556.9	582020	GEN-2011-020345.00	20066.1
573505	G08-047-GSU134.500	29576.0	573505	G08-047-GSU134.500	29707.7
560010	G14-037-TAP 345.00	14733.7	560010	G14-037-TAP 345.00	14986.0
576395	GEN-2010-014345.00	11100.7	576395	GEN-2010-014345.00	11229.0
576396	G10-014-XFMR115.00	13147.4	576396	G10-014-XFMR115.00	13204.9
576397	G10-014-XF-1115.00	9181.6	576397	G10-014-XF-1115.00	9209.7
599950	LAMAR7 345.00	2445.0	599950	LAMAR7 345.00	2458.8
523151	OCHLTRE_TR1113.200	10320.7	523151	OCHLTRE_TR1113.200	10266.8
576408	G10-014XFMR234.500	18446.4	576408	G10-014XFMR234.500	18470.2
523154	OCHILTREE 3115.00	5860.4	523154	OCHILTREE 3115.00	5854.0
523155	OCHILTREE 6230.00	4197.0	523155	OCHILTREE 6230.00	4200.3
523158	PERRYTON 3115.00	5590.8	523158	PERRYTON 3115.00	5584.5
576407	G10-014-XF-2115.00	12390.7	576407	G10-014-XF-2115.00	12441.8
523160	FRISCO_WND 3115.00	6953.8	523160	FRISCO_WND 3115.00	6926.2
562075	G11-051-TAP 345.00	11948.6	562075	G11-051-TAP 345.00	17039.7
525213	SWISHER 6230.00	10315.7	525213	SWISHER 6230.00	10419.0
560033	G1524&G1525T345.00	19095.1	560033	G1524&G1525T345.00	19759.1
523174	GOODWELLWND3115.00	6570.9	523174	GOODWELLWND3115.00	6600.9
523175	LASLEY 3115.00	5643.8	523175	LASLEY 3115.00	5592.8
523177	RB-SPURLOCK3115.00	5642.5	523177	RB-SPURLOCK3115.00	5610.6
583090	G1149&G1504 345.00	4619.4	583090	G1149&G1504 345.00	4723.4
578547	G10-001-GSU234.500	16781.3	578547	G10-001-GSU234.500	16835.8
523195	HANSFORD 3115.00	10214.1	523195	HANSFORD 3115.00	10227.6
523197	EXCELN4-HV23115.00	4722.6	523197	EXCELN4-HV23115.00	4733.2
583110	GEN-2011-051345.00	11948.6	583110	GEN-2011-051345.00	17039.7
531404	WALKMYR2 69.000	8227.9	531404	WALKMYR2 69.000	8322.2

2017 SP			2025 SP		
Number	**Name**	**3PH(Amp)**	**Number**	**Name**	**3PH(Amp)**
531405	WALKMYR3 115.00	9889.6	531405	WALKMYR3 115.00	9954.5
523216	RB-HOGUE 3115.00	3636.2	523216	RB-HOGUE 3115.00	3578.7
523256	ETTER 3115.00	5245.0	523256	ETTER 3115.00	5207.0
523221	XIT_INTG 6230.00	2608.2	523221	XIT_INTG 6230.00	2574.1
581113	G11-014XFMR134.500	13790.7	581113	G11-014XFMR134.500	13930.3
579412	G08-051-GSU234.500	16068.7	579412	G08-051-GSU234.500	15866.4
524623	DEAFSMITH 6230.00	7732.1	524623	DEAFSMITH 6230.00	7854.4
585180	GEN-2015-081345.00	10459.4	585180	GEN-2015-081345.00	14085.3
531450	HOLCTER1 13.800	18136.0	531450	HOLCTER1 13.800	18291.9
515554	BVRCNTY7 345.00	13760.2	515554	BVRCNTY7 345.00	14111.8
582119	G11-019XFMR134.500	37552.4	582119	G11-019XFMR134.500	38292.8
582120	G11-020XFMR134.500	37570.8	582120	G11-020XFMR134.500	38311.1
524266	BUSHLAND 3115.00	9120.3	524266	BUSHLAND 3115.00	9153.6
524267	BUSHLAND 6230.00	9507.9	524267	BUSHLAND 6230.00	9487.0
578542	GEN-2010-001345.00	11360.6	578542	GEN-2010-001345.00	11603.9
578543	G10-001XFMR134.500	17052.5	578543	G10-001XFMR134.500	17109.9
578544	G10-001-GSU134.500	16930.5	578544	G10-001-GSU134.500	16986.1
578545	G10-001-GEN10.6900	672498.4	578545	G10-001-GEN10.6900	673290.0
578546	G10-001XFMR234.500	17009.1	578546	G10-001XFMR234.500	17066.7
579411	G08-051XFMR234.500	16639.5	579411	G08-051XFMR234.500	16430.9
578548	G10-001-GEN20.6900	668172.0	578548	G10-001-GEN20.6900	668953.2
531448	HOLCOMB3 115.00	22230.9	531448	HOLCOMB3 115.00	22412.8
525481	PLANT_X 6230.00	22368.2	525481	PLANT_X 6230.00	23630.6
581112	GEN-2011-014345.00	11389.6	581112	GEN-2011-014345.00	11762.8
531449	HOLCOMB7 345.00	10500.3	531449	HOLCOMB7 345.00	10615.9
581114	G11-014-GSU134.500	13186.3	581114	G11-014-GSU134.500	13316.1
581117	G11-014XFMR234.500	12834.4	581117	G11-014XFMR234.500	12966.1
581118	G11-014-GSU234.500	12101.2	581118	G11-014-GSU234.500	12221.7

4 POWER FACTOR ANALYSIS

Since the studied project is a renewable energy project, power factor analysis was performed on three provided cluster scenarios upon SPP's request.

4.1 POWER FACTOR ANALYSIS METHODOLOGY

Power Factor Analysis was performed for the studied wind farm under system intact and contingency conditions. All N-1, three phase stability faults shown in Table 2-1 were analyzed as power flow contingencies. The power factor requirements for the wind farm were determined to maintain the voltage at the POI to the schedule voltage which is the higher of the POI voltage in the provided base case or 1.0 per unit. Fictitious var generator was added to the studied wind farm to maintain the scheduled voltage following all studied contingencies. The MW and Mvar injections from the studied wind farm at the POI were recorded and the power factors were calculated for all contingencies. The most lagging and most leading power factors determine the minimum power factor range capability required for the studied wind farm.

If more than one studied project share the same POI, the projects were grouped together and common power factor requirements were determined for this group of studied projects. With this method, none of the studied projects is required to provide more or less than its fair share of the reactive power requirements at the same POI. If a prior-queued project is connected at the same POI as the studied project, the prior-queued project was not grouped with the studied project since its reactive power requirements was determined in previous studies. However, the voltage schedules of the prior-queued project and the studied project at the same POI were coordinated and the local existing capacitor banks were set to their maximum capability, if necessary.

Per FERC and SPP requirements, if the power factor needed to maintain the scheduled voltage is less than 0.95 lagging or leading, the requirements is limited to 0.95 lagging or leading.

If the required power factor at the POI is beyond the capability of the studied wind turbine, the approximate size of the additional capacitors were determined.

4.2 STUDY RESULTS

Power Factor Analysis was performed to ensure the studied project meets FERC and SPP power factor requirements for wind farm interconnections.

Table 4-1 summarizes the power factor analysis results. The detailed power factor analysis results for each studied contingency are provided in Appendix C.

There are several cases which the wind project was observed to require less than 95% power factor (providing vars) at the Point of Interconnection. Per SPP and FERC requirements, the generating facility shall be designed to meet the requirement of 95% lagging (providing vars) and 95% leading (absorbing vars) to the Point of Interconnection.

These capacitor bank sizes are only estimates based on the information provided by the Interconnection Customer for its collector system design. Final needs will be based on final designs of the collector system determined by the Interconnection Customer to meet the power factor requirement.

Table 4-1 Power Factor Analysis Results

Request	Size	Generator	POI	Scenario	PF Analysis Worst Scenario		Final PF Requirement	
	(MW)	Model			Leading[1]	Lagging[2]	Leading[1]	Lagging[2]
GEN-2014-037	200	Vestas V110 2.0MW	Tap on Hitchland to Beaver County 345kV (Optima 345kV – 560010)	16WP	N/A	0.506	1.0	0.95
				17SP	N/A	0.721	1.0	0.95
				25SP	1.0	0.780	1.0	0.95

Notes:

1. Leading is when the generator is absorbing reactive power from the transmission grid.
2. Lagging is when the generator is providing reactive power to the transmission grid.

5 LOW WIND/NO WIND ANALYSIS

In this study, ABB investigated the GEN-2014-037 project for low wind/no wind conditions, since the interconnected wind farm is connected at a 345kV bus.

5.1 LOW/NO WIND ANALYSIS METHODOLOGY

Low wind/No wind analysis is performed to determine the required shunt reactor size at the study project substation high side bus to bring the MVAr flow into the POI down to approximately zero.

For each studied scenario, the studied wind generator and capacitor bank (none in this case) was switched out of service with the collector system as modeled remaining in service. The resulting reactive power injection into the transmission network coming from the capacitance of the project's transmission lines and collector cables was measured. Then, the required shunt reactor size was calculated to bring the MVAr flow into the POI down to approximately zero.

5.2 STUDY RESULTS

Table 5-1 summaries the Low/No Wind analysis results. It is shown that 13.55 MVAr shunt reactor at the substation high side bus (560010) is required to bring the MVAr flow in the POI down to approximately zero under low/no wind conditions for all three studied seasons. This reactor bank size is approximate to be finalized during final facility and collector system design.

Table 5-1 Low/No Wind Analysis Results

Scenario	Reactive Power Injection at POI (MVAr)	Bus 560010 Volt (pu)	Required Shunt Reactor (MVAr)
16WP	13.6	1.0018	**13.55**
17SP	13.6	1.0042	**13.49**
25SP	13.7	1.0057	**13.55**

6 CONCLUSIONS

Southwest Power Pool (SPP) has commissioned ABB Inc., to perform a Definitive Impact Study for DISIS-2015-002_1 (Group 02) which includes generation interconnection request GEN-2014-037 (200 MW wind farm connected on the tap from Hitchland to Beaver County 345kV line).

Request	Size (MW)	Generator Model	POI
GEN-2014-037	200.0	Vestas V110 2.0MW	Tap on Hitchland to Beaver County 345kV (Optima 345kV – 560010)

The objective of this study is to evaluate the impact of project GEN-2014-037 on the existing and future planning system. The study is performed on three system scenarios provided by SPP:

- 2016 Winter Peak Case
- 2017 Summer Peak Case
- 2025 Summer Peak Case

Fault FLT08-3PH in all three seasons showed high voltage violations. Those bus voltages have little spike right after fault clearing and the peak values are slightly over 1.2 p.u. Pre-project case was created for the 2016 Winter Peak case which presents the most the voltage violations. The simulation results show no over voltage violations for the pre-project case; therefore, it can be concluded that this high voltage violations are caused by the studied generators.

For FLT04-3PH and FLT06-3PH, the studied generators and several pre-queued projects showed undamped oscillations. And a couple of bus voltages and machine responses also showed wiggling response following these two faults for all three seasons. Pre-project cases were created for all three study season to simulate the above two faults. For FLT06-3PH, undamped oscillations were observed for all the pre-project study cases. For FLT04-3PH, only 2016 winter peak pre-project case presents undamped oscillation. In discussions with SPP since FLT04-3PH, FLT06-3PH, and FLT 08-3PH are double circuit faults, the mitigation will be the curtailment of generation in the area.

For the rest of the studied faults, the simulation results showed no instability problems and no voltage violations for all three seasons. All the simulation results were summarized in Table 2-2.

System short-circuit current levels at up to five buses away from the point of interconnection were calculated and tabulated for SPP's reference.

Power Factor Analysis was performed to ensure the studied project meets FERC and SPP power factor requirements for wind farm interconnections. The results show significant need for reactive power from the study project following the critical contingencies. The proposed GEN-2014-037 need to design their facility to meet the SPP pro-forma 95% lagging (providing vars) and 95% leading (absorbing vars) power factor requirements at the Point of Interconnection.

The Low/No Wind analysis shows that a 13.55 MVAr shunt reactor is required to bring the MVAr flow in the POI down to approximate zero under low/no wind conditions. The reactor bank size is approximate and the final size will be determined in the final facility and collector system design.

The results of this analysis are based on available data and assumptions made at the time of conducting this study. If any of the data and/or assumptions made in developing the study model change, the results provided in this report may not apply.

APPENDIX A SOUTHWEST POWER POOL DISTURBANCE PERFORMANCE CRITERIA REQUIREMENTS

OVERVIEW

These Disturbance Performance Requirements (“Requirements”) shall be applicable to the Bulk Electric System within the Southwest Power Pool Planning Area. Utilization of these Requirements applies to all registered entities within the Southwest Power Pool Planning Area. These Requirements shall not be applicable to facilities that are not part of Bulk Electric System. More stringent Requirements are at the sole discretion of each Transmission Owner.

Transient and dynamic stability assessments are generally performed to assure adequate avoidance of loss of generator synchronism and prevention of system voltage collapse within the first 20 seconds after a system disturbance. These Requirements provide a basis for evaluating the system response during the initial transient period following a disturbance on the Bulk Electric System by establishing minimum requirements for machine rotor angle damping and transient voltage recovery.

ROTOR ANGLE DAMPING REQUIREMENT

Machine Rotor Angles shall exhibit well damped angular oscillations [as defined below] and acceptable power swings following a disturbance on the Bulk Electric System for all NERC Category A, B and C events.

Well damped angular oscillations shall meet one of the following two requirements when calculated directly from the rotor angle:

1. Successive Positive Peak Ratio (SPPR) must be less than or equal to 0.95 where SPPR is calculated as follows:

$$SPPR = \frac{\text{Peak Rotor Angle of } 2^{nd} \text{ Positive Swing Peak}}{\text{Peak Rotor Angle of } 1^{st} \text{ Positive Swing Peak}} \leq 0.95$$

   -or- Damping Factor % = (1 – SPPR) x 100% ≥ 5%

   The machine rotor angle damping ratio may be determined by appropriate modal analysis (i.e. Prony Analysis) where the following equivalent requirement must be met:

   Damping Ratio ≥ 0.0081633

2. Successive Positive Peak Ratio Five (SPPR5) must be less than or equal to 0.774 where SPPR5 is calculated as follows:

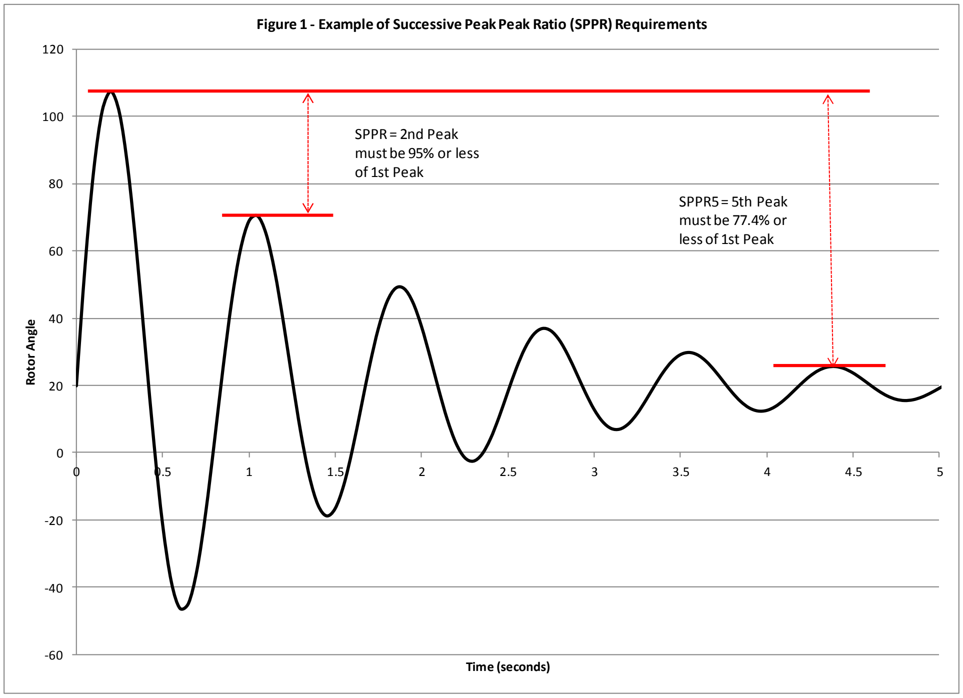
$$SPPR5 = \frac{\text{Peak Rotor Angle of } 5^{th} \text{ Positive Swing Peak}}{\text{Peak Rotor Angle of } 1^{st} \text{ Positive Swing Peak}} \leq 0.774$$

   -or- Damping Factor % = (1 – SPPR5) x 100% ≥ 22.6%

   The machine rotor angle damping ratio may be determined by appropriate modal analysis (i.e. Prony Analysis) where the following equivalent requirement must be met:

Damping Ratio ≥ 0.0081633

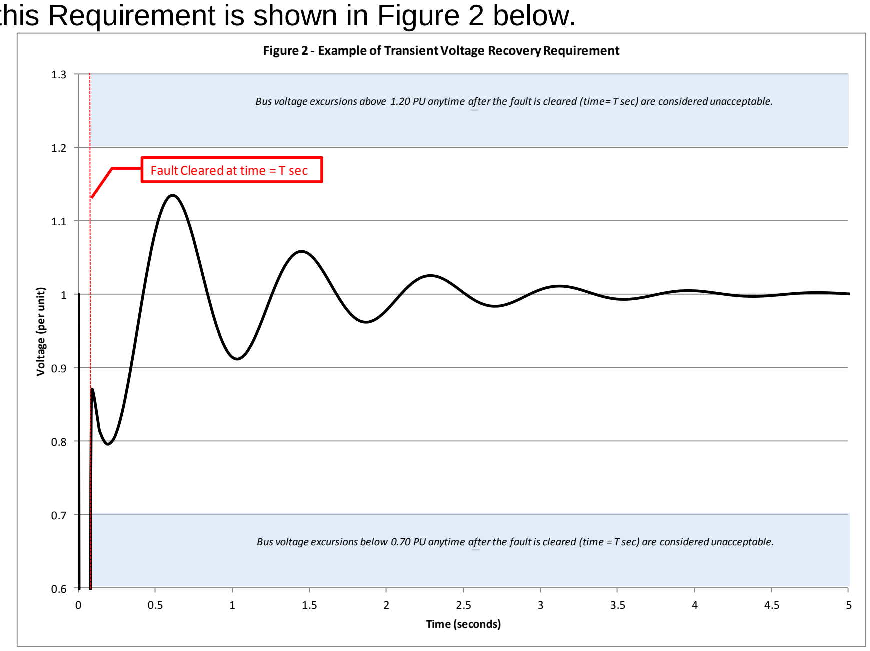
Qualitatively, these Requirements are shown in Figure 1 below.



TRANSIENT VOLTAGE RECOVERY REQUIREMENT

After a disturbance is cleared; bus voltages on the Bulk Electric System shall recover above 0.70 per unit, 2.5 seconds after the fault is cleared. Bus voltages shall not swing above 1.20 per unit after the fault is cleared, unless affected transmission system elements are designed to handle the rise above 1.2 per unit.

Qualitatively, this Requirement is shown in Figure 2 below.



APPENDIX B SIMULATION PLOTS FOR STABILITY ANALYSIS

APPENDIX C POWER FACTOR ANALYSIS RESULTS

All the contingency numbers shown in this appendix match with the fault numbers shown in Table 2-1.

C.1 GEN-2014-037 2016 Winter Peak Case

The GEN-2014-037 POI voltage is 0.9905 pu in the provided 2016 winter peak case. Therefore, the power factor requirements for the wind farm were determined to maintain the voltage at 1.0 pu. The lowest lagging and leading power factors are highlighted in the table below.

Outage No.		MW	Mvar	PF	
System Intact	0	-196.4	-59.4	0.957	lagging
Contingency	1	-196.4	-64.9	0.950	lagging
Contingency	2	-196.3	-65.1	0.949	lagging
Contingency	3	-196.3	-109.5	0.873	lagging
Contingency	4	-195.4	-249.4	0.617	lagging
Contingency	5	-196.5	-73.3	0.937	lagging
Contingency	6	-196.4	-74.3	0.935	lagging
Contingency	7	-196.4	-90.1	0.909	lagging
Contingency	8	-196.4	-66.7	0.947	lagging
Contingency	9	-196.3	-56.0	0.962	lagging
Contingency	10	-196.3	-104.1	0.884	lagging
Contingency	11	-196.3	-110.7	0.871	lagging
Contingency	12	-196.4	-62.9	0.952	lagging
Contingency	13	-196.4	-62.0	0.954	lagging
Contingency	14	-196.4	-63.3	0.952	lagging
Contingency	15	-194.4	-331.7	**0.506**	lagging
Contingency	16	-196.4	-62.8	0.953	lagging
Contingency	17	-196.3	-109.3	0.874	lagging
Contingency	18	-196.5	-73.9	0.936	lagging
Contingency	19	-196.4	-81.1	0.924	lagging
Contingency	20	-195.3	-258.3	0.603	lagging
Contingency	21	-196.3	-106.8	0.879	lagging
Contingency	22	-196.3	-143.6	0.807	lagging
Contingency	23	-196.5	-72.9	0.937	lagging
Contingency	24	-196.4	-59.4	0.957	lagging
Contingency	25	-196.3	-55.9	0.962	lagging
Contingency	26	-196.4	-66.0	0.948	lagging
Contingency	27	-196.5	-73.0	0.937	lagging
Contingency	28	-196.5	-70.0	0.942	lagging

C.2 GEN-2014-037 2017 Summer Peak Case

The GEN-2014-037 POI voltage is 0.9948 pu in the provided 2017 summer peak case. Therefore, the power factor requirements for the wind farm were determined to maintain the voltage at 1.0 pu. The lowest lagging and leading power factors are highlighted in the table below.

Outage No.		MW	Mvar	PF	
System Intact	0	-196.3	-18.2	0.996	lagging
Contingency	1	-196.3	-28.1	0.990	lagging
Contingency	2	-196.3	-23.8	0.993	lagging
Contingency	3	-196.4	-64.7	0.950	lagging
Contingency	4	-196.0	-188.6	**0.721**	lagging
Contingency	5	-196.3	-24.2	0.993	lagging
Contingency	6	-196.3	-30.4	0.988	lagging
Contingency	7	-196.4	-41.7	0.978	lagging
Contingency	8	-196.3	-25.0	0.992	lagging
Contingency	9	-196.3	-18.4	0.996	lagging
Contingency	10	-196.4	-38.0	0.982	lagging
Contingency	11	-196.4	-41.4	0.978	lagging
Contingency	12	-196.3	-22.0	0.994	lagging
Contingency	13	-196.3	-22.6	0.993	lagging
Contingency	14	-196.3	-20.7	0.994	lagging
Contingency	15	-196.3	-24.0	0.993	lagging
Contingency	16	-196.4	-79.9	0.926	lagging
Contingency	17	-196.3	-33.0	0.986	lagging
Contingency	18	-196.3	-35.6	0.984	lagging
Contingency	19	-196.3	-127.5	0.839	lagging
Contingency	20	-196.4	-61.6	0.954	lagging
Contingency	21	-196.3	-112.2	0.868	lagging
Contingency	22	-196.4	-40.4	0.979	lagging
Contingency	23	-196.3	-22.3	0.994	lagging
Contingency	24	-196.3	-17.7	0.996	lagging
Contingency	25	-196.3	-25.9	0.991	lagging
Contingency	26	-196.3	-26.9	0.991	lagging
Contingency	27	-196.3	-26.0	0.991	lagging

C.3 GEN-2014-037 2025 Summer Peak Case

The GEN-2014-037 POI voltage is 0.9972 pu in the provided 2025 summer peak case. Therefore, the power factor requirements for the wind farm were determined to maintain the voltage at 1.0 pu. The lowest lagging and leading power factors are highlighted in the table below.

Outage No.		MW	Mvar	PF	
System Intact	0	-196.2	4.4	1.000	leading
Contingency	1	-196.4	-13.1	0.998	lagging
Contingency	2	-196.3	0.9	1.000	leading
Contingency	3	-196.4	-41.4	0.978	lagging
Contingency	4	-196.2	-157.6	**0.780**	lagging
Contingency	5	-196.3	2.9	1.000	leading
Contingency	6	-196.3	-4.4	1.000	lagging
Contingency	7	-196.3	-3.6	1.000	lagging
Contingency	8	-196.2	1.3	1.000	leading
Contingency	9	-196.3	0.6	1.000	leading
Contingency	10	-196.2	5.4	1.000	leading
Contingency	11	-196.2	4.9	1.000	leading
Contingency	12	-196.2	1.3	1.000	leading
Contingency	13	-196.2	1.1	1.000	leading
Contingency	14	-196.2	3.6	1.000	leading
Contingency	15	-196.3	-5.7	1.000	lagging
Contingency	16	-196.4	-58.2	0.959	lagging
Contingency	17	-196.4	-12.1	0.998	lagging
Contingency	18	-196.3	-24.5	0.992	lagging
Contingency	19	-196.4	-78.9	0.928	lagging
Contingency	20	-196.4	-34.5	0.985	lagging
Contingency	21	-196.4	-87.3	0.914	lagging
Contingency	22	-196.4	-12.5	0.998	lagging
Contingency	23	-196.3	-3.0	1.000	lagging
Contingency	24	-196.2	2.2	1.000	leading
Contingency	25	-196.3	0.8	1.000	leading
Contingency	26	-196.3	0.6	1.000	leading
Contingency	27	-196.3	-1.5	1.000	lagging

11.15 L: Group 6 Dynamic Stability Analysis Report

See next page

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Southwest Power Pool, Inc. (SPP)

DISIS-2015-002-1 (Group 06) Definitive Impact Study

Final Report

PXE-1302
Revision #00

August 2016

Submitted By:
Mitsubishi Electric Power Products, Inc. (MEPPI)
Power Systems Engineering Services Department
Warrendale, PA

Title:	**DISIS-2015-002-1 (Group 06) Definitive Impact Study: Final Report PXE-1302**
Date:	August 2016
Author:	Nicholas W. Tenza; Engineer II, Power Systems Engineering Dept. *Nicholas W. Tenza*
Approved:	Rajat Majumder; Section Manager, Power Systems Engineering Dept. *Rajat Majumder*

EXECUTIVE SUMMARY

SPP requested a Definitive Interconnection System Impact Study (DISIS). The DISIS required a Stability Analysis, Short Circuit Analysis, Power Factor Analysis, and Low Wind/No Wind Analysis detailing the impacts of the interconnecting projects as shown in Table ES-1.

Table ES-1
Interconnection Projects Evaluated

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2015-020	100.0	Eaton Power Xpert Solar 1.67MW (584623) (solar)	Oasis 115kV (524874)
GEN-2015-031	150.53	GE 1.79 MW (wind)	Swisher (525213) to Amarillo South (524415) 230 kV (560050)
GEN-2015-056	101	GE 2.3 MW (wind)	Crossroads 345kV (527656) (Tap Eddy (527802) to Tolk(525549)
GEN-2015-058	50	Power Electronics Solar 1.667 MW (solar)	Atoka 115kV (527786)
GEN-2015-068	300	GE 2.0 MW (wind)	Tuco 345kV (525832)
GEN-2015-075	50	GE 4.0MVA Inverter (solar)	Carlisle 69kV (526159)
GEN-2015-079	129.2	GE LV5 3.8 MW (solar)	Tap Yoakum (526935) to Hobbs (527894) 230 kV (560059)
GEN-2015-080	129.2	GE LV5 3.8 MW (solar)	Tap Yoakum (526935) to Hobbs (527894) 230 kV (560059)

SUMMARY OF STABILITY ANALYSIS

The Stability Analysis determined that there were multiple contingencies across all seasons that resulted in system/voltage instability, generation tripping offline, and poor post-fault voltage recovery when all generation interconnection requests were at 100% output.

To mitigate the system/voltage instability, voltage violations, generation tripping offline, and poor post-fault steady-state voltages, the following upgrades were provided by SPP and implemented in each season:

- Tuco – Yoakum – Hobbs 345kV circuit #1 (**16WP and 17SP**)
- Yoakum 345/230 kV transformer and Hobbs 345/230 kV transformer (**16WP and 17SP**)
- GEN-2014-074 345/34.5 kV transformer low side tap ratio set to 0.95 p.u.
- OKU Reactive Power Support
  - +/- 100 Mvar SVC
- Border Reactive Power Support (600 Mvar total)
  - +300 Mvar SVC
  - 300 Mvar capacitor bank
- Seminole – Mustang 115 kV circuit #1

Note for GEN-2015-058, for a three-phase fault at the point of interconnection (Atoka 115 kV), the TMEIC photovoltaic inverter model (ITMEIC) tripped offline due to over frequency protection and over voltage protection. For this study, the over frequency and over voltage protection were set to 75 Hz and 1.8 p.u., respectively, to avoid instantaneous tripping. It is recommended the supplier of the TMEIC photovoltaic inverter model examine this model for three-phase faults that cause the model to trip on over frequency and over voltage protection.

After implementing the above upgrades, the contingency analysis was re-simulated for all contingencies. With the upgrades, the Stability Analysis determined that there was no wind turbine tripping or system instability observed as a result of interconnecting all study projects at 100% output.

SUMMARY OF THE SHORT CIRCUIT ANALYSIS

The short circuit analysis was performed on the 2017 Summer Peak and 2025 Summer Peak power flows for all study projects. Refer to Table ES-2 and Table ES-3 for a list of maximum fault currents observed for each study project for the 17SP and 25SP cases, respectively.

Table ES-2
2017SP: List of Maximum Fault Currents Observed for Each Study Project

Study Project	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-020	9.57	25.84	Tolk East/West	230 kV
GEN-2015-031	9.03	30.52	LP - Cook	69 kV
GEN-2015-056	5.42	26.24	Cunnigham	115 kV
GEN-2015-058	6.59	26.24	Cunnigham	115 kV
GEN-2015-068	13.36	30.52	LP - Cook	69 kV
GEN-2015-075	2.57	25.84	Tolk East	230 kV
GEN-2015-079	8.97	29.89	Hobbs Int	115 kV
GEN-2015-080	8.97	29.89	Hobbs Int	115 kV

Table ES-3
2025SP: List of Maximum Fault Currents Observed for Each Study Project

Study Project	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-020	9.75	26.48	Tolk East/West	230 kV
GEN-2015-031	9.05	34.97	LP - Cook	69 kV
GEN-2015-056	5.48	29.66	Cunnigham	115 kV
GEN-2015-058	6.97	29.66	Cunnigham	115 kV
GEN-2015-068	13.55	34.97	LP - Cook	69 kV
GEN-2015-075	2.58	26.48	Tolk East	230 kV
GEN-2015-079	9.26	32.92	Hobbs Int	115 kV
GEN-2015-080	9.26	32.92	Hobbs Int	115 kV

SUMMARY OF POWER FACTOR ANALYSIS

The upgrades identified in the Stability Analysis were implemented in the power flow cases and utilized for the Power Factor Analysis.

Study Generator GEN-2015-020

The Power Factor Analysis shows that GEN-2015-020 has a power factor range of 0.970 leading (absorbing) to 0.990 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.973 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.979 leading (absorbing) to 1.00 (unity) for the 2020 Summer Peak conditions, a power factor range of 0.973 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.976 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-031

The Power Factor Analysis shows that GEN-2015-031 has a power factor range of 0.983 leading (absorbing) to 0.784 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.991 leading (absorbing) to 0.646 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.991 leading (absorbing) to 0.744 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.979 leading (absorbing) to 0.840 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.997 leading (absorbing) to 0.782 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-056

The Power Factor Analysis shows that GEN-2015-056 has a power factor range of 0.997 leading (absorbing) to 0.965 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.998 lagging (supplying) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.983 lagging (supplying) to 1.00 (unity) for the 2020 Summer Peak conditions, a power factor range of 0.998 leading (absorbing) to 0.974 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.979 lagging (supplying) to 1.00 (unity) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-058

The Power Factor Analysis shows that GEN-2015-058 has a power factor range of 0.971 leading (absorbing) to 0.962 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.975 leading (absorbing) to 0.947 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.976 leading (absorbing) to 0.989 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.990 leading (absorbing) to 0.993 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.972 leading (absorbing) to 0.964 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-068

The Power Factor Analysis shows that GEN-2015-068 has a power factor range of 0.738 to 0.916 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.709 to 0.954 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.859 to 0.997 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.782 to 0.949 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.913 to 0.998 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-075

The Power Factor Analysis shows that GEN-2015-075 has a power factor range of 0.994 leading (absorbing) to 0.998 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.988 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.996 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.995 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.989 leading (absorbing) to 0.995 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-079

The Power Factor Analysis shows that GEN-2015-079 has a power factor range of 0.986 leading (absorbing) to 0.999 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.982 leading (absorbing) to 0.996 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.984 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.989 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.971 leading (absorbing) to 0.994 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-080

The Power Factor Analysis shows that GEN-2015-080 has a power factor range of 0.986 leading (absorbing) to 0.999 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.982 leading (absorbing) to 0.996 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.984 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.989 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.971 leading (absorbing) to 0.994 lagging (supplying) for the 2025 Summer Peak conditions.

SUMMARY OF LOW WIND/NO WIND ANALYSIS

The amount of reactive power injected into the transmission network was recorded at the point of interconnection for each wind and solar powered interconnection request for each season. The maximum reactance needed for zero Mvar flow was 58 Mvar for GEN-2015-068 (Tuco 345 kV). The minimum reactance needed for zero Mvar flow was 0.4 Mvar for GEN-2015-058 (Atoka 115 kV).

Table of Contents

SECTION 1: OBJECTIVES

The objective of this report is to provide Southwest Power Pool, Inc. (SPP) with the deliverables for the "DISIS-2015-002-1 (Group 06) Definitive Impact Study." SPP requested an Interconnection System Impact Study for eight (8) generation interconnections for 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak, and 2025 Summer Peak, which requires a Stability Analysis, Short Circuit Analysis, Power Factor Analysis, Low Wind/No Wind Analysis, and an Impact Study Report.

SECTION 2: BACKGROUND

The Siemens Power Technologies International PSS/E power system simulation program Version 32.2.0 was used for this study. SPP provided the stability database cases for 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak, and 2025 Summer Peak conditions and a list of contingencies to be examined. The model includes the study projects shown in Table 2-1 and the previously queued projects listed in Table 2-2. Refer to Appendix A for the steady-state and dynamic model data for the study projects. A power flow one-line diagram for each generation interconnection project is shown in Figures 2-1 through 2-7. Note that the one-line diagrams represent the 2017 Summer Peak case.

The Stability Analysis determined the impacts of the new interconnecting projects 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 as listed in Table 2-3.

A Short Circuit Analysis was performed on the 2017 Summer Peak and 2025 Summer Peak study years for each study generator. The study was performed five buses out from the study generator's point of interconnection and results were documented.

The Power Factor Analysis determined the power factor at the point of interconnection for the wind or solar interconnection projects for pre-contingency and post-contingency conditions. Table 2-3 lists the contingencies developed from the three-phase fault definitions provided in the group's interconnection impact study request.

The Low Wind/No Wind Analysis was completed for all wind farm and solar farm interconnections. This analysis determined if reactive support was needed to have an Mvar flow of approximately zero at the point of interconnection (POI).

Table 2-1
Interconnection Projects Evaluated

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2015-020	100.0	Eaton Power Xpert Solar 1.67MW (584623) (solar)	Oasis 115kV (524874)
GEN-2015-031	150.53	GE 1.79 MW (wind)	Swisher (525213) to Amarillo South (524415) 230 kV (560050)
GEN-2015-056	101	GE 2.3 MW (wind)	Crossroads 345kV (527656) (Tap Eddy (527802) to Tolk(525549)
GEN-2015-058	50	Power Electronics Solar 1.667 MW (solar)	Atoka 115kV (527786)
GEN-2015-068	300	GE 2.0 MW (wind)	Tuco 345kV (525832)
GEN-2015-075	50	GE 4.0MVA Inverter (solar)	Carlisle 69kV (526159)
GEN-2015-079	129.2	GE LV5 3.8 MW (solar)	Tap Yoakum (526935) to Hobbs (527894) 230 kV (560059)
GEN-2015-080	129.2	GE LV5 3.8 MW (solar)	Tap Yoakum (526935) to Hobbs (527894) 230 kV (560059)

Table 2-2
Previously Queued Nearby Interconnection Projects Included

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2001-033	180	Mitsubishi 1000	San Juan Mesa 230kV (524885)
GEN-2001-036	80	Mitsubishi 1000	Norton 115kV (524502)
GEN-2006-018	170	GENSAL	Tuco 230kV (525830)
GEN-2006-026	502	GENROU (527901, 527902, 527903)	Hobbs 115kV(527891) Hobbs 230kV (527894)
GEN-2008-022	300	Vestas	Tap on Eddy County – Tolk 345kV line (G08-022-POI, 560007)
GEN-2010-006	180 Summer 205 Winter	GENROU	Jones_bus2 230kV(526337)
ASGI-2010-010	42	GENSAL	Lovington 115kV (528334)
ASGI-2010-020	30	Nordex 2.5MW	Tap LE-Tatum to LE-Crsroads 69kV (AS10-020-POI, 560360)
ASGI-2010-021	15	Mitsubishi MPS-1000A 1.0MW	Tap LE-Saundrtp to LE-Anderson 69kV (ASGI-021-POI, 560364)
GEN-2010-046	56	GENSAL	Tuco 230kV (525830)
ASGI-2011-001	27.3	Suzlon 2.1MW	Lovington 115kV (528334)
ASGI-2011-003	10	Sany 2.0MW	Hendricks 69kV (525943)
ASGI-2011-004	19.8	Sany 1.8MW	Crosby 69kV (525915)
GEN-2011-025	80	GE 1.6MW	Tap on Floyd County - Crosby County 115kV line (G11-025-POI, 562004)
GEN-2011-045	180 Summer 205 Winter	GENROU	Jones_bus2 230kV (526337)
GEN-2011-046	23 Summer 27 Winter	GENROU	Quay County 115kV (524472)
GEN-2011-048	165 Summer 175 Winter	GENROU	Mustang 230kV (527151)
GEN-2012-001	61.2	CCWE 3.6MW (WT4)	Tap Grassland to Borden 230kV (526679)
ASGI-2012-002	18	Vestas 1.65MW V82	Clovis 115kV (524808)
GEN-2012-020	478	GE 1.68MW	Tuco 230kV (525830)

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2012-034	7 MW increase (Pgen=157MW)	GENROU	Mustang 230kV (527151)
GEN-2012-035	7 MW increase (Pgen=157MW)	GENROU	Mustang 230kV (527151)
GEN-2012-036	7 MW increase (Pgen=172MW Summer/182 MW Winter)	GENROU	Mustang 230kV (527151)
GEN-2012-037	196 Summer 203 Winter	GENROU	Tuco 345kV (525832)
ASGI-2012-002	18	Vestas 1.65MW V82	Clovis 115kV (524808)
GEN-2013-016	191 Summer 203 Winter	GENROU (583456)	Tuco 345kV (525832)
ASGI-2013-002	18.4	Siemens 2.3MW VS (583613)	Tucumcari 115kV (524509)
ASGI-2013-003	18.4	Siemens 2.3MW VS (583623)	Clovis 115kV (524808)
ASGI-2013-005	19.8 (1.65 MW Uprate)	Vestas V82 1.65MW (583283)	FE-Clovis 115kV (524808)
ASGI-2013-006	2.0	Gamesa G114 2MW (583813)	Erskine 115kV (526109)
GEN-2013-022	25.0	Solaron 500kW (583313)	Caprock 115kV (524486)
GEN-2013-027	150.0	Siemens 2.3/2.415	Tap on Yoakum to Tolk 230kV (562480)

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2014-012	186 Summer 225 Winter	GENROU (528607)	Tap Hobbs (527894 in 2015SP/WP, 527896 in 2025SP) to Andrews (528604) 230kV (345kV in 2025SP) (Tap bus is 528611)
ASGI-2014-001	2.3	GE 107m 2.3MW (583816)	Erskine 69kV (526109)
GEN-2014-033	70	SC 500HE/CP 0.5MVA inverter	Chaves County 115kV
GEN-2014-034	70	SC 500HE/CP 0.5MVA inverter	Chaves County 115kV
GEN-2014-035	30	SC 500HE/CP 0.5MVA inverter	Chaves County 115kV
GEN-2014-047	40	AE 500NX 0.5 MW PV inverters	Tap Tolk - Eddy County (Crossroads) 345kV
GEN-2014-074	152.0	Vestas V110 2.0MW (584443)	Tap Tuco – OKU 345kV (560027)
GEN-2015-014	150.0	Vestas V110 2.0MW (584563)	Tap on Cochran – LG Plains 115kV (560030)
GEN-2015-022	112.0	GE LV5 4.0MW Inverters (584643)	Swisher 115kV (525212)
ASGI-2015-002	2.0	GE 2.0MW (584723)	Yuma Interchange 115/69kV (526469)

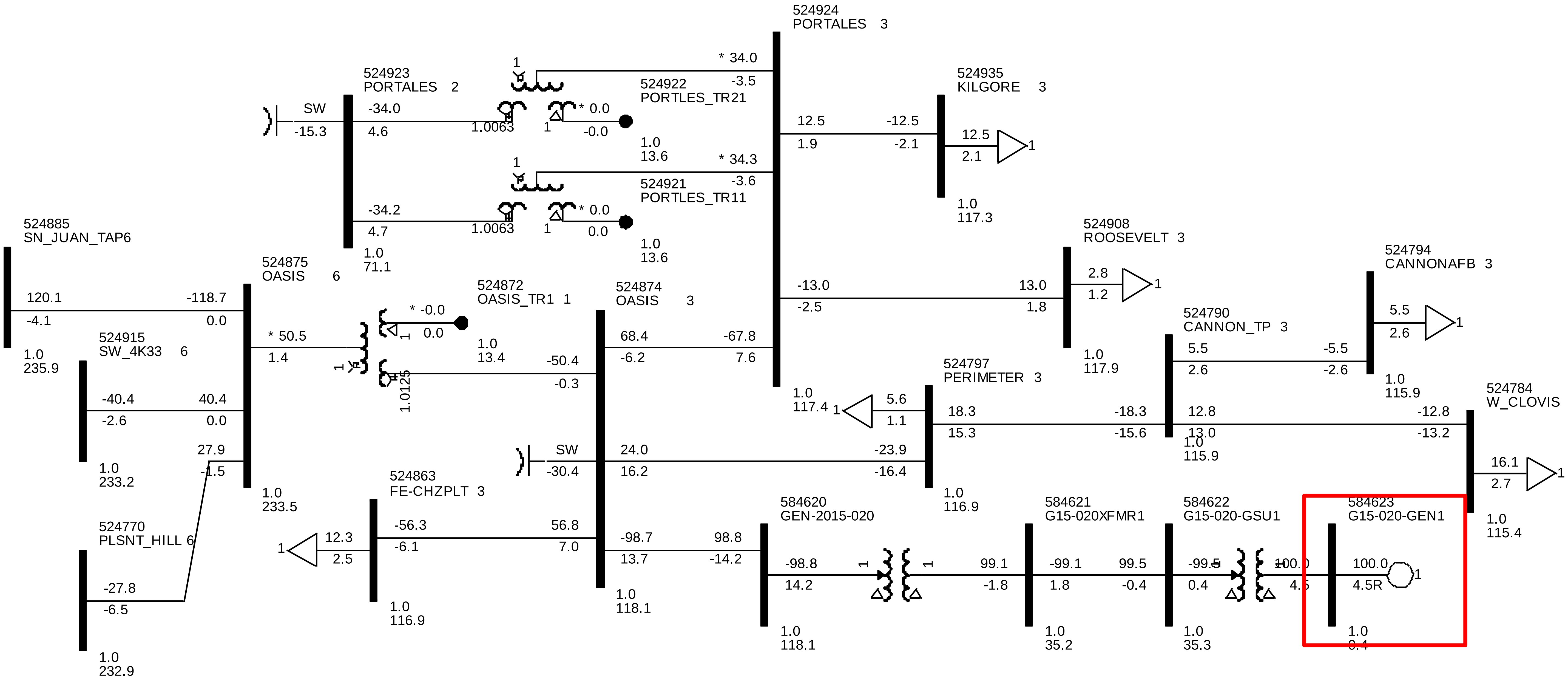

Figure 2-1. Power flow one-line diagram for interconnection project at the Oasis 115 kV POI (GEN-2015-020).

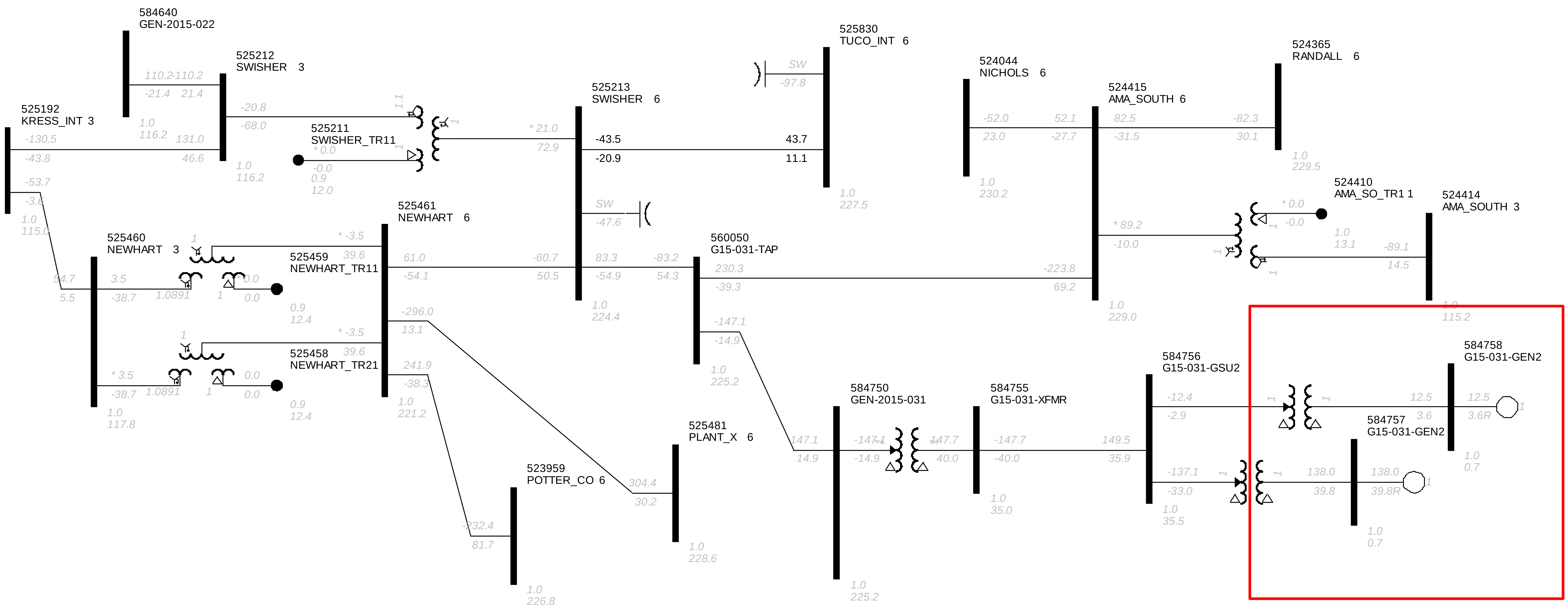

Figure 2-2. Power flow one-line diagram for interconnection project at the Swisher to Amarillo South 230 kV POI (GEN-2015-031).

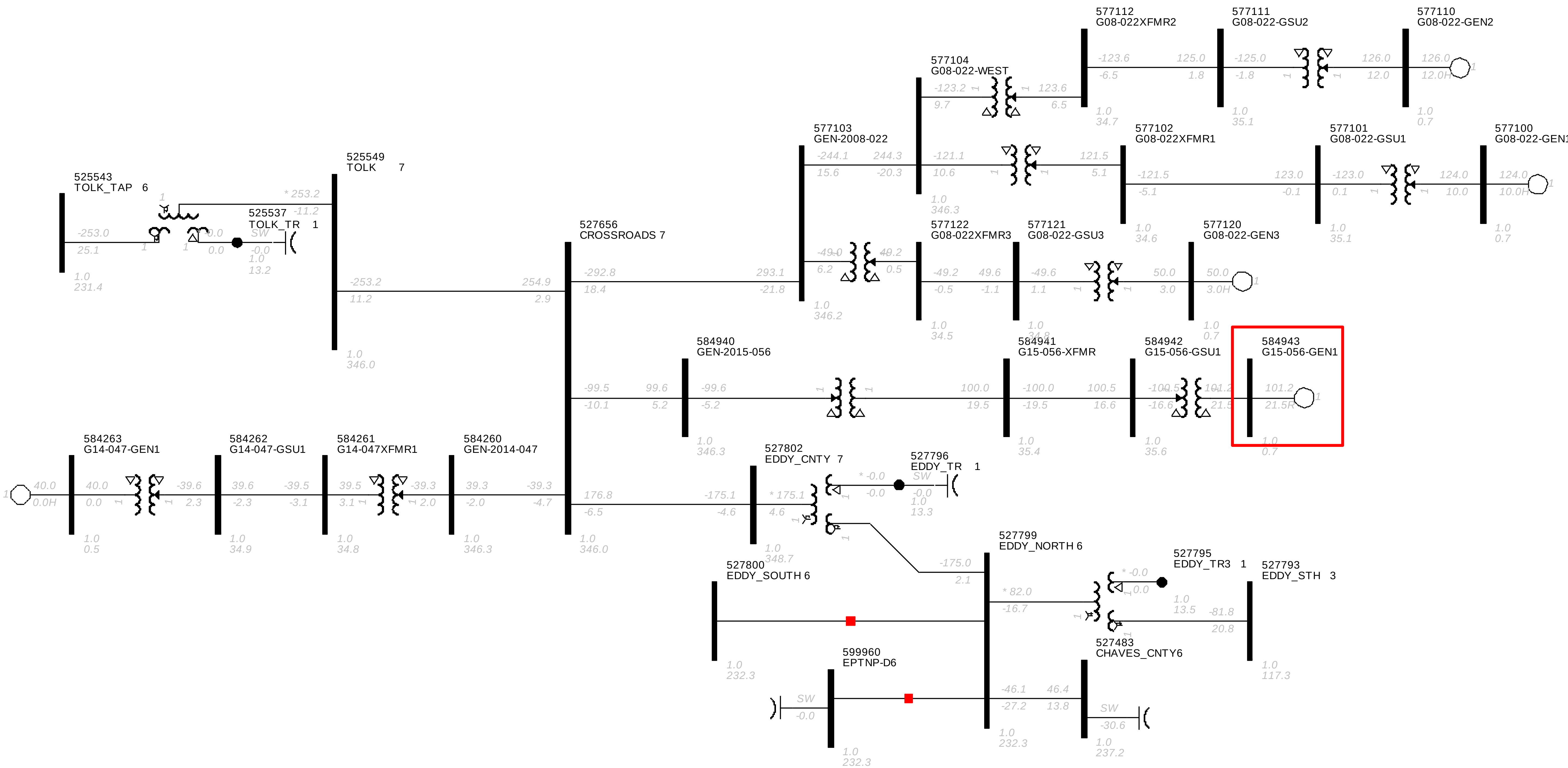

Figure 2-3. Power flow one-line diagram for interconnection project at the Crossroads 345 kV POI (GEN-2015-056).

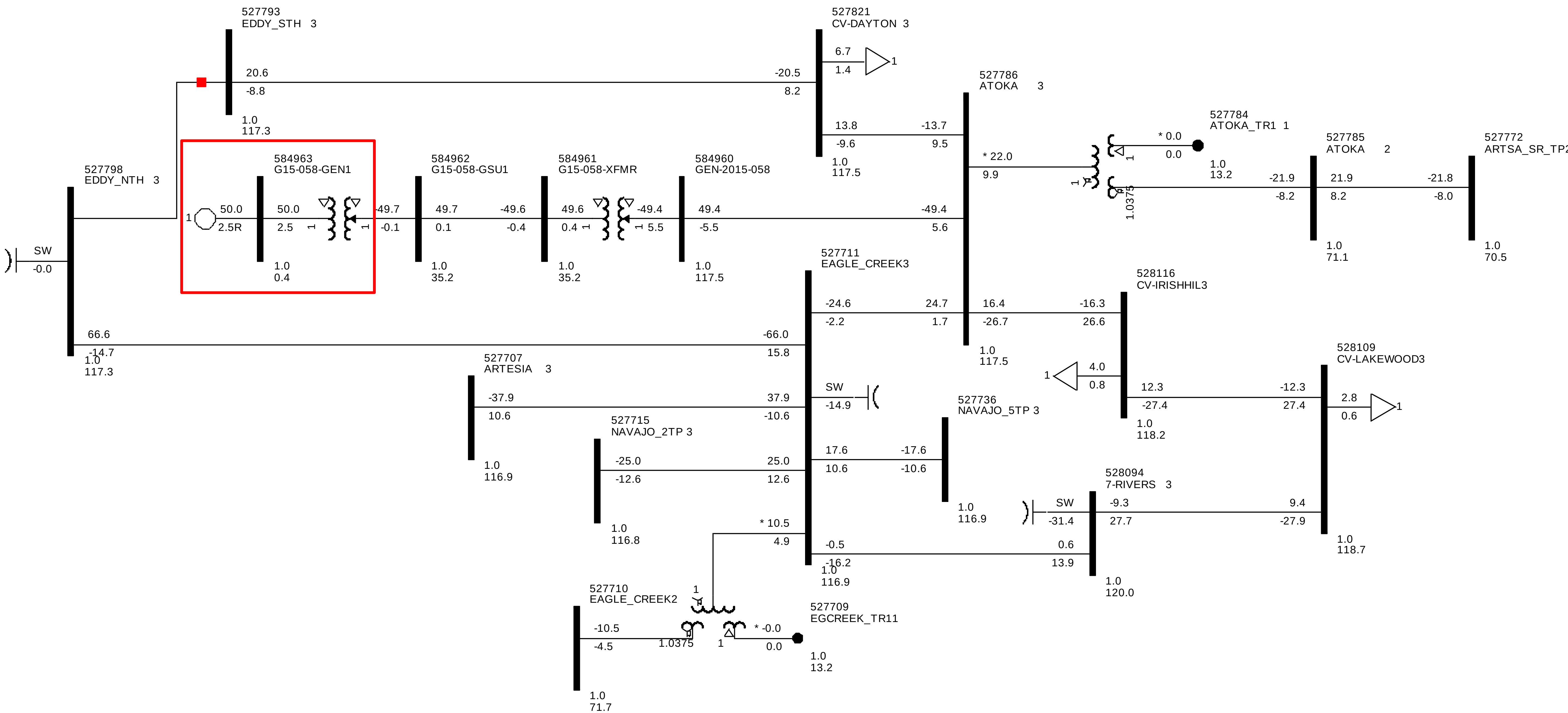

Figure 2-4. Power flow one-line diagram for interconnection project at Atoka 115 kV POI (GEN-2015-058).

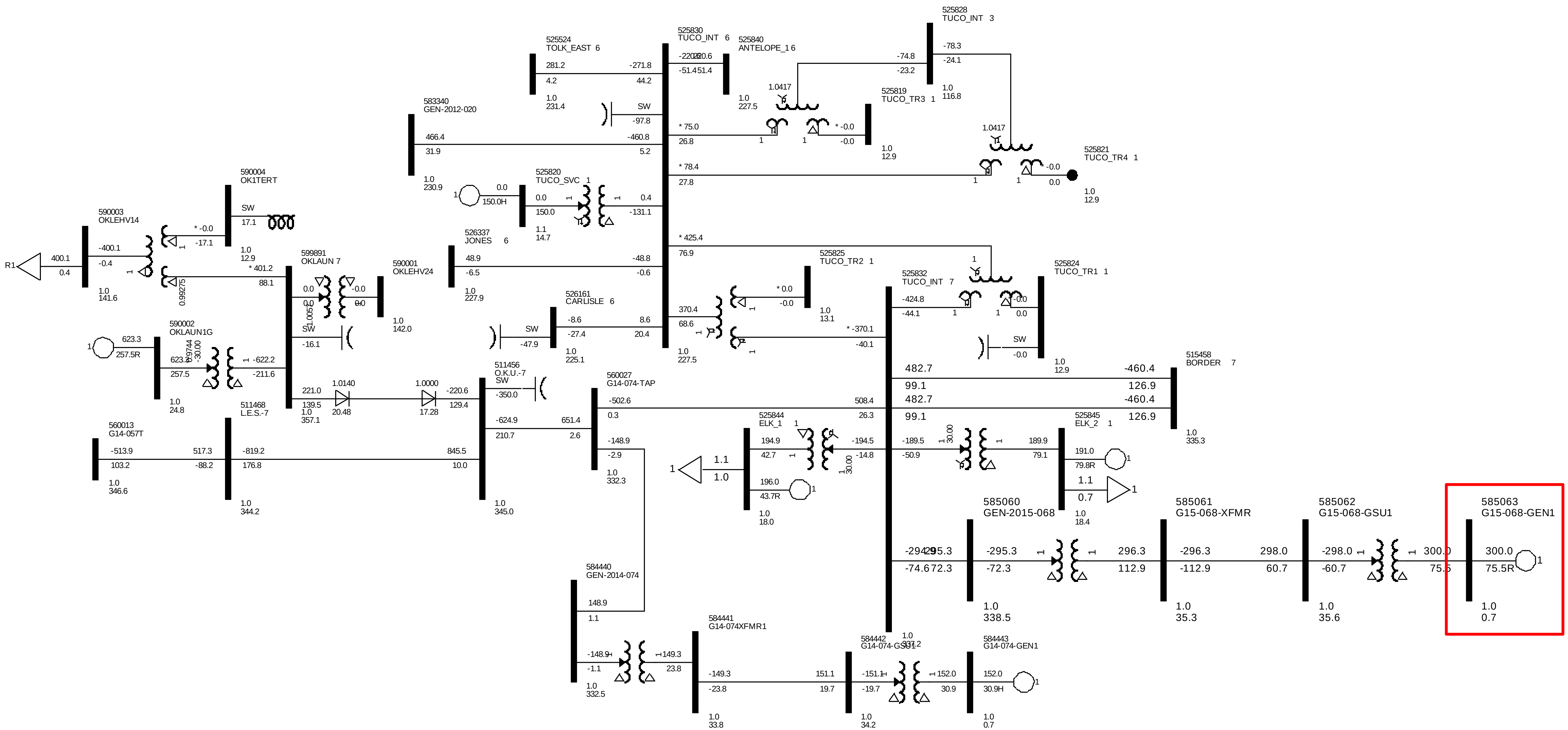

Figure 2-5. Power flow one-line diagram for interconnection project at the Tuco 345 kV POI (GEN-2015-068).

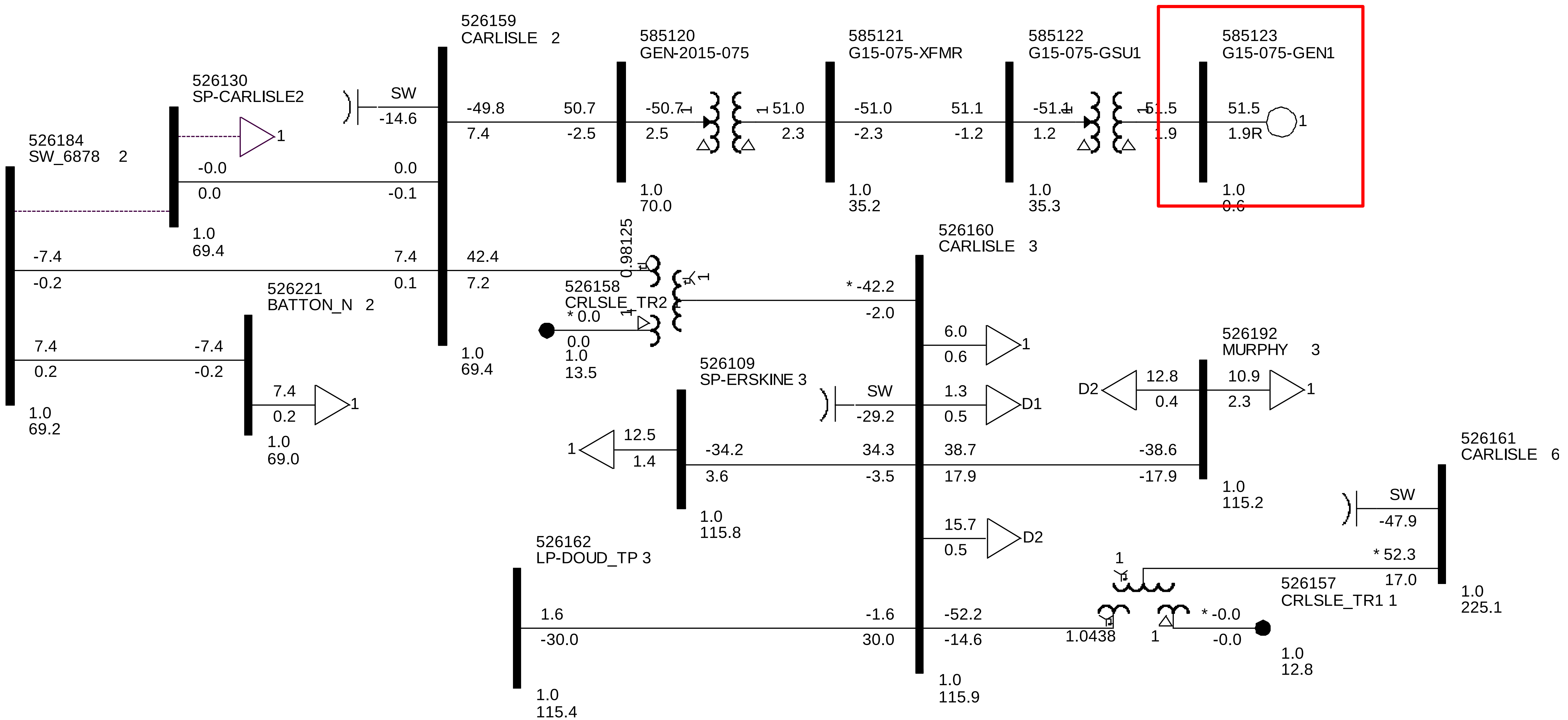

Figure 2-6. Power flow one-line diagram for interconnection project at the Carlisle 69 kV POI (GEN-2015-075).

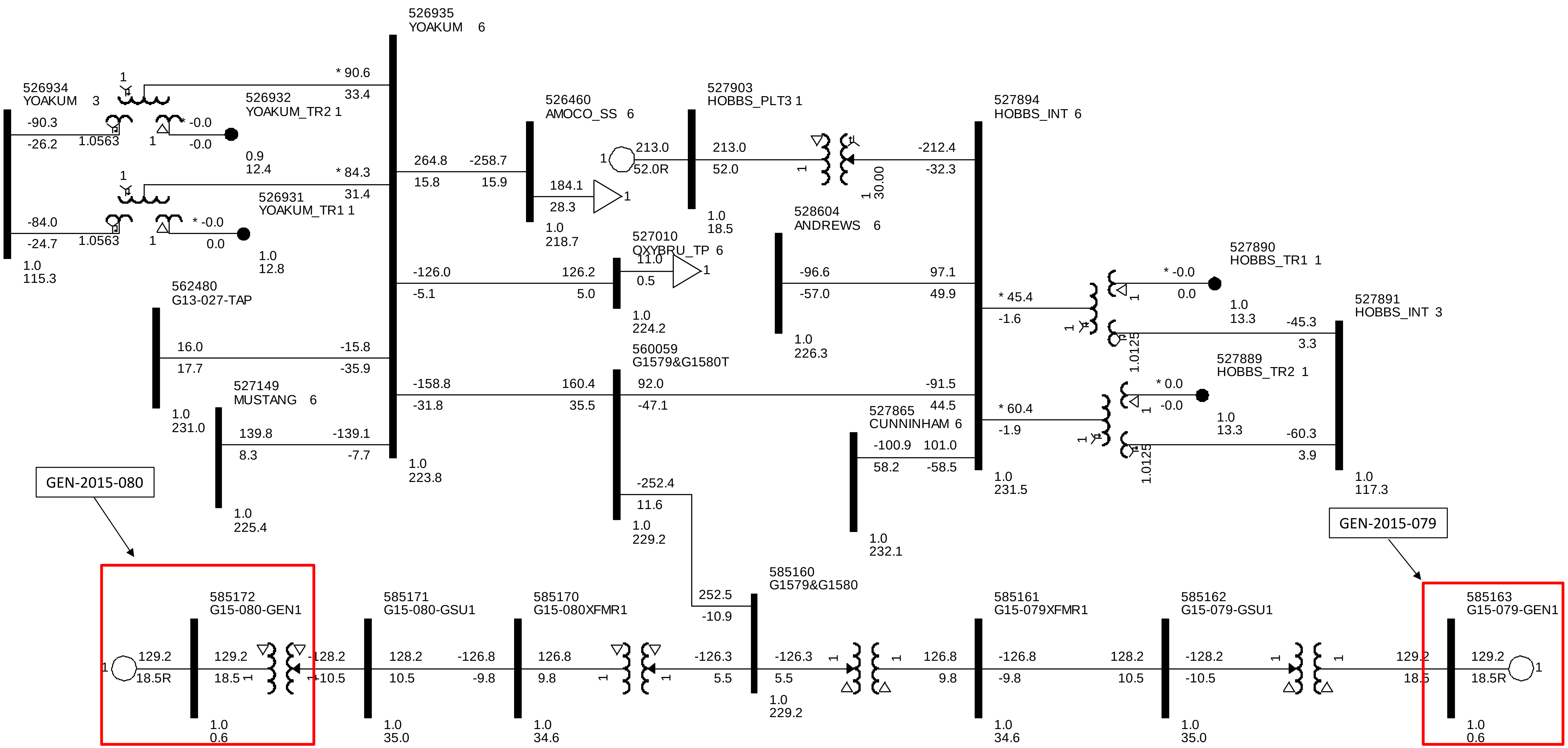

Figure 2-7. Power flow one-line diagram for interconnection project at Yoakum to Hobbs 230 kV POI (GEN-2015-079 and GEN-2015-080).

Table 2-3
Case List with Contingency Description

Cont. No.	Cont. Name	Description
1	FLT01-3PH	3 phase fault on Chaves County 115 kV (527482) to Samson 115 kV (527546) CKT 1, near Chaves County. a. Apply fault at the Chaves County 115 kV bus. b. Clear fault after 5 cycles and trip 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 Chaves County 115 kV (527482) to Urton 115 kV (527501) CKT 1, near Chaves County. a. Apply fault at the Chaves County 115 kV bus. b. Clear fault after 5 cycles and trip 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 Chaves County 115 kV (527482) to Chaves County 230 kV (527483) to Chaves County 13.2 kV (527478) XFMR CKT 1, near Chaves County 115 kV. a. Apply fault at the Chaves County 115 kV bus. b. Clear fault after 5 cycles and trip the faulted transformer.
4	FLT04-3PH	3 phase fault on Chaves County 230 kV (527483) to San Juan Tap 230 kV (524885) CKT 1, near Chaves County. a. Apply fault at the Chaves County 230 kV bus. b. Clear fault after 5 cycles and trip 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 Chaves County 230 kV (527483) to Eddy North 230 kV (527799) CKT 1, near Chaves County. a. Apply fault at the Chaves County 230 kV bus. b. Clear fault after 5 cycles and trip 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 Samson 115 kV (527546) to Roswell_Int 115 kV (527564) CKT 1, near Samson. a. Apply fault at the Samson 115 kV bus. b. Clear fault after 5 cycles and trip 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 Urton 115 kV (527501) to Roswell City 115 kV (527522) CKT 1, near Urton. a. Apply fault at the Urton 115 kV bus. b. Clear fault after 5 cycles and trip 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
8	FLT10-SB	**Single phase fault with stuck breaker** at **Chaves County (527482)** a. Apply fault at the Chaves 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Chaves County 115 kV (527482)/ 230 kV (527483)/13.2 kV (527479) transformer d. Chaves County (527482) - Samson (527546) 115 kV
9	FLT11-3PH	3 phase fault on the G15-018T (560032) to FE-Curry (524822) 115 kV line circuit 1, near G15-018T. a. Apply fault at the G15-018T 115 kV 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	FLT12-3PH	3 phase fault on the G15-018T (560032) to FE-Bailey County (525028) 115 kV line circuit 1, near G15-018T. a. Apply fault at the G15-018T 115 kV 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.
11	FLT13-3PH	3 phase fault on the FE-Bailey County 115 kV (525028) to Bailey County 2 69 kV (525027) to Bailey transformer 1 13.2 kV (525025) XFMR CKT 1, near FE-Bailey County 115 kV. a. Apply fault at the FE-Bailey County 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
12	FLT14-3PH	3 phase fault on the FE-Bailey County (525028) to EMU&VLY Tap (525019) 115 kV line circuit 1, near FE-Bailey County. a. Apply fault at the FE-Bailey County 115 kV 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.
13	FLT15-3PH	3 phase fault on the FE-Curry (524822) to DS#20 (524669) 115 kV line circuit 1, near FE-Curry. a. Apply fault at the FE-Curry 115 kV 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.
14	FLT16-3PH	3 phase fault on the FE-Curry (524822) to Norris Tap (524764) 115 kV line circuit 1, near FE-Curry. a. Apply fault at the FE-Curry 115 kV 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	FLT17-3PH	3 phase fault on the FE-Curry (524822) to E_Clovis (524773) 115 kV line circuit 1, near FE-Curry. a. Apply fault at the FE-Curry 115 kV 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
16	FLT18-3PH	3 phase fault on the FE-Curry (524822) to FE_Clovis2 (524838) 115 kV line circuit 1, near FE-Curry. a. Apply fault at the FE-Curry 115 kV 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.
17	FLT19-3PH	3 phase fault on the FE-Curry (524822) to Roosevelt (524908) 115 kV line circuit 1, near FE-Curry. a. Apply fault at the FE-Curry 115 kV 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.
18	FLT20-3PH	3 phase fault on the FE-Curry 115 kV (524822) to Curry 69 kV (524821) to Curry 13.2 kV (524819) XFMR CKT 1, near FE-Curry 115 kV. a. Apply fault at the FE-Curry 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
19	FLT21-3PH	3 phase fault on the Oasis (524874) to Perimeter (524797) 115 kV line circuit 1, near Oasis. a. Apply fault at the Oasis 115 kV 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.
20	FLT22-3PH	3 phase fault on the Oasis (524874) to FE-Chzplt (524863) 115 kV line circuit 1, near Oasis. a. Apply fault at the Oasis 115 kV 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.
21	FLT23-3PH	3 phase fault on the FE-Chzplt (524863) to Norris Tap (524764) 115 kV line circuit 1, near FE-Chzplt. a. Apply fault at the FE-Chzplt 115 kV 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	FLT24-3PH	3 phase fault on the Perimeter (524797) to Cannon Top (524790)115 kV line circuit 1, near Perimeter. a. Apply fault at the Perimeter 115 kV 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	FLT25-3PH	3 phase fault on the Oasis (524874) to Portales (524924) 115 kV line circuit 1, near Oasis. a. Apply fault at the Oasis 115 kV 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
24	FLT26-3PH	3 phase fault on the Portales (524924) to Roosevelt (524908) 115 kV line circuit 1, near Oasis. a. Apply fault at the Portales 115 kV 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.
25	FLT27-3PH	3 phase fault on the Portales 115 kV (524924) to Portales 69 kV (524923) to Portales 13.2 kV (524921) XFMR CKT 1, near Portales 115 kV. a. Apply fault at the Portales 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
26	FLT28-3PH	3 phase fault on the Oasis 115 kV (524874) to Oasis 230 kV (524875) to Oasis 13.2 kV (524872) XFMR CKT 1, near Oasis 115 kV. a. Apply fault at the Oasis 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
27	FLT29-3PH	3 phase fault on the Oasis (524875) to San Juan Tap (524885) 230 kV line circuit 1, near Oasis. a. Apply fault at the Oasis 230 kV 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	FLT30-3PH	3 phase fault on the Oasis (524875) to SW_4k33 (524915) 230 kV line circuit 1, near Oasis. a. Apply fault at the Oasis 230 kV 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	FLT31-3PH	3 phase fault on the Oasis (524875) to Pleasant Hill (524770) 230 kV line circuit 1, near Oasis. a. Apply fault at the Oasis 230 kV 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	FLT32-PO	**Prior Outage of the Oasis 115 kV (524874) to Oasis 230 kV (524875) to Oasis 13.2 kV (524872) XFMR CKT 1;** 3 phase fault on the Oasis (524874) to Perimeter (524797) 115 kV line circuit 1, near Oasis 115 kV. a. Apply fault at the Oasis 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.

Cont. No.	Cont. Name	Description
31	FLT33-PO	**Prior Outage of the Oasis (524874) to Perimeter (524797) 115 kV line circuit 1;** 3 phase fault on the Oasis 115 kV (524874) to Oasis 230 kV (524875) to Oasis 13.2 kV (524872) XFMR CKT 1, near Oasis 115 kV. a. Apply fault at the Oasis 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
32	FLT34-3PH	3 phase fault on the Gen-2015-031 Tap (560050) to Amarillo South (524415) 230 kV line circuit 1, near Gen-2015-031 Tap. a. Apply fault at the Gen-2015-031 230 kV 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	FLT35-3PH	3 phase fault on the Gen-2015-031 Tap (560050) to Swisher (525213) 230 kV line circuit 1, near Gen-2015-031 Tap. a. Apply fault at the Gen-2015-031 230 kV 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	FLT36-3PH	3 phase fault on the Swisher 230 kV (525213) to Swisher 115 kV (525212) to Swisher 13.2 kV (525211) XFMR CKT 1, near Swisher 230 kV. a. Apply fault at the Swisher 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
35	FLT37-3PH	3 phase fault on the Swisher (525213) to Tuco Int (525830) 230 kV line circuit 1, near Swisher. a. Apply fault at the Swisher 230 kV 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.
36	FLT38-3PH	3 phase fault on the Swisher (525213) to Newhart (525461) 230 kV line circuit 1, near Swisher. a. Apply fault at the Swisher 230 kV 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.
37	FLT39-3PH	3 phase fault on the Amarillo South 230 kV (524415) to Amarillo South 115 kV (524414) to Amarillo South 13.2 kV (524410) XFMR CKT 1, near Amarillo South 230 kV. a. Apply fault at the Amarillo 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Cont. No.	Cont. Name	Description
38	FLT40-3PH	3 phase fault on the Amarillo South (524415) to Nichols (524044) 230 kV line circuit 1, near Amarillo South. a. Apply fault at the Amarillo South 230 kV 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.
39	FLT41-3PH	3 phase fault on the Amarillo South (524415) to Randal (524365) 230 kV line circuit 1, near Amarillo South. a. Apply fault at the Amarillo South 230 kV 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	FLT42-SB	**Single phase fault with stuck breaker at Swisher (525213)** a. Apply fault at the Swisher 230 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Swisher 230 kV (525213)/ 115 kV (525212)/13.2 kV (525211) transformer d. Swisher (525213) – Tuco2 (560021) 230 kV
41	FLT43-3PH	3 phase fault on the Rio Blanco 345 kV (560027) to Tuco (525832) 345 kV line circuit 1, near Rio Blanco. a. Apply fault at the Rio Blanco 345 kV 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.
42	FLT44-3PH	3 phase fault on the Rio Blanco 345 kV (560027) to OKU (511456) 345 kV line circuit 1, near Rio Blanco. a. Apply fault at the Rio Blanco 345 kV 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	FLT45-3PH	3 phase fault on the Tuco Int (525832) to Border (515458) 345 kV line circuit 1, near Tuco. a. Apply fault at the Tuco 345 kV 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	FLT46-3PH	3 phase fault on the Tuco 345 kV (525832) to Tuco 230 kV (525830) to Tuco 13.2 kV (525824) XFMR CKT 1, near Tuco 345 kV bus. a. Apply fault at the Tuco 345 kV bus. b. Clear fault after 5 cycles by tripping the transformer
45	FLT47-3PH (20WP, 20SP, 25SP)	3 phase fault on the Tuco (525832) to Yoakam (526936) 345 kV line circuit 1, near Tuco. a. Apply fault at the Tuco (525832) 345 kV 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
46	FLT48-3PH	3 phase fault on the OKU (511456) to Oklaun (599891) 345 kV line circuit 1, near OKU. a. Apply fault at the OKU 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted line and remove the fault. c. Block the DC tie at OKU.
47	FLT49-3PH	3 phase fault on the OKU (511456) to L.E.S (511468) 345 kV line circuit 1, near OKU. a. Apply fault at the OKU 345 kV 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.
48	FLT50-PO	**Prior Outage of the Tuco 345 kV (525832) to Tuco 230 kV (525830) to Tuco 13.2 kV (525824) XFMR CKT 1;** 3 phase fault on the Rio Blanco 345 kV (560027) to OKU (511456) 345 kV line circuit 1, near Rio Blanco. a. Apply fault at the Rio Blanco 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
49	FLT51-PO	**Prior Outage of the Tuco 345 kV (525832) to Tuco 230 kV (525830) to Tuco 13.2 kV (525824) XFMR CKT 1;** 3 phase fault on the Tuco Int (525832) to Border (515458) 345 kV line circuit 1, near Tuco. a. Apply fault at the Tuco 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
50	FLT52-3PH	3 phase fault on the Plant X (525481) to Deaf Smith (524623) 230 kV line circuit 1, near Plant X. a. Apply fault at the Plant X 230 kV 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.
51	FLT54-3PH	3 phase fault on the Deaf Smith (524623) to Bushland (524267) 230 kV line circuit 1, near Deaf Smith. a. Apply fault at the Deaf Smith 230 kV 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	FLT55-3PH	3 phase fault on the Deaf Smith 230 kV (524623) to Deaf Smith 115 kV (524622) to Deaf Smith 13.2 kV (524620) XFMR CKT 1, near Deaf Smith 230 kV. a. Apply fault at the Deaf Smith 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
53	FLT56-3PH	3 phase fault on the Plant X (525481) to Tolk East (525524) 230 kV line circuit 2, near Plant X. a. Apply fault at the Plant X 230 kV 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.
54	FLT57-3PH	3 phase fault on the Plant X (525481) to Newhart (525461) 230 kV line circuit 1, near Plant X. a. Apply fault at the Plant X 230 kV 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
55	FLT58-3PH	3 phase fault on the Plant X (525481) to Tolk West (525531) 230 kV line circuit 1, near Plant X. a. Apply fault at the Plant X 230 kV 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	FLT59-3PH	3 phase fault on the Plant X (525481) to Sundown (526435) 230 kV line circuit 1, near Plant X. a. Apply fault at the Plant X 230 kV 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	FLT60-3PH	3 phase fault on the Plant X 230 kV (525481) to Plant X 115 kV (525480) to Plant X 13.2 kV (525479) XFMR CKT 1, near Plant X 230 kV. a. Apply fault at the Plant X 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
58	FLT61-SB	**Single phase fault with stuck breaker** on the Tolk West (525531) to Plant X (525481) 230 kV circuit #1 line, near Tolk West. a. Apply fault at the Tolk West 230 kV bus. b. Run 5 cycles, and then open Plant X end of the faulted line. c. Run 10 cycles, and then clear the fault and disconnect Tolk West 230 kV bus (525531).
59	FLT62-SB	**Single phase fault with stuck breaker** on the Tolk East (525524) to Plant X (525481) 230 kV line circuit #2, near Tolk East. a. Apply fault at the Tolk East 230 kV bus. b. Run 5 cycles, and then open Plant X end of the faulted line. c. Run 10 cycles, and then clear the fault and disconnect Tolk East 230 kV bus (525524).
60	FLT63-3PH	3 phase fault on the Mustang (527149) to Amocowasson (526784) 230 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 230 kV 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	FLT64-3PH	3 phase fault on the Mustang 230 kV (527149) to Mustang 115 kV (527146) to Mustang 13.2 kV (527143) XFMR CKT 1, near Mustang 230 kV. a. Apply fault at the Mustang 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
62	FLT65-3PH	3 phase fault on the Mustang (527149) to Yoakum (526935) 230 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 230 kV 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	FLT66-3PH	3 phase fault on the Mustang (527149) to Seminole (527276) 230 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 230 kV 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	FLT67-3PH	3 phase fault on the Seminole 230 kV (527276) to Seminole 115 kV (527275) to Seminole 13.2 kV (527273) XFMR CKT 1, near Seminole 230 kV. a. Apply fault at the Seminole 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
65	FLT68-3PH	3 phase fault on the Amocowasson (526784) to OxyBru Tap (527010) 230 kV line circuit 1, near Amocowasson. a. Apply fault at the Amocowasson 230 kV 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.
66	FLT69-3PH	3 phase fault on the Yoakum (526935) to G13-027-TAP (562480) 230 kV line, near Yoakum. a. Apply fault at the Yoakum 230 kV 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.
67	FLT70-3PH	3 phase fault on the Yoakum 230 kV (526935) to Yoakum 115 kV (526934) to Yoakum 13.2 kV (526932) XFMR CKT 2, near Yoakum 230 kV. a. Apply fault at the Yoakum 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
68	FLT71-3PH	3 phase fault on the Mustang (527146) to Denver North (527130) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV 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.
69	FLT72-3PH	3 phase fault on the Mustang (527146) to Seagraves (527202) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV 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.
70	FLT73-3PH	3 phase fault on the Mustang (527146) to Denver South (527136) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV 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
71	FLT74-3PH (2017SP & 2025SP Only)	3 phase fault on the Mustang (527146) to Shell Co (527062) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV 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	FLT75-3PH	3 phase fault on the Yoakum (526935) to Amoco-SS (526460) 230 kV line, near Yoakum. a. Apply fault at the Yoakum 230 kV 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.
73	FLT76-3PH	3 phase fault on the Yoakum (526935) to OxyBru Tap (527010) 230 kV line, near Yoakum. a. Apply fault at the Yoakum 230 kV 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.
74	FLT77-3PH	3 phase fault on the Yoakum (526935) to GEN-2015-079 Tap (560059) 230 kV line, near Yoakum. a. Apply fault at the Yoakum 230 kV 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.
75	FLT78-SB	**Single phase fault with stuck breaker at Mustang (527149)** a. Apply fault at the Mustang 230 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Mustang 230 kV (527149) /115 kV (527146)/13.2 kV (527143) transformer d. Mustang (527149) - Amocowasson (526784) 230 kV
76	FLT79-SB	**Single phase fault with stuck breaker** on the Tolk West (525531) to GEN-2013-027 (562480) 230 kV line, near Tolk West. a. Apply fault at the Tolk West 230 kV bus. b. Run 5 cycles, and then open GEN-2013-027 end of the faulted line. c. Run 10 cycles, and then clear the fault and disconnect Tolk West 230 kV bus (525531).
77	FLT80-SB	**Single phase fault with stuck breaker** on the Yoakum (526935) to GEN-2013-027 (562480) 230 kV line, near Yoakum. a. Apply fault at the Yoakum 230 kV bus. b. Run 5 cycles, and then open GEN-2013-027 end of the faulted line. c. Run 10 cycles, and then clear the fault and open Yoakum end of the line in (b) and trip Yoakum (526935) to Yoakum 115 (526934)/13.2 kV (526931) transformer circuit #1.
78	FLT81-SB	**Single phase fault with stuck breaker** on the Yoakum (526935) to Amoco-SS (526460) 230 kV line, near Yoakum. a. Apply fault at the Yoakum 230 kV bus. b. Run 5 cycles, and then open Amoco-SS end of the faulted line. c. Run 10 cycles, and then clear the fault and trip Yoakum 230 kV (526935) bus.

Cont. No.	Cont. Name	Description
79	FLT82-PO	**Prior Outage of the Mustang (527149) to Seminole (527276) 230 kV line circuit 1;** 3 phase fault on the Mustang (527149) to Yoakum (526935) 230 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
80	FLT83-PO	**Prior Outage of the Mustang (527149) to Yoakum (526935) 230 kV line circuit 1;** 3 phase fault on the Mustang (527149) to Seminole (527276) 230 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
81	FLT84-3PH	3 phase fault on the Woodward (515375) to Chisholm (511553) 345 kV line circuit 1, near Border. a. Apply fault at the Woodward 345 kV 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.
82	FLT85-3PH	3 phase fault on the Tuco (525830) to Carlisle (526161) 230 kV line circuit 1, near Tuco. a. Apply fault at the Tuco 230 kV 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.
83	FLT86-3PH	3 phase fault on the Tuco (525830) to Tolk East (525524) 230 kV line circuit 1, near Tuco. a. Apply fault at the Tuco 230 kV 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.
84	FLT87-3PH	3 phase fault on the Tuco (525830) to Jones (526337) 230 kV line circuit 1, near Tuco. a. Apply fault at the Tuco 230 kV 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.
85	FLT88-3PH	3 phase fault on the Tuco 230 kV (525830) to Tuco 115 kV (525828) to Tuco 13.2 kV (525819) XFMR CKT 2, near Tuco 230 kV. a. Apply fault at the Tuco 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
86	FLT89-PO	**Prior Outage of the Tuco 345 kV (525832) to Tuco 230 kV (525830) to Tuco 13.2 kV (525824) XFMR CKT 1;** 3 phase fault on the Tuco 345 kV (525832) to Tuco 230 kV (525830) to Tuco 13.2 kV (525825) XFMR CKT 2, near Tuco 345 kV. a. Apply fault at the Tuco 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
87	FLT90-PO	**Prior Outage of the Tuco 345 kV (525832) to Tuco 230 kV (525830) to Tuco 13.2 kV (525825) XFMR CKT 2;** 3 phase fault on the Tuco 345 kV (525832) to Tuco 230 kV (525830) to Tuco 13.2 kV (525824) XFMR CKT 1, near Tuco 345 kV. a. Apply fault at the Tuco 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Cont. No.	Cont. Name	Description
88	FLT91-SB	**Single phase fault with stuck breaker** at **Tuco (525832)** a. Apply fault at the Tuco 345 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Tuco 345 kV (525832) /230 kV (525830) /13.2 kV (525824) transformer d. Tuco (525832)- Rio Blanco (560027) 345 kV
89	FLT92-3PH	3 phase fault on the Crossroads (527656) to Tolk (525549) 345 kV line circuit 1, near Crossroads. a. Apply fault at the Crossroads 345 kV 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	FLT93-3PH	3 phase fault on the Crossroads (527656) to Eddy County (527802) 345 kV line circuit 1, near Crossroads. a. Apply fault at the Crossroads 345 kV 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.
91	FLT94-3PH	3 phase fault on the Tolk 345 kV (525549) to Tolk Tap 230 kV (525543) to Tolk 13.2 kV (525537) XFMR CKT 1, near Tolk 345 kV. a. Apply fault at the Tolk 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer
92	FLT95-3PH	3 phase fault on the Eddy County 345 kV (527802) to Eddy North 230 kV (527799) to Eddy 13.2 kV (527796) XFMR CKT 1, near Eddy County 345 kV. a. Apply fault at the Eddy County 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer
93	FLT96-3PH	3 phase fault on the Atoka (527786) to CV-Dayton (527821) 115 kV line circuit 1, near Atoka. a. Apply fault at the Atoka 115 kV 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	FLT97-3PH	3 phase fault on the Atoka (527786) to CV-Irishhill (528116) 115 kV line circuit 1, near Atoka. a. Apply fault at the Atoka 115 kV 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.
95	FLT98-3PH	3 phase fault on the Atoka (527786) to Eagle Creek (527711) 115 kV line circuit 1, near Atoka. a. Apply fault at the Atoka 115 kV 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
96	FLT99-3PH	3 phase fault on the CV-Dayton (527821) to Eddy South (527793) 115 kV line circuit 1, near CV-Dayton. a. Apply fault at the CV-Dayton 115 kV 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	FLT100-3PH	3 phase fault on the CV-Irishhill (528116) to CV-Lakewood (528109) 115 kV line circuit 1, near CV-Irishhill. a. Apply fault at the CV-Irishhill 115 kV 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	FLT101-3PH	3 phase fault on the Eagle Creek (527711) to Seven Rivers (528094) 115 kV line circuit 1, near Eagle Creek. a. Apply fault at the Eagle Creek 115 kV 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	FLT102-3PH	3 phase fault on the Eagle Creek (527711) to Eddy North (527798) 115 kV line circuit 1, near Eagle Creek. a. Apply fault at the Eagle Creek 115 kV 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	FLT103-PO	**Prior Outage of the Atoka (527786) to CV-Dayton (527821) 115 kV line circuit 1;** 3 phase fault on the Atoka (527786) to Eagle Creek (527711) 115 kV line circuit 1, near Atoka. a. Apply fault at the Atoka 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
101	FLT104-PO	**Prior Outage of the Atoka (527786) to Eagle Creek (527711) 115 kV line circuit 1;** 3 phase fault on the Atoka (527786) to CV-Dayton (527821) 115 kV line circuit 1, near Atoka. a. Apply fault at the Atoka 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
102	FLT105-3PH	3 phase fault on the Carlisle (526160) to LP-Doud Tap (526162) 115 kV line circuit 1, near Carlisle. a. Apply fault at the Carlisle 115 kV 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.
103	FLT106-3PH	3 phase fault on the Carlisle 115 kV (526160) to Carlisle 230 kV (526161) to Carlisle 13.2 kV (526157) XFMR CKT 1, near Carlisle 115 kV bus. a. Apply fault at the Carlisle 115 kV bus. b. Clear fault after 5 cycles by tripping the transformer

Cont. No.	Cont. Name	Description
104	FLT107-3PH	3 phase fault on the Carlisle (526160) to SP-Erskine (526109) 115 kV line circuit 1, near Carlisle. a. Apply fault at the Carlisle 115 kV 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.
105	FLT108-3PH	3 phase fault on the Carlisle (526160) to Murphy (526192) 115 kV line circuit 1, near Carlisle. a. Apply fault at the Carlisle 115 kV 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	FLT109-3PH	3 phase fault on the GEN-2015-077 Tap (560058) to Terry County (526736) 115 kV line circuit 1, near GEN-2015-077 Tap. a. Apply fault at the GEN-2015-077 Tap 115 kV 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.
107	FLT110-3PH	3 phase fault on the GEN-2015-077 Tap (560058) to LG-Clauene (526491) 115 kV line circuit 1, near GEN-2015-077 Tap. a. Apply fault at the GEN-2015-077 Tap 115 kV 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.
108	FLT111-3PH	3 phase fault on the Terry County (526736) to Prentice (526792) 115 kV line circuit 1, near Terry County. a. Apply fault at the Terry County 115 kV 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.
109	FLT112-3PH	3 phase fault on the Terry County (526736) to Denver North (527130) 115 kV line circuit 1, near Terry County. a. Apply fault at the Terry County 115 kV 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.
110	FLT113-3PH	3 phase fault on the Terry County (526736) to Sulphur (527262) 115 kV line circuit 1, near Terry County. a. Apply fault at the Terry County 115 kV 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.
111	FLT114-3PH	3 phase fault on the Terry County 115 kV (526736) to Terry County 69 kV (526735) to Terry County 13.2 kV (526733) XFMR CKT 1, near Terry County 115 kV. a. Apply fault at the Terry County 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Cont. No.	Cont. Name	Description
112	FLT115-3PH	3 phase fault on the Terry County (526736) to Wolf Forth (526524) 115 kV line circuit 1, near Terry County. a. Apply fault at the Terry County 115 kV 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.
113	FLT116-3PH	3 phase fault on the LG-Clauene (526491) to LG-Leveland (526484) 115 kV line circuit 1, near LG-Clauene. a. Apply fault at the LG-Clauene 115 kV 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.
114	FLT117-3PH	3 phase fault on the Seagraves (527202) to Sulphur (527262) 115 kV line circuit 1, near Seagraves. a. Apply fault at the Seagraves 115 kV 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.
115	FLT118-3PH	3 phase fault on the Seagraves (527202) to LG-Plshill (527194) 115 kV line circuit 1, near Seagraves. a. Apply fault at the Seagraves 115 kV 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.
116	FLT119-3PH	3 phase fault on the Denver South (527136) to San Andreas (527105) 115 kV line circuit 1, near Denver South. a. Apply fault at the Denver South 115 kV 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.
117	FLT120-3PH	3 phase fault on the Denver South (527136) to Shell C2 (527036) 115 kV line circuit 1, near Denver South. a. Apply fault at the Denver South 115 kV 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	FLT121-3PH	3 phase fault on the Denver South 115 kV (527136) to Denver City 69 kV (527125) to Denver South 13.2 kV (527123) XFMR CKT 2, near Denver South 115 kV. a. Apply fault at the Denver South 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
119	FLT122-PO	**Prior Outage of the Mustang 115 kV (527146) to Mustang 230 kV (527149) to Mustang 13.2 kV (527143) XFMR CKT 1;** 3 phase fault on the Mustang (527146) to Denver South (527136) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.

Cont. No.	Cont. Name	Description
120	FLT123-PO	**Prior Outage of the Mustang 115 kV (527146) to Mustang 230 kV (527149) to Mustang 13.2 kV (527143) XFMR CKT 1;** 3 phase fault on the Mustang (527146) to Denver North (527130) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
121	FLT124-PO	**Prior Outage of the Mustang (527146) to Denver South (527136) 115 kV line circuit 1;** 3 phase fault on the Mustang (527146) to Denver North (527130) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
122	FLT125-PO	**Prior Outage of the Mustang (527146) to Denver North (527130) 115 kV line circuit 1;** 3 phase fault on the Mustang (527146) to Denver South (527136) 115 kV line circuit 1, near Mustang. a. Apply fault at the Mustang 115 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
123	FLT126-3PH	3 phase fault on the GEN-2015-079 Tap (560059) to Hobbs (527894) 230 kV line circuit 1, near GEN-2015-079 Tap. a. Apply fault at the GEN-2015-079 Tap 230 kV 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.
124	FLT127-3PH	3 phase fault on the Hobbs (527894) to Andrews (528604) 230 kV line circuit 1, near Hobbs. a. Apply fault at the Hobbs 230 kV 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.
125	FLT128-3PH	3 phase fault on the Hobbs (527894) to Cunningham (527865) 230 kV line circuit 1, near Hobbs. a. Apply fault at the Hobbs 230 kV 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.
126	FLT129-3PH	3 phase fault on the Hobbs 230 kV (527894) to Hobbs 115 kV (527891) to Hobbs 13.2 kV (527889) XFMR CKT 2, near Hobbs 230 kV. a. Apply fault at the Hobbs 230 kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
127	FLT130-PO (2025SP)	**Prior Outage of the GEN-2015-079 Tap (560059) to Hobbs (527894) 230 kV line circuit 1;** 3 phase fault on the Yoakum (526936) to Tuco (525832) 345 kV line circuit 1, near Yoakum. a. Apply fault at the Yoakum 345 kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
128	FLT131-SB	**Single phase fault with stuck breaker at Chaves County (527482)** a. Apply fault at the Chaves 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Chaves County 230 kV (527483)/ 115 kV (527482)/13.2 kV (527478) transformer d. Chaves County (527482) - Urton (527501) 115 kV

Cont. No.	Cont. Name	Description
129	FLT132-SB	**Single phase fault with stuck breaker at Bailey Co (525028)** a. Apply fault at the Bailey County 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Bailey County 115 kV (525028)/ 69 kV (525027)/13.2 kV (525026) transformer d. Bailey County (525028) - G15-018T (560032) 115 kV
130	FLT133-SB	**Single phase fault with stuck breaker at Oasis (524874)** a. Apply fault at the Oasis 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Oasis (524874) - FE-CHZPLT (524863) 115 kV d. Oasis (524874) - Portales (524924) 115 kV
131	FLT134-SB	**Single phase fault with stuck breaker at Amarillo South (524415)** a. Apply fault at the Amarillo South 230 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Amarillo South (524415) - Nichols (524044) 230 kV d. Amarillo South (524415) - Randall (524365) 230 kV
132	FLT135-SB (20WP, 20SP, 25SP)	**Single phase fault with stuck breaker at Tuco Int (525832)** a. Apply fault at the Tuco Int 345 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Tuco Int (525832) - Border (515458) 345 kV d. Tuco Int (525832) - Yoakum (526936) 345 kV
133	FLT136-SB	**Single phase fault with stuck breaker at Deafsmith (524623)** a. Apply fault at the Deafsmith 230 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Deafsmith 230 kV (524623)/115 kV (524622)/13.8 kV (524620) transformer d. Deafsmith (524623) - Bushland (524267) 230 kV
134	FLT137-SB	**Single phase fault with stuck breaker at Mustang (527149)** a. Apply fault at the Mustang 230 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Mustang (527149) - Seminole (527276) 230 kV d. Mustang (527149) - Yoakum (526935) 230 kV
135	FLT138-SB	**Single phase fault with stuck breaker at Crossroads (527656)** a. Apply fault at the Crossroads 345 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Crossroads (527656) - Eddy County (527802) 345 kV d. Crossroads (527656) - Tolk (525549) 345 kV
136	FLT139-SB	**Single phase fault with stuck breaker at Atoka (527786)** a. Apply fault at the Atoka 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Atoka (527786) - Eagle Creek (527711) 115 kV d. Atoka (527786) - Irish Hill (528116) 115 kV
137	FLT140-SB	**Single phase fault with stuck breaker at Carlisle (526160)** a. Apply fault at the Carlisle 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Carlisle (526160) - Murphy (526192) 115 kV d. Carlisle (526160) - Erskine (526109) 115 kV

Cont. No.	Cont. Name	Description
138	FLT141-SB	**Single phase fault with stuck breaker at Terry County (526736)** a. Apply fault at the Terry County 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Terry County (526736) - Wolfforth (526524) 115 kV d. Terry County (526736) - Denver (527130) 115 kV
139	FLT142-SB	**Single phase fault with stuck breaker at Mustang (527146)** a. Apply fault at the Mustang 115 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Mustang (527146) - Seagraves (527202) 115 kV d. Mustang (527146) - Denver S (527136) 115 kV
140	FLT143-SB	**Single phase fault with stuck breaker at Hobbs (527894)** a. Apply fault at the Hobbs 230 kV bus. b. Clear fault after 16 cycles and trip the following elements c. Hobbs (527894) - Andrews (528604) 230 kV d. Hobbs (527894) - Cunningham (527865) 230 kV

SECTION 3: STABILITY ANALYSIS

The objective of the Stability Analysis was to determine the impacts of the generator interconnections on the stability and voltage recovery on the SPP transmission system. If problems with stability or voltage recovery were identified, the need for reactive compensation or system upgrades was investigated.

3.1 Approach

SPP provided MEPPI with the following five power flow cases[1]:

- MDWG15-16WP_DIS15021_G06
- MDWG15-17SP_DIS15021_G06
- MDWG15-20SP_DIS15021_G06
- MDWG15-20WP_DIS15021_G06
- MDWG15-25SP_DIS15021_G06

Each case was examined prior to the Stability Analysis to ensure the case contained the proposed study projects and any previously queued projects listed in Tables 2-1 and 2-2 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 2-3 were examined. Single-phase fault impedances were calculated

[1] The models include certain upgrades that SPP identified as necessary prior to starting the analysis

for each season to result in a voltage of approximately 60% of the pre-fault voltage. Refer to Table 3-1 for a list of the calculated single-phase fault impedances utilized.

Table 3-1
Calculated Single-Phase Fault Impedances

Cont. No.*	Cont. Name	Single-Phase Fault Impedance (MVA)				
		2016 Winter	2017 Summer	2020 Summer	2020 Winter	2025 Summer
8	FLT10-SB	-812.5	-812.5	-812.5	-812.5	-812.5
40	FLT42-SB	-2609.4	-2609.4	-2609.4	-2812.5	2609.4
58	FLT61-SB	-6875.0	-6168.8	-6875.0	-6875.0	-6875.0
59	FLT62-SB	-6875.0	-6468.8	-6875.0	-6875.0	-6875.0
75	FLT78-SB	-3625.0	-3625.0	-4234.4	-4234.4	-4234.4
76	FLT79-SB	-6875.0	-6468.8	-6875.0	-6875.0	-6875.0
77	FLT80-SB	-3625.0	-3625.0	-4437.5	-4437.5	-4437.5
78	FLT81-SB	-3625.0	-3625.0	-4437.5	-4437.5	-4437.5
88	FLT91-SB	-4437.5	-4843.8	-6062.5	-5250.0	-6062.5
128	FLT131-SB	-812.5	-812.5	-812.5	-812.5	-812.5
129	FLT132-SB	-812.5	-812.5	-937.5	-1000.0	-937.5
130	FLT133-SB	-1312.5	-1250.0	-1312.5	-1312.5	-1312.5
131	FLT134-SB	-3421.9	-3625.0	-3625.0	-3625.0	-3625.0
132	FLT135-SB	-4437.5	-4843.8	-6062.5	-5250.0	6062.5
133	FLT136-SB	-1875.0	-1750.0	-1875.0	-1875.0	-1875.0
134	FLT137-SB	-3625.0	-3625.0	-4234.4	-4234.4	-4234.4
135	FLT138-SB	-2101.6	-2101.6	-2203.1	-2203.1	-2203.1
136	FLT139-SB	-812.5	-875.0	-937.5	-937.5	-937.5
137	FLT140-SB	-1625.0	-1750.0	-1750.0	-1750.0	-1750.0
138	FLT141-SB	-1375.0	-1375.0	-1375.0	-1375.0	-1375.0
139	FLT142-SB	-2812.5	-2812.5	-3015.6	-3015.6	-2812.5
140	FLT143-SB	-3015.6	-3828.1	-4843.8	-4843.8	-5250.0

*Refer to Table 2-3 for a description of the contingency

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

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

The results of the analysis determined if reactive compensation or system upgrades were required to obtain acceptable system performance. If additional reactive compensation was required, the size, type, and location were determined. The proposed reactive reinforcements would ensure the wind or solar farm meets FERC Order 661A low voltage requirements and return the wind or solar farm to its pre-disturbance operating voltage. If the results indicated the need for fast responding reactive support, dynamic support such as an SVC or STATCOM was investigated. If tripping of the prior queued projects was observed during the stability analysis (for under/over voltage or under/over frequency) the simulations were re-ran with the prior queued project's voltage and frequency tripping disabled.

3.2 Stability Analysis Results

The Stability Analysis determined that there were multiple contingencies across all seasons that resulted in system/voltage instability, generation tripping offline, and poor post-fault voltage recovery when all generation interconnection requests were at 100% output.

Refer to Table 3-2 for a summary of the Stability Analysis results for the contingencies listed in Table 2-3. Table 3-2 is a summary of the stability results for the 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak, and 2025 Summer Peak conditions and states whether the system remained stable or 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. and 1.2 p.u. 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.

Refer to Appendix B, Appendix C, Appendix D, Appendix E, and Appendix F for a complete set of plots for all contingencies for 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak, and 2025 Summer Peak conditions, respectively.

Table 3-2
Stability Analysis Summary of Results for 2016 Winter, 2017 Summer, 2020 Summer, 2020 Winter, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2016 Winter Peak				2017 Summer Peak				2020 Summer Peak				2020 Winter Peak				2025 Summer Peak			
		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	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than 0.70 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.			Less than .70 p.u.	Greater than 1.20 p.u.		
1	FLT01-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
2	FLT02-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
3	FLT03-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
4	FLT04-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
5	FLT05-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
6	FLT06-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
7	FLT07-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
8	FLT10-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
9	FLT11-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
10	FLT12-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
11	FLT13-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
12	FLT14-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
13	FLT15-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
14	FLT16-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
15	FLT17-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
16	FLT18-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
17	FLT19-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
18	FLT20-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
19	FLT21-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
20	FLT22-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
21	FLT23-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
22	FLT24-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
23	FLT25-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
24	FLT26-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
25	FLT27-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
26	FLT28-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
27	FLT29-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
28	FLT30-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
29	FLT31-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
30	FLT32-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
31	FLT33-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
32	FLT34-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
33	FLT35-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
34	FLT36-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
35	FLT37-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
36	FLT38-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
37	FLT39-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
38	FLT40-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Note 1: Generator tripping observed
Note 2: Poor voltage damping
Note 3: Low voltage observed as a result of a radial system not serving load

Table 3-2 (continued)
Stability Analysis Summary of Results for 2016 Winter, 2017 Summer, 2020 Summer, 2020 Winter, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2016 Winter Peak				2017 Summer Peak				2020 Summer Peak				2020 Winter Peak				2025 Summer Peak			
		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	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than 0.70 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.			Less than .70 p.u.	Greater than 1.20 p.u.		
39	FLT41-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
40	FLT42-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
41	FLT43-3PH	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip
42	FLT44-3PH	-	-	V > 1.1 p.u.	Unstable	-	-	V > 1.1 p.u. V < 0.9 p.u.	Stable	-	-	V > 1.1 p.u.	Stable	-	-	V > 1.1 p.u.	Unstable[2]	-	-	Compliant	Stable
43	FLT45-3PH	-	-	V <0.9 p.u.	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Unstable[3]	-	-	Compliant	Stable
44	FLT46-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
45	FLT47-3PH (2025SP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Compliant	Stable
46	FLT48-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
47	FLT49-3PH	Voltage Instability				Voltage Instability				-	-	V > 1.1 p.u.	Gen Trip	Voltage Instability				-	-	V > 1.1 p.u.	Stable
48	FLT50-PO	Voltage Instability				-	-	V > 1.1 p.u. V < 0.9 p.u.	Stable	-	-	V > 1.1 p.u.	Stable	Voltage Instability				-	-	Compliant	Stable
49	FLT51-PO	-	-	V <0.9 p.u.	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	Voltage Instability				-	-	Compliant	Stable
50	FLT52-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
51	FLT54-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
52	FLT55-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
53	FLT56-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
54	FLT57-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
55	FLT58-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
56	FLT59-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
57	FLT60-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
58	FLT61-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
59	FLT62-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
60	FLT63-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
61	FLT64-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
62	FLT65-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
63	FLT66-3PH	-	-	Compliant	Stable	-	-	Compliant[3]	Stable	-	-	Compliant[3]	Stable	-	-	Compliant[3]	Stable	-	-	V < 0.9 p.u.	Stable
64	FLT67-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
65	FLT68-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
66	FLT69-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
67	FLT70-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
68	FLT71-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
69	FLT73-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
70	FLT72-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
71	FLT74-3PH (17SP & 25SP)	N/A	N/A	N/A	N/A	No	No	No	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Compliant	Stable

Note 1: Generator tripping observed
Note 2: Poor voltage damping
Note 3: Low voltage observed as a result of a radial system not serving load

Table 3-2 (continued)
Stability Analysis Summary of Results for 2016 Winter, 2017 Summer, 2020 Summer, 2020 Winter, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2016 Winter Peak				2017 Summer Peak				2020 Summer Peak				2020 Winter Peak				2025 Summer Peak			
		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	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than 0.70 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.			Less than .70 p.u.	Greater than 1.20 p.u.		
72	FLT75-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
73	FLT76-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
74	FLT77-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
75	FLT78-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
76	FLT79-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
77	FLT80-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
78	FLT81-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
79	FLT82-PO	-	-	Compliant	Stable	-	-	Compliant[3]	Stable	-	-	Compliant[3]	Stable	-	-	Compliant[3]	Stable	-	-	V < 0.9 p.u.	Stable
80	FLT83-PO	-	-	Compliant	Stable	-	-	Compliant[3]	Stable	-	-	Compliant[3]	Stable	-	-	Compliant[3]	Stable	-	-	V < 0.9 p.u.	Stable
81	FLT84-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
82	FLT85-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
83	FLT86-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
84	FLT87-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
85	FLT88-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
86	FLT89-PO	-	-	Compliant	Stable	-	-	Compliant	Unstable[2]	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
87	FLT90-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
88	FLT91-SB	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip	-	-	V > 1.1 p.u.	Gen Trip
89	FLT92-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
90	FLT93-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
91	FLT94-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
92	FLT95-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
93	FLT96-3PH	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip
94	FLT97-3PH	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip
95	FLT98-3PH	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip
96	FLT99-3PH	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip
97	FLT100-3PH	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip
98	FLT101-3PH	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
99	FLT102-3PH	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
100	FLT103-PO	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip
101	FLT104-PO	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip	-	-	Compliant	Gen Trip
102	FLT105-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
103	FLT106-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
104	FLT107-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
105	FLT108-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
106	FLT109-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
107	FLT110-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Note 1: Generator tripping observed
Note 2: Poor voltage damping
Note 3: Low voltage observed as a result of a radial system not serving load

Table 3-2 (continued)
Stability Analysis Summary of Results for 2016 Winter, 2017 Summer, 2020 Summer, 2020 Winter, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2016 Winter Peak				2017 Summer Peak				2020 Summer Peak				2020 Winter Peak				2025 Summer Peak			
		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	Voltage Recovery		Post Fault Steady-State Voltage	System Stability
		Less than 0.70 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.			Less than .70 p.u.	Greater than 1.20 p.u.		
108	FLT111-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
109	FLT112-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
110	FLT113-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
111	FLT114-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
112	FLT115-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
113	FLT116-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
114	FLT117-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
115	FLT118-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
116	FLT119-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
117	FLT120-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
118	FLT121-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
119	FLT122-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
120	FLT123-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
121	FLT124-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
122	FLT125-PO	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
123	FLT126-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
124	FLT127-3PH	-	-	Compliant	Stable	-	-	Yes[3]	Stable	-	-	Compliant	Stable	-	-	Yes[3]	Yes	-	-	Yes[3]	Stable
125	FLT128-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
126	FLT129-3PH	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
127	FLT130-PO (2025SP)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	-	-	Compliant	Stable
128	FLT131-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
129	FLT132-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
130	FLT133-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
131	FLT134-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
132	FLT135-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	V < 0.9 p.u.	Unstable[2]	-	-	Compliant	Stable
133	FLT136-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
134	FLT137-SB	-	-	Compliant	Stable	-	-	Yes[3]	Stable	-	-	Yes[3]	Stable	-	-	Yes[3]	Stable	-	-	Yes[3]	Stable
135	FLT138-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
136	FLT139-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
137	FLT140-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
138	FLT141-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
139	FLT142-SB	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable
140	FLT143-SB	-	-	Compliant	Stable	-	-	Yes[3]	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable	-	-	Compliant	Stable

Note 1: Generator tripping observed
Note 2: Poor voltage damping
Note 3: Low voltage observed as a result of a radial system not serving load

The following faults were observed to have system/voltage instability, generation tripping offline, and/or poor post-fault steady-state voltages:

- **FLT43-3PH**: 3PH fault resulting in the loss of Rio Blanco to Tuco 345 kV (All study years)
- **FLT44-3PH**: 3PH fault resulting in the loss of Rio Blanco to OKU 345 kV (16WP, 17SP, 20SP, 20WP)
- **FLT45-3PH**: 3PH fault resulting in the loss of Tuco to Border 345 kV (16WP, 20WP)
- **FLT49-3PH**: 3PH fault resulting in the loss of OKU to LES 345 kV (All study years)
- **FLT50-PO**: Prior outage of Tuco 345/230 kV transformer followed by a 3PH fault resulting in the loss of Rio Blanco to OKU 345 kV (16WP, 17SP, 20SP, 20WP)
- **FLT51-PO**: Prior outage of Tuco 345/230 kV transformer followed by a 3PH fault resulting in the loss of Tuco to Border 345 kV (16WP, 20WP)
- **FLT66-3PH**: 3PH fault resulting in the loss of Mustang to Seminole 230 kV (17SP, 20SP, 20WP, 25SP)
- **FLT82-PO**: Prior outage of Mustang to Seminole 230 kV followed by a 3PH fault resulting in the loss of Mustang to Yoakum 230 kV (17SP, 20SP, 20WP, 25SP)
- **FLT83-PO**: Prior outage of Mustang to Yoakum 230 kV followed by a 3PH fault resulting in the loss of Mustang to Seminole 230 kV (17SP, 20SP, 20WP, 25SP)
- **FLT89-PO**: Prior outage Tuco 345/230 kV transformer followed by 3-PH fault resulting in the loss of Tuco 345/230 kV transformer #2 (17SP)
- **FLT91-SB**: 1PH stuck breaker fault resulting in the loss of Tuco 345/230 kV transformer and Tuco to Rio Blanco 345 kV (All study years)
- **FLT96-3PH**: 3PH fault resulting in the loss of Atoka to CV-Dayton 115 kV (All study years)
- **FLT97-3PH**: 3PH fault resulting in the loss of Atoka to CV-Irish Hill 115 kV (All study years)
- **FLT98-3PH**: 3PH fault resulting in the loss of Atoka to Eagle Creek 116 kV (All study years)
- **FLT99-3PH**: 3PH fault resulting in the loss of CV-Dayton to Eddy South 115 kV (All study years)
- **FLT100-3PH**: 3PH fault resulting in the loss of CV-Irish Hill to CV-Lakewood 115 kV (All study years)
- **FLT101-3PH**: 3PH fault resulting in the loss of Eagle Creek to Seven Rivers 115 kV (16WP, 17SP)
- **FLT102-3PH**: 3PH fault resulting in the loss of Eagle Creek to Eddy North 115 kV (16WP, 17SP)
- **FLT103-PO**: Prior outage of Atoka to CV-Dayton 115 kV followed by a 3PH fault resulting in the loss of Atoka to Eagle Creek 115 kV (All study years)

- **FLT104-PO**: Prior outage of Atoka to Eagle Creek 115 kV followed by a 3PH fault resulting in the loss of Atoka to CV-Dayton 115 kV (All study years)
- **FLT127-3PH**: 3PH fault resulting in the loss of Hobbs to Andrews 230 kV (17SP, 20WP, 25SP)
- **FLT135-SB***:* 1PH stuck breaker fault resulting in the loss of Tuco to Border 345 kV and Tuco to Yoakum 345 kV (20WP)
- **FLT137-SB**: 1PH stuck breaker fault resulting in the loss of Mustang to Seminole 230 kV and Mustang to Yoakum 230 kV (17SP, 20SP, 20WP, 25SP)
- **FLT143-SB**: 1PH stuck breaker fault resulting in the loss of Hobbs to Andrews 230 kV and Hobbs to Cunningham 230 kV (17SP)

Note for the following faults, the post-fault steady-steady voltage violations are not a concern because the bus in violation is at the end of a radial line segment and is not serving load (except 25SP):

- **FLT66-3PH**: 3PH fault resulting in the loss of Mustang to Seminole 230 kV (17SP, 20SP, 20WP, 25SP)
- **FLT82-PO**: Prior outage of Mustang to Seminole 230 kV followed by a 3PH fault resulting in the loss of Mustang to Yoakum 230 kV (20SP, 20WP, 25SP)
- **FLT83-PO**: Prior outage of Mustang to Yoakum 230 kV followed by a 3PH fault resulting in the loss of Mustang to Seminole 230 kV (17SP, 20SP, 20WP, 25SP)
- **FLT127-3PH**: 3PH fault resulting in the loss of Hobbs to Andrews 230 kV (17SP, 25SP)
- **FLT137-SB**: 1PH stuck breaker fault resulting in the loss of Mustang to Seminole 230 kV and Mustang to Yoakum 230 kV (17SP, 20SP, 20WP, 25SP)
- **FLT143-SB**: 1PH stuck breaker fault resulting in the loss of Hobbs to Andrews 230 kV and Hobbs to Cunningham 230 kV (17SP)

Refer to Figure 3-1 and Figure 3-2 for a one-line diagram of the post-fault topology near Seminole 230 kV and Andrews 230 kV, respectively. It can be observed that both buses are at the end of a radial segment and do not serve load, therefore, are not a cause for concern.

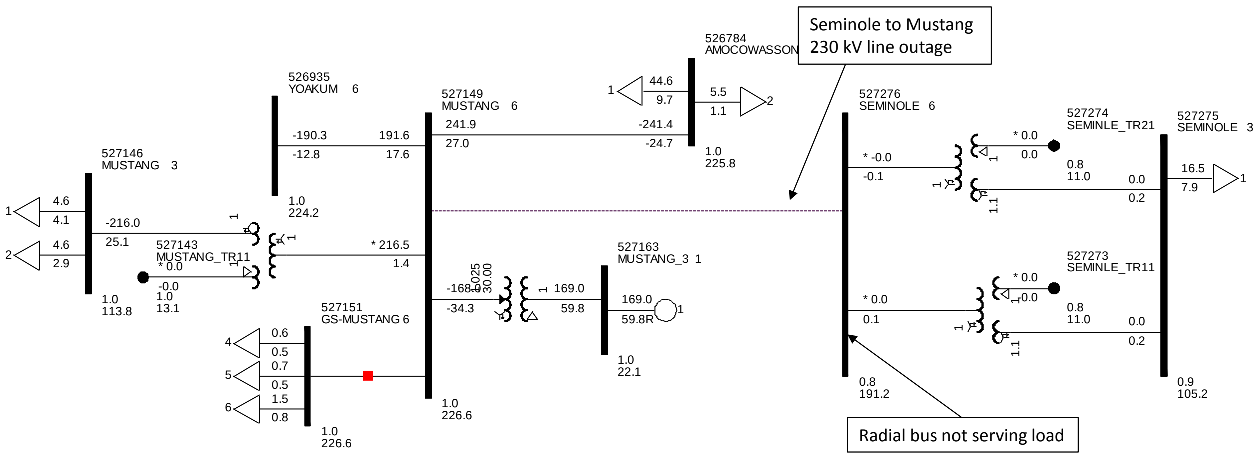

Figure 3-1: One-line diagram of post-fault steady-state topology for FLT66-3PH.

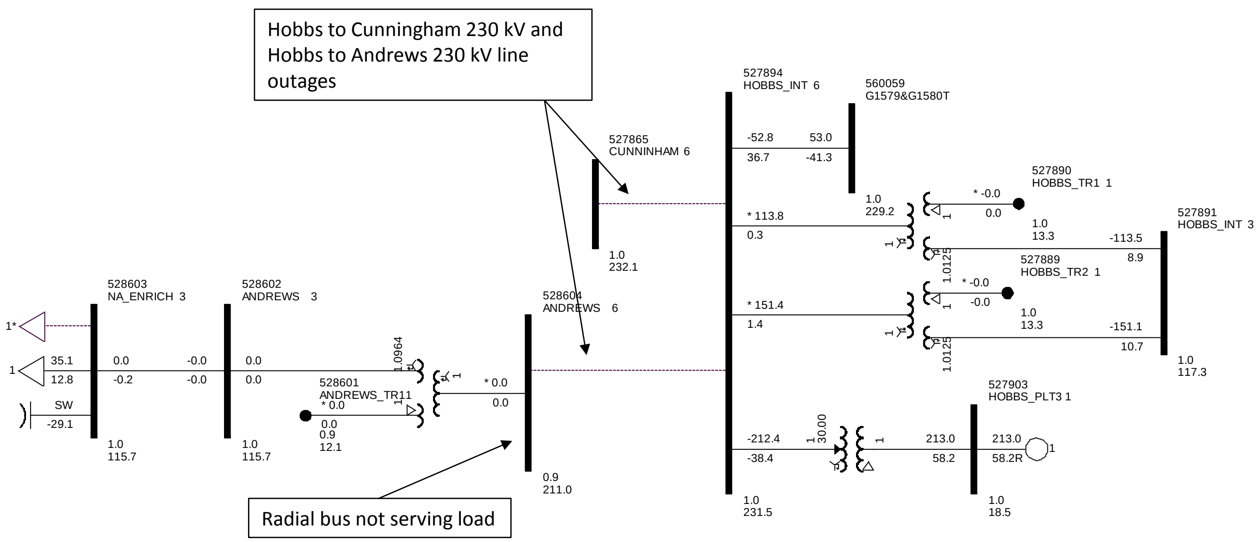

Figure 3-2: One-line diagram of post-fault steady-state topology for FLT143-SB.

To mitigate the system/voltage instability, voltage violations, generation tripping offline, and poor post-fault steady-state voltages, the following upgrades were provided by SPP and implemented in each season:

- Tuco – Yoakum – Hobbs 345kV circuit #1 (**16WP and 17SP**)
- Yoakum 345/230 kV transformer and Hobbs 345/230 kV transformer (**16WP and 17SP**)
- GEN-2014-074 345/34.5 kV transformer low side tap ratio set to 0.95 p.u.
- OKU Reactive Power Support
  - +/- 100 Mvar SVC
- Border Reactive Power Support (600 Mvar total)
  - +300 Mvar SVC
  - 300 Mvar capacitor bank

- Seminole – Mustang 115 kV circuit #1

FLT43-3PH, a 3PH fault resulting in the loss of Rio Blanco to Tuco 345 kV, was observed to have voltages above 1.1 p.u. post fault steady-state, poor voltage damping, and generation tripping offline (due to high voltage protection settings). Refer to Figure 3-3 for a representative comparison plot of Oklaunion and Border area voltages for the 2016 Winter Peak case with and without system upgrades. Refer to Figure 3-4 for comparison plot of GEN-2014-074's real power for the 2016 Winter Peak case with and without system upgrades. Note for the voltage to settle below 1.1 p.u. at the Oklaunion 345 kV bus for post fault steady-state conditions, the capacitor bank at Oklaunion 345 kV is required to be switched offline.

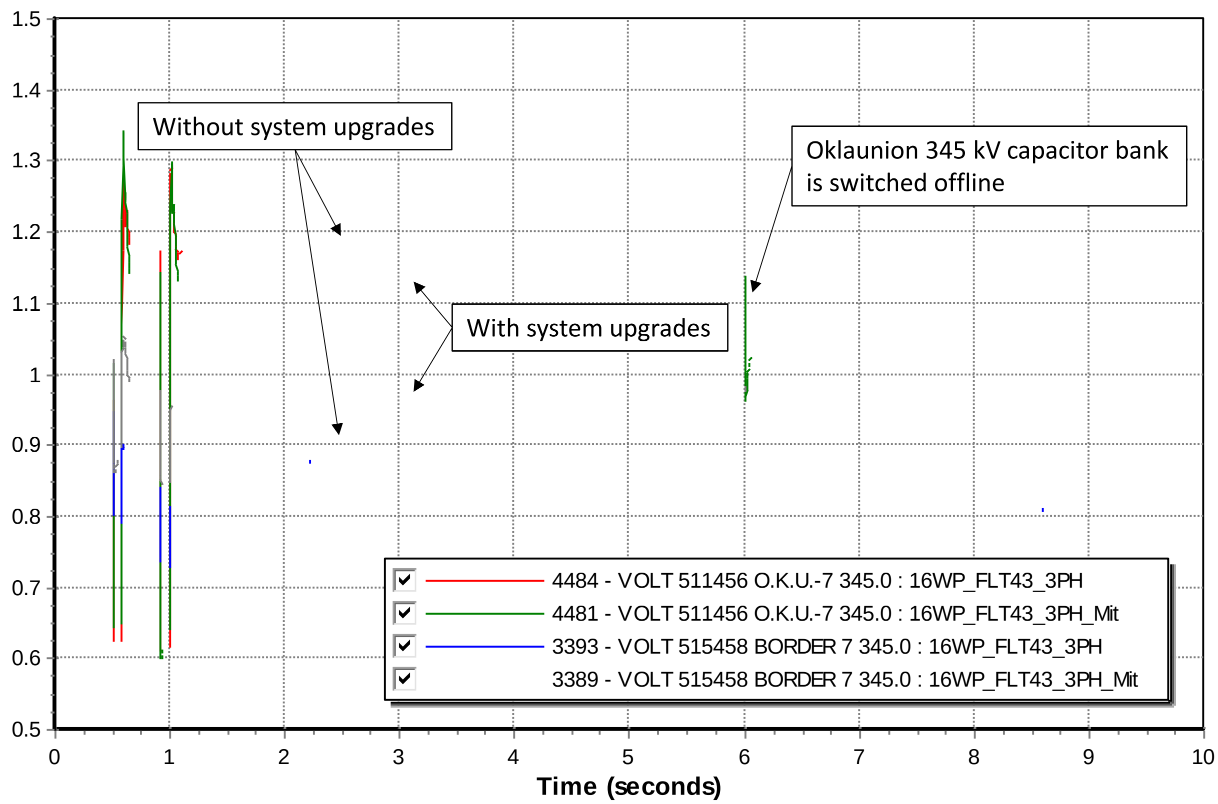

Figure 3-3: Representative plot of Oklaunion and Border area voltages for 2016 Winter Peak conditions with and without system upgrades.

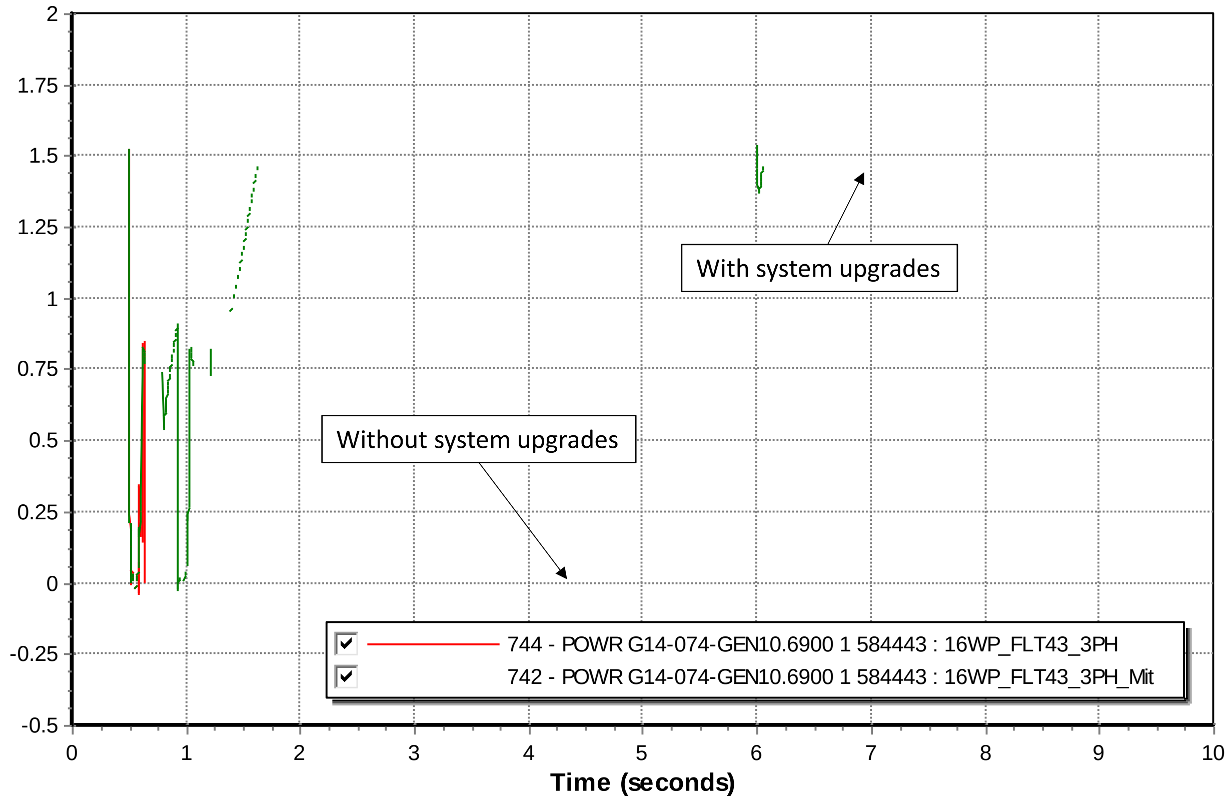

Figure 3-4: Comparison plot of GEN-2014-074's real power for 2016 Winter Peak conditions with and without system upgrades.

FLT44-3PH, a 3PH fault resulting in the loss of Rio Blanco to OKU 345 kV, was observed to have voltage instability (growing voltage oscillations near Border 345 kV). Refer to Figure 3-5 for a representative comparison plot of Oklaunion and Border 345 kV bus voltages for the 2016 Winter Peak case with and without system upgrades.

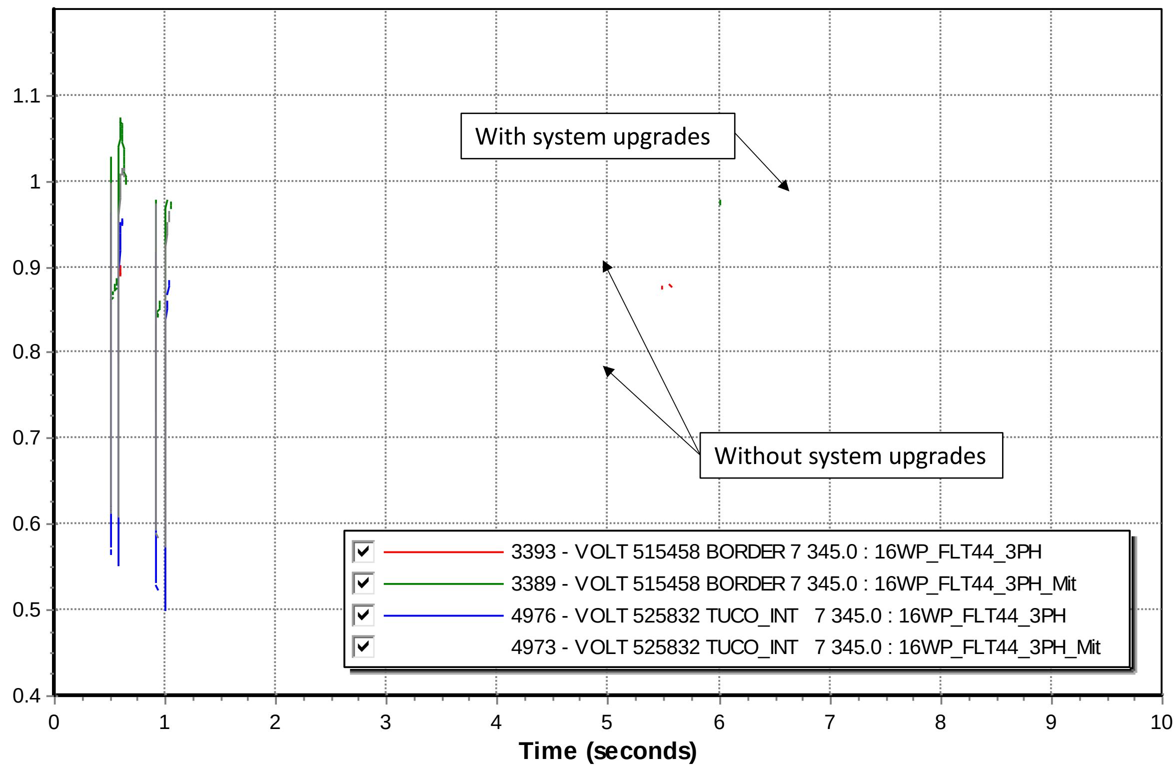

Figure 3-5: Representative plot of Border and Tuco 345 kV voltages for 2016 Winter Peak conditions with and without system upgrades.

For the 25SP case, low voltages were observed in the Seminole and Mustang 230 kV area for faults resulting in the loss of Seminole to Mustang 230 kV or Mustang to Yoakum 230 kV. With the addition of the Seminole to Mustang 115 kV circuit #1, these low voltage were mitigated. Refer to Figure 3-6 for a representative comparison plot of bus voltages in the Seminole 230 kV area for FLT66-3PH (3PH fault resulting in loss of Seminole to Mustang 230 kV circuit #1) with and without system upgrades.

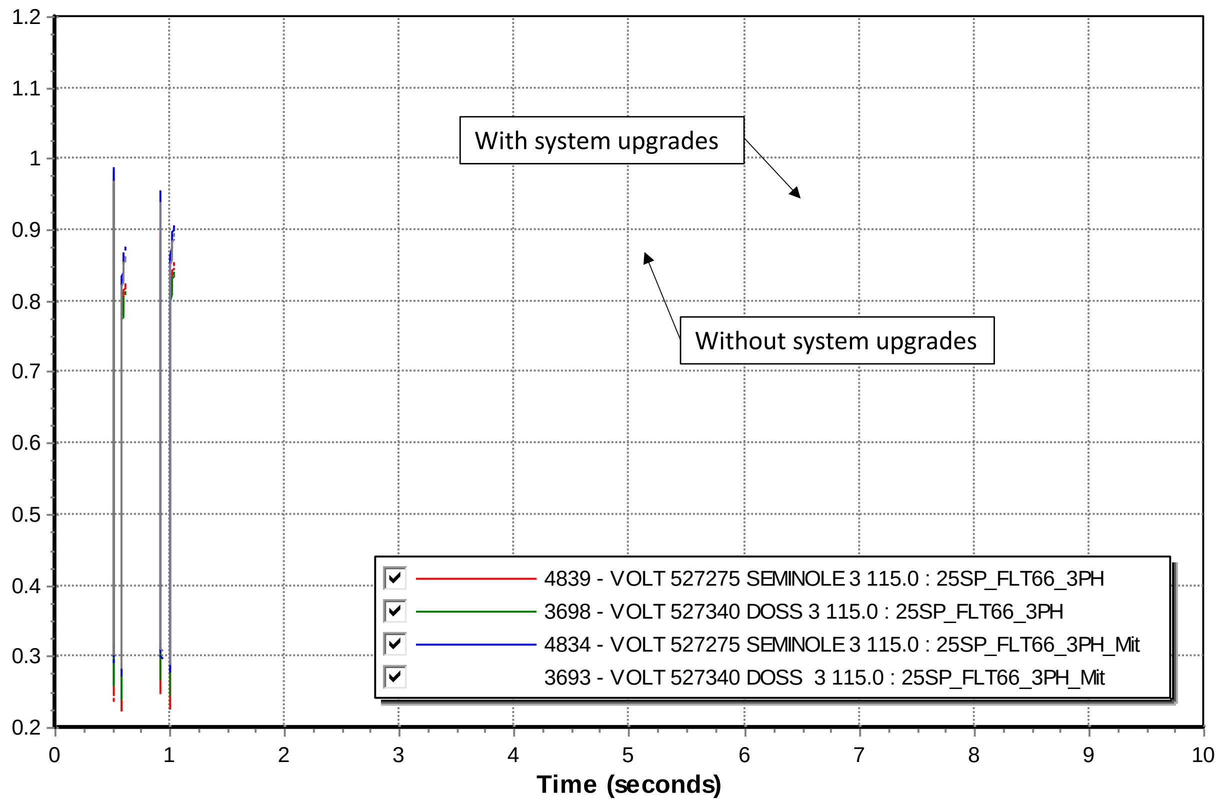

Figure 3-6: Representative plot of Seminole 230 kV bus voltages for 2025 Summer Peak conditions with and without system upgrades.

For faults FLT96 through FLT104, which are three-phase faults at Atoka 115 kV and adjacent buses, GEN-2015-058 trips offline due to over frequency and over voltage protection. For this study, the over frequency and over voltage protection of the TMEIC photovoltaic inverter model (ITMEIC) were set to 75 Hz and 1.8 p.u., respectively, to avoid instantaneous tripping. It is recommended the developer of the TMEIC photovoltaic inverter model examine this model for three-phase faults that cause the model to trip on over frequency and over voltage protection.

After the upgrades were implemented, the Stability Analysis was re-simulated to determine system stability. With the required upgrade, the Stability Analysis determined that there was no wind turbine tripping or system instability as a result of interconnected all study projects at 100% output.

SECTION 4: SHORT CIRCUIT ANALYSIS

The objective of this task is to quantify the three-phase to ground fault currents for the 2017 Summer Peak and 2025 Summer Peak seasons for each interconnecting generator.

4.1 Approach

The short-circuit analysis will assess breaker adequacy and fault duties for the generator interconnection bus and five buses away from the point of interconnection. MEPPI will assume no outages to find maximum short-circuit currents that flow through the breaker. The Automatic Sequencing Fault Calculation (ASCC) function in PSS/E was utilized to perform this task. FLAT conditions were applied to pre-fault conditions and the following adjustments were utilized:

- All synchronous and asynchronous machine P and Q output was set to zero
- All transformer tap ratios were set to 1.0 p.u. and all phase shift angles were set to zero
- All generator reactance's were fixed to the subtransient reactance
- All line charging was set to zero
- All shunts were set to zero
- All loads were set to zero
- All pre-fault bus voltages were set to 1.0 p.u. and a phase shift angle of zero

Note upgrades found to be necessary for the Stability Analysis were included in the Short-Circuit Analysis.

4.2 Short Circuit Results: 2017 Summer Peak

The maximum fault current for each bus is provided for the 2017 Summer Peak conditions. The following tables show the short circuit results for the study generators for the 2017 Summer Peak condition:

- Table 4-1: Short Circuit Analysis for GEN-2015-020 (17SP)
- Table 4-2: Short Circuit Analysis for GEN-2015-031 (17SP)
- Table 4-3: Short Circuit Analysis for GEN-2015-056 (17SP)
- Table 4-4: Short Circuit Analysis for GEN-2015-058 (17SP)
- Table 4-5: Short Circuit Analysis for GEN-2015-068 (17SP)
- Table 4-6: Short Circuit Analysis for GEN-2015-075 (17SP)
- Table 4-7: Short Circuit Analysis for GEN-2015-079 and GEN-2015-080 (17SP)

Table 4-1
Short Circuit Analysis for Study Project GEN-2015-020 (17SP)

Study Generator GEN-2015-020											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524486	CAPROCK 3	115	2.86	524863	FE-CHZPLT 3	115	7.72	525531	TOLK_WEST 6	230	25.84
524502	NORTON 3	115	2.72	524874	OASIS 3	115	9.57	525543	TOLK_TAP 6	230	25.84
524509	FE-TUCMCARI3	115	1.93	524875	OASIS 6	230	7.30	525637	LAMB_CNTY 6	230	5.34
524662	PARMER_CO 3	115	4.10	524885	SN_JUAN_TAP6	230	4.64	525830	TUCO_INT 6	230	22.92
524669	DS-#20 3	115	4.83	524889	SN_JUAN_WND6	230	4.45	527481	CHAVES_CNTY2	69	2.26
524764	NORRIS_TP 3	115	10.72	524908	ROOSEVELT 3	115	10.33	527482	CHAVES_CNTY3	115	6.18
524768	PLSNT_HILL 3	115	9.87	524909	ROSEVELT_N 6	230	8.76	527483	CHAVES_CNTY6	230	3.99
524770	PLSNT_HILL 6	230	6.09	524911	ROSEVELT_S 6	230	8.76	527501	URTON 3	115	5.25
524773	E_CLOVIS 3	115	8.51	524915	SW_4K33 6	230	8.76	527546	SAMSON 3	115	4.91
524776	N_CLOVIS_TP3	115	7.16	524923	PORTALES 2	69	7.13	527793	EDDY_STH 3	115	10.18
524777	N_CLOVIS 3	115	6.49	524924	PORTALES 3	115	7.24	527799	EDDY_NORTH 6	230	7.28
524783	W_CLOVIS 2	69	2.42	524929	RO-PORT_MTR2	69	7.13	527800	EDDY_SOUTH 6	230	7.28
524784	W_CLOVIS 3	115	6.11	524934	ZODIAC 2	69	5.31	527802	EDDY_CNTY 7	345	4.11
524790	CANNON_TP 3	115	5.82	524935	KILGORE 3	115	5.65	560032	G15-018T	115	5.19
524794	CANNONAFB 3	115	5.47	524941	PORTALES#1 2	69	5.50	562480	G13-027-TAP	230	9.13
524797	PERIMETER 3	115	6.34	524948	PORTALES#2 2	69	4.68	583280	ASGI2012-002	115	1.05
524801	NORRIS 3	115	9.83	524962	S_PORTALES 2	69	4.17	583950	GEN-2014-033	115	6.18
524808	FE-CLVS_INT3	115	6.68	524976	MARKET_ST 2	69	3.95	583970	GEN-2014-035	115	5.89
524821	CURRY 2	69	4.37	525019	EMU&VLY_TP 3	115	6.09	584620	GEN-2015-020	115	9.33
524822	CURRY 3	115	10.75	525027	BAILEYCO 2	69	5.38	599955	PNM-DC6	230	8.76
524831	FE-HOLLAND 3	115	8.76	525028	BAILEYCO 3	115	5.99	599960	EPTNP-D6	230	7.28
524838	FE-CLOVIS2 3	115	10.17	525481	PLANT_X 6	230	22.25				
524846	FARWELL 2	69	2.08	525524	TOLK_EAST 6	230	25.84				

Table 4-2
Short Circuit Analysis for Study Project GEN-2015-031 (17SP)

Study Generator GEN-2015-031											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
511456	O.K.U.-7	345	5.46	524185	PIERCE_TP 3	115	18.96	525480	PLANT_X 3	115	21.23
511553	CHISHOLM7	345	12.26	524224	MANHATTAN 3	115	18.36	525481	PLANT_X 6	230	22.25
515458	BORDER 7	345	10.18	524266	BUSHLAND 3	115	9.33	525524	TOLK_EAST 6	230	25.84
522800	MU-TULIA 3	115	5.09	524267	BUSHLAND 6	230	9.63	525531	TOLK_WEST 6	230	25.84
522823	LP-MILWAKEE6	230	10.03	524282	34TH_ST 3	115	14.90	525543	TOLK_TAP 6	230	25.84
522828	LP-MILWAKEE2	69	7.49	524290	WILDOR2_JUS6	230	6.60	525549	TOLK 7	345	6.98
522861	LP-SOUTHEST6	230	13.76	524296	SPNSPUR_WND7	345	4.45	525636	LAMB_CNTY 3	115	8.51
522866	LP-COOK 2	69	30.52	524306	COULTER 3	115	15.13	525637	LAMB_CNTY 6	230	5.34
522870	LP-HOLLY 6	230	14.76	524321	GEORGIA 2	69	6.64	525731	SP-ABERNTHY2	69	3.02
522888	LP-WADSWRTH6	230	12.05	524322	GEORGIA 3	115	16.32	525738	HALECENTER 2	69	2.46
523095	HITCHLAND 6	230	14.86	524331	PULLMAN 3	115	7.10	525779	FLOYD_CNTY 2	69	5.31
523097	HITCHLAND 7	345	15.59	524338	SOUTHEAST 3	115	10.97	525780	FLOYD_CNTY 3	115	6.03
523221	XIT_INTG 6	230	2.60	524345	OSAGE 3	115	13.72	525816	TUCO_INT2 2	69	4.67
523267	PRINGLE 6	230	4.26	524364	RANDALL 3	115	20.81	525826	TUCO_INT 2	69	7.92
523308	MOORE_E 3	115	10.99	524365	RANDALL 6	230	14.20	525828	TUCO_INT 3	115	20.01
523309	MOORE_CNTY 6	230	6.69	524377	FARMERS 3	115	15.05	525830	TUCO_INT 6	230	22.92
523332	EXELL_TP 3	115	4.81	524388	CROUSE_HIND3	115	15.05	525832	TUCO_INT 7	345	13.36
523339	FAIN 3	115	5.27	524397	ARROWHEAD 3	115	13.55	525840	ANTELOPE_1 6	230	22.74
523344	BLKHAWK_W 3	115	11.81	524404	OWENSCORN 3	115	14.76	525853	LH-WIL&ELLN2	69	2.58
523377	RIVERVIEW 3	115	13.27	524414	AMA_SOUTH 3	115	16.55	525885	SP-NEWDEAL 2	69	3.39
523410	CRMWA_#4 3	115	9.70	524415	AMA_SOUTH 6	230	13.39	525926	CROSBY 3	115	4.49
523485	CAMX/AGR TP3	115	13.90	524425	ESTACADO_TP3	115	13.17	526076	STANTON_W 3	115	9.40
523494	MEREDITH 3	115	7.72	524432	ESTACADO 3	115	11.60	526109	SP-ERSKINE 3	115	11.41
523543	HUTCHISON 2	69	9.04	524516	CANYON_WEST3	115	4.91	526146	INDIANA 3	115	9.75
523544	HUTCH_N 3	115	15.58	524522	CANYON E_TP3	115	5.15	526159	CARLISLE 2	69	2.57
523546	HUTCH_S 3	115	15.58	524523	CANYON_EAST3	115	4.79	526160	CARLISLE 3	115	13.24
523551	HUTCHISON 6	230	7.19	524530	PALO_DURO 3	115	6.54	526161	CARLISLE 6	230	10.68
523636	GRAY_CNTY 3	115	3.90	524544	SPRING_DRW 3	115	6.36	526162	LP-DOUD_TP 3	115	11.67
523748	BOWERS 3	115	6.88	524622	DEAFSMITH 3	115	11.95	526192	MURPHY 3	115	10.67
523770	GRAPEVINE 3	115	7.89	524623	DEAFSMITH 6	230	7.70	526268	LUBBCK_STH 3	115	18.90
523771	GRAPEVINE 6	230	5.73	524694	DS-#22 3	115	4.96	526269	LUBBCK_STH 6	230	17.45
523776	WHEELER 3	115	6.41	524734	DS-#21 3	115	10.79	526297	LUBBCK_EST 2	69	8.03
523777	WHEELER 6	230	5.87	524745	CASTRO_CNTY2	69	9.59	526298	LUBBCK_EST 3	115	15.21
523779	STLN-DEMARC6	230	7.02	524746	CASTRO_CNTY3	115	11.64	526299	LUBBCK_EST 6	230	12.89
523815	LLANO_WND 3	115	9.43	524909	ROSEVELT_N 6	230	8.76	526337	JONES 6	230	19.72
523817	MIDSTRM_TP 3	115	6.71	524911	ROSEVELT_S 6	230	8.76	526434	SUNDOWN 3	115	11.48
523869	CHAN/TASCOS6	230	3.84	524915	SW_4K33 6	230	8.76	526435	SUNDOWN 6	230	10.95
523928	MARTIN 3	115	7.47	525019	EMU&VLY_TP 3	115	6.09	526460	AMOCO_SS 6	230	9.62
523931	HIGHLAND_TP3	115	11.36	525050	BC-KELLEY 3	115	8.36	526524	WOLFFORTH 3	115	11.51
523959	POTTER_CO 6	230	20.20	525056	BC-EARTH 3	115	8.78	526525	WOLFFORTH 6	230	13.12
523961	POTTER_CO 7	345	7.42	525124	HART_INDUST3	115	7.58	526676	GRASSLAND 3	115	6.12
523977	HARRNG_WST 6	230	25.94	525154	HAPPY_INT 3	115	5.35	526677	GRASSLAND 6	230	6.41
523978	HARRNG_MID 6	230	25.94	525179	TULIA_TP 3	115	6.29	526679	CIRRUS_WND 6	230	5.00
523979	HARRNG_EST 6	230	25.94	525191	KRESS_INT 2	69	4.43	526935	YOAKUM 6	230	17.12
524007	ROLLHILLS 3	115	19.29	525192	KRESS_INT 3	115	11.16	526936	YOAKUM_345	345	8.47
524009	CHERRY 3	115	18.45	525203	SW-KRESS 2	69	4.43	527896	HOBBS_INT 7	345	7.14
524010	ROLLHILLS 6	230	19.24	525212	SWISHER 3	115	10.31	560027	G14-074-TAP	345	6.71
524016	ASARCO 3	115	26.38	525213	SWISHER 6	230	10.48	560050	G15-031-TAP	230	9.03
524018	ASARCO_TP 3	115	28.52	525224	KRESS_RURL 2	69	2.51	562004	G11-025-TAP	115	4.60
524043	NICHOLS 3	115	30.48	525225	KRESS_RURAL3	115	6.24	562480	G13-027-TAP	230	9.13
524044	NICHOLS 6	230	25.21	525257	N_PLAINVEW 3	115	5.08	583090	G1149&G1504	345	8.37
524058	WHITAKER 3	115	21.85	525326	COX 3	115	5.89	583340	GEN-2012-020	230	9.20
524079	CONWAY 3	115	5.00	525414	LAMTON 3	115	7.80	584220	GEN-2014-040	115	10.35
524088	KIRBY 3	115	5.42	525446	SPGLAKE_TP3	115	10.60	584440	GEN-2014-074	345	6.31
524106	NORTHWEST 3	115	11.24	525453	HALE_CNTY 2	69	6.92	584640	GEN-2015-022	115	10.31
524136	HASTINGS 3	115	13.69	525454	HALE_CNTY 3	115	10.17	584750	GEN-2015-031	230	9.03
524162	EAST_PLANT 3	115	22.83	525460	NEWHART 3	115	15.13	585060	GEN-2015-068	345	10.65
524163	EAST_PLANT 6	230	13.64	525461	NEWHART 6	230	10.87	599955	PNM-DC6	230	8.76

Table 4-3
Short Circuit Analysis for Study Project GEN-2015-056 (17SP)

Study Generator GEN-2015-056											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524623	DEAFSMITH 6	230	7.70	526161	CARLISLE 6	230	10.68	527963	POTASH_JCT 6	230	6.31
524770	PLSNT_HILL 6	230	6.09	526337	JONES 6	230	19.72	528070	CV-AZMESA 3	115	6.66
524875	OASIS 6	230	7.30	526435	SUNDOWN 6	230	10.95	528094	7-RIVERS 3	115	7.49
524885	SN_JUAN_TAP6	230	4.64	526935	YOAKUM 6	230	17.12	528095	7-RIVERS 6	230	5.51
524889	SN_JUAN_WND6	230	4.45	527481	CHAVES_CNTY2	69	2.26	528132	OCOTILLO 3	115	5.35
524908	ROOSEVELT 3	115	10.33	527482	CHAVES_CNTY3	115	6.18	528137	N_CANAL 3	115	7.14
524909	ROSEVELT_N 6	230	8.76	527483	CHAVES_CNTY6	230	3.99	528160	CARLSBAD 3	115	8.68
524911	ROSEVELT_S 6	230	8.76	527501	URTON 3	115	5.25	528178	PECOS 3	115	9.15
524915	SW_4K33 6	230	8.76	527546	SAMSON 3	115	4.91	528179	PECOS 6	230	5.70
525213	SWISHER 6	230	10.48	527597	TWEEDY 3	115	4.68	528226	HOPI_SUB 3	115	3.91
525461	NEWHART 6	230	10.87	527656	CROSSROADS 7	345	5.42	562480	G13-027-TAP	230	9.13
525480	PLANT_X 3	115	21.23	527711	EAGLE_CREEK3	115	6.84	577103	GEN-2008-022	345	5.13
525481	PLANT_X 6	230	22.25	527786	ATOKA 3	115	6.59	577104	G08-022-WEST	345	4.81
525524	TOLK_EAST 6	230	25.84	527793	EDDY_STH 3	115	10.18	583340	GEN-2012-020	230	9.20
525531	TOLK_WEST 6	230	25.84	527798	EDDY_NTH 3	115	10.18	583840	GEN-2013-027	230	8.12
525543	TOLK_TAP 6	230	25.84	527799	EDDY_NORTH 6	230	7.28	583950	GEN-2014-033	115	6.18
525549	TOLK 7	345	6.98	527800	EDDY_SOUTH 6	230	7.28	583970	GEN-2014-035	115	5.89
525636	LAMB_CNTY 3	115	8.51	527802	EDDY_CNTY 7	345	4.11	584260	GEN-2014-047	345	4.38
525637	LAMB_CNTY 6	230	5.34	527809	CV-8_MILE 3	115	5.07	584940	GEN-2015-056	345	4.79
525828	TUCO_INT 3	115	20.01	527821	CV-DAYTON 3	115	6.51	599955	PNM-DC6	230	8.76
525830	TUCO_INT 6	230	22.92	527864	CUNNINHAM 3	115	26.24	599960	EPTNP-D6	230	7.28
525832	TUCO_INT 7	345	13.36	527865	CUNNINHAM 6	230	16.06				
525840	ANTELOPE_1 6	230	22.74	527894	HOBBS_INT 6	230	17.20				

Table 4-4
Short Circuit Analysis for Study Project GEN-2015-058 (17SP)

Study Generator GEN-2015-058											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524885	SN_JUAN_TAP6	230	4.64	527754	CV-ARTESIA 2	69	3.07	527930	PCA 3	115	8.14
527482	CHAVES_CNTY3	115	6.18	527757	ARTESIA_TP 2	69	3.64	527962	POTASH_JCT 3	115	8.69
527483	CHAVES_CNTY6	230	3.99	527761	ARTESIA_W 2	69	3.32	527963	POTASH_JCT 6	230	6.31
527534	BRASHER_TP 3	115	4.98	527762	ARTSA_CC_TP2	69	1.90	528003	CV-DAGGR&IH2	69	1.62
527541	CAPITAN 3	115	3.36	527763	CV-W_ARTSIA2	69	1.60	528070	CV-AZMESA 3	115	6.66
527546	SAMSON 3	115	4.91	527768	ARTESIA_CC 2	69	1.74	528076	CV-WALTCYN 3	115	4.23
527563	ROSWLL_INT 2	69	3.46	527772	ARTSA_SR_TP2	69	1.97	528079	CV-CONEBUTE3	115	3.17
527564	ROSWLL_INT 3	115	5.00	527775	ARTESIA_SR 2	69	1.90	528093	7-RIVERS 2	69	2.35
527597	TWEEDY 3	115	4.68	527785	ATOKA 2	69	2.33	528094	7-RIVERS 3	115	7.49
527656	CROSSROADS 7	345	5.42	527786	ATOKA 3	115	6.59	528095	7-RIVERS 6	230	5.51
527664	CV-CTTNWOOD2	69	2.65	527793	EDDY_STH 3	115	10.18	528109	CV-LAKEWOOD3	115	5.97
527678	SMITH 2	69	3.77	527798	EDDY_NTH 3	115	10.18	528116	CV-IRISHHIL3	115	5.99
527701	ARTESIA 2	69	3.78	527799	EDDY_NORTH 6	230	7.28	528132	OCOTILLO 3	115	5.35
527707	ARTESIA 3	115	6.33	527800	EDDY_SOUTH 6	230	7.28	528137	N_CANAL 3	115	7.14
527710	EAGLE_CREEK2	69	2.29	527802	EDDY_CNTY 7	345	4.11	528151	FIESTA 3	115	7.77
527711	EAGLE_CREEK3	115	6.84	527808	CV-8_MILE 2	67	1.80	528159	CARLSBAD 2	69	4.15
527715	NAVAJO_2TP 3	115	6.55	527809	CV-8_MILE 3	115	5.07	528160	CARLSBAD 3	115	8.68
527717	NAVAJO_2 3	115	6.47	527810	CV-ABO 2	67	1.59	528178	PECOS 3	115	9.15
527720	NAVAJO_3 3	115	6.51	527811	CV-KEWAN_TP3	115	2.82	528179	PECOS 6	230	5.70
527733	NAVAJO_1 2	69	2.15	527821	CV-DAYTON 3	115	6.51	528182	NORTH_LOVNG3	115	2.31
527736	NAVAJO_5TP 3	115	6.51	527822	CV-TURKYTRK3	115	3.31	528226	HOPI_SUB 3	115	3.91
527739	NAVAJO_4 3	115	6.50	527864	CUNNINHAM 3	115	26.24	584960	GEN-2015-058	115	6.50
527743	NAVAJO_5 3	115	6.50	527865	CUNNINHAM 6	230	16.06	599960	EPTNP-D6	230	7.28
527747	ARTESIA_TWN2	69	2.11	527894	HOBBS_INT 6	230	17.20				

Table 4-5
Short Circuit Analysis for Study Project GEN-2015-068 (17SP)

Study Generator GEN-2015-068											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
511423	FLE TAP4	138	8.31	525225	KRESS_RURAL3	115	6.24	526679	CIRRUS_WND 6	230	5.00
511437	COMANC-4	138	17.45	525272	KISER 3	115	5.09	526694	GRAHAM 3	115	2.68
511439	LWSTAP 4	138	11.03	525291	PLAINVW_TP 2	69	6.49	526736	TERRY_CNTY 3	115	10.86
511456	O.K.U.-7	345	5.46	525298	S_PLAINVEW 2	69	2.58	526784	AMOCOWASSON6	230	13.69
511458	ELKCTY-4	138	11.55	525325	COX 2	69	3.36	526792	PRENTICE 3	115	5.94
511466	L.E.S.-2	69	16.33	525326	COX 3	115	5.89	526928	PLAINS_INT 3	115	9.83
511467	L.E.S.-4	138	23.32	525413	LAMTON 2	69	5.22	526934	YOAKUM 3	115	16.64
511468	L.E.S.-7	345	12.38	525414	LAMTON 3	115	7.80	526935	YOAKUM 6	230	17.12
511474	SHERID4	138	11.84	525432	SP-HALFWAY 2	69	5.87	526936	YOAKUM_345	345	8.47
511486	ELGINJT4	138	9.68	525440	LC-S_OLTON 3	115	7.43	526944	LG-PLAINS 3	115	7.92
511490	ELKCITY6	230	7.81	525446	SPGLAKE_TP3	115	10.60	527010	OXYBRU_TP 6	230	13.70
511494	COMMTAP4	138	20.55	525453	HALE_CNTY 2	69	6.92	527018	BENNETT 3	115	13.14
511541	SWEETWT6	230	7.82	525454	HALE_CNTY 3	115	10.17	527041	ARCO_TP 3	115	13.04
511542	BUFFCK6	230	5.74	525460	NEWHART 3	115	15.13	527047	OXY_WILRD1 3	115	10.48
511544	DEMPSEY6	230	4.94	525461	NEWHART 6	230	10.87	527062	SHELL_CO2 3	115	15.93
511547	ROARK6	230	4.47	525480	PLANT_X 3	115	21.23	527130	DENVER_N 3	115	20.86
511553	CHISHOLM7	345	12.26	525481	PLANT_X 6	230	22.25	527136	DENVER_S 3	115	20.86
511557	CHISHOLM6	230	11.60	525524	TOLK_EAST 6	230	25.84	527146	MUSTANG 3	115	23.16
514785	WOODWRD4	138	12.14	525531	TOLK_WEST 6	230	25.84	527149	MUSTANG 6	230	15.45
514796	IODINE-4	138	7.20	525543	TOLK_TAP 6	230	25.84	527151	GS-MUSTANG 6	230	15.45
514801	MINCO 7	345	16.24	525549	TOLK 7	345	6.98	527194	LG-PLSHILL 3	115	7.55
514901	CIMARON7	345	27.65	525636	LAMB_CNTY 3	115	8.51	527202	SEAGRAVES 3	115	8.57
515136	SUNNYSD7	345	9.88	525637	LAMB_CNTY 6	230	5.34	527275	SEMINOLE 3	115	14.43
515375	WWRDEHV7	345	19.16	525724	COUNTYLINE 2	69	2.21	527276	SEMINOLE 6	230	7.65
515376	WWRDEHV4	138	23.29	525731	SP-ABERNTHY2	69	3.02	527656	CROSSROADS 7	345	5.42
515394	KEENAN 4	138	8.06	525738	HALECENTER 2	69	2.46	527800	EDDY_SOUTH 6	230	7.28
515398	OUSPRT 4	138	8.86	525745	LH-HALECTR 2	69	2.43	527864	CUNNINHAM 3	115	26.24
515407	TATONGA7	345	10.26	525769	BARWISE 2	69	3.76	527865	CUNNINHAM 6	230	16.06
515444	MCNOWND7	345	16.20	525779	FLOYD_CNTY 2	69	5.31	527891	HOBBS_INT 3	115	29.89
515458	BORDER 7	345	10.18	525780	FLOYD_CNTY 3	115	6.03	527894	HOBBS_INT 6	230	17.20
515549	MNCWND37	345	11.31	525790	FLOYDADA_TP2	69	2.49	527896	HOBBS_INT 7	345	7.14
515554	BVRCNTY7	345	14.45	525811	LH-HARMONY 2	69	4.25	527963	POTASH_JCT 6	230	6.31
515599	NBUFFRG7	345	8.41	525816	TUCO_INT2 2	69	4.67	528333	LE-WEST_SUB3	115	8.54
515800	GRACMNT7	345	15.72	525826	TUCO_INT 2	69	7.92	528355	MADDOX 3	115	25.33
515802	GRACMNT4	138	25.99	525828	TUCO_INT 3	115	20.01	528433	NEW_NHOBBS 3	115	7.91
515997	WWPAR4	138	16.93	525830	TUCO_INT 6	230	22.92	528435	MILLEN 3	115	11.30
520814	ANADARK4	138	27.99	525832	TUCO_INT 7	345	13.36	528602	ANDREWS 3	115	7.93
521089	WASHITA4	138	24.49	525840	ANTELOPE_1 6	230	22.74	528604	ANDREWS 6	230	6.02
522819	LP-NORTHEST2	69	10.09	525853	LH-WIL&ELLN2	69	2.58	528626	LE-PLNSINT 2	69	4.36
522822	LP-NORTHWST2	69	4.34	525860	SP-BECTON 2	69	2.29	539800	CLARKCOUNTY7	345	11.52
522823	LP-MILWAKEE6	230	10.03	525885	SP-NEWDEAL 2	69	3.39	539801	THISTLE7	345	15.19
522828	LP-MILWAKEE2	69	7.49	525892	WHITE&MONRO2	69	2.56	539804	THISTLE4	138	16.22
522832	LP-VICKSBRG2	69	11.44	525925	CROSBY 2	69	4.77	560000	G11-14-TAP	345	13.36
522857	LP-SOUTHEST2	69	21.47	525926	CROSBY 3	115	4.49	560013	G14-057T	345	9.49
522861	LP-SOUTHEST6	230	13.76	526076	STANTON_W 3	115	9.40	560027	G14-074-TAP	345	6.71
522866	LP-COOK 2	69	30.52	526109	SP-ERSKINE 3	115	11.41	560033	G1524&G1525T	345	19.06
522870	LP-HOLLY 6	230	14.76	526130	SP-CARLISLE2	69	2.11	560050	G15-031-TAP	230	9.03
522879	LP-WADSWRTH2	69	19.67	526146	INDIANA 3	115	9.75	560059	G1579&G1580T	230	8.97
522888	LP-WADSWRTH6	230	12.05	526159	CARLISLE 2	69	2.57	562004	G11-025-TAP	115	4.60
523309	MOORE_CNTY 6	230	6.69	526160	CARLISLE 3	115	13.24	562075	G11-051-TAP	345	12.07
523779	STLN-DEMARC6	230	7.02	526161	CARLISLE 6	230	10.68	562480	G13-027-TAP	230	9.13
523869	CHAN/TASCOS6	230	3.84	526162	LP-DOUD_TP 3	115	11.67	581112	GEN-2011-014	345	11.99
523959	POTTER_CO 6	230	20.20	526176	LP-DOUD 3	115	9.06	581137	GEN-2011-025	115	4.60
523961	POTTER_CO 7	345	7.42	526184	SW_6878 2	69	2.16	582019	GEN-2011-019	345	19.16
523979	HARRNG_EST 6	230	25.94	526192	MURPHY 3	115	10.67	582020	GEN-2011-020	345	19.16
524010	ROLLHILLS 6	230	19.24	526199	SP-FRANKFRD3	115	9.68	583090	G1149&G1504	345	8.37
524044	NICHOLS 6	230	25.21	526213	ALLEN 3	115	10.72	583110	GEN-2011-051	345	12.07
524267	BUSHLAND 6	230	9.63	526267	LUBBCK_STH 2	69	4.35	583340	GEN-2012-020	230	9.20
524365	RANDALL 6	230	14.20	526268	LUBBCK_STH 3	115	18.90	583819	ASGI2014-001	115	11.41
524414	AMA_SOUTH 3	115	16.55	526269	LUBBCK_STH 6	230	17.45	583840	GEN-2013-027	230	8.12
524415	AMA_SOUTH 6	230	13.39	526284	PLANTERS 2	69	6.31	584070	GEN-2014-057	345	6.58
524622	DEAFSMITH 3	115	11.95	526297	LUBBCK_EST 2	69	8.03	584440	GEN-2014-074	345	6.31
524623	DEAFSMITH 6	230	7.70	526298	LUBBCK_EST 3	115	15.21	584640	GEN-2015-022	115	10.31
524746	CASTRO_CNTY3	115	11.64	526299	LUBBCK_EST 6	230	12.89	584750	GEN-2015-031	230	9.03
524770	PLSNT_HILL 6	230	6.09	526310	CLUTTER 2	69	5.44	584980	GEN-2015-060	138	5.66
524875	OASIS 6	230	7.30	526337	JONES 6	230	19.72	585060	GEN-2015-068	345	10.65
524908	ROOSEVELT 3	115	10.33	526434	SUNDOWN 3	115	11.48	585080	GEN-2015-071	345	10.25

Table 4-5 (continued)
Short Circuit Analysis for Study Project GEN-2015-068 (17SP)

Study Generator GEN-2015-056											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524623	DEAFSMITH 6	230	7.70	526161	CARLISLE 6	230	10.68	527963	POTASH_JCT 6	230	6.31
524770	PLSNT_HILL 6	230	6.09	526337	JONES 6	230	19.72	528070	CV-AZMESA 3	115	6.66
524875	OASIS 6	230	7.30	526435	SUNDOWN 6	230	10.95	528094	7-RIVERS 3	115	7.49
524885	SN_JUAN_TAP6	230	4.64	526935	YOAKUM 6	230	17.12	528095	7-RIVERS 6	230	5.51
524889	SN_JUAN_WND6	230	4.45	527481	CHAVES_CNTY2	69	2.26	528132	OCOTILLO 3	115	5.35
524908	ROOSEVELT 3	115	10.33	527482	CHAVES_CNTY3	115	6.18	528137	N_CANAL 3	115	7.14
524909	ROSEVELT_N 6	230	8.76	527483	CHAVES_CNTY6	230	3.99	528160	CARLSBAD 3	115	8.68
524911	ROSEVELT_S 6	230	8.76	527501	URTON 3	115	5.25	528178	PECOS 3	115	9.15
524915	SW_4K33 6	230	8.76	527546	SAMSON 3	115	4.91	528179	PECOS 6	230	5.70
525213	SWISHER 6	230	10.48	527597	TWEEDY 3	115	4.68	528226	HOPI_SUB 3	115	3.91
525461	NEWHART 6	230	10.87	527656	CROSSROADS 7	345	5.42	562480	G13-027-TAP	230	9.13
525480	PLANT_X 3	115	21.23	527711	EAGLE_CREEK3	115	6.84	577103	GEN-2008-022	345	5.13
525481	PLANT_X 6	230	22.25	527786	ATOKA 3	115	6.59	577104	G08-022-WEST	345	4.81
525524	TOLK_EAST 6	230	25.84	527793	EDDY_STH 3	115	10.18	583340	GEN-2012-020	230	9.20
525531	TOLK_WEST 6	230	25.84	527798	EDDY_NTH 3	115	10.18	583840	GEN-2013-027	230	8.12
525543	TOLK_TAP 6	230	25.84	527799	EDDY_NORTH 6	230	7.28	583950	GEN-2014-033	115	6.18
525549	TOLK 7	345	6.98	527800	EDDY_SOUTH 6	230	7.28	583970	GEN-2014-035	115	5.89
525636	LAMB_CNTY 3	115	8.51	527802	EDDY_CNTY 7	345	4.11	584260	GEN-2014-047	345	4.38
525637	LAMB_CNTY 6	230	5.34	527809	CV-8_MILE 3	115	5.07	584940	GEN-2015-056	345	4.79
525828	TUCO_INT 3	115	20.01	527821	CV-DAYTON 3	115	6.51	599955	PNM-DC6	230	8.76
525830	TUCO_INT 6	230	22.92	527864	CUNNINHAM 3	115	26.24	599960	EPTNP-D6	230	7.28
525832	TUCO_INT 7	345	13.36	527865	CUNNINHAM 6	230	16.06				
525840	ANTELOPE_1 6	230	22.74	527894	HOBBS_INT 6	230	17.20				

Table 4-6
Short Circuit Analysis for Study Project GEN-2015-075 (17SP)

Study Generator GEN-2015-075											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
515458	BORDER 7	345	10.18	526076	STANTON_W 3	115	9.40	526299	LUBBCK_EST 6	230	12.89
522822	LP-NORTHWST2	69	4.34	526109	SP-ERSKINE 3	115	11.41	526337	JONES 6	230	19.72
522823	LP-MILWAKEE6	230	10.03	526130	SP-CARLISLE2	69	2.11	526434	SUNDOWN 3	115	11.48
522828	LP-MILWAKEE2	69	7.49	526146	INDIANA 3	115	9.75	526435	SUNDOWN 6	230	10.95
522832	LP-VICKSBRG2	69	11.44	526159	CARLISLE 2	69	2.57	526460	AMOCO_SS 6	230	9.62
522861	LP-SOUTHEST6	230	13.76	526160	CARLISLE 3	115	13.24	526469	SP-YUMA 2	69	3.07
522870	LP-HOLLY 6	230	14.76	526161	CARLISLE 6	230	10.68	526475	YUMA_INT 3	115	11.00
524911	ROSEVELT_S 6	230	8.76	526162	LP-DOUD_TP 3	115	11.67	526481	SP-WOLF_TP 3	115	11.18
525212	SWISHER 3	115	10.31	526176	LP-DOUD 3	115	9.06	526483	SP-WOLFORTH3	115	8.67
525213	SWISHER 6	230	10.48	526184	SW_6878 2	69	2.16	526524	WOLFFORTH 3	115	11.51
525454	HALE_CNTY 3	115	10.17	526192	MURPHY 3	115	10.67	526525	WOLFFORTH 6	230	13.12
525461	NEWHART 6	230	10.87	526199	SP-FRANKFRD3	115	9.68	526677	GRASSLAND 6	230	6.41
525481	PLANT_X 6	230	22.25	526205	IVORY 2	69	3.93	526736	TERRY_CNTY 3	115	10.86
525524	TOLK_EAST 6	230	25.84	526213	ALLEN 3	115	10.72	526936	YOAKUM_345	345	8.47
525543	TOLK_TAP 6	230	25.84	526221	BATTON_N 2	69	1.78	560027	G14-074-TAP	345	6.71
525780	FLOYD_CNTY 3	115	6.03	526228	BATTON_S 2	69	2.72	560050	G15-031-TAP	230	9.03
525816	TUCO_INT2 2	69	4.67	526243	SP-QUAKER 3	115	9.73	583340	GEN-2012-020	230	9.20
525826	TUCO_INT 2	69	7.92	526256	IVORY_TP 2	69	3.93	583810	ASGI2013-006	115	8.67
525828	TUCO_INT 3	115	20.01	526267	LUBBCK_STH 2	69	4.35	583819	ASGI2014-001	115	11.41
525830	TUCO_INT 6	230	22.92	526268	LUBBCK_STH 3	115	18.90	585060	GEN-2015-068	345	10.65
525832	TUCO_INT 7	345	13.36	526269	LUBBCK_STH 6	230	17.45	585120	GEN-2015-075	69	1.55
525840	ANTELOPE_1 6	230	22.74	526298	LUBBCK_EST 3	115	15.21				

Table 4-7
Short Circuit Analysis for Study Project GEN-2015-079 and GEN-2015-080 (17SP)

Study Generator GEN-2015-079 and GEN-2015-080											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
511456	O.K.U.-7	345	5.46	527041	ARCO_TP 3	115	13.04	528094	7-RIVERS 3	115	7.49
511553	CHISHOLM7	345	12.26	527046	OXY_WILRD2 3	115	10.46	528095	7-RIVERS 6	230	5.51
515458	BORDER 7	345	10.18	527047	OXY_WILRD1 3	115	10.48	528160	CARLSBAD 3	115	8.68
524623	DEAFSMITH 6	230	7.70	527051	ODC_TP 3	115	13.15	528178	PECOS 3	115	9.15
524770	PLSNT_HILL 6	230	6.09	527062	SHELL_CO2 3	115	15.93	528179	PECOS 6	230	5.70
524908	ROOSEVELT 3	115	10.33	527080	EL_PASO 3	115	15.68	528317	ENRON_TP 3	115	6.28
524909	ROSEVELT_N 6	230	8.76	527105	SAN_ANDS_TP3	115	16.34	528325	LE-WAITS 3	115	6.68
524911	ROSEVELT_S 6	230	8.76	527125	DENVER_CTY 2	69	8.63	528333	LE-WEST_SUB3	115	8.54
524915	SW_4K33 6	230	8.76	527130	DENVER_N 3	115	20.86	528334	LE-LOVINTON3	115	8.45
525213	SWISHER 6	230	10.48	527136	DENVER_S 3	115	20.86	528348	BUCKEYE_TP 3	115	8.12
525461	NEWHART 6	230	10.87	527146	MUSTANG 3	115	23.16	528355	MADDOX 3	115	25.33
525480	PLANT_X 3	115	21.23	527149	MUSTANG 6	230	15.45	528385	BUCKEYE 3	115	7.31
525481	PLANT_X 6	230	22.25	527151	GS-MUSTANG 6	230	15.45	528392	PEARLE 3	115	6.16
525524	TOLK_EAST 6	230	25.84	527194	LG-PLSHILL 3	115	7.55	528394	QUAHADA 3	115	7.26
525531	TOLK_WEST 6	230	25.84	527201	SEAGRAVES 2	69	5.41	528399	LEA_NATIONL3	115	6.31
525543	TOLK_TAP 6	230	25.84	527202	SEAGRAVES 3	115	8.57	528413	TAYLOR 3	115	14.03
525549	TOLK 7	345	6.98	527238	ROZ 3	115	11.16	528422	DCP_ZIA TP 3	115	6.37
525636	LAMB_CNTY 3	115	8.51	527242	AMERADA 3	115	11.31	528433	NEW_NHOBBS 3	115	7.91
525637	LAMB_CNTY 6	230	5.34	527262	SULPHUR 3	115	5.70	528435	MILLEN 3	115	11.30
525828	TUCO_INT 3	115	20.01	527275	SEMINOLE 3	115	14.43	528442	NE_HOBBS 3	115	11.58
525830	TUCO_INT 6	230	22.92	527276	SEMINOLE 6	230	7.65	528463	SANGER_SW 3	115	15.41
525832	TUCO_INT 7	345	13.36	527284	RUSSELL 3	115	8.99	528484	SW_4J44 3	115	10.72
525840	ANTELOPE_1 6	230	22.74	527286	XTO_RUSSEL 3	115	9.92	528491	MONUMENT 3	115	14.86
526036	LC-OPDYKE 3	115	5.81	527322	GAINES 3	115	9.31	528498	W_HOBBS 3	115	11.21
526161	CARLISLE 6	230	10.68	527340	DOSS 3	115	7.97	528568	MONUMNT_TP 3	115	9.63
526269	LUBBCK_STH 6	230	17.45	527362	JOHNSON_DRW3	115	10.58	528575	OXYPERMIAN 3	115	14.81
526337	JONES 6	230	19.72	527363	HIGG 3	115	10.09	528582	BYRD 3	115	7.72
526352	LEHMAN 3	115	6.07	527483	CHAVES_CNTY6	230	3.99	528589	DRINKARD 3	115	6.95
526424	PACIFIC 3	115	9.71	527597	TWEEDY 3	115	4.68	528602	ANDREWS 3	115	7.93
526434	SUNDOWN 3	115	11.48	527711	EAGLE_CREEK3	115	6.84	528603	NA_ENRICH 3	115	7.89
526435	SUNDOWN 6	230	10.95	527793	EDDY_STH 3	115	10.18	528604	ANDREWS 6	230	6.02
526445	AMOCO_TP 3	115	10.82	527798	EDDY_NTH 3	115	10.18	528605	TARGA 3	115	6.48
526460	AMOCO_SS 6	230	9.62	527799	EDDY_NORTH 6	230	7.28	528618	LE-LOVINTON2	69	7.18
526491	LG-CLAUENE 3	115	9.13	527800	EDDY_SOUTH 6	230	7.28	528626	LE-PLNSINT 2	69	4.36
526524	WOLFFORTH 3	115	11.51	527802	EDDY_CNTY 7	345	4.11	528627	LE-TXACO_TP3	115	7.01
526525	WOLFFORTH 6	230	13.12	527809	CV-8_MILE 3	115	5.07	528740	LE-PLANS_TP2	69	3.61
526735	TERRY_CNTY 2	69	7.08	527864	CUNNINHAM 3	115	26.24	560027	G14-074-TAP	345	6.71
526736	TERRY_CNTY 3	115	10.86	527865	CUNNINHAM 6	230	16.06	560058	G15-077-TAP	115	8.23
526784	AMOCOWASSON6	230	13.69	527891	HOBBS_INT 3	115	29.89	560059	G1579&G1580T	230	8.97
526792	PRENTICE 3	115	5.94	527894	HOBBS_INT 6	230	17.20	562480	G13-027-TAP	230	9.13
526928	PLAINS_INT 3	115	9.83	527896	HOBBS_INT 7	345	7.14	583090	G1149&G1504	345	8.37
526934	YOAKUM 3	115	16.64	527930	PCA 3	115	8.14	583340	GEN-2012-020	230	9.20
526935	YOAKUM 6	230	17.12	527961	POTASH_JCT 2	69	6.94	583840	GEN-2013-027	230	8.12
526936	YOAKUM_345	345	8.47	527962	POTASH_JCT 3	115	8.69	584440	GEN-2014-074	345	6.31
526944	LG-PLAINS 3	115	7.92	527963	POTASH_JCT 6	230	6.31	585060	GEN-2015-068	345	10.65
527010	OXYBRU_TP 6	230	13.70	527999	INTREPDW_TP3	115	7.93	585160	G1579&G1580	230	8.52
527018	BENNETT 3	115	13.14	528025	RDRUNNER 3	115	5.89	599960	EPTNP-D6	230	7.28
527036	SHELL_C2 3	115	12.78	528027	RDRUNNER 6	230	3.59				

4.3 Short Circuit Results: 2025 Summer Peak

The maximum fault current for each bus is provided for the 2025 Summer Peak conditions. The following tables show the short circuit results for the study generators for the 2025 Summer Peak conditions:

- Table 4-8: Short Circuit Analysis for GEN-2015-020 (25SP)
- Table 4-9: Short Circuit Analysis for GEN-2015-031 (25SP)
- Table 4-10: Short Circuit Analysis for GEN-2015-056 (25SP)
- Table 4-11: Short Circuit Analysis for GEN-2015-058 (25SP)

- Table 4-12: Short Circuit Analysis for GEN-2015-068 (25SP)
- Table 4-13: Short Circuit Analysis for GEN-2015-075 (25SP)
- Table 4-14: Short Circuit Analysis for GEN-2015-079 and GEN-2015-080 (25SP)

Table 4-8

Short Circuit Analysis for Study Project GEN-2015-020 (25SP)

Study Generator GEN-2015-020											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524486	CAPROCK 3	115	3.22	524874	OASIS 3	115	9.75	525524	TOLK_EAST 6	230	26.48
524502	NORTON 3	115	3.32	524875	OASIS 6	230	7.42	525531	TOLK_WEST 6	230	26.48
524509	FE-TUCMCARI3	115	2.61	524885	SN_JUAN_TAP6	230	4.69	525543	TOLK_TAP 6	230	26.48
524662	PARMER_CO 3	115	4.14	524889	SN_JUAN_WND6	230	4.49	525637	LAMB_CNTY 6	230	5.56
524669	DS-#20 3	115	4.89	524908	ROOSEVELT 3	115	10.56	525830	TUCO_INT 6	230	23.39
524764	NORRIS_TP 3	115	11.14	524909	ROSEVELT_N 6	230	8.91	527482	CHAVES_CNTY3	115	6.31
524768	PLSNT_HILL 3	115	10.19	524911	ROSEVELT_S 6	230	8.91	527483	CHAVES_CNTY6	230	4.08
524770	PLSNT_HILL 6	230	6.19	524915	SW_4K33 6	230	8.91	527501	URTON 3	115	5.34
524773	E_CLOVIS 3	115	8.75	524923	PORTALES 2	69	7.19	527508	PRICE 3	115	4.95
524776	N_CLOVIS_TP3	115	7.31	524924	PORTALES 3	115	7.35	527546	SAMSON 3	115	5.07
524777	N_CLOVIS 3	115	6.61	524929	RO-PORT_MTR2	69	7.19	527793	EDDY_STH 3	115	10.95
524783	W_CLOVIS 2	69	2.43	524934	ZODIAC 2	69	5.34	527799	EDDY_NORTH 6	230	7.76
524784	W_CLOVIS 3	115	6.21	524935	KILGORE 3	115	6.01	527800	EDDY_SOUTH 6	230	7.76
524790	CANNON_TP 3	115	5.90	524941	PORTALES#1 2	69	5.53	527802	EDDY_CNTY 7	345	4.26
524794	CANNONAFB 3	115	5.54	524948	PORTALES#2 2	69	4.70	560032	G15-018T	115	5.48
524797	PERIMETER 3	115	6.42	524962	S_PORTALES 2	69	4.19	562480	G13-027-TAP	230	9.19
524801	NORRIS 3	115	10.19	524963	S_PORTALES 3	115	5.65	583280	ASGI2012-002	115	1.05
524808	FE-CLVS_INT3	115	6.81	524976	MARKET_ST 2	69	3.97	583950	GEN-2014-033	115	6.31
524821	CURRY 2	69	4.41	524977	MARKET_ST 3	115	5.57	583970	GEN-2014-035	115	6.00
524822	CURRY 3	115	11.18	525019	EMU&VLY_TP 3	115	7.33	584620	GEN-2015-020	115	9.50
524831	FE-HOLLAND 3	115	9.01	525027	BAILEYCO 2	69	6.01	599955	PNM-DC6	230	8.91
524838	FE-CLOVIS2 3	115	10.54	525028	BAILEYCO 3	115	7.46	599960	EPTNP-D6	230	7.76
524846	FARWELL 2	69	2.09	525040	BAILEY_PMP 3	115	5.25				
524863	FE-CHZPLT 3	115	7.89	525481	PLANT_X 6	230	23.40				

Table 4-9
Short Circuit Analysis for Study Project GEN-2015-031 (25SP)

Study Generator GEN-2015-031											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
511456	O.K.U.-7	345	5.49	524185	PIERCE_TP 3	115	19.01	525480	PLANT_X 3	115	26.91
511553	CHISHOLM7	345	12.40	524224	MANHATTAN 3	115	18.43	525481	PLANT_X 6	230	23.40
515458	BORDER 7	345	10.26	524266	BUSHLAND 3	115	9.33	525524	TOLK_EAST 6	230	26.48
522800	MU-TULIA 3	115	5.10	524267	BUSHLAND 6	230	9.64	525531	TOLK_WEST 6	230	26.48
522823	LP-MILWAKEE6	230	13.04	524282	34TH_ST 3	115	14.94	525543	TOLK_TAP 6	230	26.48
522828	LP-MILWAKEE2	69	8.30	524290	WILDOR2_JUS6	230	6.61	525549	TOLK 7	345	7.05
522861	LP-SOUTHEST6	230	17.10	524296	SPNSPUR_WND7	345	4.45	525614	W_LITLFLDTP3	115	8.29
522866	LP-COOK 2	69	34.97	524306	COULTER 3	115	15.17	525637	LAMB_CNTY 6	230	5.56
522870	LP-HOLLY 6	230	16.91	524321	GEORGIA 2	69	6.65	525731	SP-ABERNTHY2	69	3.02
522888	LP-WADSWRTH6	230	12.59	524322	GEORGIA 3	115	16.37	525738	HALECENTER 2	69	2.46
523095	HITCHLAND 6	230	14.92	524331	PULLMAN 3	115	7.12	525779	FLOYD_CNTY 2	69	5.31
523097	HITCHLAND 7	345	15.73	524338	SOUTHEAST 3	115	11.02	525780	FLOYD_CNTY 3	115	6.04
523221	XIT_INTG 6	230	2.60	524345	OSAGE 3	115	13.75	525816	TUCO_INT2 2	69	4.68
523267	PRINGLE 6	230	4.26	524364	RANDALL 3	115	20.98	525826	TUCO_INT 2	69	7.93
523308	MOORE_E 3	115	11.00	524365	RANDALL 6	230	14.24	525828	TUCO_INT 3	115	20.18
523309	MOORE_CNTY 6	230	6.70	524377	FARMERS 3	115	15.09	525830	TUCO_INT 6	230	23.39
523332	EXELL_TP 3	115	4.81	524388	CROUSE_HIND3	115	15.09	525832	TUCO_INT 7	345	13.55
523339	FAIN 3	115	5.27	524397	ARROWHEAD 3	115	13.58	525840	ANTELOPE_1 6	230	23.20
523344	BLKHAWK_W 3	115	11.82	524404	OWENSCORN 3	115	14.79	525853	LH-WIL&ELLN2	69	2.58
523377	RIVERVIEW 3	115	13.30	524414	AMA_SOUTH 3	115	16.59	525885	SP-NEWDEAL 2	69	3.39
523410	CRMWA_#4 3	115	9.71	524415	AMA_SOUTH 6	230	13.43	525926	CROSBY 3	115	4.50
523485	CAMX/AGR TP3	115	13.95	524425	ESTACADO_TP3	115	13.19	526076	STANTON_W 3	115	9.52
523494	MEREDITH 3	115	7.73	524432	ESTACADO 3	115	11.63	526109	SP-ERSKINE 3	115	11.63
523543	HUTCHISON 2	69	9.05	524516	CANYON_WEST3	115	5.32	526146	INDIANA 3	115	9.89
523544	HUTCH_N 3	115	15.65	524522	CANYON E_TP3	115	5.48	526159	CARLISLE 2	69	2.58
523546	HUTCH_S 3	115	15.65	524523	CANYON_EAST3	115	5.07	526160	CARLISLE 3	115	13.56
523551	HUTCHISON 6	230	7.20	524530	PALO_DURO 3	115	6.55	526161	CARLISLE 6	230	13.44
523636	GRAY_CNTY 3	115	3.90	524544	SPRING_DRW 3	115	6.36	526162	LP-DOUD_TP 3	115	11.90
523748	BOWERS 3	115	6.88	524622	DEAFSMITH 3	115	12.18	526192	MURPHY 3	115	10.81
523770	GRAPEVINE 3	115	7.90	524623	DEAFSMITH 6	230	7.78	526268	LUBBCK_STH 3	115	19.38
523771	GRAPEVINE 6	230	5.74	524694	DS-#22 3	115	4.98	526269	LUBBCK_STH 6	230	19.02
523776	WHEELER 3	115	6.42	524734	DS-#21 3	115	10.90	526297	LUBBCK_EST 2	69	8.07
523777	WHEELER 6	230	5.88	524745	CASTRO_CNTY2	69	9.64	526298	LUBBCK_EST 3	115	15.43
523779	STLN-DEMARC6	230	7.03	524746	CASTRO_CNTY3	115	11.76	526299	LUBBCK_EST 6	230	13.48
523815	LLANO_WND 3	115	9.43	524909	ROSEVELT_N 6	230	8.91	526337	JONES 6	230	21.04
523817	MIDSTRM_TP 3	115	6.71	524911	ROSEVELT_S 6	230	8.91	526434	SUNDOWN 3	115	11.59
523869	CHAN/TASCOS6	230	3.84	524915	SW_4K33 6	230	8.91	526435	SUNDOWN 6	230	11.12
523928	MARTIN 3	115	7.88	525019	EMU&VLY_TP 3	115	7.33	526460	AMOCO_SS 6	230	9.75
523931	HIGHLAND_TP3	115	11.52	525050	BC-KELLEY 3	115	8.60	526524	WOLFFORTH 3	115	11.68
523959	POTTER_CO 6	230	20.24	525056	BC-EARTH 3	115	9.16	526525	WOLFFORTH 6	230	13.63
523961	POTTER_CO 7	345	7.43	525124	HART_INDUST3	115	7.63	526676	GRASSLAND 3	115	6.17
523977	HARRNG_WST 6	230	26.01	525154	HAPPY_INT 3	115	5.36	526677	GRASSLAND 6	230	6.53
523978	HARRNG_MID 6	230	26.01	525179	TULIA_TP 3	115	6.30	526679	CIRRUS_WND 6	230	5.07
523979	HARRNG_EST 6	230	26.01	525191	KRESS_INT 2	69	4.44	526935	YOAKUM 6	230	17.62
524007	ROLLHILLS 3	115	19.33	525192	KRESS_INT 3	115	11.21	526936	YOAKUM_345	345	8.97
524009	CHERRY 3	115	18.48	525203	SW-KRESS 2	69	4.44	527896	HOBBS_INT 7	345	8.43
524010	ROLLHILLS 6	230	19.27	525212	SWISHER 3	115	10.34	560027	G14-074-TAP	345	6.75
524016	ASARCO 3	115	26.48	525213	SWISHER 6	230	10.52	560050	G15-031-TAP	230	9.05
524018	ASARCO_TP 3	115	28.64	525224	KRESS_RURL 2	69	2.51	562004	G11-025-TAP	115	4.61
524043	NICHOLS 3	115	30.61	525225	KRESS_RURAL3	115	6.26	562480	G13-027-TAP	230	9.19
524044	NICHOLS 6	230	25.27	525257	N_PLAINVEW 3	115	5.10	583090	G1149&G1504	345	8.42
524058	WHITAKER 3	115	21.91	525326	COX 3	115	5.91	583340	GEN-2012-020	230	9.26
524079	CONWAY 3	115	5.00	525414	LAMTON 3	115	7.96	584220	GEN-2014-040	115	10.42
524088	KIRBY 3	115	5.43	525446	SPGLAKE_TP3	115	11.54	584440	GEN-2014-074	345	6.34
524106	NORTHWEST 3	115	11.26	525453	HALE_CNTY 2	69	6.95	584640	GEN-2015-022	115	10.34
524136	HASTINGS 3	115	13.72	525454	HALE_CNTY 3	115	10.29	584750	GEN-2015-031	230	9.05
524162	EAST_PLANT 3	115	22.91	525460	NEWHART 3	115	15.20	585060	GEN-2015-068	345	10.76
524163	EAST_PLANT 6	230	13.66	525461	NEWHART 6	230	10.92	599955	PNM-DC6	230	8.91

Table 4-10
Short Circuit Analysis for Study Project GEN-2015-056 (25SP)

Study Generator GEN-2015-056											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524908	ROOSEVELT 3	115	10.56	583950	GEN-2014-033	115	6.31	527483	CHAVES_CNTY6	230	4.08
525480	PLANT_X 3	115	26.91	583970	GEN-2014-035	115	6.00	527799	EDDY_NORTH 6	230	7.76
525636	LAMB_CNTY 3	115	9.76	524623	DEAFSMITH 6	230	7.78	527800	EDDY_SOUTH 6	230	7.76
525828	TUCO_INT 3	115	20.18	524770	PLSNT_HILL 6	230	6.19	527865	CUNNINHAM 6	230	17.33
527482	CHAVES_CNTY3	115	6.31	524875	OASIS 6	230	7.42	527894	HOBBS_INT 6	230	19.11
527501	URTON 3	115	5.34	524885	SN_JUAN_TAP6	230	4.69	527963	POTASH_JCT 6	230	6.91
527508	PRICE 3	115	4.95	524889	SN_JUAN_WND6	230	4.49	528095	7-RIVERS 6	230	5.99
527546	SAMSON 3	115	5.07	524909	ROSEVELT_N 6	230	8.91	528179	PECOS 6	230	6.35
527597	TWEEDY 3	115	4.93	524911	ROSEVELT_S 6	230	8.91	562480	G13-027-TAP	230	9.19
527711	EAGLE_CREEK3	115	7.23	524915	SW_4K33 6	230	8.91	583340	GEN-2012-020	230	9.26
527786	ATOKA 3	115	6.97	525213	SWISHER 6	230	10.52	583840	GEN-2013-027	230	8.17
527793	EDDY_STH 3	115	10.95	525461	NEWHART 6	230	10.92	599955	PNM-DC6	230	8.91
527798	EDDY_NTH 3	115	10.95	525481	PLANT_X 6	230	23.40	599960	EPTNP-D6	230	7.76
527809	CV-8_MILE 3	115	5.25	525524	TOLK_EAST 6	230	26.48	525549	TOLK 7	345	7.05
527821	CV-DAYTON 3	115	6.87	525531	TOLK_WEST 6	230	26.48	525832	TUCO_INT 7	345	13.55
527864	CUNNINHAM 3	115	29.66	525543	TOLK_TAP 6	230	26.48	527656	CROSSROADS 7	345	5.48
528070	CV-AZMESA 3	115	7.34	525637	LAMB_CNTY 6	230	5.56	527802	EDDY_CNTY 7	345	4.26
528094	7-RIVERS 3	115	8.16	525830	TUCO_INT 6	230	23.39	577103	GEN-2008-022	345	5.18
528132	OCOTILLO 3	115	6.13	525840	ANTELOPE_1 6	230	23.20	577104	G08-022-WEST	345	4.86
528137	N_CANAL 3	115	8.59	526161	CARLISLE 6	230	13.44	584260	GEN-2014-047	345	4.42
528160	CARLSBAD 3	115	11.08	526337	JONES 6	230	21.04	584940	GEN-2015-056	345	4.84
528178	PECOS 3	115	11.67	526435	SUNDOWN 6	230	11.12				
528226	HOPI_SUB 3	115	6.64	526935	YOAKUM 6	230	17.62				

Table 4-11
Short Circuit Analysis for Study Project GEN-2015-058 (25SP)

Study Generator GEN-2015-058											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524885	SN_JUAN_TAP6	230	4.69	527757	ARTESIA_TP 2	69	3.70	527930	PCA 3	115	11.08
527482	CHAVES_CNTY3	115	6.31	527761	ARTESIA_W 2	69	3.37	527962	POTASH_JCT 3	115	14.26
527483	CHAVES_CNTY6	230	4.08	527762	ARTSA_CC_TP2	69	1.92	527963	POTASH_JCT 6	230	6.91
527552	RIAC 2	115	4.53	527763	CV-W_ARTSIA2	69	1.62	528003	CV-DAGGR&IH2	69	1.63
527564	ROSWLL_INT 3	115	5.30	527768	ARTESIA_CC 2	69	1.75	528070	CV-AZMESA 3	115	7.34
527596	RIACTWTY_TP3	115	5.06	527772	ARTSA_SR_TP2	69	1.99	528076	CV-WALTCYN 3	115	4.50
527597	TWEEDY 3	115	4.93	527775	ARTESIA_SR 2	69	1.92	528079	CV-CONEBUTE3	115	3.32
527656	CROSSROADS 7	345	5.48	527785	ATOKA 2	69	2.36	528093	7-RIVERS 2	69	2.39
527664	CV-CTTNWOOD2	69	2.68	527786	ATOKA 3	115	6.97	528094	7-RIVERS 3	115	8.16
527678	SMITH 2	69	3.84	527793	EDDY_STH 3	115	10.95	528095	7-RIVERS 6	230	5.99
527701	ARTESIA 2	69	3.85	527798	EDDY_NTH 3	115	10.95	528109	CV-LAKEWOOD3	115	6.32
527707	ARTESIA 3	115	6.66	527799	EDDY_NORTH 6	230	7.76	528116	CV-IRISHHIL3	115	6.32
527710	EAGLE_CREEK2	69	2.31	527800	EDDY_SOUTH 6	230	7.76	528132	OCOTILLO 3	115	6.13
527711	EAGLE_CREEK3	115	7.23	527802	EDDY_CNTY 7	345	4.26	528137	N_CANAL 3	115	8.59
527715	NAVAJO_2TP 3	115	6.90	527808	CV-8_MILE 2	67	1.81	528151	FIESTA 3	115	9.65
527717	NAVAJO_2 3	115	6.82	527809	CV-8_MILE 3	115	5.25	528159	CARLSBAD 2	69	4.86
527720	NAVAJO_3 3	115	6.86	527810	CV-ABO 2	67	1.60	528160	CARLSBAD 3	115	11.08
527733	NAVAJO_1 2	69	2.17	527811	CV-KEWAN_TP3	115	2.88	528178	PECOS 3	115	11.67
527736	NAVAJO_5TP 3	115	6.86	527821	CV-DAYTON 3	115	6.87	528179	PECOS 6	230	6.35
527739	NAVAJO_4 3	115	6.84	527822	CV-TURKYTRK3	115	3.38	528182	NORTH_LOVNG3	115	8.40
527743	NAVAJO_5 3	115	6.84	527864	CUNNINHAM 3	115	29.66	528226	HOPI_SUB 3	115	6.64
527747	ARTESIA_TWN2	69	2.14	527865	CUNNINHAM 6	230	17.33	584960	GEN-2015-058	115	6.86
527754	CV-ARTESIA 2	69	3.12	527894	HOBBS_INT 6	230	19.11	599960	EPTNP-D6	230	7.76

Table 4-12
Short Circuit Analysis for Study Project GEN-2015-068 (25SP)

Study Generator GEN-2015-068											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
511423	FLE TAP4	138	8.55	525325	COX 2	69	3.37	526936	YOAKUM_345	345	8.97
511437	COMANC-4	138	17.74	525326	COX 3	115	5.91	526944	LG-PLAINS 3	115	7.95
511439	LWSTAP 4	138	11.17	525413	LAMTON 2	69	5.27	527010	OXYBRU_TP 6	230	13.98
511456	O.K.U.-7	345	5.49	525414	LAMTON 3	115	7.96	527018	BENNETT 3	115	13.23
511458	ELKCTY-4	138	11.64	525432	SP-HALFWAY 2	69	5.90	527041	ARCO_TP 3	115	13.13
511466	L.E.S.-2	69	16.47	525440	LC-S_OLTON 3	115	7.67	527047	OXY_WILRD1 3	115	10.54
511467	L.E.S.-4	138	23.90	525446	SPGLAKE_TP3	115	11.54	527062	SHELL_CO2 3	115	16.06
511468	L.E.S.-7	345	12.63	525453	HALE_CNTY 2	69	6.95	527130	DENVER_N 3	115	21.10
511474	SHERID4	138	11.99	525454	HALE_CNTY 3	115	10.29	527136	DENVER_S 3	115	21.10
511486	ELGINJT4	138	9.95	525460	NEWHART 3	115	15.20	527146	MUSTANG 3	115	23.41
511490	ELKCITY6	230	7.86	525461	NEWHART 6	230	10.92	527149	MUSTANG 6	230	15.71
511494	COMMTAP4	138	20.99	525480	PLANT_X 3	115	26.91	527151	GS-MUSTANG 6	230	15.71
511541	SWEETWT6	230	7.84	525481	PLANT_X 6	230	23.40	527194	LG-PLSHILL 3	115	7.57
511542	BUFFCK6	230	5.75	525524	TOLK_EAST 6	230	26.48	527202	SEAGRAVES 3	115	8.60
511544	DEMPSEY6	230	4.95	525531	TOLK_WEST 6	230	26.48	527275	SEMINOLE 3	115	14.56
511547	ROARK6	230	4.47	525543	TOLK_TAP 6	230	26.48	527276	SEMINOLE 6	230	7.72
511553	CHISHOLM7	345	12.40	525549	TOLK 7	345	7.05	527656	CROSSROADS 7	345	5.48
511557	CHISHOLM6	230	11.67	525614	W_LITLFLDTP3	115	8.29	527800	EDDY_SOUTH 6	230	7.76
514785	WOODWRD4	138	12.24	525637	LAMB_CNTY 6	230	5.56	527864	CUNNINHAM 3	115	29.66
514796	IODINE-4	138	7.25	525724	COUNTYLINE 2	69	2.21	527865	CUNNINHAM 6	230	17.33
514801	MINCO 7	345	16.88	525731	SP-ABERNTHY2	69	3.02	527891	HOBBS_INT 3	115	32.92
514901	CIMARON7	345	31.14	525738	HALECENTER 2	69	2.46	527894	HOBBS_INT 6	230	19.11
515136	SUNNYSD7	345	9.92	525745	LH-HALECTR 2	69	2.44	527896	HOBBS_INT 7	345	8.43
515375	WWRDEHV7	345	21.53	525769	BARWISE 2	69	3.76	527930	PCA 3	115	11.08
515376	WWRDEHV4	138	24.18	525779	FLOYD_CNTY 2	69	5.31	527961	POTASH_JCT 2	69	8.41
515394	KEENAN 4	138	8.16	525780	FLOYD_CNTY 3	115	6.04	527962	POTASH_JCT 3	115	14.26
515398	OUSPRT 4	138	8.98	525790	FLOYDADA_TP2	69	2.50	527963	POTASH_JCT 6	230	6.91
515407	TATONGA7	345	16.58	525811	LH-HARMONY 2	69	4.25	527965	KIOWA 7	345	5.60
515444	MCNOWND7	345	16.83	525816	TUCO_INT2 2	69	4.68	527999	INTREPDW_TP3	115	12.39
515458	BORDER 7	345	10.26	525826	TUCO_INT 2	69	7.93	528025	RDRUNNER 3	115	8.88
515549	MNCWND37	345	11.60	525828	TUCO_INT 3	115	20.18	528027	RDRUNNER 7	345	3.80
515554	BVRCNTY7	345	14.68	525830	TUCO_INT 6	230	23.39	528160	CARLSBAD 3	115	11.08
515599	NBUFFRG7	345	8.75	525832	TUCO_INT 7	345	13.55	528182	NORTH_LOVNG3	115	8.40
515800	GRACMNT7	345	16.23	525840	ANTELOPE_1 6	230	23.20	528185	N_LOVING 7	345	4.44
515802	GRACMNT4	138	28.52	525853	LH-WIL&ELLN2	69	2.58	528223	CHINA_DRAW 7	345	3.63
515997	WWPAR4	138	17.31	525860	SP-BECTON 2	69	2.29	528333	LE-WEST_SUB3	115	8.79
520814	ANADARK4	138	31.21	525885	SP-NEWDEAL 2	69	3.39	528355	MADDOX 3	115	27.76
521089	WASHITA4	138	27.77	525892	WHITE&MONRO2	69	2.56	528433	NEW_NHOBBS 3	115	8.04
522819	LP-NORTHEST2	69	13.12	525925	CROSBY 2	69	4.78	528435	MILLEN 3	115	11.67
522822	LP-NORTHWST2	69	4.60	525926	CROSBY 3	115	4.50	528604	ANDREWS 6	230	6.96
522823	LP-MILWAKEE6	230	13.04	526076	STANTON_W 3	115	9.52	528610	GAINES_GEN 6	230	8.58
522828	LP-MILWAKEE2	69	8.30	526109	SP-ERSKINE 3	115	11.63	528611	GAINESGENTP6	230	9.92
522832	LP-VICKSBRG2	69	14.09	526130	SP-CARLISLE2	69	2.11	528626	LE-PLNSINT 2	69	4.37
522857	LP-SOUTHEST2	69	24.55	526146	INDIANA 3	115	9.89	539800	CLARKCOUNTY7	345	11.60
522861	LP-SOUTHEST6	230	17.10	526159	CARLISLE 2	69	2.58	539801	THISTLE7	345	15.50
522866	LP-COOK 2	69	34.97	526160	CARLISLE 3	115	13.56	539804	THISTLE4	138	16.43
522870	LP-HOLLY 6	230	16.91	526161	CARLISLE 6	230	13.44	560000	G11-14-TAP	345	13.67
522879	LP-WADSWRTH2	69	22.78	526162	LP-DOUD_TP 3	115	11.90	560013	G14-057T	345	9.58
522888	LP-WADSWRTH6	230	12.59	526176	LP-DOUD 3	115	9.20	560027	G14-074-TAP	345	6.75
523309	MOORE_CNTY 6	230	6.70	526184	SW_6878 2	69	2.17	560033	G1524&G1525T	345	19.59
523779	STLN-DEMARC6	230	7.03	526192	MURPHY 3	115	10.81	560050	G15-031-TAP	230	9.05
523869	CHAN/TASCOS6	230	3.84	526199	SP-FRANKFRD3	115	9.76	560059	G1579&G1580T	230	9.26
523959	POTTER_CO 6	230	20.24	526213	ALLEN 3	115	10.81	562004	G11-025-TAP	115	4.61
523961	POTTER_CO 7	345	7.43	526267	LUBBCK_STH 2	69	4.37	562075	G11-051-TAP	345	17.57
523979	HARRNG_EST 6	230	26.01	526268	LUBBCK_STH 3	115	19.38	562480	G13-027-TAP	230	9.19
524010	ROLLHILLS 6	230	19.27	526269	LUBBCK_STH 6	230	19.02	581112	GEN-2011-014	345	12.24
524044	NICHOLS 6	230	25.27	526284	PLANTERS 2	69	6.34	581137	GEN-2011-025	115	4.61
524267	BUSHLAND 6	230	9.64	526297	LUBBCK_EST 2	69	8.07	582019	GEN-2011-019	345	21.53
524365	RANDALL 6	230	14.24	526298	LUBBCK_EST 3	115	15.43	582020	GEN-2011-020	345	21.53
524414	AMA_SOUTH 3	115	16.59	526299	LUBBCK_EST 6	230	13.48	583090	G1149&G1504	345	8.42
524415	AMA_SOUTH 6	230	13.43	526310	CLUTTER 2	69	5.46	583110	GEN-2011-051	345	17.57
524622	DEAFSMITH 3	115	12.18	526337	JONES 6	230	21.04	583340	GEN-2012-020	230	9.26
524623	DEAFSMITH 6	230	7.78	526434	SUNDOWN 3	115	11.59	583819	ASGI2014-001	115	11.63
524746	CASTRO_CNTY3	115	11.76	526435	SUNDOWN 6	230	11.12	583840	GEN-2013-027	230	8.17
524770	PLSNT_HILL 6	230	6.19	526460	AMOCO_SS 6	230	9.75	584070	GEN-2014-057	345	6.62
524875	OASIS 6	230	7.42	526475	YUMA_INT 3	115	11.19	584440	GEN-2014-074	345	6.34
524908	ROOSEVELT 3	115	10.56	526481	SP-WOLF_TP 3	115	11.38	584640	GEN-2015-022	115	10.34

Table 4-12 (continued)
Short Circuit Analysis for Study Project GEN-2015-068 (25SP)

Study Generator GEN-2015-068											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
524909	ROSEVELT_N 6	230	8.91	526524	WOLFFORTH 3	115	11.68	584750	GEN-2015-031	230	9.05
524911	ROSEVELT_S 6	230	8.91	526525	WOLFFORTH 6	230	13.63	584980	GEN-2015-060	138	5.70
524915	SW_4K33 6	230	8.91	526562	SLATON 2	69	2.48	585060	GEN-2015-068	345	10.76
525019	EMU&VLY_TP 3	115	7.33	526602	SP-WOODROW 3	115	9.48	585080	GEN-2015-071	345	10.34
525056	BC-EARTH 3	115	9.16	526656	LYNN_CNTY 3	115	5.66	585120	GEN-2015-075	69	1.55
525124	HART_INDUST3	115	7.63	526676	GRASSLAND 3	115	6.17	585160	G1579&G1580	230	8.78
525179	TULIA_TP 3	115	6.30	526677	GRASSLAND 6	230	6.53	585180	GEN-2015-081	345	14.39
525191	KRESS_INT 2	69	4.44	526679	CIRRUS_WND 6	230	5.07	585270	GEN-2015-093	345	9.54
525192	KRESS_INT 3	115	11.21	526694	GRAHAM 3	115	2.69	590001	OKLEHV24	138	4.79
525212	SWISHER 3	115	10.34	526736	TERRY_CNTY 3	115	10.93	590003	OKLEHV14	138	4.80
525213	SWISHER 6	230	10.52	526784	AMOCOWASSON6	230	13.92	599074	NTHBUF_EHV2	345	6.63
525225	KRESS_RURAL3	115	6.26	526792	PRENTICE 3	115	5.96	599891	OKLAUN 7	345	4.04
525272	KISER 3	115	5.10	526928	PLAINS_INT 3	115	9.89	599955	PNM-DC6	230	8.91
525291	PLAINVW_TP 2	69	6.52	526934	YOAKUM 3	115	16.81				
525298	S_PLAINVEW 2	69	2.59	526935	YOAKUM 6	230	17.62				
525272	KISER 3	115	5.10	526298	LUBBCK_EST 3	115	15.24				

Table 4-13
Short Circuit Analysis for Study Project GEN-2015-075 (25SP)

Study Generator GEN-2015-075											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
515458	BORDER 7	345	10.26	525840	ANTELOPE_1 6	230	23.20	526298	LUBBCK_EST 3	115	15.43
522822	LP-NORTHWST2	69	4.60	526076	STANTON_W 3	115	9.52	526299	LUBBCK_EST 6	230	13.48
522823	LP-MILWAKEE6	230	13.04	526109	SP-ERSKINE 3	115	11.63	526337	JONES 6	230	21.04
522828	LP-MILWAKEE2	69	8.30	526130	SP-CARLISLE2	69	2.11	526434	SUNDOWN 3	115	11.59
522832	LP-VICKSBRG2	69	14.09	526146	INDIANA 3	115	9.89	526435	SUNDOWN 6	230	11.12
522857	LP-SOUTHEST2	69	24.55	526159	CARLISLE 2	69	2.58	526460	AMOCO_SS 6	230	9.75
522861	LP-SOUTHEST6	230	17.10	526160	CARLISLE 3	115	13.56	526469	SP-YUMA 2	69	3.07
522870	LP-HOLLY 6	230	16.91	526161	CARLISLE 6	230	13.44	526475	YUMA_INT 3	115	11.19
524911	ROSEVELT_S 6	230	8.91	526162	LP-DOUD_TP 3	115	11.90	526481	SP-WOLF_TP 3	115	11.38
525212	SWISHER 3	115	10.34	526176	LP-DOUD 3	115	9.20	526483	SP-WOLFORTH3	115	8.80
525213	SWISHER 6	230	10.52	526184	SW_6878 2	69	2.17	526524	WOLFFORTH 3	115	11.68
525454	HALE_CNTY 3	115	10.29	526192	MURPHY 3	115	10.81	526525	WOLFFORTH 6	230	13.63
525461	NEWHART 6	230	10.92	526199	SP-FRANKFRD3	115	9.76	526677	GRASSLAND 6	230	6.53
525481	PLANT_X 6	230	23.40	526205	IVORY 2	69	3.94	526736	TERRY_CNTY 3	115	10.93
525524	TOLK_EAST 6	230	26.48	526213	ALLEN 3	115	10.81	526936	YOAKUM_345	345	8.97
525543	TOLK_TAP 6	230	26.48	526221	BATTON_N 2	69	1.78	560027	G14-074-TAP	345	6.75
525780	FLOYD_CNTY 3	115	6.04	526228	BATTON_S 2	69	2.72	560050	G15-031-TAP	230	9.05
525816	TUCO_INT2 2	69	4.68	526243	SP-QUAKER 3	115	9.80	583340	GEN-2012-020	230	9.26
525826	TUCO_INT 2	69	7.93	526256	IVORY_TP 2	69	3.94	583810	ASGI2013-006	115	8.80
525828	TUCO_INT 3	115	20.18	526267	LUBBCK_STH 2	69	4.37	583819	ASGI2014-001	115	11.63
525830	TUCO_INT 6	230	23.39	526268	LUBBCK_STH 3	115	19.38	585060	GEN-2015-068	345	10.76
525832	TUCO_INT 7	345	13.55	526269	LUBBCK_STH 6	230	19.02	585120	GEN-2015-075	69	1.55

Table 4-14
Short Circuit Analysis for Study Project GEN-2015-079 and GEN-2015-080 (25SP)

Study Generator GEN-2015-079 and GEN-2015-080											
Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
511456	O.K.U.-7	345	5.49	527046	OXY_WILRD2 3	115	10.52	528095	7-RIVERS 6	230	5.99
511553	CHISHOLM7	345	12.40	527047	OXY_WILRD1 3	115	10.54	528160	CARLSBAD 3	115	11.08
515458	BORDER 7	345	10.26	527051	ODC_TP 3	115	13.24	528178	PECOS 3	115	11.67
524623	DEAFSMITH 6	230	7.78	527062	SHELL_CO2 3	115	16.06	528179	PECOS 6	230	6.35
524770	PLSNT_HILL 6	230	6.19	527080	EL_PASO 3	115	15.81	528182	NORTH_LOVNG3	115	8.40
524908	ROOSEVELT 3	115	10.56	527105	SAN_ANDS_TP3	115	16.48	528185	N_LOVING 7	345	4.44
524909	ROSEVELT_N 6	230	8.91	527125	DENVER_CTY 2	69	8.65	528223	CHINA_DRAW 7	345	3.63
524911	ROSEVELT_S 6	230	8.91	527130	DENVER_N 3	115	21.10	528317	ENRON_TP 3	115	6.98
524915	SW_4K33 6	230	8.91	527136	DENVER_S 3	115	21.10	528325	LE-WAITS 3	115	6.76
525213	SWISHER 6	230	10.52	527146	MUSTANG 3	115	23.41	528333	LE-WEST_SUB3	115	8.79
525461	NEWHART 6	230	10.92	527149	MUSTANG 6	230	15.71	528334	LE-LOVINTON3	115	8.71
525480	PLANT_X 3	115	26.91	527151	GS-MUSTANG 6	230	15.71	528348	BUCKEYE_TP 3	115	8.43
525481	PLANT_X 6	230	23.40	527194	LG-PLSHILL 3	115	7.57	528355	MADDOX 3	115	27.76
525524	TOLK_EAST 6	230	26.48	527201	SEAGRAVES 2	69	5.42	528385	BUCKEYE 3	115	7.56
525531	TOLK_WEST 6	230	26.48	527202	SEAGRAVES 3	115	8.60	528392	PEARLE 3	115	6.41
525543	TOLK_TAP 6	230	26.48	527238	ROZ 3	115	11.23	528394	QUAHADA 3	115	8.40
525549	TOLK 7	345	7.05	527242	AMERADA 3	115	11.39	528399	LEA_NATIONL3	115	7.03
525636	LAMB_CNTY 3	115	9.76	527262	SULPHUR 3	115	5.72	528413	TAYLOR 3	115	14.61
525637	LAMB_CNTY 6	230	5.56	527275	SEMINOLE 3	115	14.56	528422	DCP_ZIA TP 3	115	7.25
525828	TUCO_INT 3	115	20.18	527276	SEMINOLE 6	230	7.72	528433	NEW_NHOBBS 3	115	8.04
525830	TUCO_INT 6	230	23.39	527284	RUSSELL 3	115	9.09	528435	MILLEN 3	115	11.67
525832	TUCO_INT 7	345	13.55	527286	XTO_RUSSEL 3	115	10.03	528442	NE_HOBBS 3	115	11.97
525840	ANTELOPE_1 6	230	23.20	527322	GAINES 3	115	9.39	528463	SANGER_SW 3	115	16.22
526036	LC-OPDYKE 3	115	5.93	527340	DOSS 3	115	8.02	528484	SW_4J44 3	115	11.19
526161	CARLISLE 6	230	13.44	527362	JOHNSON_DRW3	115	10.76	528491	MONUMENT 3	115	15.68
526269	LUBBCK_STH 6	230	19.02	527363	HIGG 3	115	10.22	528498	W_HOBBS 3	115	11.75
526337	JONES 6	230	21.04	527483	CHAVES_CNTY6	230	4.08	528568	MONUMNT_TP 3	115	10.10
526352	LEHMAN 3	115	6.08	527597	TWEEDY 3	115	4.93	528575	OXYPERMIAN 3	115	15.54
526424	PACIFIC 3	115	9.78	527711	EAGLE_CREEK3	115	7.23	528582	BYRD 3	115	8.05
526434	SUNDOWN 3	115	11.59	527793	EDDY_STH 3	115	10.95	528602	ANDREWS 3	115	9.05
526435	SUNDOWN 6	230	11.12	527798	EDDY_NTH 3	115	10.95	528603	NA_ENRICH 3	115	9.12
526445	AMOCO_TP 3	115	10.92	527799	EDDY_NORTH 6	230	7.76	528604	ANDREWS 6	230	6.96
526460	AMOCO_SS 6	230	9.75	527800	EDDY_SOUTH 6	230	7.76	528610	GAINES_GEN 6	230	8.58
526491	LG-CLAUENE 3	115	9.18	527802	EDDY_CNTY 7	345	4.26	528611	GAINESGENTP6	230	9.92
526524	WOLFFORTH 3	115	11.68	527809	CV-8_MILE 3	115	5.25	528618	LE-LOVINTON2	69	9.31
526525	WOLFFORTH 6	230	13.63	527864	CUNNINHAM 3	115	29.66	528626	LE-PLNSINT 2	69	4.37
526735	TERRY_CNTY 2	69	7.10	527865	CUNNINHAM 6	230	17.33	528627	LE-TXACO_TP3	115	7.25
526736	TERRY_CNTY 3	115	10.93	527891	HOBBS_INT 3	115	32.92	528740	LE-PLANS_TP2	69	3.62
526784	AMOCOWASSON6	230	13.92	527894	HOBBS_INT 6	230	19.11	560027	G14-074-TAP	345	6.75
526792	PRENTICE 3	115	5.96	527896	HOBBS_INT 7	345	8.43	560058	G15-077-TAP	115	8.27
526928	PLAINS_INT 3	115	9.89	527930	PCA 3	115	11.08	560059	G1579&G1580T	230	9.26
526934	YOAKUM 3	115	16.81	527961	POTASH_JCT 2	69	8.41	562480	G13-027-TAP	230	9.19
526935	YOAKUM 6	230	17.62	527962	POTASH_JCT 3	115	14.26	583090	G1149&G1504	345	8.42
526936	YOAKUM_345	345	8.97	527963	POTASH_JCT 6	230	6.91	583340	GEN-2012-020	230	9.26
526944	LG-PLAINS 3	115	7.95	527965	KIOWA 7	345	5.60	583840	GEN-2013-027	230	8.17
527010	OXYBRU_TP 6	230	13.98	527999	INTREPDW_TP3	115	12.39	584440	GEN-2014-074	345	6.34
527018	BENNETT 3	115	13.23	528025	RDRUNNER 3	115	8.88	585060	GEN-2015-068	345	10.76
527036	SHELL_C2 3	115	12.88	528027	RDRUNNER 7	345	3.80	585160	G1579&G1580	230	8.78
527041	ARCO_TP 3	115	13.13	528094	7-RIVERS 3	115	8.16	599960	EPTNP-D6	230	7.76

SECTION 5: POWER FACTOR ANALYSIS

The objective of this task is to quantify the power factor at the point of interconnection for the wind farms during base case and system contingencies. SPP transmission planning practice requires interconnecting generation projects to maintain the power factor (pf) at the Point of Interconnection (POI) within +/- 0.95 pf for system intact conditions and for post-contingency conditions. This is analyzed by having the wind farm maintain a prescribed voltage schedule at the point of interconnection of 1.0 p.u. voltage.

The 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak, and 2025 Summer Peak power flows provided by SPP were examined prior to the Power Factor Analysis to ensure they contained the proposed study project modeled at 100% of the nameplate rating and any previously queued projects listed in Table 2-2. There was no suspect power flow data in the study area. The proposed study project and any previously queued projects at the same point of interconnection were turned off during the power factor analysis. The wind farm(s) were then replaced by a generator modeled at the high side bus with the same real power (MW) capability as the wind farm(s) and open limits for the reactive power set points (Mvar). The generator was set to hold the POI scheduled bus voltage. All N-1, three-phase fault contingencies from Table 2-3 were then applied and the reactive power required to maintain the bus voltage was recorded.

5.1 Approach

The upgrades that were identified in the Stability Analysis were implemented to each power case for the power factor analysis. Refer to Section 3 for the necessary upgrades.

GEN-2015-020 was disabled and a generator was placed at the study project's high side bus. The generator was modeled with PGEN = 100.0 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's high side bus to GEN-2015-020 were disabled. The scheduled voltage was set to 1.0327 p.u. for 2016 Winter Peak conditions, 1.0276 p.u. for 2017 Summer Peak conditions, 1.0179 p.u. for 2020 Summer Peak conditions, 1.0287 p.u. for 2020 Winter Peak conditions, and 1.0213 p.u. for 2025 Summer Peak conditions.

GEN-2015-031 was disabled and a generator was placed at the study project's high side bus. The generator was modeled with PGEN = 150.53 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's high side bus to GEN-2015-031 were disabled. The scheduled voltage was set to 1.001 for 2020 Winter Peak conditions and 1.00 p.u. for the 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, and 2025 Summer Peak conditions.

GEN-2015-056 and GEN-2014-047 were disabled and a generator was placed at the corresponding project's high side bus. GEN-2015-056 was modeled with PGEN = 101.0 MW and GEN-2014-

047 was modeled with PGEN = 40.0 MW. Both generators reactive capability was modeled with QMin = -9999 Mvar and QMax = 9999 Mvar. All buses and transformers connected from the project's high side bus to the corresponding project were disabled. The scheduled voltage was set to 1.0059 p.u. for 2016 Winter Peak conditions, 1.0027 p.u. for 2017 Summer Peak conditions, 1.0125 p.u. for 2020 Summer Peak conditions, 1.0119 p.u. for 2020 Winter Peak conditions, and 1.0084 p.u. for 2025 Summer Peak conditions.

GEN-2015-058 was disabled and a generator was placed at the study project's high side bus. The generator was modeled with PGEN = 50.0 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's high side bus to GEN-2015-058 were disabled. The scheduled voltage was set to 1.0175 p.u. for 2016 Winter Peak conditions, 1.0216 p.u. for 2017 Summer Peak conditions, 1.0274 p.u. for 2020 Summer Peak conditions, 1.0127 p.u. for 2020 Winter Peak conditions, and 1.0281 p.u. for 2025 Summer Peak conditions.

GEN-2015-068 and the ELK generation was disabled and a generator was placed at the study project's high side bus and the ELK generation high side bus (GEN-2015-068 POI). The GEN-2015-068 generator was modeled with PGEN = 300.0 MW, Qmin = -9999 Mvar, Qmax = 9999 Mvar. The ELK generator was modeled with PGEN = 411.0 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's high side bus to both projects were disabled. The scheduled voltage was set to 1.0047 p.u. for 2020 Summer Peak conditions and 1.0079 p.u. for 2025 Summer Peak conditions. The scheduled voltage was set to 1.00 p.u. for 2016 Winter Peak conditions, 2017 Summer Peak conditions, and 2020 Winter Peak conditions.

GEN-2015-075 was disabled and a generator was placed at the study project's high side bus. The generator was modeled with PGEN = 50.0 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's high side bus to GEN-2015-075 were disabled. The scheduled voltage was set to 1.0044 p.u. for 2016 Winter Peak conditions, 1.0071 p.u. for 2017 Summer Peak conditions, 1.0006 p.u. for 2020 Summer Peak conditions, 1.0027 p.u. for 2020 Winter Peak conditions, and 1.0049 p.u. for 2025 Summer Peak conditions.

GEN-2015-079 and GEN-2015-080 were disabled and a generator was placed at the corresponding study project's high side bus. Both generators were modeled with PGEN = 129.2 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's high side bus to GEN-2015-079 and GEN-2015-080 were disabled. The scheduled voltage was set to 1.0019 p.u. for 2016 Winter Peak conditions, 1.00 p.u. for 2017 Summer Peak conditions, 1.0012 p.u. for 2020 Summer Peak conditions, 1.0022 p.u. for 2020 Winter Peak conditions, and 1.0045 p.u. for 2025 Summer Peak conditions.

5.2 Power Factor Analysis Results

The power factor was calculated for the 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak, and 2025 Summer Peak condition. The following tables show the power factor results for the study generators:

- Table 5-1: Power Factor Analysis for GEN-2015-020
- Table 5-2: Power Factor Analysis for GEN-2015-031
- Table 5-3: Power Factor Analysis for GEN-2015-056
- Table 5-4: Power Factor Analysis for GEN-2015-058
- Table 5-5: Power Factor Analysis for GEN-2015-068
- Table 5-6: Power Factor Analysis for GEN-2015-075
- Table 5-7: Power Factor Analysis for GEN-2015-079
- Table 5-8: Power Factor Analysis for GEN-2015-080

Note that a positive Q (Mvar) output illustrates that the generator is absorbing reactive power from the system, implying a leading power factor; a negative Q (Mvar) illustrates that the generator is supplying reactive power to the system, implying a lagging power factor.

Table 5-1
Power Factor Analysis: GEN-2015-020

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
1	FLT01-3PH	0.986	Leading	16.99	0.990	Leading	14.23	0.996	Leading	9.52	0.989	Leading	14.87	0.994	Leading	11.34
2	FLT02-3PH	0.986	Leading	16.80	0.990	Leading	14.00	0.996	Leading	9.34	0.989	Leading	14.72	0.994	Leading	11.14
3	FLT03-3PH	0.984	Leading	18.08	0.989	Leading	15.11	0.994	Leading	11.28	0.986	Leading	17.19	0.993	Leading	11.78
4	FLT04-3PH	0.996	Leading	9.44	1.000	Leading	1.36	0.999	Leading	3.85	0.998	Leading	6.57	0.999	Leading	4.71
5	FLT05-3PH	0.989	Leading	14.81	0.988	Leading	15.38	0.996	Leading	9.31	0.996	Leading	9.20	0.994	Leading	11.08
6	FLT06-3PH	0.986	Leading	17.05	0.990	Leading	14.27	0.995	Leading	9.57	0.989	Leading	14.94	0.994	Leading	11.39
7	FLT07-3PH	0.986	Leading	17.03	0.990	Leading	14.26	0.995	Leading	9.55	0.989	Leading	14.91	0.994	Leading	11.37
8	FLT11-3PH	0.986	Leading	17.10	0.986	Leading	16.88	0.993	Leading	11.64	0.990	Leading	14.46	0.989	Leading	15.27
9	FLT12-3PH	0.985	Leading	17.36	0.986	Leading	17.15	0.993	Leading	11.97	0.989	Leading	14.79	0.988	Leading	15.61
10	FLT13-3PH	0.986	Leading	17.09	0.991	Leading	13.56	0.996	Leading	9.00	0.989	Leading	15.05	0.994	Leading	10.63
11	FLT14-3PH	0.987	Leading	16.57	0.999	Leading	5.32	0.998	Leading	5.72	0.993	Leading	11.72	0.998	Leading	5.96
12	FLT15-3PH	0.994	Leading	11.38	0.990	Leading	14.34	0.999	Leading	4.91	0.998	Leading	5.98	0.998	Leading	7.04
13	FLT16-3PH	0.982	Leading	19.13	0.982	Leading	19.02	0.990	Leading	14.48	0.984	Leading	17.91	0.987	Leading	16.43
14	FLT17-3PH	0.986	Leading	16.75	0.990	Leading	14.21	0.996	Leading	9.51	0.989	Leading	14.64	0.994	Leading	11.32
15	FLT18-3PH	0.986	Leading	16.94	0.989	Leading	14.63	0.995	Leading	9.96	0.989	Leading	14.81	0.993	Leading	11.75
16	FLT19-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
17	FLT20-3PH	0.986	Leading	16.96	0.990	Leading	14.25	0.995	Leading	9.74	0.989	Leading	15.09	0.993	Leading	11.51
18	FLT21-3PH	0.970	Leading	25.02	0.973	Leading	23.73	0.979	Leading	20.71	0.973	Leading	23.77	0.976	Leading	22.54
19	FLT22-3PH	0.980	Leading	20.50	0.978	Leading	21.29	0.980	Leading	20.13	0.981	Leading	19.55	0.981	Leading	19.74
20	FLT23-3PH	0.981	Leading	19.52	0.981	Leading	19.82	0.988	Leading	15.54	0.983	Leading	18.46	0.985	Leading	17.76
21	FLT24-3PH	0.971	Leading	24.74	0.974	Leading	23.21	0.980	Leading	20.06	0.974	Leading	23.43	0.977	Leading	21.80
22	FLT25-3PH	0.984	Leading	17.90	0.992	Leading	12.99	0.997	Leading	8.12	0.991	Leading	13.25	0.995	Leading	10.39
23	FLT26-3PH	0.994	Leading	11.09	0.994	Leading	11.30	0.998	Leading	6.37	0.990	Leading	14.49	0.997	Leading	7.38
24	FLT27-3PH	0.987	Leading	16.02	0.992	Leading	12.81	0.996	Leading	8.56	0.990	Leading	14.28	0.995	Leading	10.06
25	FLT28-3PH	0.990	Lagging	-14.51	0.998	Leading	6.94	1.000	Leading	2.94	0.997	Lagging	-7.72	1.000	Leading	0.96
26	FLT29-3PH	0.996	Leading	9.13	1.000	Leading	2.05	0.999	Leading	3.24	0.996	Leading	8.64	1.000	Lagging	-2.04
27	FLT30-3PH	0.993	Leading	12.03	0.987	Leading	16.49	0.995	Leading	9.87	0.995	Leading	10.37	0.992	Leading	12.56
28	FLT31-3PH	0.992	Leading	12.46	0.994	Leading	10.81	0.998	Leading	5.99	0.994	Leading	10.55	0.997	Leading	8.06
29	FLT34-3PH	0.988	Leading	15.45	0.991	Leading	13.35	0.996	Leading	8.55	0.991	Leading	13.22	0.994	Leading	10.70
30	FLT35-3PH	0.987	Leading	16.42	0.990	Leading	14.19	0.996	Leading	9.35	0.990	Leading	14.30	0.994	Leading	11.38
31	FLT36-3PH	0.986	Leading	17.05	0.990	Leading	14.58	0.995	Leading	9.72	0.989	Leading	15.00	0.993	Leading	11.51
32	FLT37-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
33	FLT38-3PH	0.986	Leading	16.88	0.990	Leading	14.44	0.995	Leading	9.58	0.989	Leading	14.81	0.994	Leading	11.38
34	FLT39-3PH	0.985	Leading	17.24	0.990	Leading	14.58	0.995	Leading	9.71	0.989	Leading	15.06	0.993	Leading	11.48
35	FLT40-3PH	0.986	Leading	17.12	0.989	Leading	14.61	0.995	Leading	9.76	0.989	Leading	15.06	0.993	Leading	11.50
36	FLT41-3PH	0.986	Leading	17.11	0.989	Leading	14.62	0.995	Leading	9.76	0.989	Leading	15.04	0.993	Leading	11.56
37	FLT43-3PH	0.989	Leading	15.00	0.992	Leading	12.64	0.997	Leading	8.20	0.992	Leading	13.01	0.994	Leading	10.82
38	FLT44-3PH	0.990	Leading	14.48	0.993	Leading	11.80	0.997	Leading	7.55	0.992	Leading	12.83	0.995	Leading	10.41
39	FLT45-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
40	FLT46-3PH	0.986	Leading	16.91	0.990	Leading	14.50	0.995	Leading	9.71	0.989	Leading	14.90	0.993	Leading	11.46
41	FLT47-3PH	0.986	Leading	16.63	0.991	Leading	13.56	0.996	Leading	8.72	0.990	Leading	13.96	0.993	Leading	11.58
42	FLT48-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
43	FLT49-3PH	0.990	Leading	14.39	0.995	Leading	9.90	0.998	Leading	6.16	0.993	Leading	12.25	0.995	Leading	9.69
44	FLT52-3PH	0.993	Leading	12.29	0.998	Leading	6.37	1.000	Leading	1.25	0.996	Leading	9.50	0.999	Leading	5.06
45	FLT54-3PH	0.987	Leading	16.53	0.992	Leading	12.66	0.997	Leading	8.03	0.990	Leading	14.15	0.997	Leading	7.98
46	FLT55-3PH	0.988	Leading	15.65	0.992	Leading	12.36	0.997	Leading	7.64	0.991	Leading	13.52	0.996	Leading	9.19
47	FLT56-3PH	0.985	Leading	17.52	0.990	Leading	14.15	0.996	Leading	9.43	0.988	Leading	15.52	0.994	Leading	11.33
48	FLT57-3PH	0.986	Leading	16.88	0.991	Leading	13.56	0.996	Leading	8.84	0.989	Leading	14.71	0.994	Leading	10.76
49	FLT58-3PH	0.985	Leading	17.54	0.990	Leading	14.11	0.996	Leading	9.39	0.988	Leading	15.54	0.994	Leading	11.30
50	FLT59-3PH	0.986	Leading	17.09	0.990	Leading	14.58	0.996	Leading	9.47	0.989	Leading	15.05	0.994	Leading	10.61
51	FLT60-3PH	0.985	Leading	17.43	0.990	Leading	14.34	0.996	Leading	9.43	0.988	Leading	15.37	0.993	Leading	11.69
52	FLT63-3PH	0.986	Leading	17.18	0.989	Leading	14.65	0.995	Leading	9.82	0.989	Leading	15.07	0.993	Leading	11.59
53	FLT64-3PH	0.986	Leading	17.15	0.989	Leading	14.69	0.995	Leading	9.82	0.989	Leading	15.13	0.993	Leading	11.56
54	FLT65-3PH	0.986	Leading	17.18	0.989	Leading	14.66	0.995	Leading	9.79	0.989	Leading	15.08	0.993	Leading	11.60
55	FLT66-3PH	0.986	Leading	17.12	0.989	Leading	14.65	0.995	Leading	9.82	0.989	Leading	15.08	0.993	Leading	11.49
56	FLT67-3PH	0.986	Leading	17.15	0.989	Leading	14.66	0.995	Leading	9.80	0.989	Leading	15.10	0.993	Leading	11.58
57	FLT68-3PH	0.986	Leading	17.18	0.989	Leading	14.66	0.995	Leading	9.80	0.989	Leading	15.08	0.993	Leading	11.60
58	FLT69-3PH	0.986	Leading	17.16	0.990	Leading	14.55	0.995	Leading	9.72	0.989	Leading	15.15	0.994	Leading	11.05
59	FLT70-3PH	0.986	Leading	17.17	0.989	Leading	14.66	0.995	Leading	9.80	0.989	Leading	15.07	0.993	Leading	11.51
60	FLT71-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.80	0.989	Leading	15.10	0.993	Leading	11.58
61	FLT72-3PH	0.986	Leading	17.19	0.989	Leading	14.65	0.995	Leading	9.75	0.989	Leading	15.08	0.993	Leading	11.55
62	FLT73-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
63	FLT74-3PH	0.986	Leading	17.16	0.989	Leading	14.66	0.995	Leading	9.79	0.989	Leading	15.09	0.993	Leading	11.59
64	FLT75-3PH	0.985	Leading	17.29	0.990	Leading	14.47	0.996	Leading	9.30	0.989	Leading	14.86	0.994	Leading	11.40
65	FLT76-3PH	0.986	Leading	17.18	0.989	Leading	14.66	0.995	Leading	9.80	0.989	Leading	15.08	0.993	Leading	11.60
66	FLT77-3PH	0.985	Leading	17.23	0.990	Leading	14.50	0.996	Leading	9.48	0.989	Leading	14.92	0.993	Leading	11.66
67	FLT84-3PH	0.986	Leading	16.65	0.990	Leading	14.12	0.996	Leading	9.32	0.990	Leading	14.46	0.994	Leading	11.27
68	FLT85-3PH	0.986	Leading	17.18	0.989	Leading	14.69	0.995	Leading	9.85	0.989	Leading	15.10	0.993	Leading	11.53
69	FLT86-3PH	0.986	Leading	17.06	0.990	Leading	13.89	0.996	Leading	9.15	0.989	Leading	14.89	0.994	Leading	10.78
70	FLT87-3PH	0.986	Leading	17.18	0.989	Leading	14.67	0.995	Leading	9.82	0.989	Leading	15.11	0.993	Leading	11.59
71	FLT88-3PH	0.986	Leading	17.18	0.989	Leading	14.67	0.995	Leading	9.80	0.989	Leading	15.12	0.993	Leading	11.62
72	FLT92-3PH	0.992	Leading	12.66	0.994	Leading	11.41	0.998	Leading	6.08	0.994	Leading	10.80	0.994	Leading	11.28
73	FLT93-3PH	0.989	Leading	14.96	0.994	Leading	11.38	0.997	Leading	8.06	0.991	Leading	13.67	0.995	Leading	9.67
74	FLT94-3PH	0.992	Leading	12.65	0.994	Leading	11.41	0.998	Leading	6.08	0.994	Leading	10.80	0.994	Leading	11.28

Table 5-1 (continued)
Power Factor Analysis: GEN-2015-020

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
75	FLT95-3PH	0.989	Leading	14.96	0.994	Leading	11.38	0.997	Leading	8.06	0.991	Leading	13.67	0.995	Leading	9.67
76	FLT96-3PH	0.986	Leading	17.06	0.989	Leading	14.63	0.995	Leading	9.81	0.989	Leading	15.10	0.993	Leading	11.60
77	FLT97-3PH	0.986	Leading	16.95	0.990	Leading	14.49	0.995	Leading	9.71	0.989	Leading	15.03	0.994	Leading	11.45
78	FLT98-3PH	0.986	Leading	17.08	0.989	Leading	14.64	0.995	Leading	9.79	0.989	Leading	15.09	0.993	Leading	11.58
79	FLT99-3PH	0.986	Leading	17.06	0.989	Leading	14.63	0.995	Leading	9.81	0.989	Leading	15.10	0.993	Leading	11.61
80	FLT100-3PH	0.986	Leading	16.93	0.990	Leading	14.49	0.995	Leading	9.71	0.989	Leading	15.02	0.994	Leading	11.44
81	FLT101-3PH	0.986	Leading	17.01	0.990	Leading	14.57	0.995	Leading	9.74	0.989	Leading	15.05	0.993	Leading	11.50
82	FLT102-3PH	0.986	Leading	17.05	0.989	Leading	14.62	0.995	Leading	9.78	0.989	Leading	15.08	0.993	Leading	11.62
83	FLT105-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.83	0.989	Leading	15.10	0.993	Leading	11.51
84	FLT106-3PH	0.986	Leading	17.17	0.989	Leading	14.67	0.995	Leading	9.79	0.989	Leading	15.10	0.993	Leading	11.55
85	FLT107-3PH	0.986	Leading	17.17	0.989	Leading	14.66	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.62
86	FLT108-3PH	0.986	Leading	17.18	0.989	Leading	14.68	0.995	Leading	9.84	0.989	Leading	15.09	0.993	Leading	11.64
87	FLT109-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.82	0.989	Leading	15.11	0.993	Leading	11.61
88	FLT110-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.82	0.989	Leading	15.11	0.993	Leading	11.61
89	FLT111-3PH	0.986	Leading	17.17	0.989	Leading	14.66	0.995	Leading	9.78	0.989	Leading	15.11	0.993	Leading	11.58
90	FLT112-3PH	0.986	Leading	17.19	0.989	Leading	14.65	0.995	Leading	9.75	0.989	Leading	15.10	0.993	Leading	11.60
91	FLT113-3PH	0.986	Leading	17.17	0.989	Leading	14.67	0.995	Leading	9.84	0.989	Leading	15.11	0.993	Leading	11.63
92	FLT114-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.80	0.989	Leading	15.11	0.993	Leading	11.59
93	FLT115-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
94	FLT116-3PH	0.986	Leading	17.14	0.989	Leading	14.67	0.995	Leading	9.96	0.989	Leading	15.13	0.993	Leading	11.70
95	FLT117-3PH	0.986	Leading	17.19	0.989	Leading	14.64	0.995	Leading	9.73	0.989	Leading	15.06	0.993	Leading	11.52
96	FLT118-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.10	0.993	Leading	11.59
97	FLT119-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.82	0.989	Leading	15.10	0.993	Leading	11.60
98	FLT120-3PH	0.986	Leading	17.13	0.989	Leading	14.69	0.995	Leading	9.89	0.989	Leading	15.16	0.993	Leading	11.59
99	FLT121-3PH	0.986	Leading	17.16	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.10	0.993	Leading	11.60
100	FLT126-3PH	0.986	Leading	17.15	0.989	Leading	14.70	0.995	Leading	9.94	0.989	Leading	15.17	0.994	Leading	11.36
101	FLT127-3PH	0.986	Leading	17.12	0.989	Leading	14.68	0.995	Leading	9.81	0.989	Leading	15.11	0.993	Leading	11.60
102	FLT128-3PH	0.986	Leading	17.10	0.989	Leading	14.70	0.995	Leading	9.71	0.989	Leading	15.06	0.993	Leading	11.65
103	FLT129-3PH	0.986	Leading	17.14	0.989	Leading	14.67	0.995	Leading	9.81	0.989	Leading	15.10	0.993	Leading	11.61

Study Generator GEN-2015-020

The Power Factor Analysis shows that GEN-2015-020 has a power factor range of 0.970 leading (absorbing) to 0.990 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.973 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.979 leading (absorbing) to 1.00 (unity) for the 2020 Summer Peak conditions, a power factor range of 0.973 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.976 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

Table 5-2
Power Factor Analysis: GEN-2015-031

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
1	FLT01-3PH	0.994	Lagging	-16.43	0.897	Lagging	-74.37	0.938	Lagging	-55.50	1.000	Lagging	-1.40	0.893	Lagging	-75.98
2	FLT02-3PH	0.994	Lagging	-16.46	0.896	Lagging	-74.40	0.938	Lagging	-55.52	1.000	Lagging	-1.43	0.893	Lagging	-75.99
3	FLT03-3PH	0.994	Lagging	-16.46	0.896	Lagging	-74.41	0.938	Lagging	-55.56	1.000	Lagging	-1.52	0.893	Lagging	-75.98
4	FLT04-3PH	0.994	Lagging	-16.69	0.895	Lagging	-74.85	0.938	Lagging	-55.65	1.000	Lagging	-2.10	0.892	Lagging	-76.25
5	FLT05-3PH	0.994	Lagging	-16.40	0.897	Lagging	-74.25	0.938	Lagging	-55.60	1.000	Lagging	-1.70	0.892	Lagging	-76.09
6	FLT06-3PH	0.994	Lagging	-16.43	0.897	Lagging	-74.37	0.938	Lagging	-55.50	1.000	Lagging	-1.39	0.893	Lagging	-75.98
7	FLT07-3PH	0.994	Lagging	-16.44	0.897	Lagging	-74.38	0.938	Lagging	-55.50	1.000	Lagging	-1.40	0.893	Lagging	-75.98
8	FLT11-3PH	0.994	Lagging	-16.32	0.897	Lagging	-74.29	0.938	Lagging	-55.43	1.000	Lagging	-1.29	0.893	Lagging	-75.90
9	FLT12-3PH	0.994	Lagging	-16.32	0.897	Lagging	-74.29	0.938	Lagging	-55.43	1.000	Lagging	-1.28	0.893	Lagging	-75.90
10	FLT13-3PH	0.994	Lagging	-16.43	0.896	Lagging	-74.51	0.938	Lagging	-55.60	1.000	Lagging	-1.38	0.893	Lagging	-76.06
11	FLT14-3PH	0.994	Lagging	-16.32	0.895	Lagging	-74.84	0.938	Lagging	-55.69	1.000	Lagging	-1.50	0.892	Lagging	-76.20
12	FLT15-3PH	0.992	Lagging	-18.88	0.886	Lagging	-78.73	0.930	Lagging	-59.38	1.000	Lagging	-3.55	0.886	Lagging	-78.78
13	FLT16-3PH	0.994	Lagging	-16.45	0.896	Lagging	-74.45	0.938	Lagging	-55.57	1.000	Lagging	-1.41	0.893	Lagging	-76.03
14	FLT17-3PH	0.994	Lagging	-16.39	0.896	Lagging	-74.42	0.938	Lagging	-55.47	1.000	Lagging	-1.34	0.893	Lagging	-75.95
15	FLT18-3PH	0.994	Lagging	-16.38	0.896	Lagging	-74.40	0.938	Lagging	-55.45	1.000	Lagging	-1.34	0.893	Lagging	-75.93
16	FLT19-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
17	FLT20-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.36	0.938	Lagging	-55.48	1.000	Lagging	-1.36	0.893	Lagging	-75.96
18	FLT21-3PH	0.994	Lagging	-16.53	0.896	Lagging	-74.55	0.938	Lagging	-55.65	1.000	Lagging	-1.50	0.892	Lagging	-76.09
19	FLT22-3PH	0.994	Lagging	-16.52	0.896	Lagging	-74.60	0.938	Lagging	-55.71	1.000	Lagging	-1.49	0.892	Lagging	-76.14
20	FLT23-3PH	0.994	Lagging	-16.48	0.896	Lagging	-74.52	0.938	Lagging	-55.64	1.000	Lagging	-1.45	0.892	Lagging	-76.08
21	FLT24-3PH	0.994	Lagging	-16.51	0.896	Lagging	-74.51	0.938	Lagging	-55.61	1.000	Lagging	-1.47	0.893	Lagging	-76.06
22	FLT25-3PH	0.994	Lagging	-16.47	0.896	Lagging	-74.46	0.939	Lagging	-55.29	1.000	Lagging	-1.39	0.893	Lagging	-76.03
23	FLT26-3PH	0.994	Lagging	-16.46	0.896	Lagging	-74.40	0.938	Lagging	-55.48	1.000	Lagging	-1.38	0.893	Lagging	-75.99
24	FLT27-3PH	0.994	Lagging	-16.46	0.896	Lagging	-74.40	0.938	Lagging	-55.49	1.000	Lagging	-1.36	0.893	Lagging	-75.97
25	FLT28-3PH	0.994	Lagging	-16.63	0.896	Lagging	-74.51	0.938	Lagging	-55.57	1.000	Lagging	-1.61	0.893	Lagging	-76.07
26	FLT29-3PH	0.995	Lagging	-15.56	0.898	Lagging	-73.88	0.940	Lagging	-54.46	1.000	Lagging	-0.27	0.894	Lagging	-75.63
27	FLT30-3PH	0.994	Lagging	-16.40	0.897	Lagging	-74.31	0.938	Lagging	-55.44	1.000	Lagging	-1.33	0.893	Lagging	-75.96
28	FLT31-3PH	0.994	Lagging	-16.51	0.896	Lagging	-74.50	0.938	Lagging	-55.55	1.000	Lagging	-1.45	0.893	Lagging	-76.04
29	FLT34-3PH	0.991	Lagging	-19.86	0.891	Lagging	-76.70	0.933	Lagging	-58.14	0.998	Lagging	-9.56	0.908	Lagging	-69.37
30	FLT35-3PH	0.983	Leading	27.76	0.991	Leading	20.71	0.991	Leading	20.72	0.979	Leading	31.48	0.997	Leading	10.74
31	FLT36-3PH	1.000	Leading	1.66	0.990	Lagging	-21.62	1.000	Leading	0.75	0.995	Leading	15.83	0.993	Lagging	-17.49
32	FLT37-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
33	FLT38-3PH	0.994	Leading	17.04	0.986	Lagging	-25.12	0.998	Lagging	-8.83	0.981	Leading	29.78	0.985	Lagging	-26.46
34	FLT39-3PH	0.992	Lagging	-18.77	0.900	Lagging	-72.97	0.942	Lagging	-53.86	1.000	Lagging	-1.15	0.899	Lagging	-73.45
35	FLT40-3PH	0.996	Lagging	-12.78	0.894	Lagging	-75.31	0.936	Lagging	-56.73	1.000	Leading	0.06	0.876	Lagging	-82.88
36	FLT41-3PH	0.995	Lagging	-14.83	0.895	Lagging	-75.13	0.937	Lagging	-56.34	1.000	Lagging	-3.81	0.904	Lagging	-71.28
37	FLT43-3PH	0.871	Lagging	-84.88	0.787	Lagging	-117.93	0.856	Lagging	-90.72	0.916	Lagging	-65.96	0.847	Lagging	-94.67
38	FLT44-3PH	0.784	Lagging	-119.14	0.744	Lagging	-135.32	0.825	Lagging	-103.06	0.840	Lagging	-97.34	0.822	Lagging	-104.14
39	FLT45-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
40	FLT46-3PH	0.992	Lagging	-19.21	0.893	Lagging	-76.01	0.932	Lagging	-58.35	0.999	Lagging	-5.14	0.887	Lagging	-78.42
41	FLT47-3PH	0.981	Lagging	-30.02	0.874	Lagging	-83.68	0.918	Lagging	-65.24	0.993	Lagging	-17.60	0.889	Lagging	-77.53
42	FLT48-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
43	FLT49-3PH	0.805	Lagging	-111.03	0.646	Lagging	-178.06	0.744	Lagging	-135.01	0.854	Lagging	-91.74	0.782	Lagging	-120.04
44	FLT52-3PH	0.938	Lagging	-55.72	0.807	Lagging	-110.30	0.854	Lagging	-91.85	0.965	Lagging	-40.84	0.830	Lagging	-100.98
45	FLT54-3PH	0.899	Lagging	-73.29	0.817	Lagging	-106.34	0.876	Lagging	-82.79	0.942	Lagging	-53.82	0.852	Lagging	-92.59
46	FLT55-3PH	0.994	Lagging	-17.16	0.895	Lagging	-75.03	0.937	Lagging	-56.17	1.000	Lagging	-2.02	0.891	Lagging	-76.73
47	FLT56-3PH	0.992	Lagging	-18.56	0.888	Lagging	-78.10	0.933	Lagging	-57.88	1.000	Lagging	-3.00	0.889	Lagging	-77.54
48	FLT57-3PH	0.969	Lagging	-38.10	0.853	Lagging	-92.30	0.890	Lagging	-77.15	0.989	Lagging	-22.50	0.846	Lagging	-94.96
49	FLT58-3PH	0.992	Lagging	-18.70	0.887	Lagging	-78.33	0.933	Lagging	-58.03	1.000	Lagging	-3.10	0.889	Lagging	-77.63
50	FLT59-3PH	0.993	Lagging	-18.49	0.891	Lagging	-76.61	0.933	Lagging	-57.86	1.000	Lagging	-2.79	0.889	Lagging	-77.46
51	FLT60-3PH	0.994	Lagging	-16.09	0.901	Lagging	-72.46	0.936	Lagging	-56.51	1.000	Lagging	-2.20	0.893	Lagging	-75.84
52	FLT63-3PH	0.994	Lagging	-16.69	0.896	Lagging	-74.76	0.938	Lagging	-55.68	1.000	Lagging	-1.47	0.893	Lagging	-76.02
53	FLT64-3PH	0.994	Lagging	-16.30	0.897	Lagging	-74.17	0.938	Lagging	-55.44	1.000	Lagging	-1.23	0.893	Lagging	-75.81
54	FLT65-3PH	0.994	Lagging	-16.61	0.896	Lagging	-74.63	0.938	Lagging	-55.60	1.000	Lagging	-1.44	0.893	Lagging	-75.99
55	FLT66-3PH	0.994	Lagging	-16.89	0.895	Lagging	-75.13	0.937	Lagging	-56.13	1.000	Lagging	-2.25	0.891	Lagging	-76.51
56	FLT67-3PH	0.994	Lagging	-16.55	0.896	Lagging	-74.60	0.938	Lagging	-55.70	1.000	Lagging	-1.63	0.892	Lagging	-76.14
57	FLT68-3PH	0.994	Lagging	-16.56	0.896	Lagging	-74.57	0.938	Lagging	-55.54	1.000	Lagging	-1.40	0.893	Lagging	-75.97
58	FLT69-3PH	0.993	Lagging	-17.71	0.893	Lagging	-75.87	0.935	Lagging	-56.93	1.000	Lagging	-2.83	0.890	Lagging	-77.20
59	FLT70-3PH	0.994	Lagging	-16.54	0.896	Lagging	-74.65	0.938	Lagging	-55.64	1.000	Lagging	-1.50	0.892	Lagging	-76.20
60	FLT71-3PH	0.994	Lagging	-16.56	0.896	Lagging	-74.45	0.938	Lagging	-55.58	1.000	Lagging	-1.47	0.893	Lagging	-76.02
61	FLT72-3PH	0.994	Lagging	-16.33	0.896	Lagging	-74.65	0.938	Lagging	-55.67	1.000	Lagging	-1.30	0.893	Lagging	-75.98
62	FLT73-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
63	FLT74-3PH	0.994	Lagging	-16.41	0.896	Lagging	-74.52	0.938	Lagging	-55.62	1.000	Lagging	-1.49	0.893	Lagging	-75.99
64	FLT75-3PH	0.994	Lagging	-16.67	0.894	Lagging	-75.56	0.936	Lagging	-56.68	1.000	Lagging	-1.85	0.891	Lagging	-76.86
65	FLT76-3PH	0.994	Lagging	-16.55	0.896	Lagging	-74.55	0.938	Lagging	-55.53	1.000	Lagging	-1.39	0.893	Lagging	-75.97
66	FLT77-3PH	0.994	Lagging	-16.98	0.895	Lagging	-75.20	0.938	Lagging	-55.79	1.000	Lagging	-1.56	0.892	Lagging	-76.17
67	FLT84-3PH	0.983	Lagging	-27.91	0.878	Lagging	-81.96	0.922	Lagging	-63.02	0.996	Lagging	-13.13	0.875	Lagging	-83.35
68	FLT85-3PH	0.995	Lagging	-15.69	0.901	Lagging	-72.28	0.941	Lagging	-54.22	1.000	Leading	0.30	0.892	Lagging	-76.12
69	FLT86-3PH	0.989	Lagging	-22.70	0.886	Lagging	-78.97	0.928	Lagging	-60.36	0.998	Lagging	-9.21	0.883	Lagging	-79.92
70	FLT87-3PH	0.995	Lagging	-15.25	0.900	Lagging	-73.08	0.940	Lagging	-54.53	1.000	Lagging	-1.83	0.893	Lagging	-75.87
71	FLT88-3PH	0.994	Lagging	-16.49	0.894	Lagging	-75.35	0.936	Lagging	-56.62	1.000	Lagging	-1.43	0.888	Lagging	-77.81
72	FLT92-3PH	0.996	Lagging	-13.65	0.902	Lagging	-72.03	0.944	Lagging	-52.61	1.000	Leading	2.33	0.897	Lagging	-74.33
73	FLT93-3PH	0.993	Lagging	-17.68	0.893	Lagging	-75.88	0.934	Lagging	-57.51	1.000	Lagging	-3.48	0.888	Lagging	-77.83
74	FLT94-3PH	0.996	Lagging	-13.67	0.902	Lagging	-72.04	0.944	Lagging	-52.62	1.000	Leading	2.32	0.897	Lagging	-74.33

Table 5-2 (continued)
Power Factor Analysis: GEN-2015-031

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
75	FLT95-3PH	0.993	Lagging	-17.72	0.893	Lagging	-75.91	0.934	Lagging	-57.54	1.000	Lagging	-3.51	0.888	Lagging	-77.85
76	FLT96-3PH	0.994	Lagging	-16.39	0.897	Lagging	-74.35	0.938	Lagging	-55.50	1.000	Lagging	-1.37	0.893	Lagging	-75.97
77	FLT97-3PH	0.994	Lagging	-16.44	0.896	Lagging	-74.43	0.938	Lagging	-55.50	1.000	Lagging	-1.38	0.893	Lagging	-76.03
78	FLT98-3PH	0.994	Lagging	-16.43	0.897	Lagging	-74.38	0.938	Lagging	-55.48	1.000	Lagging	-1.36	0.893	Lagging	-75.96
79	FLT99-3PH	0.994	Lagging	-16.39	0.897	Lagging	-74.36	0.938	Lagging	-55.51	1.000	Lagging	-1.38	0.893	Lagging	-75.98
80	FLT100-3PH	0.994	Lagging	-16.50	0.896	Lagging	-74.45	0.938	Lagging	-55.50	1.000	Lagging	-1.39	0.893	Lagging	-76.04
81	FLT101-3PH	0.994	Lagging	-16.46	0.896	Lagging	-74.42	0.938	Lagging	-55.52	1.000	Lagging	-1.40	0.893	Lagging	-76.00
82	FLT102-3PH	0.994	Lagging	-16.34	0.897	Lagging	-74.32	0.938	Lagging	-55.55	1.000	Lagging	-1.41	0.893	Lagging	-76.00
83	FLT105-3PH	0.995	Lagging	-15.22	0.898	Lagging	-73.80	0.939	Lagging	-54.90	1.000	Lagging	-0.70	0.893	Lagging	-75.87
84	FLT106-3PH	0.996	Lagging	-13.63	0.896	Lagging	-74.45	0.937	Lagging	-55.97	1.000	Lagging	-1.50	0.891	Lagging	-76.70
85	FLT107-3PH	0.993	Lagging	-17.31	0.896	Lagging	-74.79	0.937	Lagging	-56.23	1.000	Lagging	-1.42	0.891	Lagging	-76.52
86	FLT108-3PH	0.996	Lagging	-13.35	0.900	Lagging	-73.06	0.940	Lagging	-54.70	1.000	Lagging	-1.83	0.893	Lagging	-75.74
87	FLT109-3PH	0.994	Lagging	-16.44	0.897	Lagging	-74.39	0.938	Lagging	-55.50	1.000	Lagging	-1.39	0.893	Lagging	-75.97
88	FLT110-3PH	0.994	Lagging	-16.43	0.897	Lagging	-74.38	0.938	Lagging	-55.50	1.000	Lagging	-1.38	0.893	Lagging	-75.97
89	FLT111-3PH	0.994	Lagging	-16.34	0.897	Lagging	-74.37	0.938	Lagging	-55.51	1.000	Lagging	-1.35	0.893	Lagging	-75.97
90	FLT112-3PH	0.994	Lagging	-16.25	0.896	Lagging	-74.43	0.938	Lagging	-55.53	1.000	Lagging	-1.33	0.893	Lagging	-75.97
91	FLT113-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.39	1.000	Lagging	-1.37	0.893	Lagging	-75.94
92	FLT114-3PH	0.994	Lagging	-16.43	0.896	Lagging	-74.46	0.938	Lagging	-55.54	1.000	Lagging	-1.36	0.893	Lagging	-75.98
93	FLT115-3PH	0.994	Lagging	-16.41	0.897	Lagging	-74.37	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
94	FLT116-3PH	0.994	Lagging	-16.51	0.896	Lagging	-74.47	0.938	Lagging	-55.47	1.000	Lagging	-1.43	0.893	Lagging	-75.95
95	FLT117-3PH	0.994	Lagging	-16.28	0.896	Lagging	-74.65	0.938	Lagging	-55.67	1.000	Lagging	-1.34	0.893	Lagging	-76.03
96	FLT118-3PH	0.994	Lagging	-16.41	0.896	Lagging	-74.41	0.938	Lagging	-55.45	1.000	Lagging	-1.36	0.893	Lagging	-75.98
97	FLT119-3PH	0.994	Lagging	-16.48	0.896	Lagging	-74.40	0.938	Lagging	-55.56	1.000	Lagging	-1.45	0.893	Lagging	-76.00
98	FLT120-3PH	0.994	Lagging	-16.36	0.897	Lagging	-74.28	0.939	Lagging	-55.35	1.000	Lagging	-1.34	0.893	Lagging	-75.95
99	FLT121-3PH	0.994	Lagging	-16.46	0.896	Lagging	-74.43	0.938	Lagging	-55.55	1.000	Lagging	-1.42	0.893	Lagging	-76.00
100	FLT126-3PH	0.994	Lagging	-16.58	0.896	Lagging	-74.76	0.938	Lagging	-55.87	1.000	Lagging	-1.68	0.892	Lagging	-76.11
101	FLT127-3PH	0.994	Lagging	-16.46	0.897	Lagging	-74.25	0.938	Lagging	-55.49	1.000	Lagging	-1.37	0.893	Lagging	-75.97
102	FLT128-3PH	0.995	Lagging	-15.55	0.897	Lagging	-74.23	0.938	Lagging	-55.59	1.000	Lagging	-1.46	0.893	Lagging	-76.05
103	FLT129-3PH	0.994	Lagging	-16.42	0.896	Lagging	-74.41	0.938	Lagging	-55.52	1.000	Lagging	-1.40	0.893	Lagging	-75.99

Study Generator GEN-2015-031

The Power Factor Analysis shows that GEN-2015-031 has a power factor range of 0.983 leading (absorbing) to 0.784 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.991 leading (absorbing) to 0.646 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.991 leading (absorbing) to 0.744 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.979 leading (absorbing) to 0.840 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.997 leading (absorbing) to 0.782 lagging (supplying) for the 2025 Summer Peak conditions.

Table 5-3
Power Factor Analysis: GEN-2015-056

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
1	FLT01-3PH	1.000	Lagging	-1.12	1.000	Lagging	-1.71	1.000	Leading	0.43	1.000	Leading	0.33	1.000	Lagging	-0.44
2	FLT02-3PH	1.000	Lagging	-1.12	1.000	Lagging	-1.71	1.000	Leading	0.43	1.000	Leading	0.33	1.000	Lagging	-0.45
3	FLT03-3PH	1.000	Lagging	-0.78	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.34	1.000	Lagging	-0.42
4	FLT04-3PH	1.000	Lagging	-1.09	1.000	Lagging	-3.04	1.000	Lagging	-0.39	1.000	Lagging	-0.41	1.000	Lagging	-3.13
5	FLT05-3PH	1.000	Lagging	-1.65	1.000	Lagging	-2.23	1.000	Leading	0.10	1.000	Lagging	-0.02	1.000	Lagging	-1.30
6	FLT06-3PH	1.000	Lagging	-1.12	1.000	Lagging	-1.70	1.000	Leading	0.43	1.000	Leading	0.33	1.000	Lagging	-0.44
7	FLT07-3PH	1.000	Lagging	-1.12	1.000	Lagging	-1.71	1.000	Leading	0.43	1.000	Leading	0.33	1.000	Lagging	-0.44
8	FLT11-3PH	1.000	Lagging	-1.01	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.40
9	FLT12-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.40
10	FLT13-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
11	FLT14-3PH	1.000	Lagging	-1.02	1.000	Lagging	-1.69	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.45
12	FLT15-3PH	1.000	Lagging	-1.09	1.000	Lagging	-1.65	1.000	Leading	0.46	1.000	Leading	0.34	1.000	Lagging	-0.37
13	FLT16-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.41
14	FLT17-3PH	1.000	Lagging	-1.06	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.41
15	FLT18-3PH	1.000	Lagging	-1.05	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.41
16	FLT19-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
17	FLT20-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
18	FLT21-3PH	1.000	Lagging	-0.97	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.41
19	FLT22-3PH	1.000	Lagging	-1.01	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.39
20	FLT23-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.40
21	FLT24-3PH	1.000	Lagging	-0.97	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.41
22	FLT25-3PH	1.000	Lagging	-1.07	1.000	Lagging	-1.66	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.38
23	FLT26-3PH	1.000	Lagging	-1.03	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.43
24	FLT27-3PH	1.000	Lagging	-1.02	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
25	FLT28-3PH	1.000	Lagging	-0.51	1.000	Lagging	-1.66	1.000	Leading	0.46	1.000	Leading	0.34	1.000	Lagging	-0.38
26	FLT29-3PH	1.000	Lagging	-1.05	1.000	Lagging	-1.17	1.000	Leading	0.59	1.000	Leading	0.28	1.000	Leading	0.78
27	FLT30-3PH	1.000	Lagging	-1.05	1.000	Lagging	-1.64	1.000	Leading	0.47	1.000	Leading	0.37	1.000	Lagging	-0.41
28	FLT31-3PH	1.000	Lagging	-1.10	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.40
29	FLT34-3PH	1.000	Lagging	-1.01	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.34	1.000	Lagging	-0.42
30	FLT35-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
31	FLT36-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
32	FLT37-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
33	FLT38-3PH	1.000	Lagging	-1.07	1.000	Lagging	-1.71	1.000	Leading	0.42	1.000	Leading	0.31	1.000	Lagging	-0.44
34	FLT39-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.41
35	FLT40-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
36	FLT41-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
37	FLT43-3PH	1.000	Lagging	-0.57	1.000	Lagging	-1.48	1.000	Leading	0.56	1.000	Leading	0.43	1.000	Lagging	-0.14
38	FLT44-3PH	1.000	Lagging	-0.44	1.000	Lagging	-1.42	1.000	Leading	0.59	1.000	Leading	0.44	1.000	Lagging	-0.03
39	FLT45-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
40	FLT46-3PH	1.000	Lagging	-1.19	1.000	Lagging	-1.80	1.000	Leading	0.36	1.000	Leading	0.25	1.000	Lagging	-0.59
41	FLT47-3PH	1.000	Leading	0.07	1.000	Lagging	-1.17	1.000	Leading	0.66	1.000	Leading	0.41	1.000	Leading	0.12
42	FLT48-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
43	FLT49-3PH	1.000	Lagging	-0.46	1.000	Lagging	-1.33	1.000	Leading	0.64	1.000	Leading	0.44	1.000	Leading	0.13
44	FLT52-3PH	1.000	Lagging	-1.27	1.000	Lagging	-1.99	1.000	Leading	0.21	1.000	Leading	0.18	1.000	Lagging	-0.92
46	FLT54-3PH	1.000	Lagging	-1.24	1.000	Lagging	-1.85	1.000	Leading	0.32	1.000	Leading	0.21	1.000	Lagging	-0.68
47	FLT55-3PH	1.000	Lagging	-1.03	1.000	Lagging	-1.69	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.43
48	FLT56-3PH	1.000	Lagging	-1.21	1.000	Lagging	-1.88	1.000	Leading	0.29	1.000	Leading	0.24	1.000	Lagging	-0.79
49	FLT57-3PH	1.000	Lagging	-1.28	1.000	Lagging	-2.00	1.000	Leading	0.19	1.000	Leading	0.16	1.000	Lagging	-0.90
50	FLT58-3PH	1.000	Lagging	-1.21	1.000	Lagging	-1.90	1.000	Leading	0.28	1.000	Leading	0.23	1.000	Lagging	-0.82
51	FLT59-3PH	1.000	Lagging	-1.31	1.000	Lagging	-2.14	1.000	Leading	0.05	1.000	Leading	0.10	1.000	Lagging	-1.45
52	FLT60-3PH	1.000	Lagging	-1.01	1.000	Lagging	-1.75	1.000	Leading	0.39	1.000	Leading	0.32	1.000	Lagging	-0.46
53	FLT63-3PH	1.000	Lagging	-0.92	1.000	Lagging	-1.65	1.000	Leading	0.46	1.000	Leading	0.35	1.000	Lagging	-0.37
54	FLT64-3PH	1.000	Lagging	-1.08	1.000	Lagging	-1.73	1.000	Leading	0.41	1.000	Leading	0.32	1.000	Lagging	-0.50
55	FLT65-3PH	1.000	Lagging	-0.93	1.000	Lagging	-1.66	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.39
56	FLT66-3PH	1.000	Lagging	-1.14	1.000	Lagging	-1.75	1.000	Leading	0.39	1.000	Leading	0.31	1.000	Lagging	-0.62
57	FLT67-3PH	1.000	Lagging	-1.03	1.000	Lagging	-1.70	1.000	Leading	0.43	1.000	Leading	0.33	1.000	Lagging	-0.48
58	FLT68-3PH	1.000	Lagging	-0.93	1.000	Lagging	-1.66	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.39
59	FLT69-3PH	1.000	Lagging	-1.27	1.000	Lagging	-2.05	1.000	Leading	0.13	1.000	Leading	0.15	1.000	Lagging	-1.47
60	FLT70-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.38
61	FLT71-3PH	1.000	Lagging	-1.02	1.000	Lagging	-1.69	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.44
62	FLT72-3PH	1.000	Lagging	-0.91	1.000	Lagging	-1.63	1.000	Leading	0.48	1.000	Leading	0.35	1.000	Lagging	-0.33
63	FLT73-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
64	FLT74-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.41
65	FLT75-3PH	1.000	Lagging	-0.41	1.000	Lagging	-1.34	1.000	Leading	0.65	1.000	Leading	0.44	1.000	Leading	0.18
66	FLT76-3PH	1.000	Lagging	-0.93	1.000	Lagging	-1.66	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.39
67	FLT77-3PH	1.000	Lagging	-0.52	1.000	Lagging	-1.34	1.000	Leading	0.64	1.000	Leading	0.43	1.000	Leading	0.19
68	FLT84-3PH	1.000	Lagging	-0.88	1.000	Lagging	-1.62	1.000	Leading	0.48	1.000	Leading	0.37	1.000	Lagging	-0.29
69	FLT85-3PH	1.000	Lagging	-1.02	1.000	Lagging	-1.70	1.000	Leading	0.43	1.000	Leading	0.33	1.000	Lagging	-0.46
70	FLT86-3PH	1.000	Lagging	-1.47	1.000	Lagging	-2.30	1.000	Lagging	-0.05	1.000	Lagging	-0.09	1.000	Lagging	-1.32
71	FLT87-3PH	1.000	Lagging	-1.01	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.43
72	FLT88-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.68	1.000	Leading	0.45	1.000	Leading	0.33	1.000	Lagging	-0.40
73	FLT92-3PH	0.965	Lagging	-27.25	0.980	Lagging	-20.43	0.994	Lagging	-11.54	0.974	Lagging	-23.40	0.996	Lagging	-9.47
74	FLT93-3PH	0.998	Lagging	-6.55	0.990	Lagging	-14.06	0.983	Lagging	-19.01	0.997	Lagging	-7.75	0.979	Lagging	-21.10
75	FLT94-3PH	0.969	Lagging	-25.76	0.983	Lagging	-18.95	0.995	Lagging	-10.03	0.977	Lagging	-21.89	0.997	Lagging	-7.98

Table 5-3 (continued)
Power Factor Analysis: GEN-2015-056

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
76	FLT95-3PH	0.997	Leading	7.71	1.000	Leading	0.12	0.999	Lagging	-4.54	0.998	Leading	6.69	0.998	Lagging	-6.74
77	FLT96-3PH	1.000	Lagging	-1.10	1.000	Lagging	-1.68	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.40
78	FLT97-3PH	1.000	Lagging	-1.10	1.000	Lagging	-1.66	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.38
79	FLT98-3PH	1.000	Lagging	-1.11	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
80	FLT99-3PH	1.000	Lagging	-1.10	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.39
81	FLT100-3PH	1.000	Lagging	-1.09	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.38
82	FLT101-3PH	1.000	Lagging	-1.10	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.34	1.000	Lagging	-0.41
83	FLT102-3PH	1.000	Lagging	-1.09	1.000	Lagging	-1.66	1.000	Leading	0.46	1.000	Leading	0.35	1.000	Lagging	-0.34
84	FLT105-3PH	1.000	Lagging	-0.98	1.000	Lagging	-1.69	1.000	Leading	0.43	1.000	Leading	0.33	1.000	Lagging	-0.46
85	FLT106-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.69	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.43
86	FLT107-3PH	1.000	Lagging	-0.98	1.000	Lagging	-1.67	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.41
87	FLT108-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.34	1.000	Lagging	-0.41
88	FLT109-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
89	FLT110-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
90	FLT111-3PH	1.000	Lagging	-0.97	1.000	Lagging	-1.66	1.000	Leading	0.46	1.000	Leading	0.34	1.000	Lagging	-0.38
91	FLT112-3PH	1.000	Lagging	-0.91	1.000	Lagging	-1.62	1.000	Leading	0.48	1.000	Leading	0.35	1.000	Lagging	-0.33
92	FLT113-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.43
93	FLT114-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
94	FLT115-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
95	FLT116-3PH	1.000	Lagging	-1.04	1.000	Lagging	-1.71	1.000	Leading	0.43	1.000	Leading	0.32	1.000	Lagging	-0.47
96	FLT117-3PH	1.000	Lagging	-0.92	1.000	Lagging	-1.63	1.000	Leading	0.48	1.000	Leading	0.35	1.000	Lagging	-0.32
97	FLT118-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
98	FLT119-3PH	1.000	Lagging	-1.00	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.44
99	FLT120-3PH	1.000	Lagging	-1.17	1.000	Lagging	-1.77	1.000	Leading	0.37	1.000	Leading	0.28	1.000	Lagging	-0.65
100	FLT121-3PH	1.000	Lagging	-0.99	1.000	Lagging	-1.68	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.41
101	FLT126-3PH	1.000	Lagging	-1.39	1.000	Lagging	-1.98	1.000	Leading	0.22	1.000	Leading	0.10	1.000	Lagging	-1.18
102	FLT127-3PH	1.000	Lagging	-1.12	1.000	Lagging	-1.72	1.000	Leading	0.44	1.000	Leading	0.33	1.000	Lagging	-0.42
103	FLT128-3PH	1.000	Lagging	-1.79	1.000	Lagging	-1.89	1.000	Leading	0.55	1.000	Leading	0.38	1.000	Lagging	-0.15
104	FLT129-3PH	1.000	Lagging	-1.04	1.000	Lagging	-1.68	1.000	Leading	0.45	1.000	Leading	0.34	1.000	Lagging	-0.38

Study Generator GEN-2015-056

The Power Factor Analysis shows that GEN-2015-056 has a power factor range of 0.997 leading (absorbing) to 0.965 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.998 lagging (supplying) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.983 lagging (supplying) to 1.00 (unity) for the 2020 Summer Peak conditions, a power factor range of 0.998 leading (absorbing) to 0.974 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.979 lagging (supplying) to 1.00 (unity) for the 2025 Summer Peak conditions.

Table 5-4
Power Factor Analysis: GEN-2015-058

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
1	FLT01-3PH	0.998	Leading	3.33	0.994	Leading	5.28	0.990	Leading	6.96	0.998	Leading	2.87	0.990	Leading	7.24
2	FLT02-3PH	0.998	Leading	3.00	0.995	Leading	4.86	0.991	Leading	6.71	0.999	Leading	2.63	0.991	Leading	6.93
3	FLT03-3PH	0.996	Leading	4.52	0.994	Leading	5.44	0.992	Leading	6.46	0.999	Leading	2.06	0.989	Leading	7.61
4	FLT04-3PH	0.990	Leading	7.19	0.991	Leading	6.74	0.987	Leading	8.18	0.998	Leading	3.54	0.983	Leading	9.48
5	FLT05-3PH	1.000	Leading	0.49	0.999	Leading	2.65	0.996	Leading	4.67	1.000	Lagging	-0.68	0.994	Leading	5.46
6	FLT06-3PH	0.997	Leading	3.56	0.994	Leading	5.60	0.990	Leading	7.18	0.998	Leading	3.03	0.989	Leading	7.50
7	FLT07-3PH	0.998	Leading	3.29	0.995	Leading	5.21	0.991	Leading	6.93	0.998	Leading	2.84	0.990	Leading	7.19
8	FLT11-3PH	0.996	Leading	4.39	0.994	Leading	5.66	0.990	Leading	7.22	0.998	Leading	3.14	0.989	Leading	7.62
9	FLT12-3PH	0.996	Leading	4.41	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.14	0.989	Leading	7.62
10	FLT13-3PH	0.996	Leading	4.42	0.994	Leading	5.64	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.59
11	FLT14-3PH	0.996	Leading	4.34	0.994	Leading	5.57	0.990	Leading	7.20	0.998	Leading	3.12	0.989	Leading	7.58
12	FLT15-3PH	0.997	Leading	3.90	0.994	Leading	5.54	0.990	Leading	7.07	0.998	Leading	2.96	0.989	Leading	7.44
13	FLT16-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.61
14	FLT17-3PH	0.996	Leading	4.27	0.994	Leading	5.63	0.990	Leading	7.20	0.998	Leading	3.13	0.989	Leading	7.58
15	FLT18-3PH	0.996	Leading	4.28	0.994	Leading	5.63	0.990	Leading	7.20	0.998	Leading	3.13	0.989	Leading	7.58
16	FLT19-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
17	FLT20-3PH	0.996	Leading	4.42	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
18	FLT21-3PH	0.996	Leading	4.48	0.994	Leading	5.66	0.990	Leading	7.24	0.998	Leading	3.17	0.989	Leading	7.61
19	FLT22-3PH	0.996	Leading	4.38	0.994	Leading	5.64	0.990	Leading	7.22	0.998	Leading	3.14	0.989	Leading	7.59
20	FLT23-3PH	0.996	Leading	4.40	0.994	Leading	5.64	0.990	Leading	7.22	0.998	Leading	3.15	0.989	Leading	7.60
21	FLT24-3PH	0.996	Leading	4.48	0.994	Leading	5.66	0.990	Leading	7.24	0.998	Leading	3.17	0.989	Leading	7.62
22	FLT25-3PH	0.996	Leading	4.22	0.994	Leading	5.59	0.990	Leading	7.15	0.998	Leading	3.11	0.989	Leading	7.53
23	FLT26-3PH	0.996	Leading	4.34	0.994	Leading	5.64	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.59
24	FLT27-3PH	0.996	Leading	4.37	0.994	Leading	5.64	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.59
25	FLT28-3PH	0.994	Leading	5.64	0.994	Leading	5.65	0.990	Leading	7.21	0.998	Leading	3.32	0.989	Leading	7.60
26	FLT29-3PH	0.999	Leading	1.95	0.998	Leading	2.93	0.993	Leading	6.05	1.000	Leading	0.57	0.993	Leading	5.86
27	FLT30-3PH	0.997	Leading	3.71	0.994	Leading	5.64	0.990	Leading	7.16	0.998	Leading	2.84	0.989	Leading	7.63
28	FLT31-3PH	0.997	Leading	3.95	0.994	Leading	5.58	0.990	Leading	7.15	0.998	Leading	3.05	0.989	Leading	7.54
29	FLT34-3PH	0.996	Leading	4.39	0.994	Leading	5.65	0.990	Leading	7.19	0.998	Leading	3.11	0.989	Leading	7.59
30	FLT35-3PH	0.996	Leading	4.41	0.994	Leading	5.65	0.990	Leading	7.21	0.998	Leading	3.13	0.989	Leading	7.60
31	FLT36-3PH	0.996	Leading	4.41	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
32	FLT37-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
33	FLT38-3PH	0.996	Leading	4.29	0.994	Leading	5.64	0.990	Leading	7.22	0.998	Leading	3.14	0.989	Leading	7.59
34	FLT39-3PH	0.996	Leading	4.44	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
35	FLT40-3PH	0.996	Leading	4.42	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.60
36	FLT41-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.60
37	FLT43-3PH	0.995	Leading	5.19	0.994	Leading	5.72	0.990	Leading	7.21	0.998	Leading	3.17	0.989	Leading	7.62
38	FLT44-3PH	0.994	Leading	5.45	0.993	Leading	5.73	0.990	Leading	7.21	0.998	Leading	3.14	0.989	Leading	7.64
39	FLT45-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
40	FLT46-3PH	0.997	Leading	4.01	0.994	Leading	5.61	0.990	Leading	7.15	0.998	Leading	3.00	0.989	Leading	7.57
41	FLT47-3PH	0.991	Leading	6.84	0.993	Leading	5.86	0.990	Leading	7.06	0.997	Leading	3.73	0.989	Leading	7.44
42	FLT48-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
43	FLT49-3PH	0.994	Leading	5.41	0.993	Leading	5.76	0.990	Leading	7.12	0.998	Leading	3.17	0.989	Leading	7.63
44	FLT52-3PH	0.997	Leading	4.01	0.994	Leading	5.55	0.990	Leading	7.05	0.998	Leading	3.01	0.989	Leading	7.48
46	FLT54-3PH	0.997	Leading	3.93	0.994	Leading	5.55	0.990	Leading	7.10	0.998	Leading	2.93	0.989	Leading	7.48
47	FLT55-3PH	0.996	Leading	4.33	0.994	Leading	5.63	0.990	Leading	7.21	0.998	Leading	3.15	0.989	Leading	7.58
48	FLT56-3PH	0.997	Leading	4.03	0.994	Leading	5.61	0.990	Leading	7.18	0.998	Leading	3.11	0.989	Leading	7.55
49	FLT57-3PH	0.997	Leading	3.99	0.994	Leading	5.57	0.990	Leading	7.11	0.998	Leading	3.00	0.989	Leading	7.50
50	FLT58-3PH	0.997	Leading	4.03	0.994	Leading	5.61	0.990	Leading	7.18	0.998	Leading	3.11	0.989	Leading	7.54
51	FLT59-3PH	0.997	Leading	3.95	0.994	Leading	5.51	0.990	Leading	7.06	0.998	Leading	2.97	0.989	Leading	7.35
52	FLT60-3PH	0.996	Leading	4.42	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.61
53	FLT63-3PH	0.996	Leading	4.56	0.994	Leading	5.65	0.990	Leading	7.16	0.998	Leading	3.11	0.989	Leading	7.55
54	FLT64-3PH	0.996	Leading	4.29	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.58
55	FLT65-3PH	0.996	Leading	4.54	0.994	Leading	5.65	0.990	Leading	7.19	0.998	Leading	3.13	0.989	Leading	7.58
56	FLT66-3PH	0.997	Leading	4.16	0.994	Leading	5.66	0.990	Leading	7.26	0.998	Leading	3.17	0.989	Leading	7.59
57	FLT67-3PH	0.996	Leading	4.37	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
58	FLT68-3PH	0.996	Leading	4.54	0.994	Leading	5.65	0.990	Leading	7.20	0.998	Leading	3.14	0.989	Leading	7.58
59	FLT69-3PH	0.997	Leading	3.97	0.994	Leading	5.54	0.990	Leading	7.11	0.998	Leading	3.01	0.989	Leading	7.38
60	FLT70-3PH	0.996	Leading	4.44	0.994	Leading	5.66	0.990	Leading	7.24	0.998	Leading	3.18	0.989	Leading	7.64
61	FLT71-3PH	0.996	Leading	4.39	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
62	FLT72-3PH	0.996	Leading	4.57	0.994	Leading	5.66	0.990	Leading	7.20	0.998	Leading	3.16	0.989	Leading	7.59
63	FLT73-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
64	FLT74-3PH	0.996	Leading	4.43	0.994	Leading	5.66	0.990	Leading	7.22	0.998	Leading	3.15	0.989	Leading	7.60
65	FLT75-3PH	0.994	Leading	5.52	0.993	Leading	5.78	0.990	Leading	7.29	0.998	Leading	3.26	0.988	Leading	7.76
66	FLT76-3PH	0.996	Leading	4.53	0.994	Leading	5.65	0.990	Leading	7.20	0.998	Leading	3.14	0.989	Leading	7.59
67	FLT77-3PH	0.994	Leading	5.31	0.993	Leading	5.81	0.990	Leading	7.17	0.998	Leading	3.19	0.989	Leading	7.60
68	FLT84-3PH	0.996	Leading	4.64	0.994	Leading	5.67	0.990	Leading	7.26	0.998	Leading	3.22	0.989	Leading	7.63
69	FLT85-3PH	0.996	Leading	4.38	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.59
70	FLT86-3PH	0.997	Leading	3.89	0.994	Leading	5.48	0.990	Leading	7.05	0.998	Leading	2.86	0.989	Leading	7.42
71	FLT87-3PH	0.996	Leading	4.41	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
72	FLT88-3PH	0.996	Leading	4.43	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.17	0.989	Leading	7.61
73	FLT92-3PH	0.996	Leading	4.59	0.992	Leading	6.17	0.989	Leading	7.64	0.998	Leading	3.36	0.988	Leading	7.91
74	FLT93-3PH	0.999	Leading	1.90	0.998	Leading	3.32	0.995	Leading	4.94	1.000	Leading	1.18	0.995	Leading	5.01
75	FLT94-3PH	0.996	Leading	4.59	0.992	Leading	6.17	0.989	Leading	7.64	0.998	Leading	3.36	0.988	Leading	7.91

Table 5-4 (continued)
Power Factor Analysis: GEN-2015-058

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
76	FLT95-3PH	0.999	Leading	1.90	0.998	Leading	3.32	0.995	Leading	4.94	1.000	Leading	1.18	0.995	Leading	5.01
77	FLT96-3PH	0.971	Leading	12.29	0.979	Leading	10.32	0.993	Leading	5.91	0.997	Leading	3.70	0.990	Leading	7.22
78	FLT97-3PH	0.966	Lagging	-13.35	0.954	Lagging	-15.80	0.995	Lagging	-5.08	0.995	Lagging	-4.78	0.975	Lagging	-11.44
79	FLT98-3PH	0.974	Leading	11.63	0.975	Leading	11.43	0.976	Leading	11.13	0.990	Leading	7.06	0.972	Leading	12.18
80	FLT99-3PH	0.982	Leading	9.67	0.989	Leading	7.58	0.998	Leading	2.74	1.000	Leading	0.58	0.997	Leading	4.00
81	FLT100-3PH	0.962	Lagging	-14.09	0.947	Lagging	-16.88	0.989	Lagging	-7.39	0.993	Lagging	-6.13	0.964	Lagging	-13.72
82	FLT101-3PH	1.000	Leading	0.18	0.999	Leading	1.83	0.997	Leading	3.89	1.000	Leading	0.47	1.000	Leading	1.51
83	FLT102-3PH	1.000	Leading	1.22	1.000	Lagging	-0.39	0.996	Lagging	-4.31	0.994	Lagging	-5.52	0.997	Lagging	-4.19
84	FLT105-3PH	0.996	Leading	4.45	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.58
85	FLT106-3PH	0.996	Leading	4.42	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.60
86	FLT107-3PH	0.996	Leading	4.45	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.61
87	FLT108-3PH	0.996	Leading	4.44	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.61
88	FLT109-3PH	0.996	Leading	4.42	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
89	FLT110-3PH	0.996	Leading	4.42	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
90	FLT111-3PH	0.996	Leading	4.47	0.994	Leading	5.66	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.61
91	FLT112-3PH	0.996	Leading	4.58	0.994	Leading	5.67	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.61
92	FLT113-3PH	0.996	Leading	4.44	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.60
93	FLT114-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.60
94	FLT115-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
95	FLT116-3PH	0.996	Leading	4.35	0.994	Leading	5.65	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.59
96	FLT117-3PH	0.996	Leading	4.57	0.994	Leading	5.67	0.990	Leading	7.22	0.998	Leading	3.17	0.989	Leading	7.61
97	FLT118-3PH	0.996	Leading	4.42	0.994	Leading	5.66	0.990	Leading	7.24	0.998	Leading	3.17	0.989	Leading	7.62
98	FLT119-3PH	0.996	Leading	4.42	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.60
99	FLT120-3PH	0.997	Leading	4.04	0.994	Leading	5.65	0.990	Leading	7.28	0.998	Leading	3.19	0.989	Leading	7.61
100	FLT121-3PH	0.996	Leading	4.43	0.994	Leading	5.65	0.990	Leading	7.22	0.998	Leading	3.16	0.989	Leading	7.60
101	FLT126-3PH	0.997	Leading	3.87	0.994	Leading	5.54	0.990	Leading	7.12	0.998	Leading	2.97	0.989	Leading	7.38
102	FLT127-3PH	0.997	Leading	3.82	0.994	Leading	5.30	0.990	Leading	7.23	0.998	Leading	3.16	0.989	Leading	7.60
103	FLT128-3PH	0.999	Leading	2.47	0.994	Leading	5.54	0.990	Leading	7.19	0.998	Leading	3.15	0.989	Leading	7.56
104	FLT129-3PH	0.996	Leading	4.36	0.994	Leading	5.71	0.990	Leading	7.29	0.998	Leading	3.23	0.988	Leading	7.67

Study Generator GEN-2015-058

The Power Factor Analysis shows that GEN-2015-058 has a power factor range of 0.971 leading (absorbing) to 0.962 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.975 leading (absorbing) to 0.947 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.976 leading (absorbing) to 0.989 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.990 leading (absorbing) to 0.993 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.972 leading (absorbing) to 0.964 lagging (supplying) for the 2025 Summer Peak conditions.

Table 5-5
Power Factor Analysis: GEN-2015-068

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.895	Lagging	-149.15	0.934	Lagging	-114.81	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
1	FLT01-3PH	0.896	Lagging	-149.04	0.934	Lagging	-114.68	0.993	Lagging	-34.59	0.936	Lagging	-112.86	0.996	Lagging	-27.06
2	FLT02-3PH	0.896	Lagging	-149.04	0.934	Lagging	-114.73	0.993	Lagging	-34.62	0.936	Lagging	-112.89	0.996	Lagging	-27.06
3	FLT03-3PH	0.895	Lagging	-149.23	0.934	Lagging	-114.90	0.993	Lagging	-34.83	0.936	Lagging	-113.23	0.996	Lagging	-27.12
4	FLT04-3PH	0.900	Lagging	-145.63	0.936	Lagging	-112.49	0.994	Lagging	-32.39	0.938	Lagging	-110.64	0.997	Lagging	-24.43
5	FLT05-3PH	0.898	Lagging	-146.76	0.935	Lagging	-113.68	0.994	Lagging	-33.65	0.937	Lagging	-111.53	0.996	Lagging	-26.21
6	FLT06-3PH	0.896	Lagging	-149.05	0.934	Lagging	-114.71	0.993	Lagging	-34.60	0.936	Lagging	-112.83	0.996	Lagging	-27.06
7	FLT07-3PH	0.896	Lagging	-149.05	0.934	Lagging	-114.69	0.993	Lagging	-34.59	0.936	Lagging	-112.86	0.996	Lagging	-27.06
8	FLT11-3PH	0.895	Lagging	-149.21	0.934	Lagging	-114.87	0.993	Lagging	-34.69	0.936	Lagging	-112.89	0.996	Lagging	-27.10
9	FLT12-3PH	0.895	Lagging	-149.21	0.934	Lagging	-114.88	0.993	Lagging	-34.71	0.936	Lagging	-112.89	0.996	Lagging	-27.11
10	FLT13-3PH	0.895	Lagging	-149.16	0.934	Lagging	-115.11	0.993	Lagging	-34.85	0.936	Lagging	-112.88	0.996	Lagging	-27.29
11	FLT14-3PH	0.895	Lagging	-149.25	0.933	Lagging	-115.47	0.993	Lagging	-34.73	0.936	Lagging	-113.11	0.996	Lagging	-27.18
12	FLT15-3PH	0.892	Lagging	-152.00	0.928	Lagging	-120.14	0.992	Lagging	-39.06	0.932	Lagging	-116.83	0.995	Lagging	-29.54
13	FLT16-3PH	0.895	Lagging	-149.23	0.934	Lagging	-114.94	0.993	Lagging	-34.76	0.936	Lagging	-112.96	0.996	Lagging	-27.16
14	FLT17-3PH	0.895	Lagging	-149.22	0.934	Lagging	-114.99	0.993	Lagging	-34.69	0.936	Lagging	-112.94	0.996	Lagging	-27.13
15	FLT18-3PH	0.895	Lagging	-149.22	0.934	Lagging	-114.99	0.993	Lagging	-34.68	0.936	Lagging	-112.93	0.996	Lagging	-27.12
16	FLT19-3PH	0.895	Lagging	-149.15	0.934	Lagging	-114.81	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
17	FLT20-3PH	0.895	Lagging	-149.14	0.934	Lagging	-114.78	0.993	Lagging	-34.62	0.936	Lagging	-112.83	0.996	Lagging	-27.08
18	FLT21-3PH	0.895	Lagging	-149.28	0.934	Lagging	-115.16	0.993	Lagging	-34.94	0.936	Lagging	-113.08	0.996	Lagging	-27.31
19	FLT22-3PH	0.895	Lagging	-149.34	0.934	Lagging	-115.21	0.993	Lagging	-35.00	0.936	Lagging	-113.12	0.996	Lagging	-27.32
20	FLT23-3PH	0.895	Lagging	-149.28	0.934	Lagging	-115.08	0.993	Lagging	-34.88	0.936	Lagging	-113.03	0.996	Lagging	-27.23
21	FLT24-3PH	0.895	Lagging	-149.25	0.934	Lagging	-115.08	0.993	Lagging	-34.86	0.936	Lagging	-113.03	0.996	Lagging	-27.25
22	FLT25-3PH	0.895	Lagging	-149.25	0.934	Lagging	-114.95	0.994	Lagging	-34.29	0.936	Lagging	-112.90	0.996	Lagging	-27.18
23	FLT26-3PH	0.895	Lagging	-149.21	0.934	Lagging	-114.87	0.993	Lagging	-34.61	0.936	Lagging	-112.86	0.996	Lagging	-27.13
24	FLT27-3PH	0.895	Lagging	-149.20	0.934	Lagging	-114.85	0.993	Lagging	-34.64	0.936	Lagging	-112.82	0.996	Lagging	-27.10
25	FLT28-3PH	0.895	Lagging	-149.38	0.934	Lagging	-115.22	0.993	Lagging	-34.90	0.936	Lagging	-113.30	0.996	Lagging	-27.36
26	FLT29-3PH	0.892	Lagging	-152.01	0.931	Lagging	-117.47	0.993	Lagging	-36.01	0.934	Lagging	-114.79	0.995	Lagging	-28.59
27	FLT30-3PH	0.895	Lagging	-149.36	0.934	Lagging	-114.79	0.993	Lagging	-34.65	0.936	Lagging	-113.04	0.996	Lagging	-27.09
28	FLT31-3PH	0.895	Lagging	-149.27	0.934	Lagging	-115.06	0.993	Lagging	-34.75	0.936	Lagging	-113.02	0.996	Lagging	-27.23
29	FLT34-3PH	0.857	Lagging	-180.67	0.904	Lagging	-141.86	0.983	Lagging	-55.75	0.896	Lagging	-148.87	0.991	Lagging	-40.23
30	FLT35-3PH	0.879	Lagging	-162.96	0.919	Lagging	-128.72	0.988	Lagging	-46.07	0.917	Lagging	-130.78	0.995	Lagging	-30.24
31	FLT36-3PH	0.895	Lagging	-149.39	0.935	Lagging	-113.38	0.994	Lagging	-32.70	0.936	Lagging	-112.36	0.996	Lagging	-27.93
32	FLT37-3PH	0.895	Lagging	-149.15	0.934	Lagging	-114.81	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
33	FLT38-3PH	0.895	Lagging	-149.21	0.938	Lagging	-110.61	0.995	Lagging	-30.51	0.940	Lagging	-108.72	0.996	Lagging	-27.25
34	FLT39-3PH	0.896	Lagging	-149.09	0.934	Lagging	-115.03	0.993	Lagging	-34.85	0.936	Lagging	-113.05	0.996	Lagging	-27.38
35	FLT40-3PH	0.894	Lagging	-150.68	0.933	Lagging	-116.06	0.993	Lagging	-35.68	0.934	Lagging	-114.67	0.996	Lagging	-27.51
36	FLT41-3PH	0.894	Lagging	-150.22	0.933	Lagging	-116.07	0.993	Lagging	-35.74	0.934	Lagging	-114.49	0.996	Lagging	-27.61
37	FLT43-3PH	0.790	Lagging	-233.00	0.857	Lagging	-180.17	0.957	Lagging	-90.46	0.839	Lagging	-194.94	0.965	Lagging	-81.17
38	FLT44-3PH	0.738	Lagging	-274.40	0.838	Lagging	-195.14	0.952	Lagging	-97.00	0.782	Lagging	-238.95	0.965	Lagging	-82.02
39	FLT45-3PH	0.895	Lagging	-149.15	0.934	Lagging	-114.81	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
40	FLT46-3PH	0.871	Lagging	-169.41	0.924	Lagging	-124.16	0.987	Lagging	-48.02	0.917	Lagging	-130.08	0.998	Lagging	-18.29
41	FLT47-3PH	0.916	Lagging	-131.83	0.954	Lagging	-94.79	0.985	Lagging	-52.38	0.915	Lagging	-132.51	0.988	Lagging	-46.19
42	FLT48-3PH	0.895	Lagging	-149.15	0.934	Lagging	-114.81	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
43	FLT49-3PH	0.746	Lagging	-267.45	0.709	Lagging	-298.72	0.859	Lagging	-178.61	0.791	Lagging	-232.07	0.913	Lagging	-133.91
44	FLT52-3PH	0.861	Lagging	-176.90	0.897	Lagging	-147.63	0.980	Lagging	-61.65	0.899	Lagging	-146.14	0.990	Lagging	-42.05
46	FLT54-3PH	0.846	Lagging	-188.91	0.900	Lagging	-145.15	0.982	Lagging	-57.31	0.888	Lagging	-155.76	0.992	Lagging	-38.80
47	FLT55-3PH	0.895	Lagging	-149.31	0.933	Lagging	-115.31	0.993	Lagging	-35.06	0.936	Lagging	-113.14	0.996	Lagging	-27.37
48	FLT56-3PH	0.893	Lagging	-151.54	0.929	Lagging	-119.87	0.992	Lagging	-38.84	0.932	Lagging	-116.71	0.995	Lagging	-28.92
49	FLT57-3PH	0.878	Lagging	-163.46	0.912	Lagging	-135.29	0.985	Lagging	-52.66	0.915	Lagging	-132.41	0.994	Lagging	-33.89
50	FLT58-3PH	0.892	Lagging	-151.72	0.928	Lagging	-120.25	0.992	Lagging	-39.15	0.932	Lagging	-117.00	0.995	Lagging	-29.06
51	FLT59-3PH	0.898	Lagging	-147.21	0.933	Lagging	-115.56	0.993	Lagging	-34.74	0.937	Lagging	-111.59	0.997	Lagging	-24.56
52	FLT60-3PH	0.895	Lagging	-149.41	0.934	Lagging	-115.10	0.993	Lagging	-35.70	0.935	Lagging	-113.52	0.996	Lagging	-27.28
53	FLT63-3PH	0.894	Lagging	-150.08	0.932	Lagging	-116.50	0.993	Lagging	-35.48	0.935	Lagging	-113.38	0.996	Lagging	-28.13
54	FLT64-3PH	0.894	Lagging	-150.27	0.933	Lagging	-116.04	0.993	Lagging	-35.31	0.935	Lagging	-113.33	0.996	Lagging	-27.95
55	FLT65-3PH	0.895	Lagging	-149.68	0.933	Lagging	-115.82	0.993	Lagging	-35.09	0.936	Lagging	-113.10	0.996	Lagging	-27.62
56	FLT66-3PH	0.893	Lagging	-151.02	0.932	Lagging	-117.09	0.993	Lagging	-36.53	0.934	Lagging	-115.23	0.995	Lagging	-28.81
57	FLT67-3PH	0.895	Lagging	-149.64	0.933	Lagging	-115.61	0.993	Lagging	-35.25	0.935	Lagging	-113.55	0.996	Lagging	-27.67
58	FLT68-3PH	0.895	Lagging	-149.39	0.933	Lagging	-115.48	0.993	Lagging	-34.82	0.936	Lagging	-112.85	0.996	Lagging	-27.38
59	FLT69-3PH	0.897	Lagging	-147.54	0.935	Lagging	-113.92	0.994	Lagging	-33.77	0.937	Lagging	-111.90	0.997	Lagging	-24.45
60	FLT70-3PH	0.895	Lagging	-149.51	0.933	Lagging	-115.68	0.993	Lagging	-35.20	0.935	Lagging	-113.32	0.996	Lagging	-27.43
61	FLT71-3PH	0.895	Lagging	-149.69	0.934	Lagging	-115.16	0.993	Lagging	-34.95	0.936	Lagging	-113.17	0.996	Lagging	-27.25
62	FLT72-3PH	0.895	Lagging	-149.58	0.932	Lagging	-116.30	0.993	Lagging	-35.51	0.936	Lagging	-113.12	0.996	Lagging	-27.60
63	FLT73-3PH	0.895	Lagging	-149.15	0.934	Lagging	-114.81	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
64	FLT74-3PH	0.895	Lagging	-149.15	0.933	Lagging	-115.42	0.993	Lagging	-35.12	0.936	Lagging	-113.30	0.996	Lagging	-27.35
65	FLT75-3PH	0.888	Lagging	-155.74	0.926	Lagging	-122.10	0.991	Lagging	-40.16	0.930	Lagging	-118.27	0.995	Lagging	-28.90
66	FLT76-3PH	0.895	Lagging	-149.33	0.933	Lagging	-115.40	0.993	Lagging	-34.76	0.936	Lagging	-112.82	0.996	Lagging	-27.33
67	FLT77-3PH	0.894	Lagging	-150.12	0.932	Lagging	-117.14	0.993	Lagging	-36.48	0.935	Lagging	-113.88	0.995	Lagging	-29.63
68	FLT84-3PH	0.910	Lagging	-136.61	0.947	Lagging	-101.81	0.997	Lagging	-22.15	0.949	Lagging	-99.25	0.997	Lagging	-22.43
69	FLT85-3PH	0.895	Lagging	-149.59	0.941	Lagging	-107.79	0.995	Lagging	-29.51	0.943	Lagging	-106.18	0.996	Lagging	-28.07
70	FLT86-3PH	0.898	Lagging	-147.10	0.942	Lagging	-106.76	0.996	Lagging	-25.21	0.944	Lagging	-104.93	0.997	Lagging	-23.98
71	FLT87-3PH	0.896	Lagging	-149.09	0.941	Lagging	-108.12	0.994	Lagging	-32.95	0.939	Lagging	-110.36	0.996	Lagging	-27.22
72	FLT88-3PH	0.895	Lagging	-149.47	0.935	Lagging	-113.33	0.994	Lagging	-33.87	0.937	Lagging	-111.97	0.996	Lagging	-27.96
73	FLT92-3PH	0.885	Lagging	-157.50	0.929	Lagging	-119.77	0.992	Lagging	-38.63	0.931	Lagging	-117.66	0.995	Lagging	-30.66
74	FLT93-3PH	0.906	Lagging	-139.88	0.942	Lagging	-107.28	0.995	Lagging	-29.45	0.942	Lagging	-106.65	0.998	Lagging	-20.88
75	FLT94-3PH	0.885	Lagging	-157.54	0.929	Lagging	-119.81	0.992	Lagging	-38.65	0.931	Lagging	-117.70	0.995	Lagging	-30.67

Table 5-5 (continued)
Power Factor Analysis: GEN-2015-068

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
76	FLT95-3PH	0.906	Lagging	-139.93	0.942	Lagging	-107.36	0.995	Lagging	-29.51	0.942	Lagging	-106.72	0.998	Lagging	-20.92
77	FLT96-3PH	0.896	Lagging	-149.08	0.934	Lagging	-114.73	0.993	Lagging	-34.63	0.936	Lagging	-112.83	0.996	Lagging	-27.07
78	FLT97-3PH	0.896	Lagging	-149.09	0.934	Lagging	-114.89	0.993	Lagging	-34.57	0.936	Lagging	-112.77	0.996	Lagging	-27.20
79	FLT98-3PH	0.895	Lagging	-149.19	0.934	Lagging	-114.85	0.993	Lagging	-34.65	0.936	Lagging	-112.87	0.996	Lagging	-27.11
80	FLT99-3PH	0.896	Lagging	-149.06	0.934	Lagging	-114.73	0.993	Lagging	-34.65	0.936	Lagging	-112.84	0.996	Lagging	-27.07
81	FLT100-3PH	0.895	Lagging	-149.20	0.934	Lagging	-114.95	0.993	Lagging	-34.61	0.936	Lagging	-112.81	0.996	Lagging	-27.22
82	FLT101-3PH	0.895	Lagging	-149.20	0.934	Lagging	-114.91	0.993	Lagging	-34.71	0.936	Lagging	-112.93	0.996	Lagging	-27.19
83	FLT102-3PH	0.896	Lagging	-148.85	0.934	Lagging	-114.51	0.993	Lagging	-34.63	0.936	Lagging	-112.77	0.996	Lagging	-27.03
84	FLT105-3PH	0.894	Lagging	-150.12	0.935	Lagging	-113.88	0.994	Lagging	-33.34	0.937	Lagging	-111.65	0.996	Lagging	-27.53
85	FLT106-3PH	0.894	Lagging	-150.61	0.934	Lagging	-114.52	0.993	Lagging	-35.52	0.936	Lagging	-113.13	0.996	Lagging	-28.09
86	FLT107-3PH	0.895	Lagging	-149.43	0.933	Lagging	-115.64	0.993	Lagging	-36.18	0.936	Lagging	-112.90	0.996	Lagging	-27.02
87	FLT108-3PH	0.894	Lagging	-150.05	0.937	Lagging	-111.57	0.994	Lagging	-32.71	0.935	Lagging	-113.67	0.996	Lagging	-26.93
88	FLT109-3PH	0.895	Lagging	-149.14	0.934	Lagging	-114.84	0.993	Lagging	-34.67	0.936	Lagging	-112.87	0.996	Lagging	-27.10
89	FLT110-3PH	0.895	Lagging	-149.13	0.934	Lagging	-114.83	0.993	Lagging	-34.65	0.936	Lagging	-112.86	0.996	Lagging	-27.09
90	FLT111-3PH	0.895	Lagging	-149.77	0.934	Lagging	-115.19	0.993	Lagging	-34.92	0.936	Lagging	-113.06	0.996	Lagging	-27.17
91	FLT112-3PH	0.895	Lagging	-149.80	0.933	Lagging	-115.63	0.993	Lagging	-35.22	0.936	Lagging	-113.18	0.996	Lagging	-27.42
92	FLT113-3PH	0.895	Lagging	-149.42	0.934	Lagging	-114.92	0.993	Lagging	-34.47	0.936	Lagging	-112.90	0.996	Lagging	-27.16
93	FLT114-3PH	0.895	Lagging	-149.18	0.934	Lagging	-115.07	0.993	Lagging	-34.77	0.936	Lagging	-112.84	0.996	Lagging	-27.16
94	FLT115-3PH	0.895	Lagging	-149.15	0.934	Lagging	-114.81	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
95	FLT116-3PH	0.896	Lagging	-148.90	0.934	Lagging	-114.90	0.993	Lagging	-34.47	0.936	Lagging	-112.70	0.996	Lagging	-26.83
96	FLT117-3PH	0.895	Lagging	-149.78	0.933	Lagging	-116.10	0.993	Lagging	-35.35	0.936	Lagging	-113.18	0.996	Lagging	-27.38
97	FLT118-3PH	0.895	Lagging	-149.20	0.934	Lagging	-114.83	0.993	Lagging	-34.43	0.936	Lagging	-112.85	0.996	Lagging	-26.78
98	FLT119-3PH	0.895	Lagging	-149.25	0.934	Lagging	-114.85	0.993	Lagging	-34.85	0.936	Lagging	-113.05	0.996	Lagging	-27.25
99	FLT120-3PH	0.896	Lagging	-148.88	0.934	Lagging	-114.31	0.994	Lagging	-33.91	0.936	Lagging	-112.41	0.996	Lagging	-26.58
100	FLT121-3PH	0.895	Lagging	-149.24	0.934	Lagging	-115.00	0.993	Lagging	-34.81	0.936	Lagging	-112.98	0.996	Lagging	-27.22
101	FLT126-3PH	0.891	Lagging	-152.67	0.930	Lagging	-118.42	0.993	Lagging	-36.47	0.934	Lagging	-114.64	0.995	Lagging	-29.99
102	FLT127-3PH	0.895	Lagging	-149.51	0.934	Lagging	-114.75	0.993	Lagging	-34.64	0.936	Lagging	-112.86	0.996	Lagging	-27.09
103	FLT128-3PH	0.892	Lagging	-151.62	0.934	Lagging	-115.19	0.994	Lagging	-34.10	0.936	Lagging	-112.49	0.996	Lagging	-26.70
104	FLT129-3PH	0.895	Lagging	-149.24	0.934	Lagging	-114.98	0.993	Lagging	-34.80	0.936	Lagging	-113.03	0.996	Lagging	-27.29

Study Generator GEN-2015-068

The Power Factor Analysis shows that GEN-2015-068 has a power factor range of 0.738 to 0.916 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.709 to 0.954 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.859 to 0.997 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.782 to 0.949 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.913 to 0.998 lagging (supplying) for the 2025 Summer Peak conditions.

Table 5-6
Power Factor Analysis: GEN-2015-075

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
1	FLT01-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
2	FLT02-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
3	FLT03-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
4	FLT04-3PH	0.997	Leading	3.72	0.996	Leading	4.20	0.999	Leading	1.74	0.999	Leading	2.12	0.999	Leading	2.49
5	FLT05-3PH	0.997	Leading	3.71	0.997	Leading	4.19	0.999	Leading	1.73	0.999	Leading	2.11	0.999	Leading	2.50
6	FLT06-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
7	FLT07-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
8	FLT11-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.11	0.999	Leading	2.51
9	FLT12-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.72	0.999	Leading	2.11	0.999	Leading	2.51
10	FLT13-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
11	FLT14-3PH	0.997	Leading	3.68	0.997	Leading	4.16	0.999	Leading	1.71	0.999	Leading	2.10	0.999	Leading	2.49
12	FLT15-3PH	0.997	Leading	3.59	0.997	Leading	4.07	0.999	Leading	1.65	0.999	Leading	2.04	0.999	Leading	2.50
13	FLT16-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
14	FLT17-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
15	FLT18-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
16	FLT19-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
17	FLT20-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
18	FLT21-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
19	FLT22-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
20	FLT23-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
21	FLT24-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
22	FLT25-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
23	FLT26-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
24	FLT27-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
25	FLT28-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
26	FLT29-3PH	0.997	Leading	3.64	0.997	Leading	4.14	0.999	Leading	1.72	0.999	Leading	2.09	0.999	Leading	2.52
27	FLT30-3PH	0.997	Leading	3.67	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
28	FLT31-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
29	FLT34-3PH	0.998	Leading	3.07	0.997	Leading	3.80	1.000	Leading	1.45	0.999	Leading	1.70	0.999	Leading	2.47
30	FLT35-3PH	0.998	Leading	3.32	0.997	Leading	3.88	1.000	Leading	1.51	0.999	Leading	1.87	0.999	Leading	2.47
31	FLT36-3PH	0.997	Leading	3.57	0.997	Leading	4.01	1.000	Leading	1.55	0.999	Leading	2.00	0.999	Leading	2.27
32	FLT37-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
33	FLT38-3PH	0.997	Leading	3.75	0.996	Leading	4.26	0.999	Leading	1.80	0.999	Leading	2.13	0.999	Leading	2.49
34	FLT39-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.11	0.999	Leading	2.51
35	FLT40-3PH	0.997	Leading	3.66	0.997	Leading	4.15	0.999	Leading	1.71	0.999	Leading	2.09	0.999	Leading	2.50
36	FLT41-3PH	0.997	Leading	3.66	0.997	Leading	4.16	0.999	Leading	1.71	0.999	Leading	2.08	0.999	Leading	2.51
37	FLT43-3PH	0.999	Leading	2.72	0.997	Leading	3.66	1.000	Leading	1.40	0.999	Leading	1.59	0.999	Leading	2.54
38	FLT44-3PH	0.999	Leading	1.94	0.998	Leading	3.40	1.000	Leading	1.37	1.000	Leading	1.19	0.999	Leading	2.55
39	FLT45-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
40	FLT46-3PH	0.996	Leading	4.26	0.996	Leading	4.49	0.999	Leading	1.91	0.999	Leading	2.47	0.999	Leading	2.53
41	FLT47-3PH	0.999	Leading	1.98	0.998	Leading	3.11	1.000	Leading	0.88	1.000	Leading	1.03	0.999	Leading	2.38
42	FLT48-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
43	FLT49-3PH	0.999	Leading	2.45	0.999	Leading	2.41	1.000	Leading	0.78	1.000	Leading	1.39	0.999	Leading	2.51
44	FLT52-3PH	0.998	Leading	2.94	0.997	Leading	3.63	1.000	Leading	1.28	0.999	Leading	1.61	0.999	Leading	2.45
46	FLT54-3PH	0.999	Leading	2.57	0.997	Leading	3.59	1.000	Leading	1.32	1.000	Leading	1.35	0.999	Leading	2.41
47	FLT55-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
48	FLT56-3PH	0.997	Leading	3.57	0.997	Leading	4.01	0.999	Leading	1.62	0.999	Leading	2.03	0.999	Leading	2.48
49	FLT57-3PH	0.998	Leading	3.11	0.997	Leading	3.72	1.000	Leading	1.36	0.999	Leading	1.71	0.999	Leading	2.46
50	FLT58-3PH	0.997	Leading	3.56	0.997	Leading	4.00	0.999	Leading	1.61	0.999	Leading	2.02	0.999	Leading	2.48
51	FLT59-3PH	0.998	Leading	2.92	0.998	Leading	3.15	1.000	Leading	0.85	0.999	Leading	1.64	1.000	Leading	1.48
52	FLT60-3PH	0.997	Leading	3.70	0.996	Leading	4.29	0.999	Leading	1.77	0.999	Leading	2.11	0.999	Leading	2.54
53	FLT63-3PH	0.998	Leading	3.51	0.997	Leading	4.03	0.999	Leading	1.63	0.999	Leading	1.98	0.999	Leading	2.43
54	FLT64-3PH	0.997	Leading	3.75	0.996	Leading	4.27	0.999	Leading	1.77	0.999	Leading	2.19	0.999	Leading	2.55
55	FLT65-3PH	0.997	Leading	3.55	0.997	Leading	4.07	0.999	Leading	1.66	0.999	Leading	2.02	0.999	Leading	2.46
56	FLT66-3PH	0.997	Leading	3.61	0.997	Leading	4.02	0.999	Leading	1.60	0.999	Leading	2.00	0.999	Leading	2.33
57	FLT67-3PH	0.997	Leading	3.67	0.997	Leading	4.15	0.999	Leading	1.70	0.999	Leading	2.08	0.999	Leading	2.48
58	FLT68-3PH	0.997	Leading	3.56	0.997	Leading	4.09	0.999	Leading	1.67	0.999	Leading	2.03	0.999	Leading	2.47
59	FLT69-3PH	0.997	Leading	3.60	0.997	Leading	4.09	0.999	Leading	1.66	0.999	Leading	2.04	0.999	Leading	2.42
60	FLT70-3PH	0.997	Leading	3.62	0.997	Leading	4.09	0.999	Leading	1.69	0.999	Leading	2.05	0.999	Leading	2.31
61	FLT71-3PH	0.997	Leading	3.62	0.997	Leading	4.14	0.999	Leading	1.69	0.999	Leading	2.07	0.999	Leading	2.47
62	FLT72-3PH	0.997	Leading	3.69	0.997	Leading	3.95	1.000	Leading	1.53	0.999	Leading	2.08	0.999	Leading	2.28
63	FLT73-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
64	FLT74-3PH	0.997	Leading	3.68	0.997	Leading	4.13	0.999	Leading	1.69	0.999	Leading	2.07	0.999	Leading	2.48
65	FLT75-3PH	0.998	Leading	3.08	0.998	Leading	3.21	1.000	Leading	0.89	1.000	Leading	1.50	0.999	Leading	1.64
66	FLT76-3PH	0.997	Leading	3.57	0.997	Leading	4.09	0.999	Leading	1.68	0.999	Leading	2.03	0.999	Leading	2.47
67	FLT77-3PH	0.997	Leading	3.56	0.997	Leading	4.00	0.999	Leading	1.63	0.999	Leading	2.05	0.999	Leading	2.36
68	FLT84-3PH	0.997	Leading	3.93	0.996	Leading	4.38	0.999	Leading	1.85	0.999	Leading	2.29	0.999	Leading	2.53
69	FLT85-3PH	1.000	Leading	0.93	0.999	Leading	2.48	1.000	Leading	0.71	1.000	Leading	1.40	1.000	Leading	0.69
70	FLT86-3PH	0.998	Leading	3.13	0.997	Leading	3.85	1.000	Leading	1.54	0.999	Leading	1.60	0.999	Leading	2.30
71	FLT87-3PH	0.997	Leading	3.76	0.996	Leading	4.26	0.999	Leading	1.72	0.999	Leading	1.99	0.999	Leading	2.44
72	FLT88-3PH	0.998	Leading	3.48	0.997	Leading	3.62	1.000	Leading	1.21	0.999	Leading	1.96	0.999	Leading	2.30
73	FLT92-3PH	0.997	Leading	3.55	0.997	Leading	4.08	0.999	Leading	1.69	0.999	Leading	2.03	0.999	Leading	2.54
74	FLT93-3PH	0.997	Leading	3.78	0.996	Leading	4.24	0.999	Leading	1.73	0.999	Leading	2.14	0.999	Leading	2.41
75	FLT94-3PH	0.997	Leading	3.55	0.997	Leading	4.08	0.999	Leading	1.69	0.999	Leading	2.03	0.999	Leading	2.54

Table 5-6 (continued)
Power Factor Analysis: GEN-2015-075

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
76	FLT95-3PH	0.997	Leading	3.78	0.996	Leading	4.24	0.999	Leading	1.73	0.999	Leading	2.14	0.999	Leading	2.41
77	FLT96-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
78	FLT97-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
79	FLT98-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
80	FLT99-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
81	FLT100-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
82	FLT101-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
83	FLT102-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
84	FLT105-3PH	0.994	Leading	5.60	0.990	Leading	7.10	0.996	Leading	4.69	0.995	Leading	4.93	0.994	Leading	5.43
85	FLT106-3PH	0.998	Lagging	-3.19	1.000	Leading	0.38	0.999	Lagging	-2.10	1.000	Lagging	-0.65	0.995	Lagging	-4.96
86	FLT107-3PH	0.994	Leading	5.28	0.996	Leading	4.62	0.999	Leading	2.56	0.999	Leading	2.03	0.996	Leading	4.75
87	FLT108-3PH	0.994	Leading	5.43	0.988	Leading	7.90	0.996	Leading	4.63	1.000	Leading	0.50	0.989	Leading	7.42
88	FLT109-3PH	0.997	Leading	3.65	0.997	Leading	4.14	0.999	Leading	1.70	0.999	Leading	2.09	0.999	Leading	2.50
89	FLT110-3PH	0.997	Leading	3.66	0.997	Leading	4.15	0.999	Leading	1.71	0.999	Leading	2.10	0.999	Leading	2.50
90	FLT111-3PH	0.997	Leading	3.91	0.996	Leading	4.23	0.999	Leading	1.76	0.999	Leading	2.19	0.999	Leading	2.47
91	FLT112-3PH	0.997	Leading	3.93	0.996	Leading	4.20	0.999	Leading	1.78	0.999	Leading	2.20	0.999	Leading	2.54
92	FLT113-3PH	0.997	Leading	3.76	0.996	Leading	4.29	0.999	Leading	1.87	0.999	Leading	2.12	0.999	Leading	2.69
93	FLT114-3PH	0.997	Leading	3.66	0.997	Leading	4.11	0.999	Leading	1.68	0.999	Leading	2.10	0.999	Leading	2.44
94	FLT115-3PH	0.997	Leading	3.68	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
95	FLT116-3PH	0.997	Leading	3.58	0.997	Leading	3.97	1.000	Leading	1.57	0.999	Leading	2.10	0.999	Leading	2.40
96	FLT117-3PH	0.997	Leading	3.74	0.997	Leading	3.93	1.000	Leading	1.47	0.999	Leading	2.03	0.999	Leading	2.15
97	FLT118-3PH	0.997	Leading	3.67	0.997	Leading	4.13	0.999	Leading	1.68	0.999	Leading	2.09	0.999	Leading	2.43
98	FLT119-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.74	0.999	Leading	2.10	0.999	Leading	2.52
99	FLT120-3PH	0.997	Leading	3.75	0.996	Leading	4.28	0.999	Leading	1.82	0.999	Leading	2.17	0.999	Leading	2.63
100	FLT121-3PH	0.997	Leading	3.67	0.997	Leading	4.17	0.999	Leading	1.72	0.999	Leading	2.10	0.999	Leading	2.51
101	FLT126-3PH	0.997	Leading	3.56	0.997	Leading	4.05	0.999	Leading	1.63	0.999	Leading	1.98	0.999	Leading	2.37
102	FLT127-3PH	0.997	Leading	3.68	0.997	Leading	4.19	0.999	Leading	1.73	0.999	Leading	2.10	0.999	Leading	2.51
103	FLT128-3PH	0.997	Leading	3.68	0.997	Leading	4.17	0.999	Leading	1.73	0.999	Leading	2.11	0.999	Leading	2.51
104	FLT129-3PH	0.997	Leading	3.69	0.997	Leading	4.18	0.999	Leading	1.73	0.999	Leading	2.12	0.999	Leading	2.52

Study Generator GEN-2015-075

The Power Factor Analysis shows that GEN-2015-075 has a power factor range of 0.994 leading (absorbing) to 0.998 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.988 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.996 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.995 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.989 leading (absorbing) to 0.995 lagging (supplying) for the 2025 Summer Peak conditions.

Table 5-7
Power Factor Analysis: GEN-2015-079

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
1	FLT01-3PH	0.998	Leading	9.09	0.999	Leading	4.75	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
2	FLT02-3PH	0.998	Leading	9.09	0.999	Leading	4.75	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
3	FLT03-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.71	0.998	Leading	9.12	0.996	Leading	10.87
4	FLT04-3PH	0.997	Leading	9.36	0.999	Leading	5.20	0.998	Leading	9.02	0.997	Leading	9.26	0.997	Leading	10.68
5	FLT05-3PH	0.997	Leading	9.28	0.999	Leading	4.97	0.998	Leading	8.87	0.997	Leading	9.22	0.997	Leading	10.82
6	FLT06-3PH	0.998	Leading	9.09	0.999	Leading	4.74	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
7	FLT07-3PH	0.998	Leading	9.09	0.999	Leading	4.75	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
8	FLT11-3PH	0.998	Leading	9.07	0.999	Leading	4.70	0.998	Leading	8.68	0.998	Leading	9.13	0.996	Leading	10.84
9	FLT12-3PH	0.998	Leading	9.07	0.999	Leading	4.70	0.998	Leading	8.67	0.998	Leading	9.12	0.997	Leading	10.84
10	FLT13-3PH	0.998	Leading	9.08	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.14	0.996	Leading	10.86
11	FLT14-3PH	0.998	Leading	9.06	0.999	Leading	4.74	0.998	Leading	8.71	0.998	Leading	9.11	0.997	Leading	10.82
12	FLT15-3PH	0.998	Leading	8.82	0.999	Leading	4.34	0.998	Leading	8.42	0.998	Leading	8.91	0.997	Leading	10.71
13	FLT16-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
14	FLT17-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
15	FLT18-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
16	FLT19-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
17	FLT20-3PH	0.998	Leading	9.08	0.999	Leading	4.73	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
18	FLT21-3PH	0.998	Leading	9.07	0.999	Leading	4.70	0.998	Leading	8.70	0.998	Leading	9.13	0.996	Leading	10.86
19	FLT22-3PH	0.998	Leading	9.06	0.999	Leading	4.69	0.998	Leading	8.68	0.998	Leading	9.12	0.996	Leading	10.85
20	FLT23-3PH	0.998	Leading	9.06	0.999	Leading	4.70	0.998	Leading	8.69	0.998	Leading	9.12	0.996	Leading	10.86
21	FLT24-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
22	FLT25-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.73	0.998	Leading	9.13	0.996	Leading	10.87
23	FLT26-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
24	FLT27-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
25	FLT28-3PH	0.998	Leading	9.06	0.999	Leading	4.69	0.998	Leading	8.69	0.998	Leading	9.11	0.996	Leading	10.86
26	FLT29-3PH	0.998	Leading	8.67	1.000	Leading	4.01	0.998	Leading	8.21	0.998	Leading	8.85	0.996	Leading	10.89
27	FLT30-3PH	0.998	Leading	9.05	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.12	0.996	Leading	10.87
28	FLT31-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
29	FLT34-3PH	0.998	Leading	8.04	1.000	Leading	4.08	0.998	Leading	8.33	0.998	Leading	8.42	0.997	Leading	10.72
30	FLT35-3PH	0.998	Leading	8.53	0.999	Leading	4.35	0.998	Leading	8.47	0.998	Leading	8.76	0.997	Leading	10.81
31	FLT36-3PH	0.998	Leading	9.06	0.999	Leading	4.76	0.998	Leading	8.75	0.998	Leading	9.12	0.996	Leading	10.85
32	FLT37-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
33	FLT38-3PH	0.998	Leading	8.96	0.999	Leading	4.66	0.998	Leading	8.65	0.998	Leading	8.97	0.997	Leading	10.77
34	FLT39-3PH	0.998	Leading	9.09	0.999	Leading	4.73	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
35	FLT40-3PH	0.998	Leading	9.03	0.999	Leading	4.69	0.998	Leading	8.70	0.998	Leading	9.10	0.996	Leading	10.86
36	FLT41-3PH	0.998	Leading	9.05	0.999	Leading	4.70	0.998	Leading	8.70	0.998	Leading	9.11	0.996	Leading	10.87
37	FLT43-3PH	0.998	Leading	7.51	1.000	Leading	3.84	0.998	Leading	8.33	0.998	Leading	8.34	0.997	Leading	10.64
38	FLT44-3PH	0.999	Leading	5.96	1.000	Leading	3.33	0.998	Leading	8.37	0.998	Leading	7.53	0.997	Leading	10.76
39	FLT45-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
40	FLT46-3PH	0.998	Leading	7.30	1.000	Leading	3.52	0.998	Leading	8.18	0.998	Leading	7.84	0.997	Leading	10.80
41	FLT47-3PH	0.996	Leading	11.68	0.999	Leading	4.64	0.999	Leading	5.75	0.997	Leading	9.25	0.998	Leading	7.62
42	FLT48-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
43	FLT49-3PH	0.999	Leading	7.06	1.000	Leading	1.21	0.998	Leading	7.25	0.998	Leading	8.00	0.997	Leading	10.40
44	FLT52-3PH	0.998	Leading	7.35	1.000	Leading	3.08	0.998	Leading	7.45	0.998	Leading	7.74	0.997	Leading	10.12
46	FLT54-3PH	0.999	Leading	6.76	1.000	Leading	3.14	0.998	Leading	7.60	0.998	Leading	7.28	0.997	Leading	10.21
47	FLT55-3PH	0.998	Leading	9.08	0.999	Leading	4.73	0.998	Leading	8.73	0.998	Leading	9.15	0.996	Leading	10.88
48	FLT56-3PH	0.998	Leading	8.56	1.000	Leading	3.94	0.998	Leading	8.05	0.998	Leading	8.63	0.997	Leading	10.37
49	FLT57-3PH	0.998	Leading	7.50	1.000	Leading	3.08	0.998	Leading	7.40	0.998	Leading	7.69	0.997	Leading	10.14
50	FLT58-3PH	0.998	Leading	8.52	1.000	Leading	3.88	0.998	Leading	8.00	0.998	Leading	8.59	0.997	Leading	10.34
51	FLT59-3PH	0.999	Leading	5.97	1.000	Leading	1.31	0.999	Leading	4.84	0.999	Leading	5.76	0.999	Leading	6.77
52	FLT60-3PH	0.998	Leading	9.03	0.999	Leading	4.67	0.998	Leading	8.46	0.998	Leading	8.99	0.997	Leading	10.83
53	FLT63-3PH	0.999	Leading	5.93	1.000	Leading	1.44	0.999	Leading	6.10	0.999	Leading	6.67	0.998	Leading	7.92
54	FLT64-3PH	0.998	Leading	8.08	1.000	Leading	2.72	0.999	Leading	7.05	0.998	Leading	7.52	0.998	Leading	8.06
55	FLT65-3PH	0.999	Leading	6.92	1.000	Leading	2.64	0.998	Leading	7.43	0.998	Leading	7.73	0.997	Leading	9.26
56	FLT66-3PH	0.998	Leading	8.75	0.999	Leading	6.13	0.998	Leading	8.84	0.997	Leading	9.58	0.996	Leading	11.33
57	FLT67-3PH	0.998	Leading	8.99	0.999	Leading	4.78	0.998	Leading	8.73	0.997	Leading	9.23	0.996	Leading	10.96
58	FLT68-3PH	0.998	Leading	7.29	1.000	Leading	3.07	0.998	Leading	7.98	0.998	Leading	8.21	0.997	Leading	9.80
59	FLT69-3PH	0.999	Leading	6.29	1.000	Leading	2.29	0.999	Leading	6.27	0.999	Leading	6.19	0.997	Leading	9.19
60	FLT70-3PH	0.997	Leading	9.57	0.999	Leading	5.10	0.998	Leading	8.78	0.997	Leading	9.89	0.995	Leading	12.30
61	FLT71-3PH	0.998	Leading	8.67	0.999	Leading	4.58	0.998	Leading	8.56	0.998	Leading	8.92	0.997	Leading	10.66
62	FLT72-3PH	0.998	Leading	8.58	1.000	Leading	3.44	0.998	Leading	7.32	0.998	Leading	8.59	0.997	Leading	9.63
63	FLT73-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
64	FLT74-3PH	0.998	Leading	9.08	0.999	Leading	4.19	0.998	Leading	8.16	0.998	Leading	8.60	0.997	Leading	10.35
65	FLT75-3PH	0.997	Leading	9.70	0.999	Leading	6.53	0.996	Leading	11.15	0.997	Leading	9.83	0.993	Leading	15.09
66	FLT76-3PH	0.998	Leading	7.47	1.000	Leading	3.22	0.998	Leading	8.14	0.998	Leading	8.38	0.997	Leading	9.94
67	FLT77-3PH	0.986	Leading	21.94	0.982	Leading	24.87	0.984	Leading	23.02	0.989	Leading	19.11	0.971	Leading	31.76
68	FLT84-3PH	0.997	Leading	9.71	0.999	Leading	5.37	0.998	Leading	9.10	0.997	Leading	9.68	0.996	Leading	11.06
69	FLT85-3PH	0.998	Leading	8.92	0.999	Leading	4.34	0.998	Leading	8.38	0.998	Leading	8.96	0.997	Leading	10.18
70	FLT86-3PH	0.998	Leading	7.10	1.000	Leading	2.64	0.999	Leading	6.90	0.999	Leading	6.88	0.997	Leading	9.57
71	FLT87-3PH	0.998	Leading	9.15	0.999	Leading	4.80	0.998	Leading	8.72	0.998	Leading	9.07	0.997	Leading	10.81
72	FLT88-3PH	0.998	Leading	9.10	0.999	Leading	4.74	0.998	Leading	8.69	0.998	Leading	9.15	0.997	Leading	10.83
73	FLT92-3PH	0.998	Leading	7.29	1.000	Leading	2.38	0.999	Leading	6.85	0.998	Leading	7.74	0.997	Leading	10.74
74	FLT93-3PH	0.997	Leading	9.34	0.999	Leading	5.74	0.998	Leading	9.10	0.998	Leading	9.03	0.997	Leading	9.29
75	FLT94-3PH	0.998	Leading	7.28	1.000	Leading	2.37	0.999	Leading	6.85	0.998	Leading	7.74	0.997	Leading	10.74

Table 5-7 (continued)
Power Factor Analysis: GEN-2015-079

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
76	FLT95-3PH	0.997	Leading	9.34	0.999	Leading	5.73	0.998	Leading	9.10	0.998	Leading	9.03	0.997	Leading	9.29
77	FLT96-3PH	0.998	Leading	9.08	0.999	Leading	4.73	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
78	FLT97-3PH	0.998	Leading	9.09	0.999	Leading	4.73	0.998	Leading	8.74	0.998	Leading	9.15	0.996	Leading	10.87
79	FLT98-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
80	FLT99-3PH	0.998	Leading	9.09	0.999	Leading	4.74	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.86
81	FLT100-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.74	0.998	Leading	9.15	0.996	Leading	10.87
82	FLT101-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
83	FLT102-3PH	0.998	Leading	9.11	0.999	Leading	4.76	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.84
84	FLT105-3PH	0.998	Leading	8.66	0.999	Leading	4.31	0.998	Leading	8.34	0.998	Leading	8.93	0.997	Leading	10.14
85	FLT106-3PH	0.998	Leading	8.75	0.999	Leading	4.66	0.998	Leading	8.54	0.998	Leading	9.09	0.997	Leading	10.53
86	FLT107-3PH	0.997	Leading	9.16	0.999	Leading	4.76	0.998	Leading	8.80	0.998	Leading	9.14	0.996	Leading	11.09
87	FLT108-3PH	0.997	Leading	9.30	0.999	Leading	5.10	0.998	Leading	8.99	0.998	Leading	8.98	0.996	Leading	11.28
88	FLT109-3PH	0.998	Leading	9.06	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.12	0.996	Leading	10.85
89	FLT110-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
90	FLT111-3PH	0.998	Leading	8.53	0.999	Leading	4.53	0.998	Leading	8.60	0.998	Leading	8.87	0.996	Leading	10.87
91	FLT112-3PH	0.998	Leading	8.80	0.999	Leading	4.23	0.998	Leading	8.29	0.998	Leading	8.83	0.997	Leading	10.60
92	FLT113-3PH	0.998	Leading	8.95	0.999	Leading	4.58	0.998	Leading	8.52	0.998	Leading	9.04	0.997	Leading	10.61
93	FLT114-3PH	0.998	Leading	9.06	0.999	Leading	4.61	0.998	Leading	8.63	0.998	Leading	9.13	0.997	Leading	10.73
94	FLT115-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
95	FLT116-3PH	0.998	Leading	9.07	0.999	Leading	4.74	0.998	Leading	8.72	0.998	Leading	9.11	0.997	Leading	10.81
96	FLT117-3PH	0.998	Leading	8.72	0.999	Leading	4.32	0.998	Leading	8.36	0.998	Leading	8.87	0.997	Leading	10.63
97	FLT118-3PH	0.998	Leading	9.07	0.999	Leading	5.11	0.997	Leading	9.27	0.997	Leading	9.37	0.996	Leading	11.68
98	FLT119-3PH	0.998	Leading	9.00	0.999	Leading	4.68	0.998	Leading	8.57	0.998	Leading	9.01	0.997	Leading	10.73
99	FLT120-3PH	0.997	Leading	10.04	0.999	Leading	6.01	0.997	Leading	10.16	0.997	Leading	10.33	0.996	Leading	12.28
100	FLT121-3PH	0.998	Leading	9.05	0.999	Leading	4.68	0.998	Leading	8.67	0.998	Leading	9.10	0.997	Leading	10.82
101	FLT126-3PH	0.999	Lagging	-5.95	0.996	Lagging	-12.14	0.999	Lagging	-6.56	1.000	Lagging	-3.40	0.994	Lagging	-14.22
102	FLT127-3PH	0.998	Leading	9.01	0.999	Leading	4.58	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
103	FLT128-3PH	0.998	Leading	8.73	1.000	Leading	3.93	0.998	Leading	8.94	0.997	Leading	9.21	0.996	Leading	10.93
104	FLT129-3PH	0.998	Leading	9.10	0.999	Leading	4.65	0.998	Leading	8.64	0.998	Leading	9.12	0.997	Leading	10.79

Study Generator GEN-2015-079

The Power Factor Analysis shows that GEN-2015-079 has a power factor range of 0.986 leading (absorbing) to 0.999 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.982 leading (absorbing) to 0.996 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.984 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.989 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.971 leading (absorbing) to 0.994 lagging (supplying) for the 2025 Summer Peak conditions.

Table 5-8
Power Factor Analysis: GEN-2015-080

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
1	FLT01-3PH	0.998	Leading	9.09	0.999	Leading	4.75	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
2	FLT02-3PH	0.998	Leading	9.09	0.999	Leading	4.75	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
3	FLT03-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.71	0.998	Leading	9.12	0.996	Leading	10.87
4	FLT04-3PH	0.997	Leading	9.36	0.999	Leading	5.20	0.998	Leading	9.02	0.997	Leading	9.26	0.997	Leading	10.68
5	FLT05-3PH	0.997	Leading	9.28	0.999	Leading	4.97	0.998	Leading	8.87	0.997	Leading	9.22	0.997	Leading	10.82
6	FLT06-3PH	0.998	Leading	9.09	0.999	Leading	4.74	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
7	FLT07-3PH	0.998	Leading	9.09	0.999	Leading	4.75	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
8	FLT11-3PH	0.998	Leading	9.07	0.999	Leading	4.70	0.998	Leading	8.68	0.998	Leading	9.13	0.996	Leading	10.84
9	FLT12-3PH	0.998	Leading	9.07	0.999	Leading	4.70	0.998	Leading	8.67	0.998	Leading	9.12	0.997	Leading	10.84
10	FLT13-3PH	0.998	Leading	9.08	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.14	0.996	Leading	10.86
11	FLT14-3PH	0.998	Leading	9.06	0.999	Leading	4.74	0.998	Leading	8.71	0.998	Leading	9.11	0.997	Leading	10.82
12	FLT15-3PH	0.998	Leading	8.82	0.999	Leading	4.34	0.998	Leading	8.42	0.998	Leading	8.91	0.997	Leading	10.71
13	FLT16-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
14	FLT17-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
15	FLT18-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
16	FLT19-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
17	FLT20-3PH	0.998	Leading	9.08	0.999	Leading	4.73	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
18	FLT21-3PH	0.998	Leading	9.07	0.999	Leading	4.70	0.998	Leading	8.70	0.998	Leading	9.13	0.996	Leading	10.86
19	FLT22-3PH	0.998	Leading	9.06	0.999	Leading	4.69	0.998	Leading	8.68	0.998	Leading	9.12	0.996	Leading	10.85
20	FLT23-3PH	0.998	Leading	9.06	0.999	Leading	4.70	0.998	Leading	8.69	0.998	Leading	9.12	0.996	Leading	10.86
21	FLT24-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
22	FLT25-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.73	0.998	Leading	9.13	0.996	Leading	10.87
23	FLT26-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
24	FLT27-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
25	FLT28-3PH	0.998	Leading	9.06	0.999	Leading	4.69	0.998	Leading	8.69	0.998	Leading	9.11	0.996	Leading	10.86
26	FLT29-3PH	0.998	Leading	8.67	1.000	Leading	4.01	0.998	Leading	8.21	0.998	Leading	8.85	0.996	Leading	10.89
27	FLT30-3PH	0.998	Leading	9.05	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.12	0.996	Leading	10.87
28	FLT31-3PH	0.998	Leading	9.07	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
29	FLT34-3PH	0.998	Leading	8.04	1.000	Leading	4.08	0.998	Leading	8.33	0.998	Leading	8.42	0.997	Leading	10.72
30	FLT35-3PH	0.998	Leading	8.53	0.999	Leading	4.35	0.998	Leading	8.47	0.998	Leading	8.76	0.997	Leading	10.81
31	FLT36-3PH	0.998	Leading	9.06	0.999	Leading	4.76	0.998	Leading	8.75	0.998	Leading	9.12	0.996	Leading	10.85
32	FLT37-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
33	FLT38-3PH	0.998	Leading	8.96	0.999	Leading	4.66	0.998	Leading	8.65	0.998	Leading	8.97	0.997	Leading	10.77
34	FLT39-3PH	0.998	Leading	9.09	0.999	Leading	4.73	0.998	Leading	8.73	0.998	Leading	9.14	0.996	Leading	10.87
35	FLT40-3PH	0.998	Leading	9.03	0.999	Leading	4.69	0.998	Leading	8.70	0.998	Leading	9.10	0.996	Leading	10.86
36	FLT41-3PH	0.998	Leading	9.05	0.999	Leading	4.70	0.998	Leading	8.70	0.998	Leading	9.11	0.996	Leading	10.87
37	FLT43-3PH	0.998	Leading	7.51	1.000	Leading	3.84	0.998	Leading	8.33	0.998	Leading	8.34	0.997	Leading	10.64
38	FLT44-3PH	0.999	Leading	5.96	1.000	Leading	3.33	0.998	Leading	8.37	0.998	Leading	7.53	0.997	Leading	10.76
39	FLT45-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
40	FLT46-3PH	0.998	Leading	7.30	1.000	Leading	3.52	0.998	Leading	8.18	0.998	Leading	7.84	0.997	Leading	10.80
41	FLT47-3PH	0.996	Leading	11.68	0.999	Leading	4.64	0.999	Leading	5.75	0.997	Leading	9.25	0.998	Leading	7.62
42	FLT48-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
43	FLT49-3PH	0.999	Leading	7.06	1.000	Leading	1.21	0.998	Leading	7.25	0.998	Leading	8.00	0.997	Leading	10.40
44	FLT52-3PH	0.998	Leading	7.35	1.000	Leading	3.08	0.998	Leading	7.45	0.998	Leading	7.74	0.997	Leading	10.12
46	FLT54-3PH	0.999	Leading	6.76	1.000	Leading	3.14	0.998	Leading	7.60	0.998	Leading	7.28	0.997	Leading	10.21
47	FLT55-3PH	0.998	Leading	9.08	0.999	Leading	4.73	0.998	Leading	8.73	0.998	Leading	9.15	0.996	Leading	10.88
48	FLT56-3PH	0.998	Leading	8.56	1.000	Leading	3.94	0.998	Leading	8.05	0.998	Leading	8.63	0.997	Leading	10.37
49	FLT57-3PH	0.998	Leading	7.50	1.000	Leading	3.08	0.998	Leading	7.40	0.998	Leading	7.69	0.997	Leading	10.14
50	FLT58-3PH	0.998	Leading	8.52	1.000	Leading	3.88	0.998	Leading	8.00	0.998	Leading	8.59	0.997	Leading	10.34
51	FLT59-3PH	0.999	Leading	5.97	1.000	Leading	1.31	0.999	Leading	4.84	0.999	Leading	5.76	0.999	Leading	6.77
52	FLT60-3PH	0.998	Leading	9.03	0.999	Leading	4.67	0.998	Leading	8.46	0.998	Leading	8.99	0.997	Leading	10.83
53	FLT63-3PH	0.999	Leading	5.93	1.000	Leading	1.44	0.999	Leading	6.10	0.999	Leading	6.67	0.998	Leading	7.92
54	FLT64-3PH	0.998	Leading	8.08	1.000	Leading	2.72	0.999	Leading	7.05	0.998	Leading	7.52	0.998	Leading	8.06
55	FLT65-3PH	0.999	Leading	6.92	1.000	Leading	2.64	0.998	Leading	7.43	0.998	Leading	7.73	0.997	Leading	9.26
56	FLT66-3PH	0.998	Leading	8.75	0.999	Leading	6.13	0.998	Leading	8.84	0.997	Leading	9.58	0.996	Leading	11.33
57	FLT67-3PH	0.998	Leading	8.99	0.999	Leading	4.78	0.998	Leading	8.73	0.997	Leading	9.23	0.996	Leading	10.96
58	FLT68-3PH	0.998	Leading	7.29	1.000	Leading	3.07	0.998	Leading	7.98	0.998	Leading	8.21	0.997	Leading	9.80
59	FLT69-3PH	0.999	Leading	6.29	1.000	Leading	2.29	0.999	Leading	6.27	0.999	Leading	6.19	0.997	Leading	9.19
60	FLT70-3PH	0.997	Leading	9.57	0.999	Leading	5.10	0.998	Leading	8.78	0.997	Leading	9.89	0.995	Leading	12.30
61	FLT71-3PH	0.998	Leading	8.67	0.999	Leading	4.58	0.998	Leading	8.56	0.998	Leading	8.92	0.997	Leading	10.66
62	FLT72-3PH	0.998	Leading	8.58	1.000	Leading	3.44	0.998	Leading	7.32	0.998	Leading	8.59	0.997	Leading	9.63
63	FLT73-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
64	FLT74-3PH	0.998	Leading	9.08	0.999	Leading	4.19	0.998	Leading	8.16	0.998	Leading	8.60	0.997	Leading	10.35
65	FLT75-3PH	0.997	Leading	9.70	0.999	Leading	6.53	0.996	Leading	11.15	0.997	Leading	9.83	0.993	Leading	15.09
66	FLT76-3PH	0.998	Leading	7.47	1.000	Leading	3.22	0.998	Leading	8.14	0.998	Leading	8.38	0.997	Leading	9.94
67	FLT77-3PH	0.986	Leading	21.94	0.982	Leading	24.87	0.984	Leading	23.02	0.989	Leading	19.11	0.971	Leading	31.76
68	FLT84-3PH	0.997	Leading	9.71	0.999	Leading	5.37	0.998	Leading	9.10	0.997	Leading	9.68	0.996	Leading	11.06
69	FLT85-3PH	0.998	Leading	8.92	0.999	Leading	4.34	0.998	Leading	8.38	0.998	Leading	8.96	0.997	Leading	10.18
70	FLT86-3PH	0.998	Leading	7.10	1.000	Leading	2.64	0.999	Leading	6.90	0.999	Leading	6.88	0.997	Leading	9.57
71	FLT87-3PH	0.998	Leading	9.15	0.999	Leading	4.80	0.998	Leading	8.72	0.998	Leading	9.07	0.997	Leading	10.81
72	FLT88-3PH	0.998	Leading	9.10	0.999	Leading	4.74	0.998	Leading	8.69	0.998	Leading	9.15	0.997	Leading	10.83
73	FLT92-3PH	0.998	Leading	7.29	1.000	Leading	2.38	0.999	Leading	6.85	0.998	Leading	7.74	0.997	Leading	10.74
74	FLT93-3PH	0.997	Leading	9.34	0.999	Leading	5.74	0.998	Leading	9.10	0.998	Leading	9.03	0.997	Leading	9.29
75	FLT94-3PH	0.998	Leading	7.28	1.000	Leading	2.37	0.999	Leading	6.85	0.998	Leading	7.74	0.997	Leading	10.74

Table 5-8 (continued)
Power Factor Analysis: GEN-2015-080

Cont. No.	Case	2016 Winter Peak			2017 Summer Peak			2020 Summer Peak			2020 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
76	FLT95-3PH	0.997	Leading	9.34	0.999	Leading	5.73	0.998	Leading	9.10	0.998	Leading	9.03	0.997	Leading	9.29
77	FLT96-3PH	0.998	Leading	9.08	0.999	Leading	4.73	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
78	FLT97-3PH	0.998	Leading	9.09	0.999	Leading	4.73	0.998	Leading	8.74	0.998	Leading	9.15	0.996	Leading	10.87
79	FLT98-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
80	FLT99-3PH	0.998	Leading	9.09	0.999	Leading	4.74	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.86
81	FLT100-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.74	0.998	Leading	9.15	0.996	Leading	10.87
82	FLT101-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
83	FLT102-3PH	0.998	Leading	9.11	0.999	Leading	4.76	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.84
84	FLT105-3PH	0.998	Leading	8.66	0.999	Leading	4.31	0.998	Leading	8.34	0.998	Leading	8.93	0.997	Leading	10.14
85	FLT106-3PH	0.998	Leading	8.75	0.999	Leading	4.66	0.998	Leading	8.54	0.998	Leading	9.09	0.997	Leading	10.53
86	FLT107-3PH	0.997	Leading	9.16	0.999	Leading	4.76	0.998	Leading	8.80	0.998	Leading	9.14	0.996	Leading	11.09
87	FLT108-3PH	0.997	Leading	9.30	0.999	Leading	5.10	0.998	Leading	8.99	0.998	Leading	8.98	0.996	Leading	11.28
88	FLT109-3PH	0.998	Leading	9.06	0.999	Leading	4.71	0.998	Leading	8.71	0.998	Leading	9.12	0.996	Leading	10.85
89	FLT110-3PH	0.998	Leading	9.07	0.999	Leading	4.72	0.998	Leading	8.71	0.998	Leading	9.13	0.996	Leading	10.86
90	FLT111-3PH	0.998	Leading	8.53	0.999	Leading	4.53	0.998	Leading	8.60	0.998	Leading	8.87	0.996	Leading	10.87
91	FLT112-3PH	0.998	Leading	8.80	0.999	Leading	4.23	0.998	Leading	8.29	0.998	Leading	8.83	0.997	Leading	10.60
92	FLT113-3PH	0.998	Leading	8.95	0.999	Leading	4.58	0.998	Leading	8.52	0.998	Leading	9.04	0.997	Leading	10.61
93	FLT114-3PH	0.998	Leading	9.06	0.999	Leading	4.61	0.998	Leading	8.63	0.998	Leading	9.13	0.997	Leading	10.73
94	FLT115-3PH	0.998	Leading	9.08	0.999	Leading	4.72	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
95	FLT116-3PH	0.998	Leading	9.07	0.999	Leading	4.74	0.998	Leading	8.72	0.998	Leading	9.11	0.997	Leading	10.81
96	FLT117-3PH	0.998	Leading	8.72	0.999	Leading	4.32	0.998	Leading	8.36	0.998	Leading	8.87	0.997	Leading	10.63
97	FLT118-3PH	0.998	Leading	9.07	0.999	Leading	5.11	0.997	Leading	9.27	0.997	Leading	9.37	0.996	Leading	11.68
98	FLT119-3PH	0.998	Leading	9.00	0.999	Leading	4.68	0.998	Leading	8.57	0.998	Leading	9.01	0.997	Leading	10.73
99	FLT120-3PH	0.997	Leading	10.04	0.999	Leading	6.01	0.997	Leading	10.16	0.997	Leading	10.33	0.996	Leading	12.28
100	FLT121-3PH	0.998	Leading	9.05	0.999	Leading	4.68	0.998	Leading	8.67	0.998	Leading	9.10	0.997	Leading	10.82
101	FLT126-3PH	0.999	Lagging	-5.95	0.996	Lagging	-12.14	0.999	Lagging	-6.56	1.000	Lagging	-3.40	0.994	Lagging	-14.22
102	FLT127-3PH	0.998	Leading	9.01	0.999	Leading	4.58	0.998	Leading	8.72	0.998	Leading	9.14	0.996	Leading	10.87
103	FLT128-3PH	0.998	Leading	8.73	1.000	Leading	3.93	0.998	Leading	8.94	0.997	Leading	9.21	0.996	Leading	10.93
104	FLT129-3PH	0.998	Leading	9.10	0.999	Leading	4.65	0.998	Leading	8.64	0.998	Leading	9.12	0.997	Leading	10.79

Study Generator GEN-2015-080

The Power Factor Analysis shows that GEN-2015-080 has a power factor range of 0.986 leading (absorbing) to 0.999 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.982 leading (absorbing) to 0.996 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.984 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.989 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.971 leading (absorbing) to 0.994 lagging (supplying) for the 2025 Summer Peak conditions.

SECTION 6: LOW WIND/NO WIND ANALYSIS

The objective of this task was to determine the impact of low wind or no wind conditions/solar irradiance on wind farms and solar farms, respectively. The 2016 Winter Peak, 2017 Summer Peak, 2020 Summer Peak, 2020 Winter Peak, and 2025 Summer Peak power flows provided by SPP were examined for this analysis.

6.1 Approach

Low/no wind and low/no solar irradiance conditions were examined for all renewable interconnections. Generators were disabled (independently), but the collector systems remained in-service. In order to maintain generation and load balance in the SPP area, the generation was scaled after disabling the respective generator. The amount of reactive power injected into the transmission network was recorded at the respective point of interconnection. This reactive power comes from the capacitance of the project's transmission lines and collector cables. A shunt reactor was added at the high side bus to bring the Mvar flow into the POI down to approximately zero.

6.2 Low Wind/No Wind Analysis Results

The reactance needed to bring the Mvar flow into the point of interconnect to zero Mvar was recorded for each season for renewable interconnections. Refer to Table 6-1 for the results of this analysis. The table lists the generators examined and the amount of reactive power needed for zero Mvar flow into the POI for each season.

Table 6-1
Low Wind/No Wind Analysis

Request	Size (MW)	Point of Interconnection	Reactor Size (Mvar)				
			16WP	17SP	20SP	20WP	25SP
GEN-2015-020	100	Oasis 115kV	0.6	0.6	0.6	0.6	0.6
GEN-2015-031	300	Swisher to Amarillo South 230 kV	6.1	6.1	6.1	6.1	6.1
GEN-2015-056	101	Crossroads 345kV	8.6	8.6	8.6	8.6	8.6
GEN-2015-058	50	Atoka 115kV	0.4	0.4	0.4	0.4	0.4
GEN-2015-068	300	Tuco 345kV	58.0	58.0	58.0	58.0	58.0
GEN-2015-075	50	Carlisle 69kV	3.9	3.9	3.9	3.9	3.9
GEN-2015-079	129.2	Tap Yoakum to Hobbs 230 kV	1.0	1.0	1.0	1.0	1.0
GEN-2015-080	129.2	Tap Yoakum to Hobbs 230 kV	1.0	1.0	1.0	1.0	1.0

SECTION 7: CONCLUSIONS

Summary of Stability Analysis

The Stability Analysis determined that there were multiple contingencies across all seasons that resulted in system/voltage instability, generation tripping offline, and poor post-fault voltage recovery when all generation interconnection requests were at 100% output.

To mitigate the system/voltage instability, voltage violations, generation tripping offline, and poor post-fault steady-state voltages, the following upgrades were provided by SPP and implemented in each season:

- Tuco – Yoakum – Hobbs 345kV circuit #1 (**16WP and 17SP**)
- Yoakum 345/230 kV transformer and Hobbs 345/230 kV transformer (**16WP and 17SP**)
- GEN-2014-074 345/34.5 kV transformer low side tap ratio set to 0.95 p.u.
- OKU Reactive Power Support
  - +/- 100 Mvar SVC
- Border Reactive Power Support (600 Mvar total)
  - +300 Mvar SVC
  - 300 Mvar capacitor bank
- Seminole – Mustang 115 kV circuit #1

Note for GEN-2015-058, for a three-phase fault at the point of interconnection (Atoka 115 kV), the TMEIC photovoltaic inverter model (ITMEIC) tripped offline due to over frequency protection and over voltage protection. For this study, the over frequency and over voltage protection were set to 75 Hz and 1.8 p.u., respectively, to avoid instantaneous tripping. It is recommended the supplier of the TMEIC photovoltaic inverter model examine this model for three-phase faults that cause the model to trip on over frequency and over voltage protection.

After implementing the above upgrades, the contingency analysis was re-simulated for all contingencies. With the upgrades, the Stability Analysis determined that there was no wind turbine tripping or system instability observed as a result of interconnecting all study projects at 100% output.

Summary of the Short Circuit Analysis

The short circuit analysis was performed on the 2017 Summer Peak and 2025 Summer Peak power flows for all study projects. Refer to Table 7-1 and Table 7-2 for a list of maximum fault currents observed for each study project for the 17SP and 25SP cases, respectively.

Table 7-1
2017SP: List of Maximum Fault Currents Observed for Each Study Project

Study Project	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-020	9.57	25.84	Tolk East/West	230 kV
GEN-2015-031	9.03	30.52	LP - Cook	69 kV
GEN-2015-056	5.42	26.24	Cunnigham	115 kV
GEN-2015-058	6.59	26.24	Cunnigham	115 kV
GEN-2015-068	13.36	30.52	LP - Cook	69 kV
GEN-2015-075	2.57	25.84	Tolk East	230 kV
GEN-2015-079	8.97	29.89	Hobbs Int	115 kV
GEN-2015-080	8.97	29.89	Hobbs Int	115 kV

Table 7-2
2025SP: List of Maximum Fault Currents Observed for Each Study Project

Study Project	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-020	9.75	26.48	Tolk East/West	230 kV
GEN-2015-031	9.05	34.97	LP - Cook	69 kV
GEN-2015-056	5.48	29.66	Cunnigham	115 kV
GEN-2015-058	6.97	29.66	Cunnigham	115 kV
GEN-2015-068	13.55	34.97	LP - Cook	69 kV
GEN-2015-075	2.58	26.48	Tolk East	230 kV
GEN-2015-079	9.26	32.92	Hobbs Int	115 kV
GEN-2015-080	9.26	32.92	Hobbs Int	115 kV

Summary of Power Factor Analysis

The upgrades identified in the Stability Analysis were implemented in the power flow cases and utilized for the Power Factor Analysis.

Study Generator GEN-2015-020

The Power Factor Analysis shows that GEN-2015-020 has a power factor range of 0.970 leading (absorbing) to 0.990 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.973 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.979 leading (absorbing) to 1.00 (unity) for the 2020 Summer Peak conditions, a power factor range of 0.973 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.976 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-031

The Power Factor Analysis shows that GEN-2015-031 has a power factor range of 0.983 leading (absorbing) to 0.784 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.991 leading (absorbing) to 0.646 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.991 leading (absorbing) to 0.744 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.979 leading (absorbing) to 0.840 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.997 leading (absorbing) to 0.782 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-056

The Power Factor Analysis shows that GEN-2015-056 has a power factor range of 0.997 leading (absorbing) to 0.965 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.998 lagging (supplying) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.983 lagging (supplying) to 1.00 (unity) for the 2020 Summer Peak conditions, a power factor range of 0.998 leading (absorbing) to 0.974 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.979 lagging (supplying) to 1.00 (unity) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-058

The Power Factor Analysis shows that GEN-2015-058 has a power factor range of 0.971 leading (absorbing) to 0.962 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.975 leading (absorbing) to 0.947 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.976 leading (absorbing) to 0.989 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.990 leading (absorbing) to 0.993 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.972 leading (absorbing) to 0.964 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-068

The Power Factor Analysis shows that GEN-2015-068 has a power factor range of 0.738 to 0.916 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.709 to 0.954 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.859 to 0.997 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.782 to 0.949 lagging (supplying) for the 2020 Winter Peak conditions, and a power factor range of 0.913 to 0.998 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-075

The Power Factor Analysis shows that GEN-2015-075 has a power factor range of 0.994 leading (absorbing) to 0.998 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.988 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, a power factor range of 0.996 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.995 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.989 leading (absorbing) to 0.995 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-079

The Power Factor Analysis shows that GEN-2015-079 has a power factor range of 0.986 leading (absorbing) to 0.999 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.982 leading (absorbing) to 0.996 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.984 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.989 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.971 leading (absorbing) to 0.994 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-080

The Power Factor Analysis shows that GEN-2015-080 has a power factor range of 0.986 leading (absorbing) to 0.999 lagging (supplying) for the 2016 Winter Peak conditions, a power factor range of 0.982 leading (absorbing) to 0.996 lagging (supplying) for the 2017 Summer Peak conditions, a power factor range of 0.984 leading (absorbing) to 0.999 lagging (supplying) for the 2020 Summer Peak conditions, a power factor range of 0.989 leading (absorbing) to 1.00 (unity) for the 2020 Winter Peak conditions, and a power factor range of 0.971 leading (absorbing) to 0.994 lagging (supplying) for the 2025 Summer Peak conditions.

Summary of the Low/No Wind Analysis

The amount of reactive power injected into the transmission network was recorded at the point of interconnection for each wind and solar powered interconnection request for each season. The maximum reactance needed for zero Mvar flow was 58 Mvar for GEN-2015-068 (Tuco 345 kV). The minimum reactance needed for zero Mvar flow was 0.4 Mvar for GEN-2015-058 (Atoka 115 kV).

11.16 M: Group 9 Dynamic Stability Analysis Report

See next page

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Southwest Power Pool, Inc. (SPP)

DISIS-2015-002-1 (Group 09) Definitive Impact Study

Final Report

PXE-1304
Revision #00

August 2016

Submitted By:
Mitsubishi Electric Power Products, Inc. (MEPPI)
Power Systems Engineering Services Department
Warrendale, PA

Title: **DISIS-2015-002-1 (Group 09) Definitive Impact Study: Final Report PXE-1304**
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EXECUTIVE SUMMARY

SPP requested a Definitive Interconnection System Impact Study (DISIS). The DISIS required a Stability Analysis, Short-circuit Analysis, Power Factor Analysis, and Low Wind/No Wind Analysis detailing the impacts of the interconnecting projects as shown in Table ES-1.

Table ES-1
Interconnection Projects Evaluated

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2015-053	50.0	GE 1.79 MW (584913) (wind)	Antelope 115 kV (640521)
GEN-2015-076	158.4	Vestas 3.3-117 3.3 MW (585133, 585136) (wind)	Belden 115 kV (640080)
GEN-2015-087	66.0	Vestas V100 2.0 MW (585233) (wind)	Tap on Fairbury (640169) to Hebron (640218) 115 kV
GEN-2015-088	300.0	Vestas V100 2.0 MW (585243) (wind)	Tap on Moore (640277) to Pauline (640312) 345 kV

SUMMARY OF STABILITY ANALYSIS

The Stability Analysis determined there were no contingencies that resulted in system instability or generation tripping offline for the examined seasonal peak conditions when all generation interconnection requests were at 100% output.

However, it was determined that two contingencies, FLT39-3PH, which is the loss of the Fairbry7 to Harbine7 115 kV line and FLT120-3PH, which is the loss of the McCool to Grand Island 345 kV line, resulted in post-contingency generator power swings for all seasonal peak conditions at FAIRBRYG and BROKENBG, respectively. After discussion with SPP, it was determined that this was a pre-existing issue for FLT39-3PH as it was still present in the contingency even with the GEN-2015-087 out of service. Similarly, for FLT120-3PH, it was determined that this was a pre-existing issue as it was still present in the contingency even with all four study generators out of service.

SUMMARY OF THE SHORT-CIRCUIT ANALYSIS

The Short-Circuit Analysis was performed on the 2017 Summer Peak and 2025 Summer Peak power flows for all study projects. Refer to Table ES-2 for a list of maximum fault currents observed for each study project for the 2017 Summer Peak case. Refer to Table ES-3 for a list of maximum fault currents observed for each study project for the 2025 Summer Peak case.

Table ES-2
List of Maximum Fault Currents Observed for Each Study Project for the 2017 Summer Peak Case

Study Project	POI Name	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-053	Antelope 115kV (640521)	13.13	29.97	S1251 5	161
GEN-2015-076	Belden 115kV (640080)	6.67	29.97	S1251 5	161
GEN-2015-087	Tap on Fairbury (640169) to Hebron (640218) 115kV	5.37	31.65	SHELDON7	115
GEN-2015-088	Tap on Moore (640277) to Pauline (640312) 345kV	10.57	39.11	S1206 5	115

Table ES-3
List of Maximum Fault Currents Observed for Each Study Project for the 2025 Summer Peak Case

Study Project	POI Name	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-053	Antelope 115kV (640521)	13.38	30.89	S1251 5	161
GEN-2015-076	Belden 115kV (640080)	6.68	30.88	S1251 5	161
GEN-2015-087	Tap on Fairbury (640169) to Hebron (640218) 115kV	5.37	32.60	SHELDON7	115
GEN-2015-088	Tap on Moore (640277) to Pauline (640312) 345kV	10.62	40.47	S1206 5	161

SUMMARY OF POWER FACTOR ANALYSIS

Study Generator GEN-2015-053

The Power Factor Analysis shows that GEN-2015-053 has a power factor range of 0.613 to 0.882 leading (absorbing) for the 2016 Winter Peak conditions, a power factor range of 0.654 to 0.969 leading (absorbing) for the 2017 Summer Peak conditions, and a power factor range of 0.645 to 0.982 leading (absorbing) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-076

The Power Factor Analysis shows that GEN-2015-076 has a power factor range of 0.975 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.985 lagging (supplying) to 0.998 leading (absorbing) for the 2017 Summer Peak conditions, and a power factor range of 0.985 lagging (supplying) to 0.998 leading (absorbing) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-087

The Power Factor Analysis shows that GEN-2015-087 has a power factor range of 0.978 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.955 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, and a power factor range of 0.917 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-088

The Power Factor Analysis shows that GEN-2015-088 has a power factor range of 0.956 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.948 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, and a power factor range of 0.966 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

SUMMARY OF LOW WIND/NO WIND ANALYSIS

The amount of reactive power injected into the transmission network was recorded at the high side of the transformer near the point of interconnection for all study projects for each season. The maximum reactance needed for zero Mvar flow was -22.20 Mvar for GEN-2015-088. The minimum reactance needed for zero Mvar flow was -3.20 Mvar for GEN-2015-053.

Table of Contents

SECTION 1: OBJECTIVES

The objective of this report is to provide Southwest Power Pool, Inc. (SPP) with the deliverables for the "DISIS-2015-002-1 (Group 09) Definitive Impact Study." SPP requested an Interconnection System Impact Study for four (4) generation interconnections for 2016 Winter Peak, 2017 Summer Peak, and 2025 Summer Peak, which requires a Stability Analysis, Short-circuit Analysis, Power Factor Analysis, Low Wind/No Wind Analysis, and an Impact Study Report.

SECTION 2: BACKGROUND

The Siemens Power Technologies International PSS/E power system simulation program Version 32.2.0 was used for this study. SPP provided the stability database cases for 2016 Winter Peak, 2017 Summer Peak, and 2025 Summer Peak conditions and a list of contingencies to be examined. The model includes the study projects shown in Table 2-1 and the previously queued projects listed in Table 2-2. Refer to Appendix A for the steady-state and dynamic model data for the study projects. A power flow one-line diagram for each generation interconnection project is shown in Figures 2-1 through 2-4. Note that the one-line diagrams represent the 2016 Winter Peak case.

The Stability Analysis determined the impacts of the new interconnecting projects 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 will be investigated. Three-phase faults and single line-to-ground faults will be examined as listed in Table 2-3. Note that all contingencies listed were examined for the Cluster Scenario.

A Short-circuit Analysis was performed on the 2017 Summer Peak and 2025 Summer Peak study years for each study generator. The study was performed five buses out from the study generator's point of interconnection and results were documented.

The Power Factor Analysis determined the power factor at the high side of the transformer near the point of interconnection for the wind or solar interconnection projects for pre-contingency and post-contingency conditions. The N-1, three phase contingencies listed in Table 2-3 were used in the Power Factor analysis.

The Low Wind/No Wind Analysis was completed for all wind and solar farm interconnections. This analysis determined if reactive support is needed to have a Mvar flow of approximately zero at the point of interconnection (POI).

Table 2-1
Interconnection Projects Evaluated

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2015-053	50.0	GE 1.79 MW (584913) (wind)	Antelope 115 kV (640521)
GEN-2015-076	158.4	Vestas 3.3-117 3.3 MW (585133, 585136) (wind)	Belden 115 kV (640080)
GEN-2015-087	66.0	Vestas V100 2.0 MW (585233) (wind)	Tap on Fairbury (640169) to Hebron (640218) 115 kV
GEN-2015-088	300.0	Vestas V100 2.0 MW (585243) (wind)	Tap on Moore (640277) to Pauline (640312) 345 kV

Table 2-2
Previously Queued Nearby Interconnection Projects Included

Request	Size (MW)	Generator Model (Gen Bus Number)	Point of Interconnection
GEN-2003-021N	75	Vestas 1.65 MW (640026)	Tap on the Ainsworth – Calamus 115kV line (640050)
GEN-2004-023N	75	GENROU (640028)	Columbus 115kV (640119)
GEN-2006-020N	42	Vestas V90 VCUS 1.8 & 3.0 MW (640421,640441)	Bloomfield 115kV (640084)
GEN-2006-037N1	75	GE 1.7MW (640499)	Broken Bow 115kV (640089)
GEN-2006-038N005	79.5	GE 1.6MW (640428)	Broken Bow 115kV (640089)
GEN-2006-038N019	79.5	GE 1.5MW (640431)	Petersburg 115kV (640444)
GEN-2006-044N	40.5	GE 1.5MW (645062)	Petersburg 115kV (640444)
GEN-2007-011N08	81	Vestas V90 VCRS 3.0MW (640418)	Bloomfield 115kV (640084)
GEN-2008-086N02/ GEN-2014-032	211.22	GE 100m 1.79MW (645063 and 645064)	Meadow Grove 230kV (GEN-2008-086N02 POI) (640540)
GEN-2008-119O	60	GE 1.5MW (645061)	S1399 161kV (646399)
GEN-2008-123N	89.7	GE 100m 1.79MW, GE 103m 1.72MW (572054)	Tap on the Pauline – Guide Rock 115kV (560137)
GEN-2009-040	73.8	Vestas V100 VCSS 2.0MW (532904)	Marshall 115kV (533303)
GEN-2010-041	10.5	GE 1.5MW (580071)	S1399 161kV (646399)
GEN-2010-051	200	GE 100m 1.7MW (580014, 580017, 580020)	Tap on the Twin Church – Hoskins 230kV line (560347)
GEN-2011-018 (replaced by GEN-2013-008)	73.6	GE 100m 1.7MW (640555)	Steele County 115kV (640426)
GEN-2011-027	120	GE 1.85MW (580022, 580021, 580023)	Tap Twin Church-Hoskins 230kV (560347)
GEN-2011-056	3.6 MW increase (Pgen=21.6MW)	GENSAL (640013)	Jeffrey 115kV (640238)
GEN-2011-056A	3.6 MW increase (Pgen=21.6MW)	GENSAL (640014)	Johnson 1 115kV (640240)
GEN-2011-056B	4.5 MW increase (Pgen=23.5MW)	GENSAL (640015)	Johnson 2 115kV (640242)
GEN-2012-021	4.8 MW	GENROU (650010)	84th & Bluff 115kV (650275)
GEN-2013-002	50.6	Siemens 108m 2.3MW (583703)	Tap Sheldon - SW7&Bennet - Folsom/Pleasant Hill 115kV (560746)
GEN-2013-008	1.2MW increase to GEN-2011-018 (Pgen=74.8MW)	GE 100m 1.7MW (640555)	Steele City (640426) 115kV
GEN-2013-014	25.5	GE 100m 1.7MW (583643)	Tap Pauline (640313) – Guide Rock (640206) 115kV (560137)
GEN-2013-019	73.6	Siemens 108m 2.3MW (583703)	Tap Sheldon - SW7&Bennet - Folsom/Pleasant Hill 115kV (560746)
GEN-2013-032	204	GE 97.4m 1.7MW (583783)	Neligh 115kV (640293)
GEN-2014-004	3.96	GE 97.4m 1.79MW (640555)	Steele City 115kV (GEN-2011-018 POI) (640426)
GEN-2014-013	73.5	GE XLE 97.4m (583833)	Meadow Grove 230kV (GEN-2008-086N02 POI) (640540)
GEN-2014-031	35.8	GE 1.79MW (583836)	Meadow Grove 230kV (GEN-2008-086N02 POI) (640540)
GEN-2014-039	73.39	GE 1.79MW (584093)	Friend 115kV (640174)
GEN-2015-007	160	GE 2.0MW	Hoskins 345kV
GEN-2015-023	300.8	GE 1.79MW	Holt County 345kV

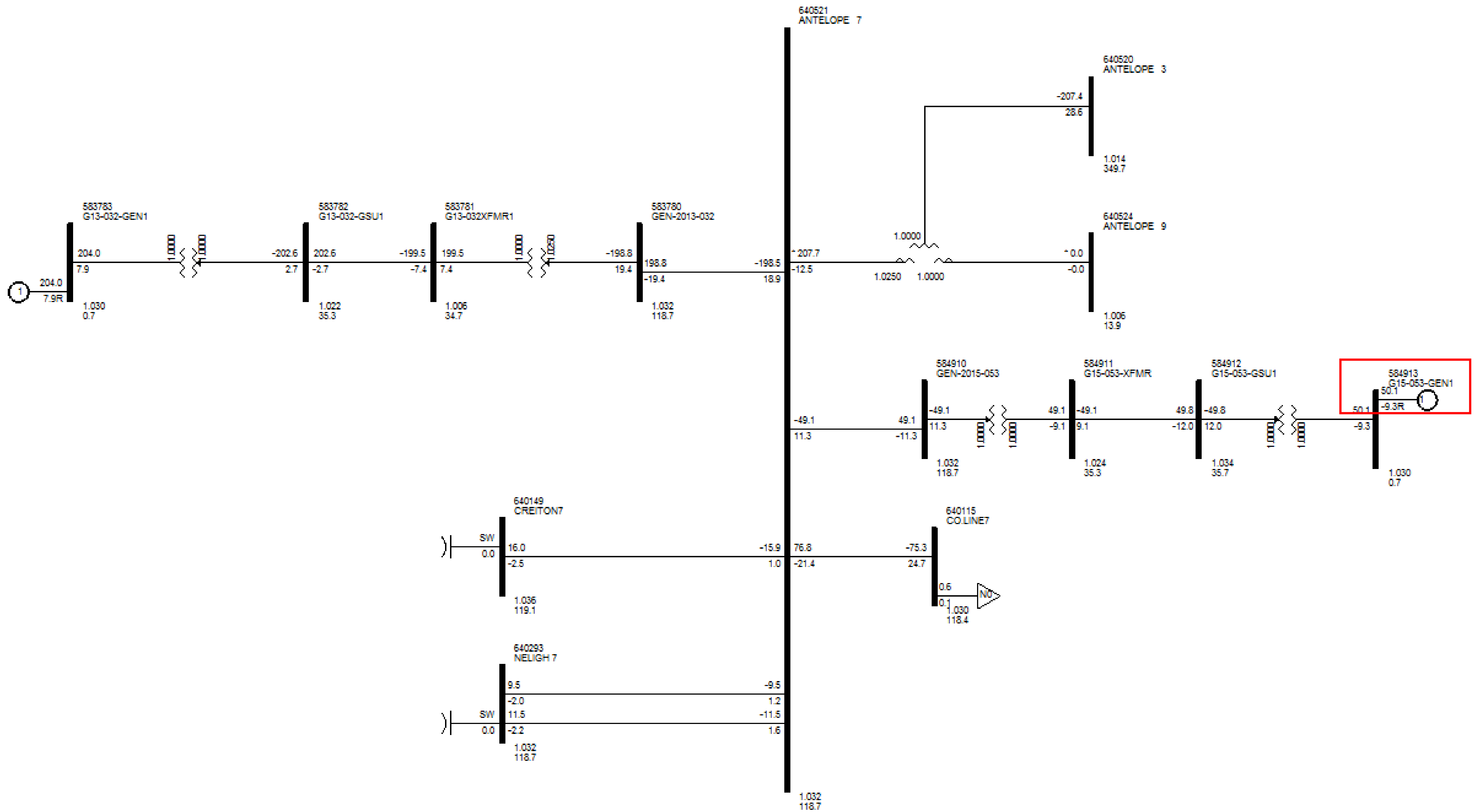

Figure 2-1. Power flow one-line diagram for interconnection project at the Antelope 115kV POI (GEN-2015-053)

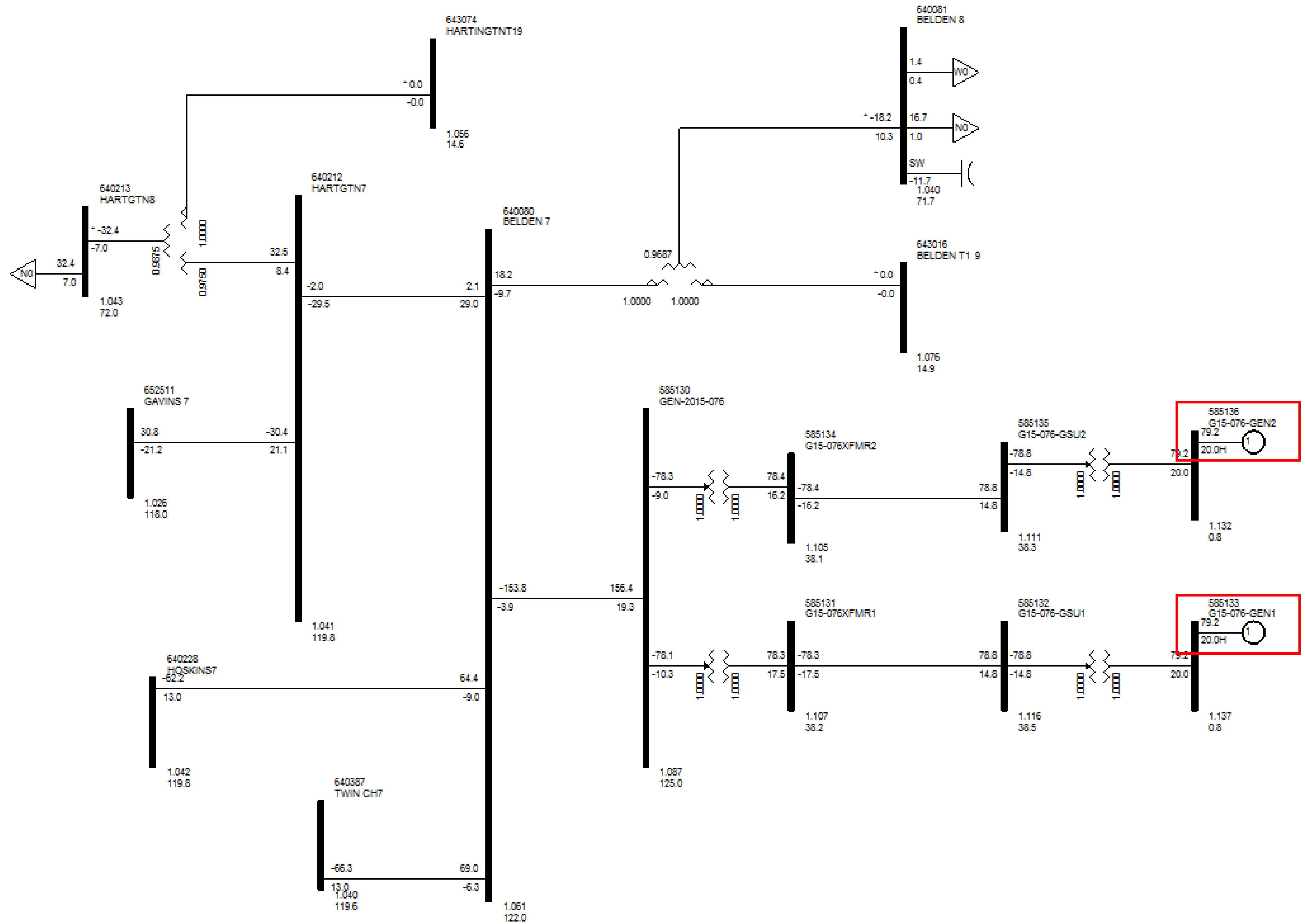

Figure 2-2. Power flow one-line diagram for interconnection project at the Belden 115kV POI (GEN-2015-076)

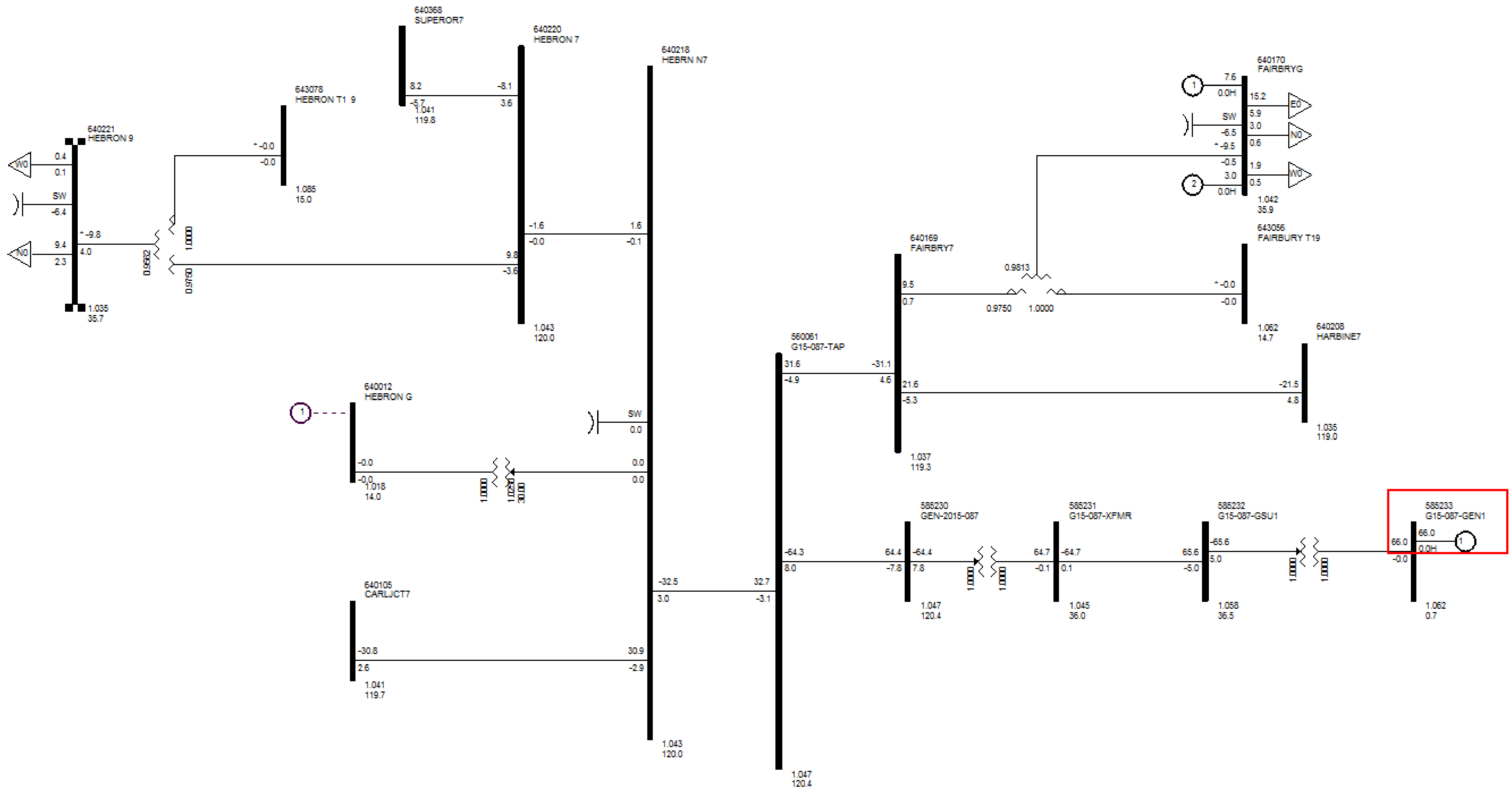

Figure 2-3. Power flow one-line diagram for interconnection project at the Tap Fairbury – Hebron 115kV POI (GEN-2015-087)

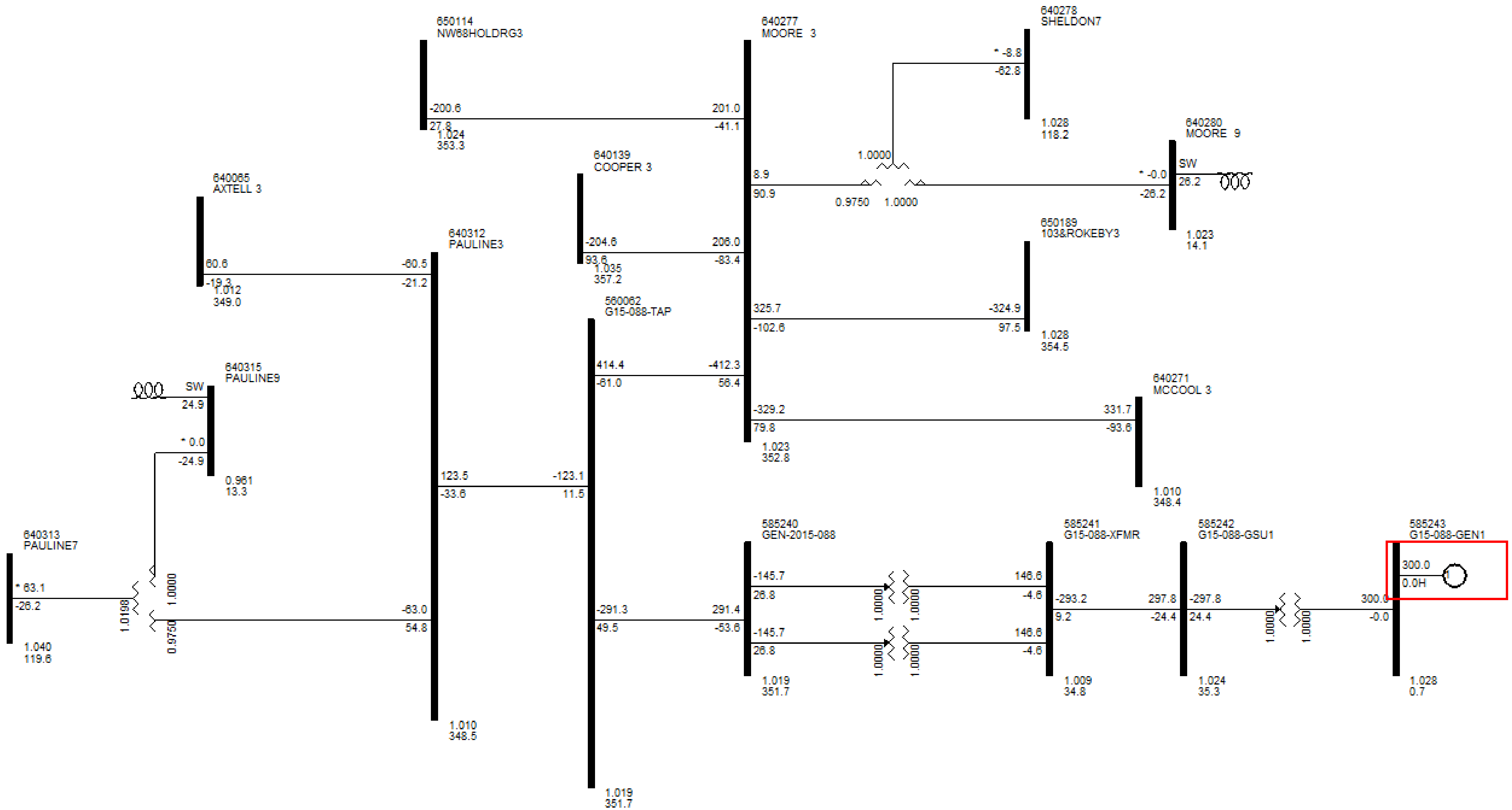

Figure 2-4. Power flow one-line diagram for interconnection project at the Tap Moore – Pauline 345kV POI (GEN-2015-088)

Table 2-3
Case List with Contingency Description

Cont. No.	Fault Name	Description
8	FLT08-3PH	**3 phase fault on the G10-051-TAP (560347) to TWIN CH4 (640386) 230 kV line circuit 1, near G10-051-TAP.**
		a. Apply fault at the G10-051-TAP 230 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT9-3PH	**3 phase fault on the G10-051-TAP (560347) to HOSKINS4 (640227) 230 kV line circuit 1, near G10-051-TAP.**
		a. Apply fault at the G10-051-TAP 230 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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 TWIN CH4 (640386) 230 kV /(640387) 115 kV / (643156) 13.8 kV Transformer circuit 1, near TWIN CH4 230 kV.**
		a. Apply fault at the TWIN CH4 230 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
11	FLT11-3PH	**3 phase fault on the TWIN CH4 (640386) to SIOUXCY4 (652565) 230 kV line circuit 1, near TWIN CH4.**
		a. Apply fault at the TWIN CH4 230 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT12-3PH	**3 phase fault on the HOSKINS4 (640227) 230 kV /(640228) 115 kV / (643083) 13.8 kV Transformer circuit 1, near HOSKINS4 230 kV.**
		a. Apply fault at the HOSKINS4 230 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
13	FLT13-3PH	**3 phase fault on the HOSKINS4 (640227) 230 kV /(640226) 345 kV / (643082) 13.8 kV Transformer circuit 1, near HOSKINS4 230 kV.**
		a. Apply fault at the HOSKINS4 230 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
14	FLT14-3PH	**3 phase fault on the ANTELOPE 7 (640521) to NELIGH 7 (640293) 115 kV line circuit 1, near ANTELOPE 7.**
		a. Apply fault at the ANTELOPE 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT15-3PH	**3 phase fault on the ANTELOPE 7 (640521) to CREITON7 (640149) 115 kV line circuit 1, near ANTELOPE 7.**
		a. Apply fault at the ANTELOPE 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
16	FLT16-3PH	**3 phase fault on the ANTELOPE 7 (640521) to CO.LINE7 (640115) 115 kV line circuit 1, near ANTELOPE 7.**
		a. Apply fault at the ANTELOPE 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
17	FLT17-3PH	**3 phase fault on the ANTELOPE 7 (640521) 115 kV /(640520) 345 kV / (640524) 13.8 kV Transformer circuit 1, near ANTELOPE 7 115 kV.**
		a. Apply fault at the ANTELOPE 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
18	FLT18-3PH	**3 phase fault on the NELIGH 7 (640293) to CLRWATR7 (640113) 115 kV line circuit 1, near NELIGH 7.**
		a. Apply fault at the NELIGH 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
19	FLT19-3PH	**3 phase fault on the NELIGH 7 (640293) to PETERSBRG.N7 (640444) 115 kV line circuit 1, near NELIGH 7.**
		a. Apply fault at the NELIGH 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
20	FLT20-3P	**3 phase fault on the CREITON7 (640149) to BLMFLD 7 (640084) 115 kV line circuit 1, near CREITON7.**
		a. Apply fault at the CREITON7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
21	FLT21-3PH	**3 phase fault on the ANTELOPE 3 (640520) to HOSKINS3 (640226) 345 kV line circuit 1, near ANTELOPE 3.**
		a. Apply fault at the ANTELOPE 3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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 CO.LINE7 (640115) to BATTLCR7 (640072) 115 kV line circuit 1, near CO.LINE7.**
		a. Apply fault at the CO.LINE7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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 BELDEN 7 (640080) to HOSKINS7 (640228) 115 kV line circuit 1, near BELDEN 7.**
		a. Apply fault at the BELDEN 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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 BELDEN 7 (640080) to HARTGTN7 (640212) 115 kV line circuit 1, near BELDEN 7.**
		a. Apply fault at the BELDEN 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
25	FLT25-3PH	**3 phase fault on the BELDEN 7 (640080) to TWIN CH7 (640387) 115 kV line circuit 1, near BELDEN 7.**
		a. Apply fault at the BELDEN 7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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 TWIN CH7 (640387) to EMERSON7 (640163) 115 kV line circuit 1, near TWIN CH7.**
		a. Apply fault at the TWIN CH7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
27	FLT27-3PH	**3 phase fault on the TWIN CH7 (640387) to S.SIOUXCITY7 (640424) 115 kV line circuit 1, near TWIN CH7.**
		a. Apply fault at the TWIN CH7115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT28-3PH	**3 phase fault on the TWIN CH7 (640387) 115 kV / (640388) 69 kV / (643157) 13.8 kV Transformer circuit 1, near TWIN CH7 115 kV.**
		a. Apply fault at the TWIN CH7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
29	FLT29-3PH	**3 phase fault on the HARTGTN7 (640212) to GAVINS 7 (652511) 115 kV line circuit 1, near HARTGTN7.**
		a. Apply fault at the HARTGTN7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT30-3PH	**3 phase fault on the HOSKINS7 (640228) to STNTN.N7 (640363) 115 kV line circuit 1, near HOSKINS7.**
		a. Apply fault at the HOSKINS7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
31	FLT31-3PH	**3 phase fault on the HOSKINS7 (640228) to NORFOLK7 (640298) 115 kV line circuit 1, near HOSKINS7.**
		a. Apply fault at the HOSKINS7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT32-3PH	**3 phase fault on the HOSKINS7 (640228) to NORFK.N7 (640296) 115 kV line circuit 1, near HOSKINS7.**
		a. Apply fault at the HOSKINS7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT33-3PH	**3 phase fault on the HOSKINS7 (640228) 115 kV / (640229) 34.5 kV / (643086) 13.8 kV Transformer circuit 1, near HOSKINS7 115 kV.**
		a. Apply fault at the HOSKINS7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
34	FLT34-3PH	**3 phase fault on the HOSKINS7 (640228) 115 kV / (640226) 345 kV / (640231) 13.8 kV Transformer circuit 1, near HOSKINS7 115 kV.**
		a. Apply fault at the HOSKINS7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
35	FLT35-3PH	**3 phase fault on the GEN15087 (G15087) to HEBRN N7 (640218) 115 kV line circuit 1, near GEN15087.**
		a. Apply fault at the GEN15087 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
36	FLT36-3PH	**3 phase fault on the GEN15087 (G15087) to FAIRBRY7 (640169) 115 kV line circuit 1, near GEN15087.**
		a. Apply fault at the GEN15087 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
37	FLT37-3PH	**3 phase fault on the HEBRN N7 (640218) to HEBRON 7 (640220) 115 kV line circuit 1, near HEBRN N7.**
		a. Apply fault at the HEBRN N7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
38	FLT38-3PH	**3 phase fault on the HEBRN N7 (640218) to CARLJCT7 (640105) 115 kV line circuit 1, near HEBRN N7.**
		a. Apply fault at the HEBRN N7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
39	FLT39-3PH	**3 phase fault on the FAIRBRY7 (640169) to HARBINE7 (640208) 115 kV line circuit 1, near FAIRBRY7.**
		a. Apply fault at the FAIRBRY7 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT40-3PH	**3 phase fault on the GEN15088 (G15088) to MOORE 3 (640277) 345 kV line circuit 1, near GEN15088.**
		a. Apply fault at the GEN15088 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT41-3P	**3 phase fault on the GEN15088 (G15088) to PAULINE3 (640312) 345 kV line circuit 1, near GEN15088.**
		a. Apply fault at the GEN15088 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
42	FLT42-3PH	**3 phase fault on the MOORE 3 (640277) to NW68HOLDRG3 (650114) 345 kV line circuit 1, near MOORE 3.**
		a. Apply fault at the MOORE 3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT43-3PH	**3 phase fault on the MOORE 3 (640277) to 103&ROKEBY3 (650189) 345 kV line circuit 1, near MOORE 3.**
		a. Apply fault at the MOORE 3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT44-3PH	**3 phase fault on the MOORE 3 (640277) to MCCOOL 3 (640271) 345 kV line circuit 1, near MOORE 3.**
		a. Apply fault at the MOORE 3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT45-3PH	**3 phase fault on the MOORE 3 (640277) to COOPER 3 (640139) 345 kV line circuit 1, near MOORE 3.**
		a. Apply fault at the MOORE 3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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	FLT46-3PH	**3 phase fault on the MOORE 3 (640277) 345 kV /(640278) 115 kV / (640280) 13.8 kV Transformer circuit 1, near MOORE 3 345 kV.**
		a. Apply fault at the MOORE 3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
47	FLT47-3PH	**3 phase fault on the PAULINE3 (640312) to AXTELL 3 (640065) 345 kV line circuit 1, near PAULINE3.**
		a. Apply fault at the PAULINE3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
48	FLT48-3PH	**3 phase fault on PAULINE3 (640312) 345 kV / (640313) 115 kV / (640315) 13.8 kV Transformer circuit 1, near PAULINE3 345 kV.**
		a. Apply fault at the PAULINE3 115 kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
49	FLT49-3PH	**3 phase fault on the SIDNEY2-LNX3 (659426) to LARAMIE3 (659131) 345 kV line circuit 1, near GEN15094.**
		a. Apply fault at the SIDNEY2-LNX3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
50	FLT50-3PH	**3 phase fault on the SIDNEY2-LNX3 (659426) to SIDNEY 3 (659133) 345 kV line circuit Z, near SIDNEY2-LNX3.**
		a. Apply fault at the SIDNEY2-LNX3 345 kV bus.
		b. Clear fault after 5 cycles and trip the faulted line and remove fault.
		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.
51	FLT51-3PH-PO	**Prior outage on the HOSKINS4 (640227) 230 kV / (640226) 345 kV / (643082) 13.8 kV transformer; 3 phase fault on the G10-051-TAP (560347) to HOSKINS4 (640227) 230 kV line circuit 1, near G14-051-TAP.**
		a. Apply fault at the G14-051-TAP 230 kV 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	FLT52-3PH-PO	**Prior outage on the TWIN CH4 (640386) 230 kV / (640387) 115 kV / (643156) 13.8 kV transformer; 3 phase fault on the G10-051-TAP (560347) to TWIN CH4 (640386) 230 kV line circuit 1, near G14-051-TAP.**
		a. Apply fault at the G14-051-TAP 230 kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
53	FLT53-3PH-PO	**Prior outage on the ANTELOPE 7 (640521) – NELIGH 7 (640293) 115 kV line circuit 1;** **3 phase fault on the ANTELOPE 7 (640521) to NELIGH 7 (640293) 115 kV line circuit 2, near ANTELOPE 7.**
		a. Apply fault at the ANTELOPE 7 115 kV 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.
54	FLT54-3PH-PO	**Prior outage on the ANTELOPE 7 (640521) – CO.LINE7 (640115) 115 kV line;** **3 phase fault on the ANTELOPE 7 (640521) to CREITON7 (640149) 115 kV line, near ANTELOPE 7.**
		a. Apply fault at the ANTELOPE 7 115 kV 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	FLT55-3PH-PO	**Prior outage on the ANTELOPE 7 (640521) 115 kV / (640520) 345 kV / (640524) 13.8 kV transformer;** **3 phase fault on the ANTELOPE 7 (640521) to CO.LINE7 (640115) 115 kV line, near ANTELOPE 7.**
		a. Apply fault at the ANTELOPE 7 115 kV 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	FLT56-3PH-PO	**Prior outage on the BELDEN 7 (640080) – HARTGTN7 (640212) 115 kV line;** **3 phase fault on the BELDEN 7 (640080) to TWIN CH7 (640387) 115 kV line, near BELDEN 7.**
		a. Apply fault at the BELDEN 7 115 kV 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	FLT57-3PH-PO	**Prior outage on the BELDEN 7 (640080) – TWIN CH7 (640387) 115 kV line;** **3 phase fault on the BELDEN 7 (640080) to HOSKINS7 (640228) 115 kV line, near BELDEN 7.**
		a. Apply fault at the BELDEN 7 115 kV 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	FLT58-3PH-PO	**Prior outage on the HEBRN N7 (640218) – CARLJCT7 (640105) 115 kV line;** **3 phase fault on the GEN15087 (G15087) to HEBRN N7 (640218) 115 kV line, near GEN15087.**
		a. Apply fault at the GEN15087 115 kV 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	FLT59-3PH-PO	**Prior outage on the HEBRN N7 (640218) – HEBRON 7 (640220) 115 kV line;** **3 phase fault on the GEN15087 (G15087) to HEBRN N7 (640218) 115 kV line, near GEN15087.**
		a. Apply fault at the GEN15087 115 kV 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	FLT60-3PH-PO	**Prior outage on the MOORE 3 (640277) – MCCOOL 3 (640271) 345 kV line;** **3 phase fault on the GEN15088 (G15088) to MOORE 3 (640277) 345 kV line, near GEN15088.**
		a. Apply fault at the GEN15088 345 kV 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	FLT61-3PH-PO	**Prior outage on the PAULINE3 (640312) – AXTELL 3 (640065) 345 kV line;** **3 phase fault on the GEN15088 (G15088) to PAULINE3 (640312) 345 kV line, near GEN15088.**
		a. Apply fault at the GEN15088 345 kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
62	FLT62-1PH_SB	**Hoskins 345 kV Stuck Breaker Scenario 1** a. Apply single phase fault at the Hoskins (640226) 345 kV bus. b. Wait 16 cycles and remove fault. c. Trip Hoskins (640226) 345 kV / (640227) 230 kV /(643082) 13.8 kV transformer circuit 1. d. Trip Hoskins (640226) to Shell Creek (640342) 345 kV line circuit 1.
63	FLT63-1PH_SB	**Hoskins 345 kV Stuck Breaker Scenario 2** a. Apply single phase fault at the Hoskins (640226) 345 kV bus. b. Wait 16 cycles and remove fault. c. Trip Hoskins (640226) 345 kV / (640228) 115 kV /(640231) 13.8 kV transformer circuit 1. d. Trip Hoskins (640226) to Raun (635200) 345 kV line circuit 1.
64	FLT64-1PH_SB	**Hoskins 345 kV Stuck Breaker Scenario 3** a. Apply single phase fault at the Hoskins (640226) 345 kV bus. b. Wait 16 cycles and remove fault. c. Trip Hoskins (640226) 345 kV / (640227) 230 kV /(643082) 13.8 kV transformer circuit 1. d. Trip Hoskins (640226) to Raun (635200) 345 kV line circuit 1.
65	FLT65-1PH_SB	**Hoskins 345 kV Stuck Breaker Scenario 4** a. Apply single phase fault at the Hoskins (640226) 345 kV bus. b. Wait 16 cycles and remove fault. c. Trip Hoskins (640226) 345 kV / (640228) 115 kV /(640231) 13.8 kV transformer circuit 1. d. Trip Hoskins (640226) to Antelope (640520) 345 kV line circuit 1.
66	FLT66-1PH_SB	**Hoskins 345 kV Stuck Breaker Scenario 5** a. Apply single phase fault at the Hoskins (640226) 345 kV bus. b. Wait 16 cycles and remove fault. c. Trip Hoskins Hoskins (640226) to Shell Creek (640342) 345 kV line circuit 1. d. Trip Hoskins (640226) to Antelope (640520) 345 kV line circuit 1.
67	FLT67-1PH_SB	**Antelope 115 kV Stuck Breaker Scenario** a. Apply single phase fault at the Antelope (640521) 115 kV bus. b. Wait 16 cycles and remove fault. c. Trip ANTELOPE7 (640521) to CREITON7 (640149) 115 kV line circuit 1. d. Trip ANTELOPE7 (640521) to CO.LINE7 (640115) 115 kV line circuit 1.
68	FLT68-1PH_SB	**Antelope 115 kV Stuck Breaker Scenario** a. Apply single phase fault at the Antelope (640521) 115 kV bus. b. Wait 16 cycles and remove fault. c. Trip ANTELOPE 7 (640521) to NELIGH 7 (640293) 115 kV line circuit 1. d. Trip Antelope 115kV (640521)/345 kV (640520)/13.8 kV (640524) transformer.
69	FLT69-1PH_SB	**Belden 115 kV Stuck Breaker Scenario** a. Apply single phase fault at the Belden (640080) 115 kV bus. b. Wait 16 cycles and remove fault. c. Trip BELDEN 7 (640080) to TWIN CH7 (640387) 115 kV line circuit 1. d. Trip BELDEN 7 (640080) to HARTGTN7 (640212) 115 kV line circuit 1.
70	FLT70-1PH_SB	**Belden 115 kV Stuck Breaker Scenario** a. Apply single phase fault at the Belden (640080) 115 kV bus. b. Wait 16 cycles and remove fault. c. Trip BELDEN 7 (640080) to TWIN CH7 (640387) 115 kV line circuit 1. d. Trip BELDEN 7 (640080) to HOSKINS7 (640228) 115 kV line circuit 1.
71	FLT71-1PH_SB	**Moore 345 kV Stuck Breaker Scenario** a. Apply single phase fault at the Moore (640277) 345 kV bus. b. Wait 16 cycles and remove fault. c. Trip MOORE 3 (640277) to NW68HOLDRG3 (650114) 345 kV line circuit 1. d. Trip MOORE 3 (640277) to MCCOOL 3 (640271) 345 kV line circuit 1.
72	FLT72-1PH_SB	**Moore 345 kV Stuck Breaker Scenario** a. Apply single phase fault at the Moore (640277) 345 kV bus. b. Wait 16 cycles and remove fault. c. Trip MOORE 3 (640277) to 103&ROKEBY3 (650189) 345 kV line circuit 1. d. Trip MOORE 3 (640277) to COOPER 3 (640139) 345 kV line circuit 1.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
73	FLT73-1PH_SB	**Pauline 345 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the Pauline (640312) 345 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip PAULINE3 (640312) 345 kV / (640313) 115 kV / (640315) 13.8 kV Transformer.
		d. Trip PAULINE3 (640312) to AXTELL 3 (640065) 345 kV line circuit 1.
74	FLT74-1PH_SB	**Sidney 345 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the Sidney (659426) 345 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip SIDNEY2-LNX3 (659426) to GEN15094 (G15094) 345 kV line circuit 1.
		d. Trip SIDNEY2-LNX3 (659426) to SIDNEY 3 (659133) 345 kV line circuit Z
75	FLT75-1PH_SB	**OGALALA4 230 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the OGALALA4 (640302) 230 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip OGALALA4 (640302) 230 kV / (640304) 115 kV / (643115) 13.8 kV Transformer.
		d. Trip OGALALA4 (640302) to GENTLMN4 (640184) 230 kV line circuit 1.
76	FLT76-1PH_SB	**G10-051-TAP 230 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the G10-051-TAP4 (560347) 230 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip G10-051-TAP (560347) to G10-051&1127 (580011) 230 kV line circuit 1.
		d. Trip G10-051-TAP (560347) to TWINCH4 (640386) 230 kV line circuit 1.
77	FLT77-1PH_SB	**ANTELOPE7 115 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the ANTELOPE7 (640521) 230 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip ANTELOPE7 (640521) 115 kV to CREITON7 (640149) 115 kV line circuit 1.
		d. Trip ANTELOPE7 (640521) 115 kV to COLINE7 (640115) 115 kV line circuit 1.
78	FLT78-1PH_SB	**BELDEN7 115 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the BELDEN7 (640080) 115 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip BELDEN7 (640080) 115 kV / (640081) 69 kV / (643016) 13.8 kV Transformer.
		d. Trip BELDEN7 (640080) to TWINCH7 (640387) 115 kV line circuit 1.
79	FLT79-1PH_SB	**FAIRBRY7 115 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the FAIRBRY7 (640169) 115 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip FAIRBRY7 (640169) 115 kV to HARBINE7 (640208) 115 kV line circuit 1.
		d. Trip FAIRBRY7 (640169) 115 kV to G15-087-TAP (560061) 115 kV line circuit 1.
80	FLT80-1PH_SB	**G15-088-TAP 345 kV Stuck Breaker Scenario**
		a. Apply single phase fault at the G15-088-TAP (560062) 345 kV bus.
		b. Wait 16 cycles and remove fault.
		c. Trip G15-088-TAP (560062) 345 kV to PAULINE3 (640312) 345 kV line circuit 1.
		d. Trip G15-088-TAP (560062) 345 kV to MOORE3 (640277) 345 kV line circuit 1.
81	FLT81-3PH	**3 phase fault on the Gentleman (640183) to Sweetwater (640374) 345kV line ckt 2, near Gentleman.**
		a. Apply fault at the Gentleman 345kV bus.
		b. Clear fault after 4.5 cycles by tripping the faulted line.
82	FLT82-3PH	**3 phase fault on the Axtell (640065) to Pauline (640312) 345kV line ckt1, near Axtell.**
		a. Apply fault at the Axtell 345kV bus.
		b. Clear fault after 4.5 cycles by tripping the faulted line.
83	FLT83-3PH	**3 phase fault on the Gentleman (640183) to Keystone (640252) 345kV line ckt1, near Gentleman.**
		a. Apply fault at the Gentleman 345kV bus.
		b. Clear fault after 4.5 cycles by tripping the faulted line.
84	FLT84-3PH	**3 phase fault on the Keystone (640252) to Sidney (659133) 345kV line ckt1, near Keystone.**
		a. Apply fault at the Keystone 345kV bus.
		b. Clear fault after 4.5 cycles by tripping the faulted line.
85	FLT85-3PH	**3 phase fault on the Axtell (640065) to Post Rock (530583) 345kV line ckt1, near Axtell.**
		a. Apply fault at the Axtell 345kV bus.
		b. Clear fault after 4.5 cycles by tripping the faulted line.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
86	FLT86-3PH	**3 phase fault on the Gentleman (640184) to N. Platte (640286) 230kV line ckt 1, near Gentleman.**
		a. Apply fault at the Gentleman 230kV bus.
		b. Clear fault after 5.5 cycles by tripping the faulted line.
87	FLT87-3PH	**3 phase fault on the Gentleman (640184) to Ogallala(640302) 230kV line ckt 1, near Gentleman.**
		a. Apply fault at the Gentleman 230kV bus.
		b. Clear fault after 5.5 cycles by tripping the faulted line.
88	FLT88-3PH	**3 phase fault on the Axtell (640065) 345kV to Axtell (640066) 115kV/(640067) 13.8kV transformer at the Axtell 345kVbus.**
		a. Apply fault at the Axtell 345kV bus.
		b. Clear fault after 5.5 cycles by tripping the transformer
89	FLT89-3PH	**3 phase fault on the Gentleman (640183) 345kV to Gentleman (640184) 230kV/(643066) 13.8kV CKT 2 transformer at the 345kV bus.**
		a. Apply fault at the Gentleman 345kV bus.
		b. Clear fault after 5.5 cycles by tripping the transformer
90	FLT90-3PH	**3 phase fault on the Gentleman (640183) 345kV to Gentleman (640184) 230kV/(643066) 13.8kV CKT 2 transformer at the 230kV bus.**
		a. Apply fault at the Gentleman 230kV bus.
		b. Clear fault after 5.5 cycles by tripping the transformer
91	FLT91-1PH_SB	**SLG fault at the Gentleman (640183) end of the Gentleman (640183) to Sweetwater (640374) ckt2 and Gentleman (640183) to Red Willow (640325) 345kV lines. Normal clearing (4.5 cycles)**
		a. Apply SLG fault at Gentleman (640183) 345kV
		b. Run for 4.5 cycles, remove fault
		c. Trip line from Gentleman (640183) to Sweetwater (640374) ckt2 345kV.
		d. Trip line from Gentleman (640183) to Red Willow (640325) 345kV.
92	FLT92-1PH_SB	**SLG fault at the Gentleman (640184) end of the Gentleman (640184) to N. Platte (640286) ckt2 and Gentleman (640184) to N. Platte (640286) ckt3345kV lines. Normal clearing (5.5 cycles)**
		a. Apply SLG fault at Gentleman (640184) 345kV
		b. Run for 5.5 cycles, remove fault
		c. Trip line from Gentleman (640184) to N. Platte (640286) ckt2 345kV
		d. Trip line from Gentleman (640184) to N. Platte (640286) ckt3 345kV
93	FLT93-1PH_SB	**Gentleman Stuck Breaker 3322**
		a. Apply single phase fault at the Gentleman (640183) 345kV bus on the Gentleman to Sweetwater (640374) ckt2 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Gentleman (640183) to Sweetwater (640374) ckt2 345kV line.
		d. Trip line from Gentleman (640183) to Red Willow (640325).
94	FLT94-1PH_SB	**Gentleman Stuck Breaker 3316**
		a. Apply single phase fault at the Gentleman (640183) 345kV bus on the Gentleman to Keystone (640252) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip the Gentleman (640183) to Keystone (640252) ckt1 345kV line
		d. Disconnect three winding transformer at bus 640183/640184/643066.
95	FLT95-1PH_SB	**Gentleman Stuck Breaker 2216**
		a. Apply single phase fault at the Gentleman (640184) 230kV bus on the Gentleman to N. Platte (640286) ckt1 230kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Gentleman (640184) to N. Platte (640286) ckt1 230kV.
		d. Trip line from Gentleman (640184) to N. Platte (640286) ckt3 230kV.
96	FLT96-1PH_SB	**Gentleman Stuck Breaker 2222**
		a. Apply single phase fault at the Gentleman (640184) 230kV bus on the Gentleman to Ogallala (640302) ckt1 230kV line.
		b. Run 16 cycles, remove fault.
		c. Trip the Gentleman (640183) to Ogallala (640320) ckt1 230V line
		d. Disconnect three winding transformer at bus 640183/640184/643066.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
97	FLT97-1PH_SB	**Sweetwater Stuck Breaker 3308**
		a. Apply single phase fault at the Sweetwater (640374) 345kV bus on the Gentleman to Sweetwater (640183) ckt1 345kV line.
		b. Wait 16 cycles, remove fault.
		c. Trip line from Gentleman (640183) to Sweetwater (640374) 345kV.
		d. Trip line from Sweetwater (640374) to Grand Island (652571) 345kV.
98	FLT98-1PH_SB	**Sweetwater Stuck Breaker 3310**
		a. Apply single phase fault at the Sweetwater (640374) 345kV bus on the Gentleman to Sweetwater (640183) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Gentleman (640183) to Sweetwater (640374) 345kV.
		d. Trip line from Sweetwater (640374) to Axtell (640065) 345kV.
99	FLT99-1PH_SB	**Keystone Stuck Breaker 3310**
		a. Apply single phase fault at the Keystone (640252) 345kV bus on the Keystone to Sidney (659133) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Keystone (640252) to Sidney (659133) 345kV.
		d. Trip line from Keystone (640252) to Gentleman (640183) 345kV.
100	FLT100-1PH_SB	**Keystone Stuck Breaker 3312**
		a. Apply single phase fault at the Keystone (640252) 345kV bus on the Keystone to Sidney (659133) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Keystone (640252) to Sidney (659133) 345kV.
		d. Trip line from Keystone (640252) to Gentleman (640183) 345kV.
101	FLT101-1PH_SB	**Keystone Stuck Breaker 3312**
		a. Apply single phase fault at the Keystone (640252) 345kV bus on the Keystone to Sidney (659133) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Keystone (640252) to Sidney (659133) 345kV.
		d. Disconnect three winding transformer at bus 640252/640253/640254.
102	FLT102-1PH_SB	**Keystone Stuck Breaker 3304**
		a. Apply single phase fault at the Keystone (640252) 345kV bus on the Keystone to Gentleman (640183) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Keystone (640252) to Gentleman (640183) 345kV.
		d. Disconnect three winding transformer at bus 640252/640253/640254.
103	FLT103-1PH_SB	**Grand Island Stuck Breaker 1396**
		a. Apply single phase fault at the Grand Island (652571) 345kV bus on the Grand Island to McCool (640271) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Grand Island (652571) to McCool (640271) 345kV.
		d. Disconnect three winding transformer at bus 652571/640200/640271.
104	FLT104-1PH_SB	**Grand Island Stuck Breaker 2204**
		a. Apply single phase fault at the Grand Island (640200) 230kV bus on the Grand Island to Riverdale (640330) ckt1 230kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Grand Island (640200) to Riverdale (640330) 230kV.
		d. Trip line from Grand Island (640200) to Hasting (640214) 230kV.
105	FLT105-1PH_SB	**N. Platte Stuck Breaker 2204**
		a. Apply single phase fault at the N. Platte (640286) 230kV bus on the N. Platte to Gentleman (640184) ckt1 230kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from N. Platte (640286) to Gentleman (640184) ckt1 230kV.
		d. Disconnect three winding transformer at bus 640286/640287/640291.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
106	FLT106-1PH_SB	**N. Platte Stuck Breaker 2212**
		a. Apply single phase fault at the N. Platte (640286) 230kV bus on the N. Platte to Gentleman (640184) ckt2 230kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from N. Platte (640286) to Gentleman (640184) ckt2 230kV.
		d. Trip line from N. Platte (640286) to C.Creek (640093) ckt1 230kV.
107	FLT107-1PH_SB	**Axtell Stuck Breaker 3304**
		a. Apply single phase fault at the Axtell (640065) 345V bus on the Axtell to Post Rock (530583) ckt1 345kV line.
		b. Run 16 cycles, remove fault.
		c. Trip line from Axtell (640065) to Post Rock (530583) ckt1 345kV.
		d. Disconnect three winding transformer at bus 640065/640066/640067.
108	FLT108-3PH	**3 phase fault on the Gavins (652511) to HartGtn (640212) 115kV line near Gavins.**
		a. Apply fault at the Gavins 115kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
109	FLT109-3PH	**3 phase fault on the Gavins (652511) to Bloomfield (640084) 115kV line near Gavins.**
		a. Apply fault at the Gavins 115kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
110	FLT110-3PH	**3 phase fault on the Gavins (652511) to Yankton Jct (660006) 115kV line near Gavins.**
		a. Apply fault at the Gavins 115kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
111	FLT111-3PH	**3 phase fault on the Gavins (652511) to Spirit Mound (659121) 115kV line near Gavins.**
		a. Apply fault at the Gavins 115kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
112	FLT112-3PH	**3 phase fault on the Manning (652517) to Spirit Mound (659121) 115kV line near Spirit Mound.**
		a. Apply fault at the Spirit Mound 115kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
113	FLT113-3PH	**3 phase fault on the Yankton Jct (660006) to Napa Jct (660026) 115kV line near Yankton.**
		a. Apply fault at the Yankton 115kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
114	FLT114-3PH	**3 phase fault on the Yankton Jct (660006) to Tyndall (652525) 115kV line near Yankton.**
		a. Apply fault at the Yankton 115kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
115	FLT115-3PH	**3 phase fault on the Utica Jct (652526) to Fort Randall (652509) 230kV line near Fort Randall.**
		a. Apply fault at the Fort Randall 230kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
116	FLT116-3PH	**3 phase fault on the Utica Jct (652526) to Rasmussen (652536) 230kV line near Rasmussen.**
		a. Apply fault at the Rasmussen 230kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
117	FLT117-3PH	**3 phase fault on the Fort Randall (652509) to Meadow Grove (640540) 230kV line near Fort Randall.**
		a. Apply fault at the Fort Randall 230kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
118	FLT118-3PH	**3 phase fault on the Fort Randall (652509) to FortThompson (652507) 230kV line near Fort Randall.**
		a. Apply fault at the Fort Randall 230kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
119	FLT119-3PH	**3 phase fault on the Holt County (#640510) to Grand Island (652871) 345kV line near Grand Island.**
		a. Apply fault at the Grand Island 345kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
120	FLT120-3PH	**3 phase fault on the McCool (640271) to Grand Island (652871) 345kV line near Grand Island.**
		a. Apply fault at the Grand Island 345kV bus.
		b. Clear fault after 6 cycles by tripping the faulted line.
121	FLT121_3PH_PO	**Prior Outage – Gavins #1**
		a. Prior outage of Gavins (652511) to Yankton Jct (660006) 115kV line
		b. 3 phase fault on the Gavins (652511) to HartGtn (640212) 115kV line near Gavins.
		c. Apply fault at the Gavins 115kV bus.
		d. Clear fault after 6 cycles by tripping the faulted line.

Table 2-3 (Continued)
Case List with Contingency Description

Cont. No.	Fault Name	Description
122	FLT122_3PH_PO	**Prior Outage – Gavins #1**
		a. Prior outage of Gins (652511) to Hartgtn (660006) 115kV line
		b. 3 phase fault on the Gavins (652511) to Bloomfield (640084) 115kV line near Gavins
		c. Apply fault at the Gavins 115kV bus.
		d. Clear fault after 6 cycles by tripping the faulted line.
123	FLT123_1PH_SB	**Stuck Breaker – Gavins #1**
		a. Apply SLG fault at Gavins (652511) for 16 cycles
		b. Clear fault
		c. Trip Gavins (652511) to Hartgtn (660006) 115kV line
		d. Trip Gavins (652511) to Bloomfield (640084) 115kV line
124	FLT124_1PH_SB	**Stuck Breaker – Gavins #2**
		a. Apply SLG fault at Gavins (652511) for 16 cycles
		b. Clear fault
		c. Trip Gavins (652511) to Hartgtn (660006) 115kV line
		d. Trip Gavins (652511) to Spirit Mount (659121) 115kV line
125	FLT125_1PH_SB	**Stuck Breaker – Utica Jct 230kV #1**
		a. Apply SLG fault at Utica Jct 230kV(652526) for 16 cycles
		b. Clear fault
		c. Trip Fort Randall (652509) to Utica Jct (652526) 230kV line
		d. Trip Utica Jct 230/115kV auto
126	FLT126_1PH_SB	**Stuck Breaker – Utica Jct 115kV #1**
		a. Apply SLG fault at Utica Jct 115kV(652626) for 16 cycles
		b. Clear fault
		c. Trip Utica Jct (652626) to NAPA Jct (660026) 115kV line
		d. Trip Utica Jct 230/115kV auto

SECTION 3: STABILITY ANALYSIS

The objective of the Stability Analysis was to determine the impacts of the generator interconnections on the stability and voltage recovery on the SPP transmission system. If problems with stability or voltage recovery were identified, the need for reactive compensation or system upgrades were investigated.

3.1 Approach

SPP provided MEPPI with the following three power flow cases:

- 2016 Winter Peak
- 2017 Summer Peak
- 2025 Summer Peak

Each case was examined prior to the Stability Analysis to ensure the case contained the proposed study projects and any previously queued projects listed in Tables 2-1 and 2-2 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 2-3 were examined. Single-phase fault impedances were calculated for each season to result in a voltage of approximately 60% of the pre-fault voltage. Refer to Table 3-1 for a list of the calculated single-phase fault impedances.

Table 3-1
Calculated Single-Phase Fault Impedances

[1]Ref. No.	Cont. Name	Single-Phase Fault Impedance (MVA)		
		2016 Winter	2017 Summer	2025 Summer
1	FLT62-1PH_SB	-4031.3	-4031.3	-4031.3
2	FLT63-1PH_SB	-4031.3	-4031.3	-4031.3
3	FLT64-1PH_SB	-4031.3	-4031.3	-4031.3
4	FLT65-1PH_SB	-4031.3	-4031.3	-4031.3
5	FLT66-1PH_SB	-4031.3	-4031.3	-4031.3
6	FLT67-1PH_SB	-1750.0	-1750.0	-1750.0
7	FLT68-1PH_SB	-1750.0	-1750.0	-1750.0
8	FLT69-1PH_SB	-937.5	-937.5	-937.5
9	FLT70-1PH_SB	-937.5	-937.5	-937.5
10	FLT71-1PH_SB	-7687.5	-8500	-8500.0
11	FLT72-1PH_SB	-7687.5	-8500	-8500.0
12	FLT73-1PH_SB	-3015.6	-3015.6	-3218.8
13	FLT74-1PH_SB	-2101.6	-2101.6	-2203.1
14	FLT75-1PH_SB	-2000.0	-2000.0	-2000.0
15	FLT76-1PH_SB	-1875.0	-1750.0	-1875.0
16	FLT77-1PH_SB	-1750.0	-1750.0	-1750.0
17	FLT78-1PH_SB	-937.5	-937.5	-937.5
18	FLT79-1PH_SB	-812.5	-812.5	-812.5
19	FLT80-1PH_SB	-4234.4	-4437.5	-4437.5
20	FLT91-1PH_SB	-5250.0	-5250.0	-5656.3
21	FLT92-1PH_SB	-4437.5	-4437.5	-4843.8
22	FLT93-1PH_SB	-5250.0	-5250.0	-5656.3
23	FLT94-1PH_SB	-5250.0	-5250.0	-5656.3
24	FLT95-1PH_SB	-4437.5	-4437.5	-4843.8
25	FLT96-1PH_SB	-4437.5	-4437.5	-4843.8
26	FLT97-1PH_SB	-3625.0	-3625.0	-3828.1
27	FLT98-1PH_SB	-3625.0	-3625.0	-3828.1
28	FLT99-1PH_SB	-3015.6	-3218.8	-3218.8
29	FLT100-1PH_SB	-3015.6	-3218.8	-3218.8
30	FLT101-1PH_SB	-3015.6	-3218.8	-3218.8
31	FLT102-1PH_SB	-3015.6	-3218.8	-3218.8
32	FLT103-1PH_SB	-4437.5	-4437.5	-4437.5
33	FLT104-1PH_SB	-4031.3	-4031.3	-4031.3
34	FLT105-1PH_SB	-3218.8	-3218.8	-3218.8
35	FLT106-1PH_SB	-3218.8	-3218.8	-3218.8
36	FLT107-1PH_SB	-3421.9	-3421.9	-3421.9
37	FLT123-1PH_SB	-1375.0	-1375.0	-1375.0
38	FLT124-1PH_SB	-1375.0	-1375.0	-1375.0
39	FLT125-1PH_SB	-2000.0	-2000.0	-2000.0
40	FLT126-1PH_SB	-1125.0	-1187.5	-1187.5

(1) Refer to Table 2-3 for a description of the contingency scenario

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:

- 534 SUNC
- 536 WERE
- 540 GMO
- 541 KCPL
- 640 NPPD
- 645 OPPD
- 650 LES
- 652 WAPA
- 635 MEC

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

The results of the analysis determined if reactive compensation or system upgrades were required to obtain acceptable system performance. If additional reactive compensation was required, the size, type, and location were determined. The proposed reactive reinforcements would ensure the wind or solar farm meets FERC Order 661A low voltage requirements and return the wind or solar farm to its pre-disturbance operating voltage. If the results indicated the need for fast responding reactive support, dynamic support such as an SVC or STATCOM was investigated. If tripping of the prior queued projects was observed during the stability analysis (for under/over voltage or under/over frequency) the simulations were re-ran with the prior queued project’s voltage and frequency tripping disabled.

3.2 Stability Analysis Results

The Stability Analysis determined there were no contingencies that resulted in system instability or generation tripping offline for the examined seasonal peak conditions when all generation interconnection requests were at 100% output.

However, it was determined that two contingencies, FLT39-3PH, which is the loss of the Fairbry7 to Harbine7 115 kV line and FLT120-3PH, which is the loss of the McCool to Grand Island 345 kV line, resulted in post-contingency generator power swings for all seasonal peak conditions at FAIRBRYG and BROKENBG, respectively. After discussion with SPP, it was determined that this was a pre-existing issue for FLT39-3PH as it was still present in the contingency even with the GEN-2015-087 out of service. Similarly, for FLT120-3PH, it was determined that this was a pre-existing issue as it was still present in the contingency even with all four study generators out of service. Plots of the generator power observed for the two cases with and without the study generators in service are shown in Figures 3-1 and 3-2.

Refer to Table 3-2 for a summary of the Stability Analysis results for the contingencies listed in Table 2-3. Table 3-2 is a summary of the stability results for the 2016 Winter Peak, 2017 Summer Peak, and 2025 Summer Peak conditions and states whether the system remained stable or generation tripped offline and if acceptable voltage recovery was observed after the fault was cleared. Voltage recovery criteria include ensuring that the transient voltage recovers to 0.7 p.u. in 2.5 seconds after the fault is cleared and ending in a steady-state voltage (for N-1 contingencies) at the pre-contingent level or at least 0.9 p.u.

Table 3-2
Stability Analysis Summary of Results for 2016 Winter, 2017 Summer, and 2025 Summer Peak Conditions

[1]Ref. No.	Cont. Name	2016 Winter Peak				2017 Summer Peak				2025 Summer Peak			
		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 0.70 p.u.	Greater than 1.2 p.u.			Less than 0.70 p.u.	Greater than 1.2 p.u.			Less than 0.70 p.u.	Greater than 1.2 p.u.		
1	FLT08-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
2	FLT09-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
3	FLT10-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
4	FLT11-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
5	FLT12-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
6	FLT13-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
7	FLT14-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
8	FLT15-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
9	FLT16-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
10	FLT17-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
11	FLT18-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
12	FLT19-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
13	FLT20-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
14	FLT21-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
15	FLT22-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
16	FLT23-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
17	FLT24-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
18	FLT25-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
19	FLT26-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
20	FLT27-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
21	FLT28-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
22	FLT29-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
23	FLT30-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
24	FLT31-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
25	FLT32-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
26	FLT33-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
27	FLT34-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
28	FLT35-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
29	FLT36-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
30	FLT37-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
31	FLT38-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
32	FLT39-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
33	FLT40-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
34	FLT41-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
35	FLT42-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
36	FLT43-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
37	FLT44-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
38	FLT45-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
39	FLT46-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
40	FLT47-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
41	FLT48-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
42	FLT49-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
43	FLT50-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
44	FLT51-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
45	FLT52-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
46	FLT53-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
47	FLT54-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
48	FLT55-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
49	FLT56-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
50	FLT57-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
51	FLT58-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
52	FLT59-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
53	FLT60-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
54	FLT61-3PH-PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
55	FLT62-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
56	FLT63-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
57	FLT64-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
58	FLT65-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
59	FLT66-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
60	FLT67-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
61	FLT68-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
62	FLT69-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
63	FLT70-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
64	FLT71-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
65	FLT72-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
66	FLT73-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
67	FLT74-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
68	FLT75-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
69	FLT76-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
70	FLT77-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable

Table 3-2 (Continued)
Stability Analysis Summary of Results for 2016 Winter, 2017 Summer, and 2025 Summer Peak Conditions

[1]Ref. No.	Cont. Name	2016 Winter Peak				2017 Summer Peak				2025 Summer Peak			
		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 0.70 p.u.	Greater than 1.2 p.u.			Less than 0.70 p.u.	Greater than 1.2 p.u.			Less than 0.70 p.u.	Greater than 1.2 p.u.		
71	FLT78-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
72	FLT79-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
73	FLT80-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
74	FLT81-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
75	FLT82-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
76	FLT83-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
77	FLT84-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
78	FLT85-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
79	FLT86-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
80	FLT87-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
81	FLT88-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
82	FLT89-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
83	FLT90-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
84	FLT91-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
85	FLT92-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
86	FLT93-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
87	FLT94-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
88	FLT95-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
89	FLT96-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
90	FLT97-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
91	FLT98-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
92	FLT99-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
93	FLT100-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
94	FLT101-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
95	FLT102-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
96	FLT103-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
97	FLT104-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
98	FLT105-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
99	FLT106-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
100	FLT107-1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
101	FLT108-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
102	FLT109-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
103	FLT110-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
104	FLT111-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
105	FLT112-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
106	FLT113-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
107	FLT114-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
108	FLT115-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
109	FLT116-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
110	FLT117-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
111	FLT118-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
112	FLT119-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
113	FLT120-3PH	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
114	FLT121_3PH_PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
115	FLT122_3PH_PO	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
116	FLT123_1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
117	FLT124_1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
118	FLT125_1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable
119	FLT126_1PH_SB	No	No	Compliant	Stable	No	No	Compliant	Stable	No	No	Compliant	Stable

(1) Refer to Table 2-3 for a description of the contingency scenario

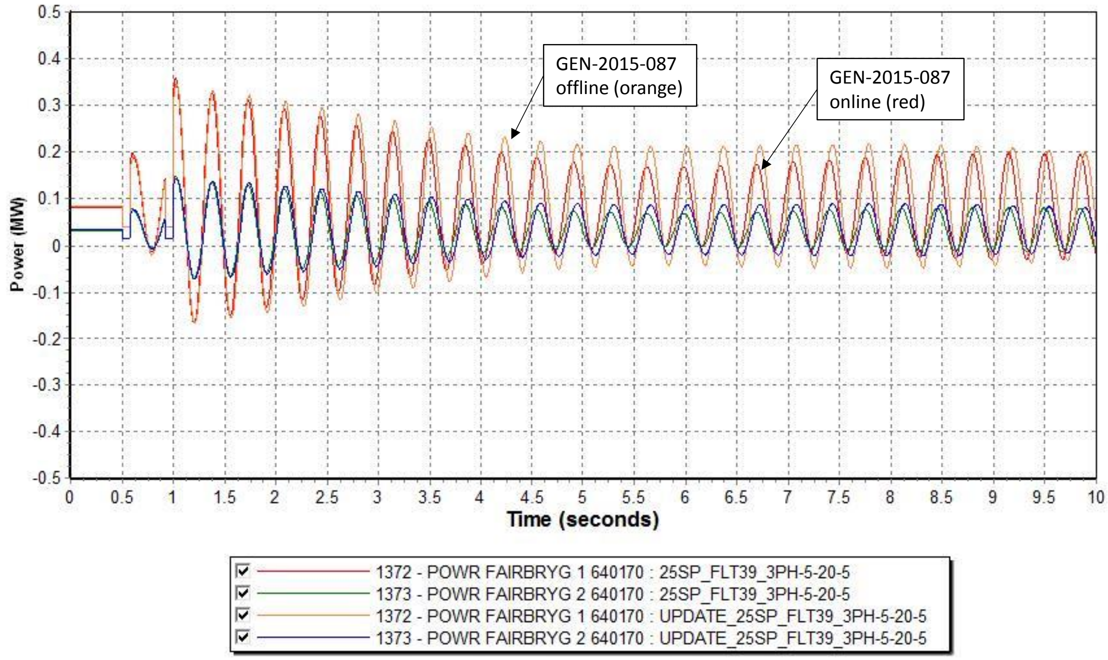

Figure 3-1. Plot of the generator power output at FAIRBRYG *for* FLT39-3PH *for 2025 Summer Peak case with and without the* GEN-2015-087 *online.*

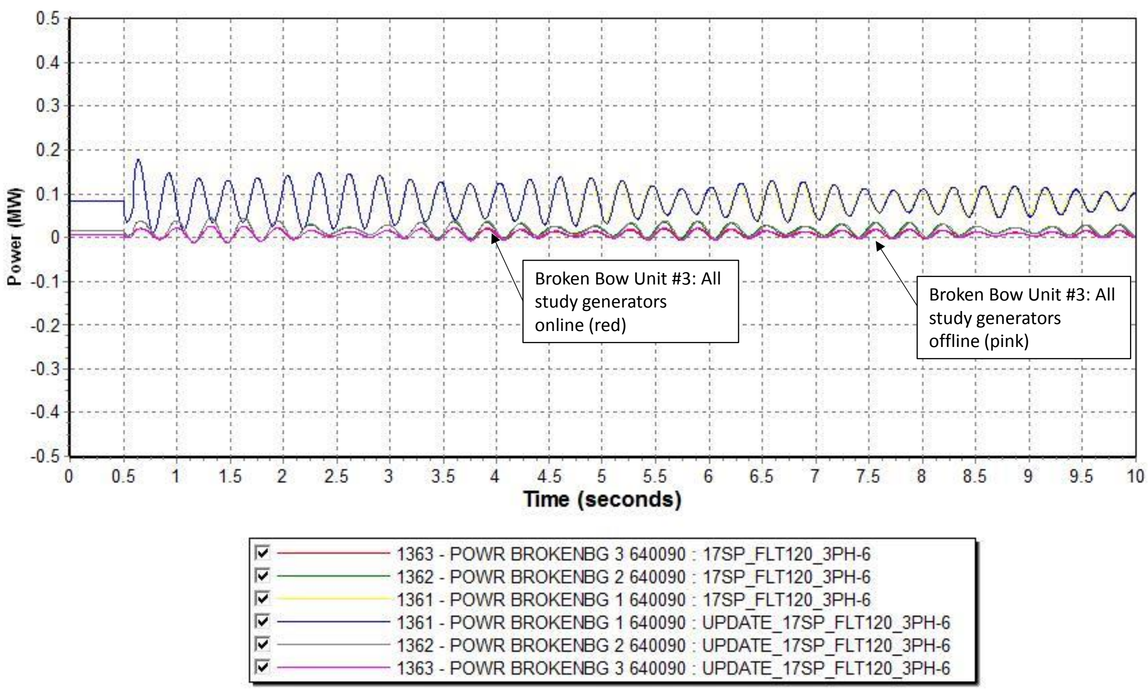

Figure 3-2. Plot of the generator power output at BROKENBG *for* FLT120-3PH *for 2017 Summer Peak case with and without the four study generators online.*

SECTION 4: SHORT-CIRCUIT ANALYSIS

The objective of this task is to quantify the three-phase to ground fault currents for the 2017 and 2025 Summer Peak season for each interconnecting generator.

4.1 Approach

The Short-Circuit analysis will assess breaker adequacy and fault duties for the generator interconnection bus and five buses away from the point of interconnection. MEPPI will assume no outages to find maximum short-circuit currents that flow through the breaker. The Automatic Sequencing Fault Calculation (ASCC) function in PSS/E was utilized to perform this task. FLAT conditions were applied to pre-fault conditions and the following adjustments were utilized:

- All synchronous and asynchronous machine P and Q output was set to zero
- All transformer tap ratios were set to 1.0 p.u. and all phase shift angles were set to zero
- All generator reactance's were fixed to the subtransient reactance
- All line charging was set to zero
- All shunts were set to zero
- All loads were set to zero
- All pre-fault bus voltages were set to 1.0 p.u. and a phase shift angle of zero

4.2 Short-circuit Results

The maximum fault current for each bus is provided for the 2017 and 2025 Summer Peak condition. The following tables show the Short-circuit results for the 2017 Summer Peak study generators:

- Table 4-1: Short-circuit Analysis for GEN-2015-053
- Table 4-2: Short-circuit Analysis for GEN-2015-076
- Table 4-3: Short-circuit Analysis for GEN-2015-087
- Table 4-4: Short-circuit Analysis for GEN-2015-088

Table 4-1
Short-Circuit Analysis for Study Project GEN-2015-053

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
560347	G10-051-TAP	230	6.9288
579444	G06-044N-HV1	115	5.57
580011	G10-051&1127	230	6.18
583780	GEN-2013-032	115	10.81
584510	GEN-2015-007	345	7.06
584910	GEN-2015-053	115	12.94
585130	GEN-2015-076	115	3.84
635200	RAUN 3	345	23.27
635201	RAUN 5	161	26.95
635202	NEAL 4 5	161	18.61
635203	NEAL N 5	161	25.47
635220	INTCHG 5	161	14.61
635230	LIBERTY5	161	24.77
635368	OBRIEN 3	345	10.65
635400	HIGHLND 3	345	10.55
635600	GRIMES 3	345	18.90
636000	WEBSTER3	345	9.42
636010	LEHIGH 3	345	10.24
640054	ALBION 7	115	5.34
640058	ATKINSN7	115	2.64
640072	BATTLCR7	115	6.93
640073	BATTLCR8	69	3.83
640080	BELDEN 7	115	6.67
640081	BELDEN 8	69	3.84
640084	BLMFLD 7	115	6.05
640085	BLMFLD 8	69	2.51
640113	CLRWATR7	115	5.13
640115	CO.LINE7	115	6.74
640125	COLMB.E3	345	9.51
640127	COLMB.E7	115	20.71
640133	COLMBUS4	230	10.84
640149	CREITON7	115	4.76
640150	CREITON8	69	3.30
640165	EMMET 7	115	2.94
640176	FULERTN7	115	2.58
640181	GENOA 7	115	4.90
640212	HARTGTN7	115	5.59
640213	HARTGTN8	69	3.60
640226	HOSKINS3	345	10.33
640227	HOSKINS4	230	9.10
640228	HOSKINS7	115	16.80
640263	MADISON7	115	6.06
640293	NELIGH 7	115	10.00
640294	NELIGH 8	69	5.91
640296	NORFK.N7	115	12.46
640298	NORFOLK7	115	11.82
640305	ONEILL 7	115	3.87
640306	ONEILL 8	69	4.19
640318	PETRSBG7	115	6.34
640342	SHELCRK3	345	9.59
640343	SHELCRK4	230	10.32
640347	SPALDNG7	115	3.39
640349	SPENCER7	115	4.56
640357	STANTON7	115	5.07
640363	STNTN.N7	115	6.83
640377	TEKAMAH5	161	8.59
640386	TWIN CH4	230	8.33
640387	TWIN CH7	115	10.50
640444	PETERSBRG.N7	115	6.35
640520	ANTELOPE 3	345	5.79
640521	ANTELOPE 7	115	13.13
645451	S3451 3	345	21.57
645454	S3454 3	345	24.24
645459	S3459 3	345	21.98
646251	S1251 5	161	29.97
650114	NW68HOLDRG3	345	16.21
652510	FTRANDL7	115	12.71
652511	GAVINS 7	115	9.92
652517	MANNING7	115	5.18
652525	TYNDALL7	115	3.83
652564	SIOUXCY3	345	14.22
652565	SIOUXCY4	230	18.81
652864	SIOUXCY-LNX3	345	14.22
658100	VERMLN 7	115	4.61
659121	SPIRITM7	115	6.46
660006	YKNTJCT7	115	9.02
660026	NAPA JCT7	115	8.39

Table 4-2
Short-Circuit Analysis for Study Projects GEN-2015-076

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
560347	G10-051-TAP	230	6.93
580011	G10-051&1127	230	6.18
583780	GEN-2013-032	115	10.81
584510	GEN-2015-007	345	7.06
584910	GEN-2015-053	115	12.94
585130	GEN-2015-076	115	3.84
635200	RAUN 3	345	23.27
635201	RAUN 5	161	26.95
635202	NEAL 4 5	161	18.61
635203	NEAL N 5	161	25.47
635220	INTCHG 5	161	14.61
635223	PLYMOTH5	161	19.46
635230	LIBERTY5	161	24.77
635368	OBRIEN 3	345	10.65
635400	HIGHLND 3	345	10.55
635600	GRIMES 3	345	18.90
636000	WEBSTER3	345	9.42
636010	LEHIGH 3	345	10.24
640070	BANCRFT7	115	5.15
640072	BATTLCR7	115	6.93
640073	BATTLCR8	69	3.83
640078	BEEMER 7	115	4.43
640080	BELDEN 7	115	6.67
640081	BELDEN 8	69	3.84
640084	BLMFLD 7	115	6.05
640085	BLMFLD 8	69	2.51
640115	CO.LINE7	115	6.74
640125	COLMB.E3	345	9.51
640127	COLMB.E7	115	20.71
640133	COLMBUS4	230	10.84
640136	COLMBUS7	115	18.51
640149	CREITON7	115	4.76
640150	CREITON8	69	3.30
640151	CRESTON7	115	5.91
640163	EMERSON7	115	5.43
640164	EMERSONG	69	3.75
640212	HARTGTN7	115	5.59
640213	HARTGTN8	69	3.60
640226	HOSKINS3	345	10.33
640227	HOSKINS4	230	9.10
640228	HOSKINS7	115	16.80
640263	MADISON7	115	6.06
640293	NELIGH 7	115	10.00
640296	NORFK.N7	115	12.46
640298	NORFOLK7	115	11.82
640300	OAKLAND7	115	7.54
640342	SHELCRK3	345	9.59
640343	SHELCRK4	230	10.32
640357	STANTON7	115	5.07
640363	STNTN.N7	115	6.83
640377	TEKAMAH5	161	8.59
640378	TEKAMAH7	115	8.06
640386	TWIN CH4	230	8.33
640387	TWIN CH7	115	10.50
640388	TWIN CH8	69	7.69
640400	W.POINT7	115	5.07
640409	WINSLOW7	115	5.19
640424	S.SIOUXCITY7	115	7.24
640425	S.SIOUXCITY8	69	4.47
640520	ANTELOPE 3	345	5.79
640521	ANTELOPE 7	115	13.13
640540	MEADOWGROVE4	230	5.38
645451	S3451 3	345	21.57
645454	S3454 3	345	24.24
645459	S3459 3	345	21.98
646251	S1251 5	161	29.97
650114	NW68HOLDRG3	345	16.21
652230	MANNING8	69	2.78
652286	TYNDALL8	69	2.51
652287	RASMUSN8	69	3.15
652463	WH SWAN7	115	12.39
652502	BERSFRD7	115	3.91
652507	FTTHOMP4	230	18.52
652509	FTRANDL4	230	10.63
652510	FTRANDL7	115	12.71
652511	GAVINS 7	115	9.92
652516	LAKPLAT4	230	5.51
652517	MANNING7	115	5.18
652525	TYNDALL7	115	3.83
652526	UTICAJC4	230	7.35
652536	RASMUSN4	230	6.47
652561	DENISON5	161	5.55
652563	SPENCER5	161	8.46
652564	SIOUXCY3	345	14.22
652565	SIOUXCY4	230	18.81
652566	SIOUXCY5	161	19.86
652567	DENISON4	230	4.46
652574	SIOUXCY8	69	17.51
652578	PAHOJA 4	230	7.16
652583	DENISON8	69	11.18
652626	UTICAJC7	115	8.75
652864	SIOUXCY-LNX3	345	14.22
658100	VERMLN 7	115	4.61
659121	SPIRITM7	115	6.46
659900	EAGLE 4	230	7.02
659901	EAGLE 8	69	13.48
660006	YKNTJCT7	115	9.02
660026	NAPA JCT7	115	8.39

Table 4-3
Short-Circuit Analysis for Study Projects GEN-2015-087

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
533303	MARSHAL3	115	4.49	640153	CRETE__7	115	8.19	640272	MCCOOL 7	115	13.78
533332	KNOB HL3	115	4.69	640169	FAIRBRY7	115	5.49	640273	MCCOOL 8	69	5.44
539665	GRNLEAF3	115	4.04	640174	FRIEND 7	115	5.83	640278	SHELDON7	115	31.17
560061	G15-087-TAP	115	5.37	640178	GENEVA 7	115	9.56	640361	STEINER7	115	4.37
560137	G08-123N-TAP	115	6.36	640179	GENEVA 8	69	4.12	640368	SUPEROR7	115	3.35
584090	GEN-2014-039	115	5.83	640206	GUIDE R7	115	4.32	640372	SUTTON 7	115	6.24
585230	GEN-2015-087	115	4.93	640207	GUIDE R8	69	2.45	640373	SUTTON 8	69	3.74
640074	BEAT. S7	115	5.19	640208	HARBINE7	115	6.97	640413	YORK SW7	115	7.94
640076	BEATRCE7	115	12.92	640218	HEBRN N7	115	5.51	640415	CARLJCT8	69	3.54
640088	BPS SUB7	115	15.69	640220	HEBRON 7	115	5.25	640426	STEELEC7	115	5.01
640105	CARLJCT7	115	5.37	640235	HUMBOLT7	115	6.38	640558	S.FLATS.PLT7	115	4.41
640111	CLATONA7	115	10.13	640271	MCCOOL 3	345	10.01	641087	EGYCNTR7	115	17.68
								647966	S966 8	69	0.47

Table 4-4
Short-Circuit Analysis for Study Project GEN-2015-088

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
300039	7FAIRPT	345	11.92
300073	5GENTRY	161	8.97
300076	5FAIRPT	161	15.81
300087	5HICKCK	161	5.15
300107	5OSBORN	161	7.18
300249	2FAIRPT	69	16.33
301347	5WINSLOW	161	9.09
530558	KNOLL 6	230	10.66
530582	S HAYS6	230	8.54
530583	POSTROCK7	345	7.75
530584	POSTROCK6	230	10.82
531469	SPERVIL7	345	12.68
541197	MULLNCR7	345	7.61
541199	ST JOE 3	345	18.75
541252	ST JOEREA 5	161	6.26
541253	ST JOE 5	161	19.90
541257	COOK 5	161	14.20
541258	WOODBIN5	161	16.75
541400	EASTOWN7	345	17.39
541401	EASTOWN5	161	17.28
542972	HAWTH 7	345	21.05
542980	NASHUA 7	345	19.70
542982	IATAN 7	345	25.79
543028	NASHUA-5	161	26.59
560009	G14-021-TAP	345	8.31
560062	G15-088-TAP	345	10.57
560137	G08-123N-TAP	115	6.36
560746	G13-002-TAP	115	27.85
562334	G13-010-TAP	345	7.42
572051	GEN2008-123N	115	4.85
579470	GEN-2008-092	230	7.87
583520	GEN-2013-002	115	27.85
583600	GEN-2013-01	345	7.42
583700	GEN-2013-01	115	21.66
583910	GEN-2014-021	345	6.52
584090	GEN-2014-039	115	5.83
585240	GEN-2015-088	345	10.18
635000	CBLUFFS3	345	28.28
635017	ATCHSNT3	345	15.01
635018	ATCHSN 3	345	14.89
635600	GRIMES 3	345	18.90
635630	BOONVIL3	345	16.08
635631	BOONVIL5	161	20.07
635635	MADISON3	345	14.87
640065	AXTELL 3	345	8.77
640066	AXTELL 7	115	13.82
640074	BEAT. S7	115	5.19
640076	BEATRCE7	115	12.92
640088	BPS SUB7	115	15.69
640105	CARLJCT7	115	5.37
640111	CLATONA7	115	10.13
640119	COL.COG7	115	18.62
640125	COLMB.E3	345	9.51
640126	E.COL. 4	230	9.27
640127	COLMB.E7	115	20.71
640131	COLMB.W4	230	9.39
640136	COLMBUS7	115	18.51
640139	COOPER 3	345	25.03
640140	COOPER 5	161	17.05
640141	COOPER_ESST8	69	4.45
640143	CORNFLD8	69	1.78
640153	CRETE__7	115	8.19
640157	DAVIDCY7	115	5.32
640161	ELMCRK_7	115	5.87
640171	FIRTH 7	115	6.06
640174	FRIEND 7	115	5.83
640178	GENEVA 7	115	9.56
640179	GENEVA 8	69	4.12
640183	GENTLMN3	345	14.14
640184	GENTLMN4	230	18.14
640200	GR ISLD4	230	15.79
640201	GR ISLD7	115	22.21
640206	GUIDE R7	115	4.32
640207	GUIDE R8	69	2.45
640208	HARBINE7	115	6.97
640214	HASTING4	230	7.16
640215	HASTING7	115	18.85
640222	HILDRTH7	115	4.20
640224	HOLDREG7	115	6.12
640226	HOSKINS3	345	10.33
640234	HUMBOLT5	161	7.44
640242	JOHN.2 7	115	12.40
640248	KEAR.NE7	115	8.95
640250	KEARNEY7	115	11.44
640252	KEYSTON3	345	8.05
640261	LOWELL 7	115	7.93
640271	MCCOOL 3	345	10.01
640272	MCCOOL 7	115	13.78
640273	MCCOOL 8	69	5.44
640275	MINDEN 7	115	7.02
640277	MOORE 3	345	20.73
640278	SHELDON7	115	31.17
640310	ORLEANS7	115	2.49
640312	PAULINE3	345	7.73
640313	PAULINE7	115	15.97
640314	PAULINE8	69	4.70
640316	PAWNEEL7	115	11.22
640325	REDWILO3	345	5.97
640330	RIVERDL4	230	6.91
640340	SEWARD 7	115	7.33
640342	SHELCRK3	345	9.59
640343	SHELCRK4	230	10.32
640361	STEINER7	115	4.37
640362	STERLNG7	115	4.25
640368	SUPEROR7	115	3.35
640372	SUTTON 7	115	6.24
640374	SWEET W3	345	9.69
640383	TOWER 7	115	8.65
640411	YORK 7	115	7.44
640413	YORK SW7	115	7.94
640446	COOPER 8	69	4.55
640447	YORK.SW T2 8	69	2.40
640448	HOLDREGE 8	69	3.68
640510	HOLT.CO3	345	5.65
641085	E7THST 7	115	17.79
641087	EGYCNTR7	115	17.68
641088	HASTCTY7	115	18.85
641090	S. 281 7	115	10.98
645451	S3451 3	345	21.57
645454	S3454 3	345	24.24
645455	S3455 3	345	27.82
645456	S3456 3	345	30.40
645458	S3458 3	345	27.81
645459	S3459 3	345	21.98
645740	S3740 3	345	17.23
646206	S1206 5	161	39.11
646254	S1254 5	161	26.03
646263	S1263 5	161	7.60
646280	S1280 5	161	9.65
647974	S974 8	69	5.35
650114	NW68HOLDRG3	345	16.21
650185	WAGENER 3	345	19.47
650189	103&ROKEBY3	345	19.42
650210	NW70FAIRFD7	115	20.76
650214	NW68HOLDRG7	115	24.78
650216	SW27&F 7	115	21.44
650218	3&VANDORN 7	115	21.08
650226	NW12&ARBOR7	115	17.87
650229	27&PLR 7	115	19.53
650230	2&N 7	115	25.27
650238	20PIONEERS7	115	26.15
650242	FOLSM&PHIL7	115	26.10
650244	SW7&BENNET7	115	21.02
650250	40&ROKEBY 7	115	19.99
650258	40&GERTIE 7	115	22.29
650267	84LEIGHTON7	115	27.97
650270	70&CALVERT7	115	25.88
650271	81&OCHENEY7	115	23.26
650283	WAVERLY 7	115	20.48
650285	WAGENER 7	115	30.48
650290	ROKEBY 7	115	24.40
652571	GR ISLD3	345	11.49
652871	GR ISLD-LNX3	345	11.49

The following tables show the Short-circuit results for the 2025 Summer Peak study generators:

- Table 4-5: Short-circuit Analysis for GEN-2015-053
- Table 4-6: Short-circuit Analysis for GEN-2015-076
- Table 4-7: Short-circuit Analysis for GEN-2015-087
- Table 4-8: Short-circuit Analysis for GEN-2015-088

Table 4-5
Short-Circuit Analysis for Study Project GEN-2015-053

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
560347	G10-051-TAP	230	6.95
579444	G06-044N-HV1	115	5.63
580011	G10-051&1127	230	6.19
583780	GEN-2013-032	115	10.97
584510	GEN-2015-007	345	7.09
584910	GEN-2015-053	115	13.18
585130	GEN-2015-076	115	3.84
635200	RAUN 3	345	23.75
635201	RAUN 5	161	27.27
635202	NEAL 4 5	161	18.76
635203	NEAL N 5	161	25.76
635220	INTCHG 5	161	14.71
635230	LIBERTY5	161	25.04
635368	OBRIEN 3	345	11.30
635400	HIGHLND 3	345	11.12
635600	GRIMES 3	345	19.45
636000	WEBSTER3	345	11.03
636010	LEHIGH 3	345	11.34
640054	ALBION 7	115	5.48
640072	BATTLCR7	115	7.44
640073	BATTLCR8	69	3.91
640080	BELDEN 7	115	6.68
640081	BELDEN 8	69	3.85
640084	BLMFLD 7	115	6.05
640085	BLMFLD 8	69	3.70
640113	CLRWATR7	115	5.17
640115	CO.LINE7	115	7.61
640125	COLMB.E3	345	9.55
640127	COLMB.E7	115	20.80
640133	COLMBUS4	230	10.87
640149	CREITON7	115	4.77
640150	CREITON8	69	4.39
640165	EMMET 7	115	3.00
640176	FULERTN7	115	2.61
640181	GENOA 7	115	4.94
640212	HARTGTN7	115	5.60
640213	HARTGTN8	69	3.60
640226	HOSKINS3	345	10.37
640227	HOSKINS4	230	9.13
640228	HOSKINS7	115	17.00
640263	MADISON7	115	6.08
640293	NELIGH 7	115	10.12
640294	NELIGH 8	69	5.94
640296	NORFK.N7	115	12.70
640298	NORFOLK7	115	11.97
640305	ONEILL 7	115	3.92
640306	ONEILL 8	69	4.23
640318	PETRSBG7	115	6.42
640342	SHELCRK3	345	9.63
640343	SHELCRK4	230	10.35
640347	SPALDNG7	115	3.65
640349	SPENCER7	115	4.59
640357	STANTON7	115	5.08
640363	STNTN.N7	115	6.86
640377	TEKAMAH5	161	8.63
640386	TWIN CH4	230	8.37
640387	TWIN CH7	115	10.52
640444	PETERSBRG.N7	115	6.43
640461	OAKDALEP23 7	115	8.29
640465	EMMETE.TAP 7	115	3.03
640466	EMMETE.P22 7	115	2.84
640520	ANTELOPE 3	345	5.82
640521	ANTELOPE 7	115	13.38
645451	S3451 3	345	22.12
645454	S3454 3	345	24.67
645459	S3459 3	345	23.43
646251	S1251 5	161	30.89
650114	NW68HOLDRG3	345	16.42
652510	FTRANDL7	115	12.89
652511	GAVINS 7	115	9.93
652517	MANNING7	115	5.18
652525	TYNDALL7	115	3.83
652564	SIOUXCY3	345	14.41
652565	SIOUXCY4	230	19.06
652864	SIOUXCY-LNX3	345	14.41
658100	VERMLN 7	115	4.61
659121	SPIRITM7	115	6.46
660006	YKNTJCT7	115	9.03
660026	NAPA JCT7	115	8.40

Table 4-6
Short-Circuit Analysis for Study Projects GEN-2015-076

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
560347	G10-051-TAP	230	6.95	640151	CRESTON7	115	5.92	646251	S1251 5	161	30.89
580011	G10-051&1127	230	6.19	640163	EMERSON7	115	5.44	650114	NW68HOLDRG3	345	16.42
583780	GEN-2013-032	115	10.97	640164	EMERSONG	69	3.75	652230	MANNING8	69	2.78
584510	GEN-2015-007	345	7.09	640212	HARTGTN7	115	5.60	652286	TYNDALL8	69	2.51
584910	GEN-2015-053	115	13.18	640213	HARTGTN8	69	3.60	652287	RASMUSN8	69	3.15
585130	GEN-2015-076	115	3.84	640226	HOSKINS3	345	10.37	652463	WH SWAN7	115	12.55
635200	RAUN 3	345	23.75	640227	HOSKINS4	230	9.13	652502	BERSFRD7	115	3.91
635201	RAUN 5	161	27.27	640228	HOSKINS7	115	17.00	652507	FTTHOMP4	230	19.02
635202	NEAL 4 5	161	18.76	640263	MADISON7	115	6.08	652509	FTRANDL4	230	10.67
635203	NEAL N 5	161	25.76	640293	NELIGH 7	115	10.12	652510	FTRANDL7	115	12.89
635220	INTCHG 5	161	14.71	640296	NORFK.N7	115	12.70	652511	GAVINS 7	115	9.93
635223	PLYMOTH5	161	19.75	640298	NORFOLK7	115	11.97	652516	LAKPLAT4	230	5.52
635230	LIBERTY5	161	25.04	640300	OAKLAND7	115	7.59	652517	MANNING7	115	5.18
635368	OBRIEN 3	345	11.30	640342	SHELCRK3	345	9.63	652525	TYNDALL7	115	3.83
635400	HIGHLND 3	345	11.12	640343	SHELCRK4	230	10.35	652526	UTICAJC4	230	7.37
635600	GRIMES 3	345	19.45	640357	STANTON7	115	5.08	652536	RASMUSN4	230	6.49
636000	WEBSTER3	345	11.03	640363	STNTN.N7	115	6.86	652561	DENISON5	161	5.60
636010	LEHIGH 3	345	11.34	640377	TEKAMAH5	161	8.63	652563	SPENCER5	161	10.14
640070	BANCRFT7	115	5.17	640378	TEKAMAH7	115	8.07	652564	SIOUXCY3	345	14.41
640072	BATTLCR7	115	7.44	640386	TWIN CH4	230	8.37	652565	SIOUXCY4	230	19.06
640073	BATTLCR8	69	3.91	640387	TWIN CH7	115	10.52	652566	SIOUXCY5	161	20.16
640078	BEEMER 7	115	4.44	640388	TWIN CH8	69	7.70	652567	DENISON4	230	4.50
640080	BELDEN 7	115	6.68	640400	W.POINT7	115	5.08	652574	SIOUXCY8	69	17.62
640081	BELDEN 8	69	3.85	640409	WINSLOW7	115	5.32	652578	PAHOJA 4	230	7.24
640084	BLMFLD 7	115	6.05	640424	S.SIOUXCITY7	115	7.25	652583	DENISON8	69	11.34
640085	BLMFLD 8	69	3.70	640425	S.SIOUXCITY8	69	4.47	652626	UTICAJC7	115	8.76
640115	CO.LINE7	115	7.61	640461	OAKDALEP23 7	115	8.29	652864	SIOUXCY-LNX3	345	14.41
640125	COLMB.E3	345	9.55	640520	ANTELOPE 3	345	5.82	658100	VERMLN 7	115	4.61
640127	COLMB.E7	115	20.80	640521	ANTELOPE 7	115	13.38	659121	SPIRITM7	115	6.46
640133	COLMBUS4	230	10.87	640540	MEADOWGROVE4	230	5.38	659900	EAGLE 4	230	7.08
640136	COLMBUS7	115	18.61	645451	S3451 3	345	22.12	659901	EAGLE 8	69	13.60
640149	CREITON7	115	4.77	645454	S3454 3	345	24.67	660006	YKNTJCT7	115	9.03
640150	CREITON8	69	4.39	645459	S3459 3	345	23.43	660026	NAPA JCT7	115	8.40

Table 4-7
Short-Circuit Analysis for Study Projects GEN-2015-087

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
533303	MARSHAL3	115	4.50	640153	CRETE__7	115	8.14	640272	MCCOOL 7	115	13.82
533332	KNOB HL3	115	4.70	640169	FAIRBRY7	115	5.49	640273	MCCOOL 8	69	5.44
539665	GRNLEAF3	115	4.04	640174	FRIEND 7	115	5.83	640278	SHELDON7	115	32.60
560061	G15-087-TAP	115	5.37	640178	GENEVA 7	115	9.57	640361	STEINER7	115	4.37
560137	G08-123N-TAP	115	6.37	640179	GENEVA 8	69	4.12	640368	SUPEROR7	115	3.35
584090	GEN-2014-039	115	5.83	640206	GUIDE R7	115	4.32	640372	SUTTON 7	115	6.24
585230	GEN-2015-087	115	4.93	640207	GUIDE R8	69	2.45	640373	SUTTON 8	69	3.75
640074	BEAT. S7	115	5.20	640208	HARBINE7	115	6.98	640413	YORK SW7	115	7.95
640076	BEATRCE7	115	12.97	640218	HEBRN N7	115	5.51	640415	CARLJCT8	69	3.55
640088	BPS SUB7	115	15.78	640220	HEBRON 7	115	5.25	640426	STEELEC7	115	5.01
640105	CARLJCT7	115	5.37	640235	HUMBOLT7	115	6.39	640558	S.FLATS.PLT7	115	4.41
640111	CLATONA7	115	10.20	640271	MCCOOL 3	345	10.10	641087	EGYCNTR7	115	17.70
								647966	S966 8	69	0.47

Table 4-8
Short-Circuit Analysis for Study Project GEN-2015-088

Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)	Bus Number	Bus Name	Bus Voltage (kV)	Fault Current 3-LG (kA)
300039	7FAIRPT	345	11.83	640119	COL.COG7	115	18.69	640343	SHELCRK4	230	10.35
300073	5GENTRY	161	8.98	640125	COLMB.E3	345	9.55	640361	STEINER7	115	4.37
300076	5FAIRPT	161	15.78	640126	E.COL. 4	230	9.29	640362	STERLNG7	115	4.27
300087	5HICKCK	161	5.15	640127	COLMB.E7	115	20.80	640368	SUPEROR7	115	3.35
300107	5OSBORN	161	7.17	640131	COLMB.W4	230	9.41	640372	SUTTON 7	115	6.24
300249	2FAIRPT	69	16.33	640136	COLMBUS7	115	18.61	640374	SWEET W3	345	9.74
301347	5WINSLOW	161	9.09	640139	COOPER 3	345	25.05	640383	TOWER 7	115	8.66
530558	KNOLL 6	230	10.71	640140	COOPER 5	161	17.07	640411	YORK 7	115	7.46
530582	S HAYS6	230	8.59	640141	COOPER_ESST8	69	4.45	640413	YORK SW7	115	7.95
530583	POSTROCK7	345	7.78	640143	CORNFLD8	69	1.78	640446	COOPER 8	69	4.55
530584	POSTROCK6	230	10.88	640153	CRETE__7	115	8.14	640447	YORK.SW T2 8	69	2.41
531469	SPERVIL7	345	12.75	640157	DAVIDCY7	115	5.33	640448	HOLDREGE 8	69	5.46
541197	MULLNCR7	345	7.61	640161	ELMCRK_7	115	5.87	640500	THEDFRD3	345	5.55
541199	ST JOE 3	345	18.30	640171	FIRTH 7	115	6.10	640510	HOLT.CO3	345	7.00
541252	ST JOEREA 5	161	6.19	640174	FRIEND 7	115	5.83	641085	E7THST 7	115	17.82
541253	ST JOE 5	161	18.62	640178	GENEVA 7	115	9.57	641087	EGYCNTR7	115	17.70
541257	COOK 5	161	12.95	640179	GENEVA 8	69	4.12	641088	HASTCTY7	115	18.88
541258	WOODBIN5	161	15.77	640183	GENTLMN3	345	15.19	641090	S. 281 7	115	10.99
541400	EASTOWN7	345	17.05	640184	GENTLMN4	230	18.62	645451	S3451 3	345	22.12
541401	EASTOWN5	161	16.01	640200	GR ISLD4	230	15.97	645454	S3454 3	345	24.67
542972	HAWTH 7	345	21.29	640201	GR ISLD7	115	22.33	645455	S3455 3	345	28.37
542980	NASHUA 7	345	19.81	640206	GUIDE R7	115	4.32	645456	S3456 3	345	31.16
542982	IATAN 7	345	27.00	640207	GUIDE R8	69	2.45	645458	S3458 3	345	27.98
543028	NASHUA-5	161	26.72	640208	HARBINE7	115	6.98	645459	S3459 3	345	23.43
560009	G14-021-TAP	345	8.32	640214	HASTING4	230	7.18	645740	S3740 3	345	17.35
560062	G15-088-TAP	345	10.62	640215	HASTING7	115	18.88	646206	S1206 5	161	40.47
560137	G08-123N-TAP	115	6.37	640222	HILDRTH7	115	4.20	646254	S1254 5	161	26.37
560746	G13-002-TAP	115	28.98	640223	HILDRTH8	69	3.20	646263	S1263 5	161	7.61
562334	G13-010-TAP	345	7.44	640224	HOLDREG7	115	6.12	646280	S1280 5	161	9.67
572051	GEN2008-123N	115	4.85	640226	HOSKINS3	345	10.37	647974	S974 8	69	5.36
579470	GEN-2008-092	230	7.90	640234	HUMBOLT5	161	7.46	650114	NW68HOLDRG3	345	16.42
583520	GEN-2013-002	115	28.98	640242	JOHN.2 7	115	12.42	650185	WAGENER 3	345	19.76
583600	GEN-2013-01	345	7.44	640248	KEAR.NE7	115	8.96	650189	103&ROKEBY3	345	19.66
583700	GEN-2013-019	115	22.33	640250	KEARNEY7	115	11.45	650210	NW70FAIRFD7	115	21.21
583910	GEN-2014-021	345	6.52	640252	KEYSTON3	345	8.28	650214	NW68HOLDRG7	115	25.43
584090	GEN-2014-039	115	5.83	640261	LOWELL 7	115	7.93	650216	SW27&F 7	115	21.97
585240	GEN-2015-088	345	10.23	640271	MCCOOL 3	345	10.10	650218	3&VANDORN 7	115	21.68
635000	CBLUFFS3	345	28.83	640272	MCCOOL 7	115	13.82	650226	NW12&ARBOR7	115	18.17
635017	ATCHSNT3	345	15.03	640273	MCCOOL 8	69	5.44	650229	27&PLR 7	115	20.48
635018	ATCHSN 3	345	14.90	640275	MINDEN 7	115	7.03	650230	2&N 7	115	26.04
635600	GRIMES 3	345	19.45	640277	MOORE 3	345	21.02	650238	20PIONEERS7	115	27.21
635630	BOONVIL3	345	16.39	640278	SHELDON7	115	32.60	650242	FOLSM&PHIL7	115	27.69
635631	BOONVIL5	161	20.33	640310	ORLEANS7	115	2.49	650244	SW7&BENNET7	115	21.85
635635	MADISON3	345	15.13	640312	PAULINE3	345	7.75	650250	40&ROKEBY 7	115	20.80
640065	AXTELL 3	345	8.79	640313	PAULINE7	115	15.98	650258	40&GERTIE 7	115	22.97
640066	AXTELL 7	115	13.83	640314	PAULINE8	69	4.70	650267	84LEIGHTON7	115	28.67
640074	BEAT. S7	115	5.20	640316	PAWNEEL7	115	11.33	650270	70&CALVERT7	115	26.69
640076	BEATRCE7	115	12.97	640325	REDWILO3	345	6.07	650271	81&OCHENEY7	115	23.93
640088	BPS SUB7	115	15.78	640330	RIVERDL4	230	6.92	650283	WAVERLY 7	115	20.77
640105	CARLJCT7	115	5.37	640340	SEWARD 7	115	7.36	650285	WAGENER 7	115	31.10
640111	CLATONA7	115	10.20	640342	SHELCRK3	345	9.63	650290	ROKEBY 7	115	26.20
								652571	GR ISLD3	345	11.72
								652871	GR ISLD-LNX3	345	11.72

SECTION 5: POWER FACTOR ANALYSIS

The objective of this task is to quantify the power factor at the high side of the collector system equivalent transformer near the point of interconnection for the wind farms during base case and system contingencies. SPP transmission planning practice requires interconnecting generation projects to maintain the power factor (pf) at the high side of the transformer near the Point of Interconnection (POI) within +/- 0.95 pf for system intact conditions and for post-contingency conditions. This is analyzed by having the wind farm maintain a prescribed voltage schedule at the point of interconnection of 1.0 p.u. voltage, or if the pre-project voltage is higher than 1.0 p.u., to maintain the pre-project voltage schedule.

The 2016 Winter Peak, 2017 Summer Peak, and 2025 Summer Peak power flows provided by SPP were examined prior to the Power Factor Analysis to ensure they contained the proposed study project modeled at 100% of the nameplate rating and any previously queued projects listed in Table 2-2. There was no suspect power flow data in the study area. The proposed study project and any previously queued projects at the same point of interconnection were turned off during the power factor analysis. The wind farm(s) were then replaced by a generator modeled at the high side bus with the same real power (MW) capability as the wind farm(s) and open limits for the reactive power set points (Mvar). The generator was set to hold the POI scheduled bus voltage. All N-1, three-phase fault contingencies from Table 2-3 were then applied and the reactive power required to maintain the bus voltage was recorded.

5.1 Approach

GEN-2015-053 and GEN-2013-032 was disabled and the generator was placed at the study project's high side of the collector system equivalent transformer. The generator was modeled with PGEN = 50 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar during Summer and Winter Peak conditions. All buses and transformers connected from the study project's high side of the collector system equivalent transformer to the generators were disabled. The scheduled voltage was set to 1.0323 p.u. for the 2016 Winter Peak conditions, 1.0326 p.u. for the 2017 Summer Peak conditions, and 1.0326 p.u. for the 2025 Summer Peak conditions.

GEN-2015-076 was disabled and the generator was placed at the study project's high side of the collector system equivalent transformer. The generator was modeled with PGEN = 158.4 MW, QMin = -9999 Mvar and QMax = 9999 Mvar during Summer and Winter Peak conditions. All buses and transformers connected from the study project's high side of the collector system equivalent transformer to the generators were disabled. The scheduled voltage was set to 1.0608 p.u. for the 2016 Winter Peak conditions, 1.0521 p.u. for the 2017 Summer Peak conditions, and 1.0523 p.u. for the 2025 Summer Peak conditions.

GEN-2015-087 was disabled and the generator was placed at the study project's high side of the collector system equivalent transformer. The generator was modeled with PGEN = 66 MW, QMin = -9999 Mvar and QMax = 9999 Mvar during Summer and Winter Peak conditions. All buses and transformers connected from the study project's high side of the collector system equivalent transformer to the generators were disabled. The scheduled voltage was set to 1.0466 p.u. for the 2016 Winter Peak conditions, 1.0309 p.u. for the 2017 Summer Peak conditions, and 1.0432 p.u. for the 2025 Summer Peak conditions.

GEN-2015-088 was disabled and the generator was placed at the study project's high side of the collector system equivalent transformer. The generator was modeled with PGEN = 300 MW, QMin = -9999 Mvar and QMax = 9999 Mvar during Summer and Winter Peak conditions. All buses and transformers connected from the study project's high side of the collector system equivalent transformer to the generators were disabled. The scheduled voltage was set to 1.0194 p.u. for the 2016 Winter Peak conditions, 1.0170 p.u. for the 2017 Summer Peak conditions, and 1.0172 p.u. for the 2025 Summer Peak conditions.

5.2 Power Factor Analysis Results

The power factor was calculated for the 2016 Winter Peak, 2017 Summer Peak, and 2025 Summer Peak conditions. The following tables show the power factor results for the study generators:

- Table 5-1: Power Factor Analysis for GEN-2015-053
- Table 5-2: Power Factor Analysis for GEN-2015-076
- Table 5-3: Power Factor Analysis for GEN-2015-087
- Table 5-4: Power Factor Analysis for GEN-2015-088

Note that a positive Q (Mvar) output illustrates that the generator is absorbing reactive power from the system, implying a leading power factor; a negative Q (Mvar) illustrates that the generator is supplying reactive power to the system, implying a lagging power factor.

Table 5-1
Power Factor Analysis: GEN-2015-053

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.644	Leading	59.383972	0.701	Leading	50.843864	0.676	Leading	54.504047
1	FLT08-3PH	0.663	Leading	56.43108	0.720	Leading	48.124294	0.693	Leading	51.985405
2	FLT09-3PH	0.669	Leading	55.516563	0.732	Leading	46.509369	0.704	Leading	50.382881
3	FLT10-3PH	0.644	Leading	59.388691	0.701	Leading	50.838543	0.676	Leading	54.484791
4	FLT11-3PH	0.658	Leading	57.165348	0.723	Leading	47.767635	0.696	Leading	51.562138
5	FLT12-3PH	0.647	Leading	58.89904	0.706	Leading	50.208527	0.681	Leading	53.822674
6	FLT13-3PH	0.638	Leading	60.397232	0.692	Leading	52.090084	0.669	Leading	55.485897
7	FLT14-3PH	0.646	Leading	59.154129	0.707	Leading	50.080109	0.685	Leading	53.167034
8	FLT15-3PH	0.645	Leading	59.201973	0.683	Leading	53.469574	0.661	Leading	56.835533
9	FLT16-3PH	0.704	Leading	50.369656	0.747	Leading	44.465824	0.688	Leading	52.775795
10	FLT17-3PH	0.876	Leading	27.506765	0.969	Leading	12.839367	0.982	Leading	9.6108379
11	FLT18-3PH	0.660	Leading	56.943192	0.654	Leading	57.83189	0.656	Leading	57.56459
12	FLT19-3PH	0.613	Leading	64.374931	0.716	Leading	48.709045	0.675	Leading	54.677528
13	FLT20-3PH	0.615	Leading	64.122322	0.664	Leading	56.297218	0.645	Leading	59.215027
14	FLT21-3PH	0.882	Leading	26.730412	0.968	Leading	12.958334	0.982	Leading	9.5929813
15	FLT22-3PH	0.702	Leading	50.715794	0.749	Leading	44.186878	0.693	Leading	52.03046
16	FLT23-3PH	0.653	Leading	58.043121	0.706	Leading	50.094093	0.683	Leading	53.507553
17	FLT24-3PH	0.629	Leading	61.745434	0.699	Leading	51.165527	0.676	Leading	54.510529
18	FLT25-3PH	0.657	Leading	57.317184	0.716	Leading	48.778702	0.689	Leading	52.660721
19	FLT26-3PH	0.646	Leading	59.022884	0.705	Leading	50.272224	0.680	Leading	53.963692
20	FLT27-3PH	0.644	Leading	59.334076	0.702	Leading	50.783848	0.676	Leading	54.441662
21	FLT28-3PH	0.644	Leading	59.354717	0.701	Leading	50.813423	0.676	Leading	54.472321
22	FLT29-3PH	0.639	Leading	60.234337	0.710	Leading	49.639404	0.680	Leading	53.959339
23	FLT30-3PH	0.647	Leading	58.873177	0.699	Leading	51.135136	0.673	Leading	54.94833
24	FLT31-3PH	0.645	Leading	59.166615	0.704	Leading	50.496376	0.679	Leading	54.001587
25	FLT32-3PH	0.653	Leading	57.918571	0.715	Leading	48.916904	0.689	Leading	52.642025
26	FLT33-3PH	0.645	Leading	59.186493	0.702	Leading	50.737782	0.677	Leading	54.371834
27	FLT34-3PH	0.644	Leading	59.398716	0.704	Leading	50.435459	0.687	Leading	52.952148
28	FLT35-3PH	0.644	Leading	59.469803	0.701	Leading	50.877613	0.675	Leading	54.597675
29	FLT36-3PH	0.645	Leading	59.257145	0.702	Leading	50.777763	0.676	Leading	54.521214
30	FLT37-3PH	0.644	Leading	59.387733	0.701	Leading	50.851894	0.676	Leading	54.514069
31	FLT38-3PH	0.644	Leading	59.393574	0.702	Leading	50.759739	0.677	Leading	54.351849
32	FLT39-3PH	0.645	Leading	59.290077	0.702	Leading	50.71014	0.676	Leading	54.454361
33	FLT40-3PH	0.665	Leading	56.148094	0.720	Leading	48.216183	0.694	Leading	51.799839
34	FLT41-3PH	0.649	Leading	58.608444	0.703	Leading	50.523174	0.678	Leading	54.213249
35	FLT42-3PH	0.648	Leading	58.740955	0.707	Leading	50.069225	0.683	Leading	53.481857
36	FLT43-3PH	0.650	Leading	58.502209	0.706	Leading	50.182873	0.680	Leading	53.872444
37	FLT44-3PH	0.661	Leading	56.828297	0.715	Leading	48.941143	0.688	Leading	52.74205
38	FLT45-3PH	0.650	Leading	58.412392	0.706	Leading	50.094265	0.682	Leading	53.590565
39	FLT46-3PH	0.641	Leading	59.941586	0.700	Leading	51.065971	0.673	Leading	54.881348
40	FLT47-3PH	0.647	Leading	58.91468	0.704	Leading	50.466824	0.679	Leading	54.084049
41	FLT48-3PH	0.644	Leading	59.412594	0.701	Leading	50.823818	0.677	Leading	54.422695
42	FLT49-3PH	0.645	Leading	59.304577	0.703	Leading	50.629086	0.677	Leading	54.306458
43	FLT50-3PH	0.644	Leading	59.383972	0.701	Leading	50.843864	0.676	Leading	54.504047

Table 5-1 (Continued)
Power Factor Analysis: GEN-2015-053

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
44	FLT81-3PH	0.648	Leading	58.768154	0.706	Leading	50.126392	0.682	Leading	53.582169
45	FLT82-3PH	0.647	Leading	58.91468	0.704	Leading	50.466824	0.679	Leading	54.084049
46	FLT83-3PH	0.646	Leading	59.143333	0.703	Leading	50.614304	0.676	Leading	54.435402
47	FLT84-3PH	0.644	Leading	59.383972	0.701	Leading	50.843864	0.676	Leading	54.504047
48	FLT85-3PH	0.652	Leading	58.177299	0.705	Leading	50.26685	0.681	Leading	53.815033
49	FLT86-3PH	0.644	Leading	59.445526	0.701	Leading	50.906616	0.676	Leading	54.464931
50	FLT87-3PH	0.644	Leading	59.376854	0.701	Leading	50.876587	0.676	Leading	54.461319
51	FLT88-3PH	0.644	Leading	59.465363	0.702	Leading	50.727867	0.676	Leading	54.445095
52	FLT89-3PH	0.645	Leading	59.298599	0.702	Leading	50.789326	0.676	Leading	54.474705
53	FLT90-3PH	0.645	Leading	59.298599	0.702	Leading	50.789326	0.676	Leading	54.474705
54	FLT108-3PH	0.639	Leading	60.234337	0.710	Leading	49.639404	0.680	Leading	53.959339
55	FLT109-3PH	0.756	Leading	43.29015	0.769	Leading	41.531597	0.740	Leading	45.400749
56	FLT110-3PH	0.697	Leading	51.440472	0.744	Leading	44.968761	0.718	Leading	48.429607
57	FLT111-3PH	0.644	Leading	59.406586	0.698	Leading	51.277496	0.674	Leading	54.85556
58	FLT112-3PH	0.668	Leading	55.687111	0.734	Leading	46.28516	0.708	Leading	49.908005
59	FLT113-3PH	0.668	Leading	55.67786	0.719	Leading	48.304348	0.692	Leading	52.154213
60	FLT114-3PH	0.645	Leading	59.314323	0.701	Leading	50.914646	0.675	Leading	54.591637
61	FLT115-3PH	0.652	Leading	58.211811	0.711	Leading	49.448254	0.687	Leading	52.91621
62	FLT116-3PH	0.655	Leading	57.658642	0.717	Leading	48.557007	0.689	Leading	52.663456
63	FLT117-3PH	0.650	Leading	58.401375	0.712	Leading	49.28933	0.686	Leading	53.084988
64	FLT118-3PH	0.642	Leading	59.666653	0.695	Leading	51.689766	0.672	Leading	55.056446
65	FLT119-3PH	0.652	Leading	58.128502	0.743	Leading	45.032101	0.710	Leading	49.58416
66	FLT120-3PH	0.644	Leading	59.383972	0.701	Leading	50.843864	0.676	Leading	54.504047

(1) Refer to Table 2-3 for a description of the contingency scenario

Study Generator GEN-2015-053

The Power Factor Analysis shows that GEN-2015-053 has a power factor range of 0.613 to 0.882 leading (absorbing) for the 2016 Winter Peak conditions, a power factor range of 0.654 to 0.969 leading (absorbing) for the 2017 Summer Peak conditions, and a power factor range of 0.645 to 0.982 leading (absorbing) for the 2025 Summer Peak conditions.

Table 5-2
Power Factor Analysis: GEN-2015-076

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.999	Lagging	-8.55	0.993	Lagging	-19.23	0.993	Lagging	-19.15
1	FLT08-3PH	0.990	Lagging	-22.80	0.986	Lagging	-26.57	0.986	Lagging	-26.77
2	FLT09-3PH	0.998	Lagging	-10.40	0.991	Lagging	-21.11	0.991	Lagging	-20.84
3	FLT10-3PH	0.997	Lagging	-11.31	0.991	Lagging	-21.17	0.991	Lagging	-21.13
4	FLT11-3PH	0.998	Lagging	-10.30	0.988	Lagging	-24.85	0.987	Lagging	-26.18
5	FLT12-3PH	0.998	Lagging	-10.32	0.992	Lagging	-20.46	0.992	Lagging	-19.69
6	FLT13-3PH	0.996	Lagging	-13.41	0.990	Lagging	-22.31	0.990	Lagging	-22.14
7	FLT14-3PH	0.999	Lagging	-8.56	0.993	Lagging	-19.37	0.993	Lagging	-19.29
8	FLT15-3PH	0.998	Lagging	-8.94	0.992	Lagging	-19.58	0.993	Lagging	-19.25
9	FLT16-3PH	0.999	Lagging	-6.12	0.993	Lagging	-18.62	0.992	Lagging	-19.97
10	FLT17-3PH	0.992	Lagging	-19.55	0.990	Lagging	-22.12	0.992	Lagging	-20.32
11	FLT18-3PH	0.998	Lagging	-8.90	0.993	Lagging	-18.43	0.993	Lagging	-18.79
12	FLT19-3PH	0.999	Lagging	-7.69	0.993	Lagging	-19.13	0.993	Lagging	-19.13
13	FLT20-3PH	0.998	Lagging	-9.06	0.989	Lagging	-23.44	0.989	Lagging	-23.99
14	FLT21-3PH	0.993	Lagging	-19.50	0.988	Lagging	-24.51	0.990	Lagging	-22.70
15	FLT22-3PH	0.999	Lagging	-6.24	0.994	Lagging	-17.99	0.993	Lagging	-19.32
16	FLT23-3PH	1.000	Lagging	-4.89	0.989	Lagging	-24.00	0.990	Lagging	-23.12
17	FLT24-3PH	0.975	Leading	36.29	0.998	Leading	10.48	0.998	Leading	10.12
18	FLT25-3PH	0.999	Leading	6.59	0.994	Lagging	-17.66	0.994	Lagging	-17.75
19	FLT26-3PH	0.998	Lagging	-8.71	0.993	Lagging	-19.10	0.993	Lagging	-18.96
20	FLT27-3PH	0.998	Lagging	-9.05	0.992	Lagging	-19.58	0.993	Lagging	-19.50
21	FLT28-3PH	0.998	Lagging	-8.84	0.993	Lagging	-19.40	0.993	Lagging	-19.33
22	FLT29-3PH	0.996	Leading	14.30	0.997	Lagging	-12.39	0.996	Lagging	-13.46
23	FLT30-3PH	0.998	Lagging	-10.57	0.992	Lagging	-20.03	0.992	Lagging	-20.06
24	FLT31-3PH	0.999	Lagging	-8.36	0.993	Lagging	-19.26	0.993	Lagging	-19.18
25	FLT32-3PH	0.999	Lagging	-7.80	0.993	Lagging	-18.89	0.993	Lagging	-18.90
26	FLT33-3PH	0.998	Lagging	-8.97	0.993	Lagging	-19.37	0.993	Lagging	-19.32
27	FLT34-3PH	0.994	Lagging	-16.90	0.987	Lagging	-25.33	0.988	Lagging	-24.72
28	FLT35-3PH	0.999	Lagging	-8.60	0.993	Lagging	-19.20	0.993	Lagging	-19.09
29	FLT36-3PH	0.999	Lagging	-8.60	0.993	Lagging	-19.27	0.993	Lagging	-19.14
30	FLT37-3PH	0.999	Lagging	-8.55	0.993	Lagging	-19.22	0.993	Lagging	-19.14
31	FLT38-3PH	0.999	Lagging	-8.60	0.993	Lagging	-19.26	0.993	Lagging	-19.22
32	FLT39-3PH	0.999	Lagging	-8.58	0.993	Lagging	-19.30	0.993	Lagging	-19.17
33	FLT40-3PH	0.997	Lagging	-12.07	0.992	Lagging	-20.56	0.992	Lagging	-20.33
34	FLT41-3PH	0.998	Lagging	-9.28	0.993	Lagging	-19.37	0.993	Lagging	-19.26
35	FLT42-3PH	0.998	Lagging	-9.12	0.993	Lagging	-19.50	0.992	Lagging	-19.52
36	FLT43-3PH	0.998	Lagging	-9.46	0.992	Lagging	-19.66	0.992	Lagging	-19.52
37	FLT44-3PH	0.998	Lagging	-10.58	0.992	Lagging	-20.26	0.992	Lagging	-19.92
38	FLT45-3PH	0.998	Lagging	-9.07	0.992	Lagging	-19.79	0.992	Lagging	-19.73
39	FLT46-3PH	0.999	Lagging	-7.96	0.993	Lagging	-19.09	0.993	Lagging	-18.92
40	FLT47-3PH	0.998	Lagging	-8.98	0.993	Lagging	-19.42	0.993	Lagging	-19.35
41	FLT48-3PH	0.999	Lagging	-8.48	0.993	Lagging	-19.22	0.993	Lagging	-19.17
42	FLT49-3PH	0.999	Lagging	-8.64	0.993	Lagging	-19.34	0.993	Lagging	-19.24
43	FLT50-3PH	0.999	Lagging	-8.55	0.993	Lagging	-19.23	0.993	Lagging	-19.15

Table 5-2 (Continued)
Power Factor Analysis: GEN-2015-076

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
44	FLT81-3PH	0.998	Lagging	-9.09	0.993	Lagging	-19.50	0.993	Lagging	-19.46
45	FLT82-3PH	0.998	Lagging	-8.98	0.993	Lagging	-19.42	0.993	Lagging	-19.35
46	FLT83-3PH	0.999	Lagging	-8.66	0.993	Lagging	-19.34	0.993	Lagging	-19.19
47	FLT84-3PH	0.999	Lagging	-8.55	0.993	Lagging	-19.23	0.993	Lagging	-19.15
48	FLT85-3PH	0.999	Lagging	-7.89	0.992	Lagging	-19.72	0.992	Lagging	-19.58
49	FLT86-3PH	0.999	Lagging	-8.54	0.993	Lagging	-19.20	0.993	Lagging	-19.16
50	FLT87-3PH	0.999	Lagging	-8.55	0.993	Lagging	-19.21	0.993	Lagging	-19.16
51	FLT88-3PH	0.999	Lagging	-8.54	0.993	Lagging	-19.24	0.993	Lagging	-19.16
52	FLT89-3PH	0.999	Lagging	-8.58	0.993	Lagging	-19.25	0.993	Lagging	-19.16
53	FLT90-3PH	0.999	Lagging	-8.58	0.993	Lagging	-19.25	0.993	Lagging	-19.16
54	FLT108-3PH	0.996	Leading	14.30	0.997	Lagging	-12.39	0.996	Lagging	-13.46
55	FLT109-3PH	0.997	Lagging	-11.96	0.993	Lagging	-19.49	0.993	Lagging	-19.51
56	FLT110-3PH	0.988	Lagging	-24.56	0.985	Lagging	-28.01	0.985	Lagging	-27.54
57	FLT111-3PH	0.999	Lagging	-8.56	0.993	Lagging	-18.74	0.993	Lagging	-18.79
58	FLT112-3PH	0.996	Lagging	-14.26	0.987	Lagging	-26.23	0.987	Lagging	-26.25
59	FLT113-3PH	0.996	Lagging	-14.40	0.990	Lagging	-22.47	0.991	Lagging	-21.88
60	FLT114-3PH	0.999	Lagging	-8.68	0.993	Lagging	-19.06	0.993	Lagging	-18.98
61	FLT115-3PH	0.998	Lagging	-9.46	0.993	Lagging	-19.10	0.992	Lagging	-19.83
62	FLT116-3PH	0.998	Lagging	-10.74	0.991	Lagging	-21.42	0.992	Lagging	-20.73
63	FLT117-3PH	0.998	Lagging	-9.63	0.992	Lagging	-20.06	0.992	Lagging	-19.87
64	FLT118-3PH	0.999	Lagging	-8.36	0.993	Lagging	-18.67	0.993	Lagging	-18.76
65	FLT119-3PH	0.998	Lagging	-9.73	0.989	Lagging	-23.54	0.991	Lagging	-21.32
66	FLT120-3PH	0.999	Lagging	-8.55	0.993	Lagging	-19.23	0.993	Lagging	-19.15

(1) Refer to Table 2-3 for a description of the contingency scenario

<u>Study Generator GEN-2015-076</u>

The Power Factor Analysis shows that GEN-2015-076 has a power factor range of 0.975 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.985 lagging (supplying) to 0.998 leading (absorbing) for the 2017 Summer Peak conditions, and a power factor range of 0.985 lagging (supplying) to 0.998 leading (absorbing) for the 2025 Summer Peak conditions.

Table 5-3
Power Factor Analysis: GEN-2015-087

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30
1	FLT08-3PH	0.995	Leading	6.50	0.995	Leading	6.94	0.996	Leading	6.25
2	FLT09-3PH	0.995	Leading	6.54	0.995	Leading	6.87	0.996	Leading	6.21
3	FLT10-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30
4	FLT11-3PH	0.995	Leading	6.57	0.995	Leading	6.93	0.996	Leading	6.24
5	FLT12-3PH	0.995	Leading	6.61	0.994	Leading	6.98	0.995	Leading	6.29
6	FLT13-3PH	0.995	Leading	6.68	0.994	Leading	7.06	0.995	Leading	6.37
7	FLT14-3PH	0.995	Leading	6.61	0.994	Leading	6.99	0.995	Leading	6.31
8	FLT15-3PH	0.995	Leading	6.62	0.994	Leading	7.00	0.995	Leading	6.31
9	FLT16-3PH	0.995	Leading	6.51	0.995	Leading	6.91	0.996	Leading	6.22
10	FLT17-3PH	0.996	Leading	6.12	0.995	Leading	6.83	0.996	Leading	6.20
11	FLT18-3PH	0.995	Leading	6.62	0.994	Leading	7.10	0.995	Leading	6.34
12	FLT19-3PH	0.995	Leading	6.49	0.994	Leading	7.14	0.996	Leading	6.26
13	FLT20-3PH	0.995	Leading	6.63	0.994	Leading	6.96	0.996	Leading	6.27
14	FLT21-3PH	0.996	Leading	5.96	0.995	Leading	6.69	0.996	Leading	6.06
15	FLT22-3PH	0.995	Leading	6.51	0.995	Leading	6.92	0.996	Leading	6.24
16	FLT23-3PH	0.995	Leading	6.57	0.995	Leading	6.94	0.996	Leading	6.26
17	FLT24-3PH	0.995	Leading	6.71	0.994	Leading	7.05	0.995	Leading	6.37
18	FLT25-3PH	0.995	Leading	6.56	0.995	Leading	6.93	0.996	Leading	6.26
19	FLT26-3PH	0.995	Leading	6.57	0.995	Leading	6.93	0.996	Leading	6.25
20	FLT27-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30
21	FLT28-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30
22	FLT29-3PH	0.995	Leading	6.64	0.994	Leading	6.96	0.995	Leading	6.29
23	FLT30-3PH	0.995	Leading	6.58	0.994	Leading	6.97	0.995	Leading	6.29
24	FLT31-3PH	0.995	Leading	6.60	0.994	Leading	6.96	0.996	Leading	6.28
25	FLT32-3PH	0.995	Leading	6.62	0.994	Leading	6.98	0.995	Leading	6.30
26	FLT33-3PH	0.995	Leading	6.61	0.994	Leading	6.99	0.995	Leading	6.30
27	FLT34-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30
28	FLT35-3PH	0.981	Leading	13.22	0.976	Leading	14.74	0.993	Leading	8.10
29	FLT36-3PH	0.989	Leading	9.97	0.989	Leading	9.97	0.969	Leading	16.73
30	FLT37-3PH	0.994	Leading	7.06	0.999	Leading	2.94	0.997	Leading	5.41
31	FLT38-3PH	0.978	Leading	14.08	0.955	Leading	20.46	0.917	Leading	28.80
32	FLT39-3PH	0.997	Leading	5.53	0.996	Lagging	-6.00	1.000	Lagging	-0.46
33	FLT40-3PH	1.000	Lagging	-2.06	1.000	Leading	0.28	1.000	Leading	0.31
34	FLT41-3PH	0.997	Leading	4.72	0.997	Leading	5.40	0.997	Leading	4.89
35	FLT42-3PH	0.995	Leading	6.33	0.995	Leading	6.78	0.996	Leading	6.20
36	FLT43-3PH	0.996	Leading	5.66	0.996	Leading	6.09	0.996	Leading	5.54
37	FLT44-3PH	0.996	Leading	5.57	0.996	Leading	5.76	0.996	Leading	5.96
38	FLT45-3PH	0.997	Leading	5.50	0.996	Leading	6.04	0.997	Leading	5.18
39	FLT46-3PH	0.995	Leading	6.85	0.994	Leading	7.04	0.996	Leading	6.23
40	FLT47-3PH	0.997	Leading	5.30	0.996	Leading	6.25	0.997	Leading	5.25
41	FLT48-3PH	0.999	Leading	2.88	0.998	Leading	3.84	0.999	Leading	2.86
42	FLT49-3PH	0.995	Leading	6.60	0.995	Leading	6.92	0.996	Leading	6.20
43	FLT50-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30

Table 5-3 (Continued)
Power Factor Analysis: GEN-2015-087

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
44	FLT81-3PH	0.996	Leading	5.97	0.996	Leading	6.25	0.996	Leading	5.56
45	FLT82-3PH	0.997	Leading	5.30	0.996	Leading	6.25	0.997	Leading	5.25
46	FLT83-3PH	0.995	Leading	6.91	0.994	Leading	7.29	0.995	Leading	6.49
47	FLT84-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30
48	FLT85-3PH	0.997	Leading	5.03	0.995	Leading	6.44	0.996	Leading	5.80
49	FLT86-3PH	0.995	Leading	6.59	0.994	Leading	7.00	0.996	Leading	6.23
50	FLT87-3PH	0.995	Leading	6.60	0.994	Leading	7.02	0.996	Leading	6.25
51	FLT88-3PH	0.995	Leading	6.66	0.995	Leading	6.81	0.996	Leading	6.03
52	FLT89-3PH	0.995	Leading	6.57	0.994	Leading	6.97	0.996	Leading	6.28
53	FLT90-3PH	0.995	Leading	6.57	0.994	Leading	6.97	0.996	Leading	6.28
54	FLT108-3PH	0.995	Leading	6.64	0.994	Leading	6.96	0.995	Leading	6.29
55	FLT109-3PH	0.995	Leading	6.50	0.995	Leading	6.93	0.996	Leading	6.25
56	FLT110-3PH	0.995	Leading	6.62	0.994	Leading	7.02	0.995	Leading	6.32
57	FLT111-3PH	0.995	Leading	6.62	0.994	Leading	7.00	0.995	Leading	6.31
58	FLT112-3PH	0.995	Leading	6.57	0.995	Leading	6.93	0.996	Leading	6.24
59	FLT113-3PH	0.995	Leading	6.61	0.994	Leading	6.99	0.995	Leading	6.30
60	FLT114-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30
61	FLT115-3PH	0.996	Leading	6.28	0.995	Leading	6.59	0.996	Leading	5.97
62	FLT116-3PH	0.995	Leading	6.45	0.995	Leading	6.77	0.996	Leading	6.15
63	FLT117-3PH	0.995	Leading	6.36	0.995	Leading	6.77	0.996	Leading	6.10
64	FLT118-3PH	0.995	Leading	6.57	0.995	Leading	6.83	0.996	Leading	6.21
65	FLT119-3PH	0.993	Leading	7.75	0.995	Leading	6.75	0.998	Leading	4.17
66	FLT120-3PH	0.995	Leading	6.62	0.994	Leading	6.99	0.995	Leading	6.30

(1) Refer to Table 2-3 for a description of the contingency scenario

Study Generator GEN-2015-087

The Power Factor Analysis shows that GEN-2015-087 has a power factor range of 0.978 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.955 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, and a power factor range of 0.917 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

Table 5-4
Power Factor Analysis: GEN-2015-088

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.984	Leading	53.87	0.984	Leading	54.32	0.984	Leading	54.32
1	FLT08-3PH	0.986	Leading	51.01	0.985	Leading	52.16	0.985	Leading	52.40
2	FLT09-3PH	0.985	Leading	53.22	0.985	Leading	53.37	0.984	Leading	53.60
3	FLT10-3PH	0.984	Leading	53.83	0.984	Leading	54.26	0.984	Leading	54.25
4	FLT11-3PH	0.985	Leading	52.45	0.985	Leading	52.82	0.985	Leading	52.99
5	FLT12-3PH	0.984	Leading	53.77	0.984	Leading	54.14	0.984	Leading	54.18
6	FLT13-3PH	0.984	Leading	54.64	0.983	Leading	55.27	0.983	Leading	55.27
7	FLT14-3PH	0.984	Leading	53.81	0.984	Leading	54.27	0.984	Leading	54.35
8	FLT15-3PH	0.984	Leading	53.88	0.984	Leading	54.47	0.984	Leading	54.45
9	FLT16-3PH	0.985	Leading	52.54	0.985	Leading	53.23	0.985	Leading	53.27
10	FLT17-3PH	0.987	Leading	48.83	0.985	Leading	52.94	0.984	Leading	53.48
11	FLT18-3PH	0.984	Leading	53.83	0.983	Leading	55.46	0.984	Leading	54.78
12	FLT19-3PH	0.985	Leading	52.66	0.983	Leading	55.56	0.984	Leading	53.80
13	FLT20-3PH	0.984	Leading	54.20	0.984	Leading	54.36	0.984	Leading	54.18
14	FLT21-3PH	0.988	Leading	46.47	0.986	Leading	50.82	0.986	Leading	51.41
15	FLT22-3PH	0.985	Leading	52.54	0.984	Leading	53.46	0.984	Leading	53.52
16	FLT23-3PH	0.984	Leading	53.45	0.984	Leading	54.04	0.984	Leading	54.05
17	FLT24-3PH	0.984	Leading	55.15	0.983	Leading	55.28	0.983	Leading	55.28
18	FLT25-3PH	0.985	Leading	52.97	0.984	Leading	53.46	0.984	Leading	53.59
19	FLT26-3PH	0.985	Leading	53.20	0.984	Leading	53.53	0.984	Leading	53.59
20	FLT27-3PH	0.984	Leading	53.84	0.984	Leading	54.28	0.984	Leading	54.28
21	FLT28-3PH	0.984	Leading	53.85	0.984	Leading	54.30	0.984	Leading	54.30
22	FLT29-3PH	0.984	Leading	54.33	0.984	Leading	54.24	0.984	Leading	54.31
23	FLT30-3PH	0.985	Leading	53.19	0.984	Leading	53.80	0.984	Leading	53.87
24	FLT31-3PH	0.984	Leading	53.68	0.984	Leading	54.04	0.984	Leading	54.07
25	FLT32-3PH	0.984	Leading	53.86	0.984	Leading	54.21	0.984	Leading	54.26
26	FLT33-3PH	0.984	Leading	53.77	0.984	Leading	54.27	0.984	Leading	54.26
27	FLT34-3PH	0.984	Leading	54.00	0.984	Leading	54.32	0.984	Leading	54.31
28	FLT35-3PH	0.984	Leading	55.08	0.984	Leading	55.00	0.983	Leading	56.08
29	FLT36-3PH	0.986	Leading	51.38	0.985	Leading	52.95	0.984	Leading	55.11
30	FLT37-3PH	0.984	Leading	53.90	0.983	Leading	55.23	0.984	Leading	54.68
31	FLT38-3PH	0.985	Leading	53.31	0.985	Leading	52.92	0.985	Leading	52.12
32	FLT39-3PH	0.985	Leading	51.98	0.986	Leading	51.21	0.985	Leading	53.17
33	FLT40-3PH	1.000	Leading	7.71	1.000	Lagging	-3.39	1.000	Leading	0.34
34	FLT41-3PH	0.982	Leading	58.25	0.977	Leading	65.31	0.980	Leading	60.96
35	FLT42-3PH	0.989	Leading	44.78	0.988	Leading	46.93	0.986	Leading	49.82
36	FLT43-3PH	0.996	Leading	27.35	0.996	Leading	28.30	0.995	Leading	31.46
37	FLT44-3PH	0.989	Leading	44.51	0.975	Leading	68.91	0.977	Leading	65.12
38	FLT45-3PH	0.996	Leading	26.46	0.995	Leading	28.91	0.996	Leading	25.90
39	FLT46-3PH	0.964	Leading	82.46	0.979	Leading	63.12	0.975	Leading	68.94
40	FLT47-3PH	0.993	Leading	35.40	0.988	Leading	46.27	0.991	Leading	39.92
41	FLT48-3PH	0.964	Leading	82.67	0.968	Leading	78.38	0.966	Leading	80.70
42	FLT49-3PH	0.984	Leading	54.03	0.984	Leading	54.15	0.984	Leading	53.72
43	FLT50-3PH	0.984	Leading	53.87	0.984	Leading	54.32	0.984	Leading	54.32

Table 5-4 (Continued)
Power Factor Analysis: GEN-2015-088

[1]Ref. No.	Cont. Name	2016 Winter Peak			2017 Summer Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
44	FLT81-3PH	0.986	Leading	50.30	0.987	Leading	49.57	0.987	Leading	49.72
45	FLT82-3PH	0.993	Leading	35.40	0.988	Leading	46.27	0.991	Leading	39.92
46	FLT83-3PH	0.982	Leading	57.97	0.982	Leading	58.11	0.983	Leading	56.85
47	FLT84-3PH	0.984	Leading	53.87	0.984	Leading	54.32	0.984	Leading	54.32
48	FLT85-3PH	0.995	Leading	31.16	0.990	Leading	42.91	0.989	Leading	44.63
49	FLT86-3PH	0.985	Leading	53.43	0.984	Leading	54.31	0.984	Leading	53.54
50	FLT87-3PH	0.984	Leading	53.66	0.984	Leading	54.60	0.984	Leading	53.69
51	FLT88-3PH	0.979	Leading	62.73	0.981	Leading	59.81	0.981	Leading	58.92
52	FLT89-3PH	0.984	Leading	53.60	0.984	Leading	54.22	0.984	Leading	54.20
53	FLT90-3PH	0.984	Leading	53.60	0.984	Leading	54.22	0.984	Leading	54.20
54	FLT108-3PH	0.984	Leading	54.33	0.984	Leading	54.24	0.984	Leading	54.31
55	FLT109-3PH	0.985	Leading	51.90	0.985	Leading	53.25	0.985	Leading	53.33
56	FLT110-3PH	0.985	Leading	53.31	0.984	Leading	54.09	0.984	Leading	54.04
57	FLT111-3PH	0.984	Leading	53.88	0.984	Leading	54.43	0.984	Leading	54.39
58	FLT112-3PH	0.985	Leading	53.03	0.985	Leading	53.23	0.985	Leading	53.27
59	FLT113-3PH	0.984	Leading	53.48	0.984	Leading	54.11	0.984	Leading	54.13
60	FLT114-3PH	0.984	Leading	53.90	0.984	Leading	54.25	0.984	Leading	54.24
61	FLT115-3PH	0.986	Leading	49.84	0.987	Leading	49.74	0.986	Leading	50.35
62	FLT116-3PH	0.985	Leading	51.90	0.985	Leading	51.78	0.985	Leading	52.45
63	FLT117-3PH	0.986	Leading	50.86	0.985	Leading	52.26	0.985	Leading	52.30
64	FLT118-3PH	0.985	Leading	53.39	0.985	Leading	53.04	0.984	Leading	53.46
65	FLT119-3PH	0.956	Leading	92.03	0.948	Leading	100.43	0.987	Leading	49.00
66	FLT120-3PH	0.984	Leading	53.87	0.984	Leading	54.32	0.984	Leading	54.32

(1) Refer to Table 2-3 for a description of the contingency scenario

Study Generator GEN-2015-088

The Power Factor Analysis shows that GEN-2015-088 has a power factor range of 0.956 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.948 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, and a power factor range of 0.966 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

SECTION 6: LOW WIND/NO WIND ANALYSIS

The objective of this task is to determine the impact of low wind or no wind conditions on wind farms that interconnect to a 345 kV or 230 kV bus. The 2016 Winter Peak, 2017 Summer Peak, and 2025 Summer Peak power flows provided by SPP were examined for this analysis.

6.1 Approach

Low wind or no wind conditions were examined for all 345 kV or 230 kV wind farms. Generators were disabled (independently), but the collector systems remained in-service. In order to maintain generation and load balance in the SPP area, the generation was scaled after disabling the respective generator. The amount of reactive power injected into the transmission network was recorded at the respective point of interconnection. This reactive power comes from the capacitance of the project's transmission lines and collector cables. A shunt reactor was added at the high side bus to bring the Mvar flow into the POI down to approximately zero.

6.2 Low Wind/No Wind Analysis Results

The reactance needed to bring the Mvar flow into the point of interconnect to zero Mvar was recorded for each season for all wind or solar farms. Refer to Table 6-1 for the Low Wind/No Wind Analysis results. The table lists the generators examined and the amount of reactive power needed for zero Mvar flow into the POI for each season.

Table 6-1
Low Wind/No Wind Analysis

Request	Size (MW)	Point of Interconnection	16WP	17SP	25SP
GEN-2015-053	50.0	Antelope 115 kV (640251)	3.30	3.30	3.30
GEN-2015-076	158.4	Belden 115kV (640080)	4.20	4.20	4.20
GEN-2015-087	66.0	Tap on Fairbury (640169) to Hebron (640218) 115kV	5.85	5.85	5.85
GEN-2015-088	300.0	Tap on Moore (640277) to Pauline (640312) 345kV	22.20	22.20	22.20

SECTION 7: CONCLUSIONS

Summary of Stability Analysis

The Stability Analysis determined there were no contingencies that resulted in system instability or generation tripping offline for the examined seasonal peak conditions when all generation interconnection requests were at 100% output.
However, it was determined that two contingencies, FLT39-3PH, which is the loss of the Fairbry7 to Harbine7 115 kV line and FLT120-3PH, which is the loss of the McCool to Grand Island 345 kV line, resulted in post-contingency generator power swings for all seasonal peak conditions at Fairbryg and Brokenbg, respectively. After discussion with SPP, it was determined that this was a pre-existing issue for FLT39-3PH as it was still present in the contingency even with the GEN-2015-087 out of service. Similarly, for FLT120-3PH, it was determined that this was a pre-existing issue as it was still present in the contingency even with all four study generators out of service.

Summary of the Short-Circuit Analysis

The Short-Circuit Analysis was performed on the 2017 Summer Peak and 2025 Summer Peak power flows for all study projects. Refer to Table 7-1 for a list of maximum fault currents observed for each study project for the 2017 Summer Peak case. Refer to Table 7-2 for a list of maximum fault currents observed for each study project for the 2025 Summer Peak case.

Table 7-1
List of Maximum Fault Currents Observed for Each Study Project for the 2017 Summer Peak Case

Study Project	POI Name	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-053	Antelope 115kV (640521)	13.13	29.97	S1251 5	161
GEN-2015-076	Belden 115kV (640080)	6.67	29.97	S1251 5	161
GEN-2015-087	Tap on Fairbury (640169) to Hebron (640218) 115kV	5.37	31.65	SHELDON7	115
GEN-2015-088	Tap on Moore (640277) to Pauline (640312) 345kV	10.57	39.11	S1206 5	115

Table 7-2
List of Maximum Fault Currents Observed for Each Study Project for the 2025 Summer Peak Case

Study Project	POI Name	Fault Current at POI (kA)	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
GEN-2015-053	Antelope 115kV (640521)	13.38	30.89	S1251 5	161
GEN-2015-076	Belden 115kV (640080)	6.68	30.88	S1251 5	161
GEN-2015-087	Tap on Fairbury (640169) to Hebron (640218) 115kV	5.37	32.60	SHELDON7	115
GEN-2015-088	Tap on Moore (640277) to Pauline (640312) 345kV	10.62	40.47	S1206 5	161

Summary of Power Factor Analysis

Study Generator GEN-2015-053

The Power Factor Analysis shows that GEN-2015-053 has a power factor range of 0.358 leading (absorbing) to 0.811 leading (absorbing) for the 2016 Winter Peak conditions, a power factor range of 0.394 leading (absorbing) to 0.949 lagging (supplying) for the 2017 Summer Peak conditions, and a power factor range of 0.438 leading (absorbing) to 0.964 lagging (supplying) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-076

The Power Factor Analysis shows that GEN-2015-076 has a power factor range of 0.975 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.985 lagging (supplying) to 0.998 leading (absorbing) for the 2017 Summer Peak conditions, and a power factor range of 0.985 lagging (supplying) to 0.998 leading (absorbing) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-087

The Power Factor Analysis shows that GEN-2015-087 has a power factor range of 0.978 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.955 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, and a power factor range of 0.917 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

Study Generator GEN-2015-088

The Power Factor Analysis shows that GEN-2015-088 has a power factor range of 0.956 leading (absorbing) to 1.00 (unity) for the 2016 Winter Peak conditions, a power factor range of 0.948 leading (absorbing) to 1.00 (unity) for the 2017 Summer Peak conditions, and a power factor range of 0.966 leading (absorbing) to 1.00 (unity) for the 2025 Summer Peak conditions.

Summary of Low Wind/No Wind Analysis

The amount of reactive power injected into the transmission network was recorded at the high side of the transformer near the point of interconnection for all study projects for each season. The maximum reactance needed for zero Mvar flow was -22.20 Mvar for GEN-2015-088. The minimum reactance needed for zero Mvar flow was -3.20 Mvar for GEN-2015-053.