Definitive Interconnection System Impact Study for Generation Interconnection Requests

(DISIS-2014-002-1)

May 2015

Generator Interconnection

Southwest Power Pool

Revision History

Date	Author	Change Description
01/30/2015	SPP	Report Issued (DISIS-2014-002)
05/18/2015	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2014-002-1)
5/27/2015	SPP	Corrected errors from 5/18/2015 posting. Added reference in Group 13 powerflow and stability sections.

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, 2014. The customers will be referred to in this study as the DISIS-2014-002 Interconnection Customers. This System Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling approximately 3,348 MW of new generation which would be located within the transmission systems of American Electric Power – Western (AEPW), Empire District Electric Company (EMDE), Kansas City Power and Light Company – Greater Missouri Operations Company (KCPL-GMO), Grand River Dam Authority (GRDA), Midwest Energy, Inc. (MIDW), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Southwestern Public Service (SPS), Sunflower Electric Power Corporation\Mid-Kansas Electric Company, LLC (SUNC\MKEC), and Westar Energy, Inc. (WERE). 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 analysis represents a restudy of the "Stand-Alone" analysis for each Interconnection Request to account for all Interconnection Requests that have met the requirements for an Interconnection Facilities Study that was performed in the original DISIS-2014-002 study. This analysis also includes an analysis of Limited Operation that determines available Interconnection Service assuming all DISIS-2014-002 Customers move forward.

Power flow analysis has indicated that for the power flow cases studied, 3,348 MW of nameplate generation may be interconnected with transmission system reinforcements within the SPP transmission system. Dynamic stability and power factor analysis has determined the need for reactive compensation in accordance with SPP stability and voltage recovery requirements and FERC Order #661A for wind farm interconnection requests and those requirements are listed for each interconnection request within the contents of 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.

[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 Facility 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.

In no way does this study guarantee operation for all periods of time. This interconnection study identifies and assigns transmission reinforcements for Energy Resource (ER) interconnection injection constraints (defined as a 20% distribution factor impact for outage based constraints and 3% distribution factor for system intact constraints) and Network Resource (NR) constraints (defined as 3% distribution factor impact), if requested by the Customer. These constraints are listed in Appendix G. 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 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-2014-002 Interconnection Customers is estimated at $332,718,791. These costs are shown in Appendix E and F. Interconnection Service to DISIS-2014-002 Interconnection Customers is also contingent upon higher queued customers paying for certain required network upgrades. **The in-service date for the DISIS customers will be deferred until the construction of these network upgrades can be completed.**

These costs do not include the Interconnection Customer Interconnection Facilities as defined by the SPP Open Access Transmission Tariff (OATT). This cost does not include additional network constraints in the SPP transmission system identified and shown in Appendix H.

Additional network constraints listed in Appendix H are in the local area of the new generation when this generation is injected throughout the SPP footprint for Energy Resource Interconnection Service (ERIS) requests. Certain Interconnection Requests were also studied for Network Resource Interconnection Service (NRIS). Those constraints are also listed in Appendix H. Constraints listed in Appendix H do not require transmission reinforcement for Interconnection Service. Additional network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. With a defined source and sink in a TSR, this 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 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.

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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, 2014. The customers will be referred to in this study as the DISIS-2014-002 Interconnection Customers. This DISIS analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling 3,348 MW of new generation which would be located within the transmission systems of American Electric Power –Western (AEPW), Empire District Electric Company (EMDE), Kansas City Power and Light Company – Greater Missouri Operations Company (KCPL-GMO), Grand River Dam Authority (GRDA), Midwest Energy, Inc. (MIDW), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Southwestern Public Service (SPS), Sunflower Electric Power Corporation\Mid-Kansas Electric Company, LLC (SUNC\MKEC), and Westar Energy, Inc. (WERE). 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 analysis represents a restudy of the ”Stand-Alone” analysis for each Interconnection Request to account for all Interconnection Requests that have met the requirements for an Interconnection Facilities Study that was performed in the original DISIS-2014-002 study. This analysis also includes an analysis of Limited Operation that determines available Interconnection Service assuming all DISIS-2014-002 Customers move forward.

The primary objective of this DISIS is to identify the system constraints associated with connecting the generation to the area transmission system. The Impact Study and other subsequent Interconnection Studies are designed to identify required interconnection facilities, Network Upgrades and other Direct Assignment Facilities needed to accept power into the grid at each specific interconnection receipt point.

[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.

Model Development

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, 2014 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, 2014. The interconnection requests that are included in this study are listed in Appendix A.

Affected System Interconnection Request

Also included in this Definitive Interconnection System Impact Study is seven (7) Affected System Studies. 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 studied only in a "cluster" scenario.

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 with equal distribution across the SPP footprint. Prior queued projects that requested Network Resource Interconnection Service (NRIS) were dispatched in an additional analysis into the balancing authority of the interconnecting transmission owner.

Development of Base Cases

Power Flow

The 2014 series Integrated Transmission Planning models (used in the 2015ITPNT) including the 2015 (spring and summer peak seasons), the 2020 (summer and winter peak seasons), and the 2025 (summer peak season) scenario 0 cases were used for this study. After the cases were developed, each of the control areas' resources were then re-dispatched to account for the new generation requests using current dispatch orders. Planned High Priority Incremental Loads (HPILs) are accounted for in these models.

Dynamic Stability

The 2014 series SPP Model Development Working Group (MDWG) Models 2014 winter, 2015 summer, and 2025 summer peak cases were used as starting points for this study.

Short Circuit

The 2025 summer peak stability case was used for this analysis.

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-2014-002 Interconnection Customers have not been assigned advancement costs for the below listed projects. <u>The DISIS-2014-002 Interconnection</u>

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, scheduled for 2021 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
    - China Draw 115kV Reactive Power Support
        - 200Mvar Capacitive and 50Mvar Inductive Static Var Compensator (SVC)
    - Road Runner 115kV Reactive Power Support
        - 200Mvar Capacitive and 50Mvar Inductive Static Var Compensator (SVC)
    - Agave Hill 115kV reactive Power Support
        - 28.8Mvar Capacitor Bank(s)
    - Potash Junction – Intrepid – IMC #1 – Livingston Ridge 115kV rebuild
- Balanced Portfolio Projects[5]:
    - Iatan – Nashua 345/161 kV Project, scheduled for 6/1/2015 in-service
        - Iatan – Nashua 345 kV circuit #1 and associated terminal equipment
        - Nashua 345/161/13 kV autotransformer circuit #1
- Nebraska City – Mullin Creek – Sibley 345kV circuit #1 build, scheduled for 6/1/2017 in-service[6]
- Northwest 345/138/13.8 kV circuit #3 autotransformer, scheduled for 6/1/2015 in-service[7]
- Hoskins – Neligh East 345/115 kV Project[8]
    - 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[9]:
    - TUCO Interchange – Yoakum – Hobbs Interchange 345/230 kV Project
        - TUCO Interchange – Yoakum – Hobbs Interchange 345 kV circuit #1 and associated terminal equipment upgrades

[3] SPP Notification to Construct (NTC) 200223
[4] SPP Notification to Construct (NTC) 200240 and 200255
[5] SPP Notification to Construct (NTC) issued June 2009
[6] SPP Notification to Construct (NTC) 20097 and 20098
[7] SPP Transmission Service Project identified in SPP 2009-AG2-AFS6. Per SPP NTC 20137 & 200194
[8] SPP Regional Reliability 2012 ITP 10 Project Per SPP-NTC-200220
[9] Per Network Upgrades assigned in High Priority Incremental Loads (HPILs) study, Including Direct Assigned Upgrades, Projects in SPP-NTC-200256 and SPP-NTC-200283.

        - Hobbs 345/230/13 kV transformer circuit #1
        - Yoakum 345/230/13 kV transformer circuit #1
    - Battle Axe – Road Runner 115 kV 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
        - 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
    - Potash 230/115/13kV Transformer circuit #1 replacement

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-2014-002 study and are assumed to be in service. This list may not be all inclusive. <u>The DISIS-2014-002 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-2014-002 Interconnection Customer Generation Facilities in-service dates may need to be delayed until the completion of the following upgrades.</u>

- Upgrades assigned to DISIS-2009-001 Interconnection Customers:
    - Spearville Project
        - Spearville 345/115 kV transformer circuit #1 addition
        - Spearville – North Ft. Dodge 115 kV addition
        - Ft Dodge – North Ft. Dodge circuit #2 addition
        - Move Fort Dodge terminal of Shooting Star 115 kV at North Ft Dodge
    - Fort Randall – Meadow Grove – Kelly 230 kV circuit #1 rerate (320 MVA)
- Upgrades assigned to DISIS-2010-001 Interconnection Customers:
    - Switch 2749 – Wildorado 69 kV circuit # 1 rebuild
- Upgrades assigned to DISIS-2010-002 Interconnection Customers:
    - Twin Church – Dixon County 230 kV circuit #1 rerate (320 MVA)
    - Buckner – Spearville 345 kV 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 – FPL Switch – Mooreland – Glass Mountain 138 kV circuit #1 rebuild
- Upgrades assigned to DISIS-2011-002 Interconnection Customers:
  - None at this time
- Upgrades assigned to DISIS-2012-001 Interconnection Customers:
  - None at this time
- Upgrades assigned to DISIS-2012-002 Interconnection Customers:
  - Amoco Wasson – Oxy Tap 230 kV circuit #1 replace line traps
  - Associated Electric Cooperatives Inc. (AECI) Fairfax 138/69 kV transformer replacement
  - Lake Creek – Lone Wolf 69 kV circuit #1 reset CT
  - Remington – Fairfax 138 kV circuit #1 conductor clearance increase
  - (NRIS only) Arkansas City – Paris –Creswell – Oak – Rainbow – City of Winfield 69kV circuit #1 rebuild
  - (NRIS only) Creswell 138/69/13kV Transformer circuit #1 and #2, replacements
- Upgrades assigned to DISIS-2013-001 Interconnection Customers:
  - None at this time
- Upgrades assigned to DISIS-2013-002 Interconnection Customers:
  - Battle Creek – County Line – Neligh East 115kV circuit #1 rebuild
- Upgrades assigned to DISIS-2014-001 Interconnection Customers:
  - National Enrichment Plant – Targa – Cardinal 115kV circuit #1 rebuild

Potential Upgrades Not in the Base Case

Any potential upgrades that do not have a Notification to Construct (NTC) and 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.

Regional Groupings

The interconnection requests listed in Appendix A were 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 were developed to accommodate the regional groupings.

Power Flow

For Energy Resource Interconnection Service (ERIS), the generating plants were modeled at 100% nameplate of maximum generation. The generating plants in the remote areas were modeled at 20% nameplate of maximum generation. These projects were dispatched as Energy Resources with a load factor by area distribution across the SPP footprint. All generators that requested Network Resource Interconnection Service (NRIS) were dispatched in an additional analysis into the balancing authority of the interconnecting transmission owner at 100% nameplate with Energy Resource Interconnection Service (ERIS) only requests at 80% nameplate. This method allowed for the identification of network constraints that were common to the regional groupings that could then in turn have the mitigating upgrade cost allocated throughout the entire cluster.

Peaking units were not dispatched in the 2015 spring model. To study peaking units' impacts, the 2015 summer, 2020 summer and winter, and 2025 summer seasonal models were chosen and peaking units were modeled at 100% of the nameplate rating and non-dispatchable generating facilities were modeled at 10% of the nameplate rating. Each interconnection request was also modeled separately at 100% nameplate for certain analyses.

Dynamic Stability

For each group, all interconnection requests were studied at 100% nameplate output while the other groups were dispatched at 20% output for wind requests and 100% output for thermal requests.

Short Circuit

The dynamic stability models (2025 SP) were used for this analysis.

Identification of Network Constraints

The initial set of network constraints were found by using PSS®MUST First Contingency Incremental Transfer Capability (FCITC) analysis on the entire cluster grouping dispatched at the various levels mentioned above. The Energy Resource Interconnection Service (ERIS) constraints were then screened to determine which of the generation interconnection requests had at least a 20% Distribution Factor (DF) upon outage based constraints (n-1) and 3% DF upon system intact constraints (n-0). In addition, stability issues are also considered for transmission reinforcement under ERIS. Interconnection Requests that have requested Network Resource Interconnection Service (NRIS) were also studied in the NRIS analysis to determine if any constraint measured at least a 3% DF. If so, these constraints were also considered for mitigation under NRIS.

Constraints that were identified and require transmission reinforcement are listed in Appendix G. These constraints met the criteria for analysis for Energy Resource Interconnection Service and Network Resource Interconnection Service (if requested).

Other network constraints which do not require transmission reinforcements are shown in Appendix H. 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 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.

Determination of Cost Allocated Network Upgrades

Cost Allocated Network Upgrades of wind generation interconnection requests were determined using the 2015 spring model. Cost Allocated Network Upgrades of peaking units was determined using the 2020 summer peak model. A PSS®MUST sensitivity analysis was performed to determine the Distribution Factors (DF), a distribution factor with no contingency that each generation interconnection request had on each new upgrade. The impact each generation interconnection request had on each upgrade project was weighted by the size of each request. Finally the costs due by each request for a particular project were 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.

Credits/Compensation for Amounts Advanced for Network Upgrades

Interconnection Customer shall be entitled to either credits or potentially Long Term Congestion Rights (LTCR)[10] 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.

[10] FERC compliance filing pending

Required Interconnection Facilities

The requirement to interconnect the 3,348 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 $332,718,791. 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" above.

Facilities Analysis

The Transmission Owner for each Interconnection Request has provided its analysis of Interconnection Facilities and Network Upgrades at the Point of Interconnection, shown in Appendix D. This analysis was limited only to the facilities at the substation at the Point of Interconnection. These costs as provided by the Transmission Owners are given with the one-line diagrams in Appendix D and are also listed in Appendix E and F as "Interconnection Costs". These costs will be 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 were either analyzed by the Transmission Owner or by SPP. These additional Network Upgrade costs will be more closely estimated by the Transmission Owner in the Interconnection Facilities Study.

Power Flow Analysis

Power Flow Analysis Methodology

The ACCC function of PSS®E was 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 were evaluated.

Power Flow Analysis

A power flow analysis was conducted for each Interconnection Customer's facility using modified versions of the 2015 spring and summer peak, the 2020 summer and winter peak, and the 2025 summer peak models. The output of the Interconnection Customer's facility was 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 pursuing Network Resource Interconnection Service (NRIS) had an additional analysis conducted for displacing resources in the interconnecting Transmission Owner's balancing authority.

Cluster Group 1 (Woodward Area)

In addition to the 3,866.54 MW of previously queued generation in the area, 350.0 MW of new interconnection service was studied. No new power flow constraints were found in this area. Limited Operation Analysis assumes all remaining DISIS-2014-002 Interconnection Requests move forward into commercial operation.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No ERIS Group 1 constraints			

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No NRIS Group 1 constraints			

Group 1 (Limited Operation)

Limited Operation Analysis		
Interconnection Request	MW	Constraint that most limits LOIS
GEN-2014-020	100.0	None
GEN-2014-056	250.0	None

Cluster Group 2 (Hitchland Area)

In addition to the 2,962.7 MW of previously queued generation in the area, 150.0 MW of new interconnection service was studied. Due to the addition of the new Interconnection Requests, potential voltage collapse was observed for an outage of the Finney – Hitchland 345kV line. To mitigate this voltage collapse, a 75Mvar SVC will be needed at Beaver County 345kV.Additionally, the Mooreland – FPL Switch – Woodward 138kV transmission line is found to be overloaded which also limits Interconnection Service for these Interconnection Requests. The upgrades, which are currently cost assigned to DISIS-2011-001 Interconnection Requests will need to be advanced by DISIS-2014-002 Interconnection Requests to realize their requested in-service dates.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Non-converged contingency	956	N/A	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FPL SWITCH - WOODWARD 138KV CKT 1	133	195.0	System Intact
FPL SWITCH - MOORELAND 138KV CKT 1	268	100.2	System Intact

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
No Current Study Requests in Group 2 with NRIS Service Type			

Group 2 (Limited Operation)

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that limits LOIS**
GEN-2014-026	0	Woodward- FPL Switch-Mooreland 138kV

Cluster Group 3 (Spearville Area)

In addition to the 3,610.3 MW of previously queued generation in the area, 299.0 MW of new interconnection service was studied. The addition of all of the Group 3 Interconnection Requests caused voltage collapse for multiple transmission outlets for the Group 3 area. It was found that adding a static var compensator (SVC) at Clark County 345kV would be adequate for mitigating these constraints. Additionally, 138kV line overloads from Harper – Milan – Clearwater will limit Interconnection Service to GEN-2014-049. These lines will need to be rebuilt.

Cluster ERIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
Non-converged contingency	1793	N/A	G13-010T 345.00 - POST ROCK 345KV CKT 1
Non-converged contingency	726.6	N/A	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
Non-converged contingency	N/A	N/A	SPP-SWPS-05
BUCKNER7 345.00 - HOLCOMB 345KV CKT 1	726.6	99.9	G13-010T 345.00 - POST ROCK 345KV CKT 1
CLEARWATER - MILAN TAP 138KV CKT 1	110	117.4	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FPL SWITCH - WOODWARD 138KV CKT 1	153	163.8	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
HARPER - MILAN TAP 138KV CKT 1	143.4	102.2	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
KNOLL 230 - POSTROCK6 230.00 230KV CKT 1	398	107.9	G13-010T 345.00 - POST ROCK 345KV CKT 1

Cluster NRIS Constraints			
MONITORED ELEMENT	**Limiting Rate A/B (MVA)**	**TC%LOADING (% MVA)**	**CONTINGENCY**
No Current Study Requests in Group 3 with NRIS Service Type			

Group 3 (Limited Operation)

Limited Operation Analysis		
Interconnection Request	**MW**	**Constraint that limits LOIS**
GEN-2013-010	0	Woodward- FPL Switch 138kV Knoll-Post Rock 230kV Buckner-Holcomb 345kV Finney-Holcomb 345kV
GEN-2014-049	0	Woodward- FPL Switch 138kV Clearwater-Milan 138kV Harper-Milan 138kV Buckner-Holcomb 345kV

Cluster Group 4 (Northwest Kansas Area)

In addition to the 1,774.7 MW of previously queued generation in the area, 123.2 MW of new interconnection service was studied. The Arnold-Ransom 115kV line will need to be rebuilt to accommodate the output from GEN-2014-041.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
ARNOLD - RANSOM 115KV CKT 1	79.7	148.0	ARNOLD - GOVE 115KV CKT 1

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
No Current Study Requests in Group 4 with NRIS Service Type			

Group 4 (Limited Operation)

Limited Operation Analysis		
Interconnection Request	MW	Constraint that limits LOIS
GEN-2014-025	2.4	None
GEN-2014-041	70	Arnold – Ransom 115kV

Cluster Group 5 (Amarillo Area)

In addition to the 704.1 MW of previously queued generation in the area, 320.0 MW of new interconnection service was studied. No new power flow constraints were found in this area.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No ERIS Group 5 constraints			

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
No Current Study Requests in Group 5 with NRIS Service Type			

Cluster Group 6 (South Texas Panhandle/New Mexico)

In addition to the 3,481.8 MW of previously queued generation in the area, 922.6 MW of new interconnection service was studied. The TUCO 345/230kV transformer overloads require a third 345/230kV transformer at a new TUCO substation that will be tapping and tying TUCO – Border 345kV line with TUCO – Swisher 230kV line. Interconnecting additional resources into the transmission system north of Pleasant Hill, NM, was also difficult due to a weak transmission system and voltage collapse. To mitigate these issues the transmission line from Norton-Pleasant Hill 115 kV was converted to 230kV and reactive equipment was added, either at specific Customer locations or on the transmission system, to support the voltage in the area under constraints. Other upgrades more specific to the individual requests were also required.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Non-Converged Contingency	159	N/A	INTREPDW_TP3115.00 - POTASH JUNCTION INTERCHANGE 115KV CKT 1

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	109.5	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	351	101.7	SPP-SWPS-01
Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	122.4	BASE CASE
PLANT X STATION - TOLK STATION EAST 230KV CKT 2	502	143.5	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
PLANT X STATION - TOLK STATION WEST 230KV CKT 1	502	144.5	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	147.3	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	644	126.6	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	351	131.0	SPP-SWPS-01

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No NRIS Group 6 constraints			

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 limits LOIS
GEN-2013-027	20	Plant X – Tolk 230kV
GEN-2014-033	11	Plant X – Tolk 230kV
GEN-2014-034	11	Plant X – Tolk 230kV
GEN-2014-035	5	Plant X – Tolk 230kV
GEN-2014-047	6	Plant X – Tolk 230kV
GEN-2014-053	36	Tuco 345/230kV xfmr
GEN-2014-054	24	Tuco 345/230kV xfmr
GEN-2014-063	18	Plant X – Tolk 230kV
GEN-2014-066	0	Stability Issues
GEN-2014-070	16	Plant X - Tolk

Cluster Group 7 (Southwestern Oklahoma)

In addition to the 1,900.25 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new power flow constraints were found in this area.

Cluster Group 8 (North Oklahoma/South Central Kansas)

In addition to the 3,849.4 MW of previously queued generation in the area, 339.8 MW of new interconnection service was studied. No new power flow constraints were found in this area.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No ERIS Group 8 constraints			

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
No Current Study Requests in Group 8 with NRIS Service Type			

Cluster Group 9 (Nebraska Area)

In addition to the 1,963.06 MW of previously queued generation in the area, 119.4 MW of new interconnection service was studied. No new power flow constraints were found in this area.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No ERIS Group 9 constraints			

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No NRIS Group 9 constraints			

Cluster Group 10 (Southeast Oklahoma/Northeast Texas)

In addition to the 0.0 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

Cluster Group 12 (Northwest Arkansas)

In addition to the 30.0 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

Cluster Group 13 (Northwest Missouri)

In addition to the 224.6 MW of previously queued generation in the area, 474.0 MW of new interconnection service was studied. No new power flow constraints were found in this area however, Interconnection Customer, GEN-2014-051, interconnecting into Jeffrey Energy Center 345kV should be aware of the existing thermal operating guide(s). For prior outages of the 345kV lines out of Jeffrey Energy Center, the GEN-2014-051 generator will have an operating limit of 0MW.

Cluster ERIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No ERIS Group 13 constraints			

Cluster NRIS Constraints			
MONITORED ELEMENT	Limiting Rate A/B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
Currently, No NRIS Group 13 constraints			

Cluster Group 14 (South Central Oklahoma)

In addition to the 362.5 MW of previously queued generation in the area, 250.0 MW of new interconnection service was studied. No new power flow 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 Requests in Group 14 with NRIS Service Type			

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.

Stability & Short Circuit Analysis

A stability and short circuit analysis was conducted for each Interconnection Customer using modified versions of the 2014 series SPP Model Development Working Group (MDWG) Models 2015 winter, 2015 summer, and 2025 summer peak dynamic cases[11]. The stability analysis was conducted with all upgrades in service that were identified in the power flow analysis unless otherwise noted in the individual group stability study. For each group, the interconnection requests were studied at 100% nameplate output while the other groups were dispatched at 20% output for non-dispatchable requests and 100% output for other requests. The output of the Interconnection Customer's facility was offset in each model by a reduction in output of existing online SPP generation. Each Interconnection Request was studied in a Stand Alone scenario in addition to the cluster scenario. The following synopsis is included for each group. The entire stability study for each group can be found in the Appendices.

Cluster Group 1 (Woodward Area)

The Group 1 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid.

Cluster Group 2 (Hitchland Area)

The Group 2 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid.

Cluster Group 3 (Spearville Area)

The Group 3 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid.

Cluster Group 4 (Northwest Kansas)

The Group 4 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid.

Cluster Group 5 (Amarillo Area)

The Group 5 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid.

Cluster Group 6 (South Texas Panhandle/New Mexico)

The Group 6 Cluster stability analysis for this area was performed by Mitsubishi Electric Power Products, Inc. (MEPPI). SPP Staff performed a sensitivity analysis to determine the impacts of interconnection requests near the Quay County generation when the unit is off-line. Stability analysis identified the need for reactive power compensation equipment at Border substation and at TUCO substation. The analysis also identified reactive compensation needs for the Interconnection Requests near Tucumcari, NM. Stability analysis has determined that with all

[11] Short Circuit analysis performed only on the 2025 Summer Peak seasonal model.

reactive power compensation equipment identified in the stability analysis, all currently assigned Network Upgrades from the power flow analysis, and all previously assigned Network Upgrades placed in service the transmission system will remain stable and low voltage ride through requirements are satisfied for the 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 MEPPI report.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Power Factor Requirement at POI*	
				Lagging (supplying)	Leading (absorbing)
GEN-2013-027**	150	Siemens 2.3MW and 2.415MW	Tap Tolk to Yoakum 230kV (562480)	0.95	0.95
GEN-2014-033	70	SMA SC 500HE/CP 0.5MW inverter	Chaves County 115kV	0.95	0.95
GEN-2014-034	70	SMA SC 500HE/CP 0.5MW inverter	Chaves County 115kV	0.95	0.95
GEN-2014-035	30	SMA SC 500HE/CP 0.5MW inverter	Chaves County 115kV	0.95	0.95
GEN-2014-047**	40	AE 500NX 0.5MW PV inverters	Tap Tolk - Eddy County (Crossroads) 345kV	0.95	0.95
GEN-2014-053**	80	GE 2.0MW WTG	Carlisle 230kV	0.95	0.95
GEN-2014-054**	120	GE 2.0MW WTG	Carlisle 230kV	0.95	0.95
GEN-2014-063**	120	Vestas V110 2.0 MW VCSS	Hobbs 230kV	0.95	0.95
GEN-2014-066	30	AE 1000NX 1.0MW PV inverter	Norton 115kV	0.95	0.95
GEN-2014-070**	113	GE 4.0MW PV inverter	Tap Hobbs - Yoakum 230kV	0.95	0.95
ASGI-2014-002	49.6	SMA 630CP-US 0.8MW PV inverter	Santa Rosa tap - Tucumcari 69kV line	0.95	0.95
ASGI-2014-005	10	Solar PV inverter	Strata 69 kV - bus 528046	0.95	0.95
ASGI-2014-008	10	Solar PV inverter	South Loving 69 kV - bus 528218	0.95	0.95
ASGI-2014-009	10	Solar PV inverter	Wood Draw 115 kV - bus 528228	0.95	0.95
ASGI-2014-010	10	Solar PV inverter	Ochoa 115 kV - bus 528232	0.95	0.95
ASGI-2014-012	10	Solar PV inverter	Cooper Ranch 115 kV - bus 528554	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

Cluster Group 7 (Southwest Oklahoma)

There were no customers requesting interconnection service in the Southwest Oklahoma area.

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-2014-002 is still valid.

Cluster Group 9 (Nebraska)

The Group 9 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid.

Cluster Group 10 (Southeast Oklahoma/Northeast Texas Area)

There were no customers requesting interconnection service in Southeast Oklahoma/Northeast Texas area.

Cluster Group 12 (Northwest Arkansas Area)

There were no customers requesting interconnection service in the Northwest Arkansas area.

Cluster Group 13 (Northwest Missouri Area)

The Group 13 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid. It is worth noting that the original analysis included identification of certain instabilities at Jeffrey Energy Center during prior outage events that would be mitigated through curtailment of the GEN-2014-051 generator to 0MW.

Cluster Group 14 (South Central Oklahoma)

The Group 14 stability analysis was not performed again for this restudy. The original analysis in DISIS-2014-002 is still valid.

Conclusion

The minimum cost of interconnecting 3,348 MW of new interconnection requests included in this Definitive Interconnection System Impact Study is estimated at $332,718,791 for the Allocated Network Upgrades and Transmission Owner Interconnection Facilities are listed in Appendix E and F. 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 Network Upgrades determined to be required by the short circuit analysis. Potential circuit breakers overdutied by short circuit capability will be identified by the Transmission Owner in the Interconnection Facilities Study. These studies will be performed if the Interconnection Customer executes the appropriate Interconnection Facilities Study Agreement and provides the required data along with demonstration of Site Control and the appropriate deposit. At the time of the Interconnection Facilities Study, a better determination of the interconnection facilities may be available.

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).

Appendices

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-2014-002	49.60	ER	SPS	Tap Tucumcari - Santa Rosa 115kV	Tap Tucumcari - Santa Rosa 115kV		TBD
ASGI-2014-005	10.00	ER	SPS	Strata 69kV	Strata 69kV		TBD
ASGI-2014-008	10.00	ER	SPS	South Loving 69kV	South Loving 69kV		TBD
ASGI-2014-009	10.00	ER	SPS	Wood Draw 115kV	Wood Draw 115kV		TBD
ASGI-2014-010	10.00	ER	SPS	Ochoa 115kV	Ochoa 115kV		TBD
ASGI-2014-012	10.00	ER	SPS	Cooper Ranch 115kV	Cooper Ranch 115kV		TBD
ASGI-2014-014	56.40	ER	GRDA	Ferguson 69kV	Ferguson 69kV		TBD
GEN-2013-010	99.00	ER	SUNCMKEC	Tap Spearville - Post Rock 345kV	Tap Spearville - Post Rock (North of GEN-2011-017 Tap) 345kV	12/31/2017	TBD
GEN-2013-027	150.00	ER	SPS	Tap Tolk - Yoakum 230kV	Tap Tolk - Yoakum 230kV	3/31/2016	TBD
GEN-2014-020	100.00	ER/NR	AEPW	Tuttle 138kV	Tuttle 138kV	12/31/2014	TBD
GEN-2014-021	300.00	ER/NR	GMO	Tap Nebraska City - Mullens Creek 345kV	Tap Nebraska City - Mullin Creek 345kV	12/1/2016	TBD
GEN-2014-025	2.40	ER	MIDW	Tap Nekoma - Bazine (Walnut Creek) 69kV	Tap Nekoma - Bazine (Walnut Creek) 69kV	10/15/2015	TBD
GEN-2014-026	150.00	ER	OKGE	Beaver County 345kV	Beaver County 345kV	12/31/2016	TBD
GEN-2014-028	35.00	ER	EMDE	Riverton 161kV	Riverton 161kV	1/1/2016	TBD
GEN-2014-031	35.80	ER/NR	NPPD	Meadow Grove 230kV	Meadow Grove 230kV	10/1/2015	TBD
GEN-2014-032	10.20	ER/NR	NPPD	Meadow Grove 230kV	Meadow Grove 230kV	10/1/2015	TBD
GEN-2014-033	70.00	ER	SPS	Chaves County 115kV	Chaves County 115kV	12/31/2016	TBD
GEN-2014-034	70.00	ER	SPS	Chaves County 115kV	Chaves County 115kV	12/31/2016	TBD
GEN-2014-035	30.00	ER	SPS	Chaves County 115kV	Chaves County 115kV	12/31/2016	TBD
GEN-2014-039	73.40	ER/NR	NPPD	Friend 115kV	Friend 115kV	12/1/2016	TBD
GEN-2014-040	320.00	ER	SPS	Castro 115kV	Castro 115kV	9/1/2016	TBD
GEN-2014-041	120.80	ER	SUNCMKEC	Arnold 115kV	Arnold 115kV	3/31/2016	TBD
GEN-2014-047	40.00	ER	SPS	Tap Tolk - Eddy County (Crossroads) 345kV	Tap Tolk - Eddy County (Crossroads) 345kV	12/1/2016	TBD
GEN-2014-049	200.00	ER	SUNCMKEC	Thistle 345kV	Thistle 345kV	12/31/2016	TBD
GEN-2014-051	174.00	ER	WERE	Jeffrey Energy Center 345kV	Jeffrey Energy Center 345kV	12/31/2016	TBD
GEN-2014-053	80.00	ER	SPS	Carlisle 230kV	Carlisle 230kV	12/31/2016	TBD
GEN-2014-054	120.00	ER	SPS	Carlisle 230kV	Carlisle 230kV	12/31/2016	TBD
GEN-2014-056	250.00	ER	OKGE	Minco 345kV	Minco 345kV	12/31/2016	TBD
GEN-2014-057	250.00	ER	AEPW	Tap Lawton - Sunnyside 345kV	Tap Lawton - Sunnyside 345kV	12/31/2016	TBD
GEN-2014-063	120.00	ER	SPS	Hobbs 230kV	Hobbs 230kV	9/1/2016	TBD
GEN-2014-064	248.40	ER	OKGE	Otter 138kV	Otter 138kV	12/1/2016	TBD
GEN-2014-066	30.00	ER/NR	SPS	Norton 115kV	Norton 115kV	12/1/2016	TBD
GEN-2014-070	113.00	ER	SPS	Tap Hobbs - Yoakum 230kV	Tap Hobbs - Yoakum 230kV	10/1/2016	TBD
Total:	**3,348.00**						

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

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	Tap Fairfax (AECI) - Shilder (AEPW) 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 115kV	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-2013-007	90.00	AECI	Tap Hickory Creek - Locust Creek 161kV	AECI System Impact Study
ASGI-2014-001	2.50	SPS	SP-Erskine 115kV	TRANSITIONED TO IFS QUEUE
GEN-2001-014	96.00	WFEC	Ft Supply 138kV	On-Line
GEN-2001-026	74.25	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-2002-009	80.00	SPS	Hansford 115kV	On-Line
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	Washita 138kV	On-Line
GEN-2004-014	154.50	SUNCMKEC	Spearville 230kV	On-Line at 100MW
GEN-2004-020	27.00	AEPW	Washita 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-2005-008	120.00	OKGE	Woodward 138kV	On-Line
GEN-2005-012	250.00	SUNCMKEC	Ironwood 345kV	On-Line at 160MW
GEN-2005-013	201.00	WERE	Caney River 345kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2006-002	101.00	AEPW	Sweetwater 230kV	On-Line
GEN-2006-006	205.50	SUNCMKEC	Spearville 345kV	On Suspension
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-2007-021	201.00	OKGE	Tatonga 345kV	On-Line
GEN-2007-025	300.00	WERE	Viola 345kV	On-Line
GEN-2007-032	150.00	WFEC	Tap Clinton Junction - Clinton 138kV	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 Schedule for 2015
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 2014
GEN-2008-003	101.00	OKGE	Woodward EHV 138kV	On-Line
GEN-2008-013	300.00	OKGE	Hunter 345kV	On-Line at 235MW
GEN-2008-017	300.00	SUNCMKEC	Setab 345kV	On Schedule for 2015
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	Tap Tolk - Eddy County (Crossroads) 345kV	On Schedule for 2015
GEN-2008-023	150.00	AEPW	Hobart Junction 138kV	On-Line
GEN-2008-037	101.00	WFEC	Tap Washita - Blue Canyon Wind 138kV	On-Line
GEN-2008-044	197.80	OKGE	Tatonga 345kV	On-Line
GEN-2008-047	300.00	OKGE	Beaver County 345kV	On Schedule for 2014
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-2008-088	50.60	SPS	Vega 69kV	On Suspension
GEN-2008-092	201.00	MIDW	Post Rock 230kV	On Schedule for 2014
GEN-2008-098	100.80	WERE	Waverly 345kV	On Schedule for 2015
GEN-2008-119O	60.00	OPPD	S1399 161kV	On-Line
GEN-2008-123N	89.70	NPPD	Tap Pauline - Hildreth (Rosemont) 115kV	On Schedule for 2014
GEN-2008-124	200.10	SUNCMKEC	Ironwood 345kV	On Schedule for 2016
GEN-2008-129	80.00	GMO	Pleasant Hill 161kV	On-Line
GEN-2009-008	199.50	MIDW	South Hays 230kV	On Schedule for 2015
GEN-2009-020	48.60	MIDW	Tap Nekoma - Bazine (Walnut Creek) 69kV	On Schedule for 2015

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2009-025	60.00	OKGE	Nardins 69kV	On-Line
GEN-2009-040	73.80	WERE	Marshall 115kV	On Schedule for 2015
GEN-2010-001	300.00	OKGE	Beaver County 345kV	On Schedule for 2014 (204 MW) and 2015 (96 MW)
GEN-2010-003	100.80	WERE	Waverly 345kV	On Schedule for 2015
GEN-2010-005	300.00	WERE	Viola 345kV	On-Line at 170MW
GEN-2010-006	205.00	SPS	Jones 230kV	On-Line
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 Suspension
GEN-2010-036	4.60	WERE	6th Street 115kV	On-Line
GEN-2010-040	300.00	OKGE	Cimarron 345kV	On-Line
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-2010-051	200.00	NPPD	Tap Twin Church - Hoskins 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 2019
GEN-2011-010	100.80	OKGE	Minco 345kV	On-Line
GEN-2011-011	50.00	KACP	Iatan 345kV	On-Line
GEN-2011-014	201.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (GEN-2011-014 Tap) 345kV	On Schedule 2016
GEN-2011-016	200.10	SUNCMKEC	Spearville 345kV	TRANSITIONED TO IFS QUEUE
GEN-2011-017	299.00	SUNCMKEC	Tap Spearville - Post Rock (GEN-2011-017T) 345kV	On Schedule 2018
GEN-2011-018	73.60	NPPD	Steele City 115kV	On-Line
GEN-2011-019	299.00	OKGE	Woodward 345kV	On Suspension
GEN-2011-020	299.00	OKGE	Woodward 345kV	On Suspension
GEN-2011-022	299.00	SPS	Hitchland 345kV	On Suspension
GEN-2011-025	80.00	SPS	Tap Floyd County - Crosby County 115kV	On Schedule for 2015
GEN-2011-027	120.00	NPPD	Hoskins 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	250.00	OKGE	Border 345kV	On Schedule for 2016
GEN-2011-050	109.80	AEPW	Santa Fe Tap 138kV	On Suspension
GEN-2011-051	104.40	OKGE	Tap Woodward - Tatonga 345kV (GEN-2011-051 Tap)	On Suspension
GEN-2011-054	300.00	OKGE	Cimarron 345kV	On Schedule for 2013 (200 MW) and 2014 (99 MW)
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 Schedule for 2014
GEN-2012-001	61.20	SPS	Cirrus Tap 230kV	On-Line
GEN-2012-004	41.40	OKGE	Carter County 138kV	On-Line
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV	On-Line
GEN-2012-009	15.00	SPS	Mustang 230kV	On Schedule for 2015
GEN-2012-010	15.00	SPS	Mustang 230kV	On Schedule for 2015
GEN-2012-020	478.00	SPS	TUCO 230kV	On Schedule for 2016

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2012-021	4.80	LES	Terry Bundy Generating Station 115kV	On-Line
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV	TRANSITIONED TO IFS QUEUE
GEN-2012-027	136.00	AEPW	Shidler 138kV	On Suspension
GEN-2012-028	74.80	WFEC	Gotebo 69kV	On Schedule for 2015
GEN-2012-032	300.00	OKGE	Open Sky 345kV	On Schedule for 2015
GEN-2012-033	98.80	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV	On Schedule for 2015
GEN-2012-034	7.00	SPS	Mustang 230kV	On Schedule for 2015
GEN-2012-035	7.00	SPS	Mustang 230kV	On Schedule for 2015
GEN-2012-036	7.00	SPS	Mustang 230kV	On-Line
GEN-2012-037	203.00	SPS	TUCO 345kV	On Schedule for 2015
GEN-2012-040	76.50	WFEC	Chilocco 138kV	On Suspension
GEN-2012-041	121.50	OKGE	Ranch Road 345kV	On Schedule for 2015
GEN-2013-002	50.60	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2	TRANSITIONED TO IFS QUEUE
GEN-2013-007	100.30	OKGE	Tap Prices Falls - Carter 138kV	On Schedule for 2015
GEN-2013-008	1.20	NPPD	Steele City 115kV	On-Line
GEN-2013-011	30.00	AEPW	Turk 138kV	TRANSITIONED TO IFS QUEUE
GEN-2013-012	147.00	OKGE	Redbud 345kV	On-Line
GEN-2013-014	25.50	NPPD	Tap Guide Rock - Pauline (Rosemont) 115kV	On Suspension
GEN-2013-016	203.00	SPS	TUCO 345kV	TRANSITIONED TO IFS QUEUE
GEN-2013-019	73.60	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2	TRANSITIONED TO IFS QUEUE
GEN-2013-022	25.00	SPS	Norton 115kV	TRANSITIONED TO IFS QUEUE
GEN-2013-028	559.50	GRDA	Tap N Tulsa - GRDA 1 345kV	TRANSITIONED TO IFS QUEUE
GEN-2013-029	300.00	OKGE	Renfrow 345kV	TRANSITIONED TO IFS QUEUE
GEN-2013-030	300.00	OKGE	Beaver County 345kV	TRANSITIONED TO IFS QUEUE
GEN-2013-032	204.00	NPPD	Neligh 115kV	TRANSITIONED TO IFS QUEUE
GEN-2013-033	28.00	MIDW	Goodman Energy Center 115kV	TRANSITIONED TO IFS QUEUE
GEN-2014-001	200.60	WERE	Tap Wichita - Emporia Energy Center 345kV	TRANSITIONED TO IFS QUEUE
GEN-2014-002	10.53	OKGE	Tatonga 345kV (GEN-2007-021 POI)	TRANSITIONED TO IFS QUEUE
GEN-2014-003	15.84	OKGE	Tatonga 345kV (GEN-2007-044 POI)	TRANSITIONED TO IFS QUEUE
GEN-2014-004	3.96	NPPD	Steele City 115kV (GEN-2011-018 POI)	TRANSITIONED TO IFS QUEUE
GEN-2014-005	5.67	OKGE	Minco 345kV (GEN-2011-010 POI)	TRANSITIONED TO IFS QUEUE
GEN-2014-012	225.00	SPS	Tap Hobbs Interchange - Andrews 230kV	TRANSITIONED TO IFS QUEUE
GEN-2014-013	73.50	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV	TRANSITIONED TO IFS QUEUE
Gray County Wind (Montezuma)	110.00	SUNCMKEC	Gray County Tap 115kV	On-Line
Llano Estacado (White Deer)	80.00	SPS	Llano Wind 115kV	On-Line
NPPD Distributed (Broken Bow)	8.30	NPPD	Broken Bow 115kV	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

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
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
SPS Distributed (Spearman)	10.00	SPS	Spearman 69kV	On-Line
SPS Distributed (TC-Texas County)	20.00	SPS	Texas County 115kV	On-Line
Total:	**24,595.0**			

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	10.53	OKGE	Tatonga 345kV (GEN-2007-021 POI)
GEN-2014-003	15.84	OKGE	Tatonga 345kV (GEN-2007-044 POI)
GEN-2014-005	5.67	OKGE	Minco 345kV (GEN-2011-010 POI)
PRIOR QUEUED SUBTOTAL	**3,866.54**		
GEN-2014-020	100.00	AEPW	Tuttle 138kV
GEN-2014-056	250.00	OKGE	Minco 345kV
CURRENT CLUSTER SUBTOTAL	**350.00**		
AREA TOTAL	**4,216.54**		

GROUP 2: HITCHLAND AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2011-002	20.00	SPS	Herring 115kV
GEN-2002-008	240.00	SPS	Hitchland 345kV
GEN-2002-009	80.00	SPS	Hansford 115kV
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-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
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	**2,962.70**		
GEN-2014-026	150.00	OKGE	Beaver County 345kV
CURRENT CLUSTER SUBTOTAL	**150.00**		
AREA TOTAL	**3,112.70**		

GROUP 3: SPEARVILLE AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2012-006	22.50	SUNCMKEC	Tap Hugoton - Rolla 69kV
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-2006-006	205.50	SUNCMKEC	Spearville 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	Spearville 345kV
GEN-2011-017	299.00	SUNCMKEC	Tap Spearville - Post Rock (GEN-2011-017T) 345kV
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV
Gray County Wind (Montezuma)	110.00	SUNCMKEC	Gray County Tap 115kV
PRIOR QUEUED SUBTOTAL	**3,610.30**		
GEN-2013-010	99.00	SUNCMKEC	Tap Spearville - Post Rock (North of GEN-2011-017 Tap) 345kV
GEN-2014-049	200.00	SUNCMKEC	Thistle 345kV
CURRENT CLUSTER SUBTOTAL	**299.00**		
AREA TOTAL	**3,909.30**		

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-2008-017	300.00	SUNCMKEC	Setab 345kV
GEN-2008-092	201.00	MIDW	Post Rock 230kV
GEN-2009-008	199.50	MIDW	South Hays 230kV
GEN-2009-020	48.60	MIDW	Tap Nekoma - Bazine (Walnut Creek) 69kV
GEN-2010-057	201.00	MIDW	Rice County 230kV
GEN-2013-033	28.00	MIDW	Goodman Energy Center 115kV
PRIOR QUEUED SUBTOTAL	**1,639.70**		
GEN-2014-025	2.40	MIDW	Tap Nekoma - Bazine (Walnut Creek) 69kV
GEN-2014-041	120.80	SUNCMKEC	Arnold 115kV
CURRENT CLUSTER SUBTOTAL	**123.20**		
AREA TOTAL	**1,762.90**		

GROUP 5: AMARILLO AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2013-001	11.50	SPS	PanTex South 115kV
GEN-2002-022	240.00	SPS	Bushland 230kV
GEN-2008-051	322.00	SPS	Potter County 345kV
GEN-2008-088	50.60	SPS	Vega 69kV
Llano Estacado (White Deer)	80.00	SPS	Llano Wind 115kV
PRIOR QUEUED SUBTOTAL	**704.10**		
GEN-2014-040	320.00	SPS	Castro 115kV
CURRENT CLUSTER SUBTOTAL	**320.00**		
AREA TOTAL	**1,024.10**		

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 115kV
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
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	Tap Tolk - Eddy County (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-2012-009	15.00	SPS	Mustang 230kV
GEN-2012-010	15.00	SPS	Mustang 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-2014-012	225.00	SPS	Tap Hobbs Interchange - Andrews 230kV
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
PRIOR QUEUED SUBTOTAL	**3,481.80**		
ASGI-2014-002	49.60	SPS	Tap Tucumcari - Santa Rosa 115kV
ASGI-2014-005	10.00	SPS	Strata 69kV
ASGI-2014-008	10.00	SPS	South Loving 69kV
ASGI-2014-009	10.00	SPS	Wood Draw 115kV
ASGI-2014-010	10.00	SPS	Ochoa 115kV
ASGI-2014-012	10.00	SPS	Cooper Ranch 115kV
GEN-2013-027	150.00	SPS	Tap Tolk - Yoakum 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-2014-047	40.00	SPS	Tap Tolk - Eddy County (Crossroads) 345kV
GEN-2014-053	80.00	SPS	Carlisle 230kV
GEN-2014-054	120.00	SPS	Carlisle 230kV
GEN-2014-063	120.00	SPS	Hobbs 230kV
GEN-2014-066	30.00	SPS	Norton 115kV
GEN-2014-070	113.00	SPS	Tap Hobbs - Yoakum 230kV
CURRENT CLUSTER SUBTOTAL	**922.60**		
AREA TOTAL	**4,404.40**		

GROUP 7: SOUTHWEST OKLAHOMA AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-026	74.25	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	Washita 138kV
GEN-2004-020	27.00	AEPW	Washita 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-2007-032	150.00	WFEC	Tap Clinton Junction - Clinton 138kV
GEN-2007-052	150.00	WFEC	Anadarko 138kV
GEN-2008-023	150.00	AEPW	Hobart Junction 138kV
GEN-2008-037	101.00	WFEC	Tap Washita - Blue Canyon Wind 138kV
GEN-2011-037	7.00	WFEC	Blue Canyon 5 138kV
GEN-2011-049	250.00	OKGE	Border 345kV
GEN-2012-028	74.80	WFEC	Gotebo 69kV
PRIOR QUEUED SUBTOTAL	**1,900.25**		
AREA TOTAL	**1,900.25**		

GROUP 8: NORTH OKLAHOMA/SOUTH CENTRAL KANSAS AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2010-006	150.00	AECI	Tap Fairfax (AECI) - Shilder (AEPW) 138kV
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	60.00	OKGE	Nardins 69kV
GEN-2010-003	100.80	WERE	Waverly 345kV
GEN-2010-005	300.00	WERE	Viola 345kV
GEN-2010-055	4.50	AEPW	Wekiwa 138kV
GEN-2011-057	150.40	WERE	Creswell 138kV
GEN-2012-027	136.00	AEPW	Shidler 138kV
GEN-2012-032	300.00	OKGE	Open Sky 345kV
GEN-2012-033	98.80	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV
GEN-2012-040	76.50	WFEC	Chilocco 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 345kV
PRIOR QUEUED SUBTOTAL	**3,849.40**		
ASGI-2014-014	56.40	GRDA	Ferguson 69kV
GEN-2014-028	35.00	EMDE	Riverton 161kV
GEN-2014-064	248.40	OKGE	Otter 138kV
CURRENT CLUSTER SUBTOTAL	**339.80**		
AREA TOTAL	**4,189.20**		

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-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 Twin Church - Hoskins 230kV
GEN-2011-018	73.60	NPPD	Steele City 115kV
GEN-2011-027	120.00	NPPD	Hoskins 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-2013-014	25.50	NPPD	Tap Guide Rock - Pauline (Rosemont) 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	Neligh 115kV
GEN-2014-004	3.96	NPPD	Steele City 115kV (GEN-2011-018 POI)
GEN-2014-013	73.50	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV
NPPD Distributed (Broken Bow)	8.30	NPPD	Broken Bow 115kV
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	**1,963.06**		
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
CURRENT CLUSTER SUBTOTAL	**119.40**		
AREA TOTAL	**2,082.46**		

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
ASGI-2013-007	90.00	AECI	Tap Hickory Creek - Locust Creek 161kV
GEN-2008-129	80.00	GMO	Pleasant Hill 161kV
GEN-2010-036	4.60	WERE	6th Street 115kV
GEN-2011-011	50.00	KACP	Iatan 345kV
PRIOR QUEUED SUBTOTAL	**224.60**		
GEN-2014-021	300.00	GMO	Tap Nebraska City - Mullin Creek 345kV
GEN-2014-051	174.00	WERE	Jeffrey Energy Center 345kV
CURRENT CLUSTER SUBTOTAL	**474.00**		
AREA TOTAL	**698.60**		

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
PRIOR QUEUED SUBTOTAL	**362.50**		
GEN-2014-057	250.00	AEPW	Tap Lawton - Sunnyside 345kV
CURRENT CLUSTER SUBTOTAL	**250.00**		
AREA TOTAL	**612.50**		

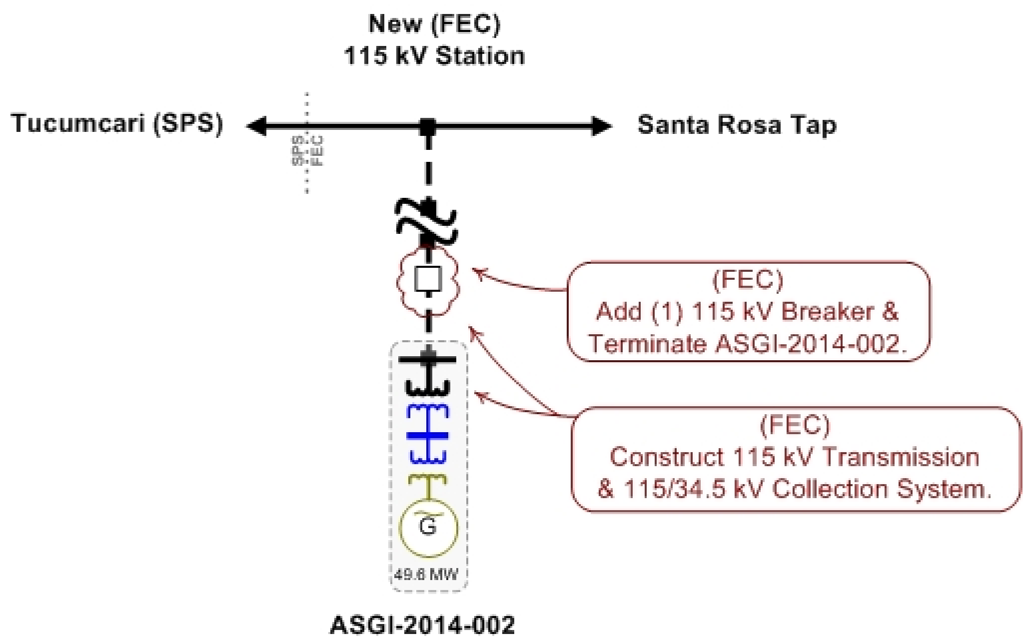
CLUSTER TOTAL (CURRENT STUDY)	**3,348.0**	MW
PQ TOTAL (PRIOR QUEUED)	**24,595.0**	MW
CLUSTER TOTAL (INCLUDING PRIOR QUEUED)	**27,943.0**	MW

D: Proposed Point of Interconnection One Line Diagrams

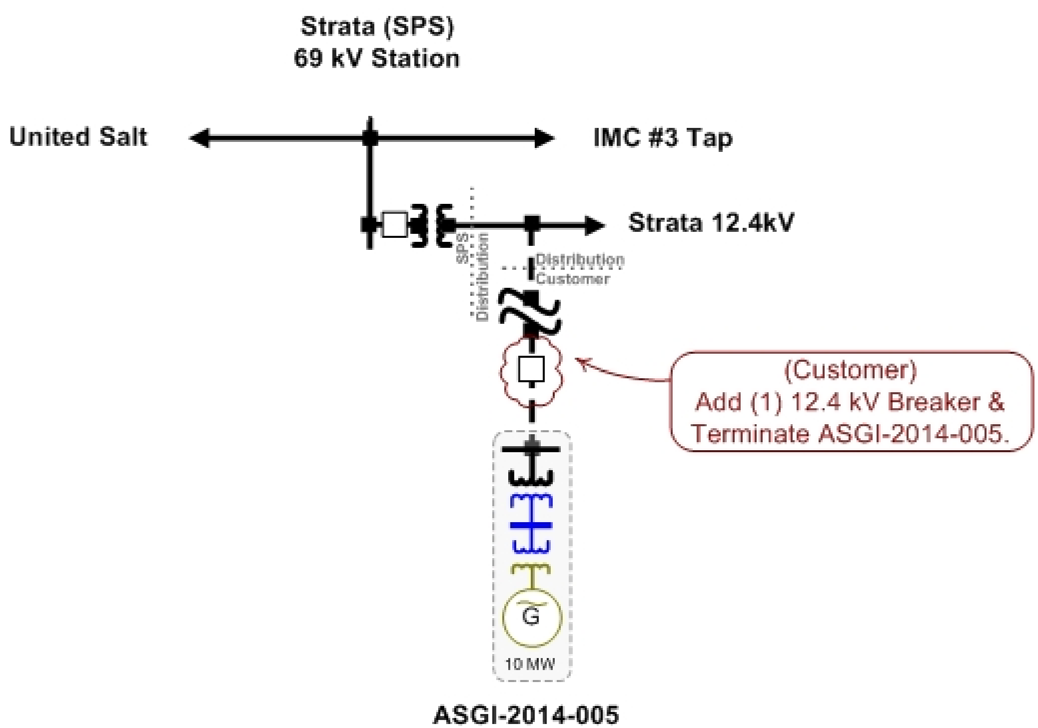
See next page

*Please note for Affected System Generation Interconnection Requests (ASGI) interconnection cost estimate could include distribution system or third party system network upgrades and costs estimates.

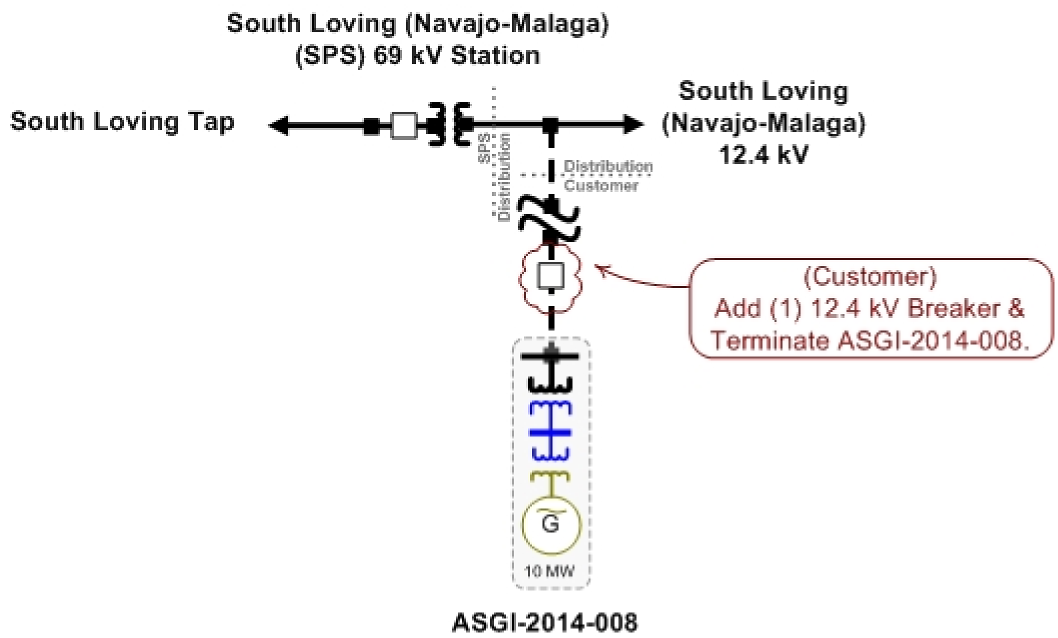
ASGI-2014-002
Estimated Interconnection Cost: $6,403,000*



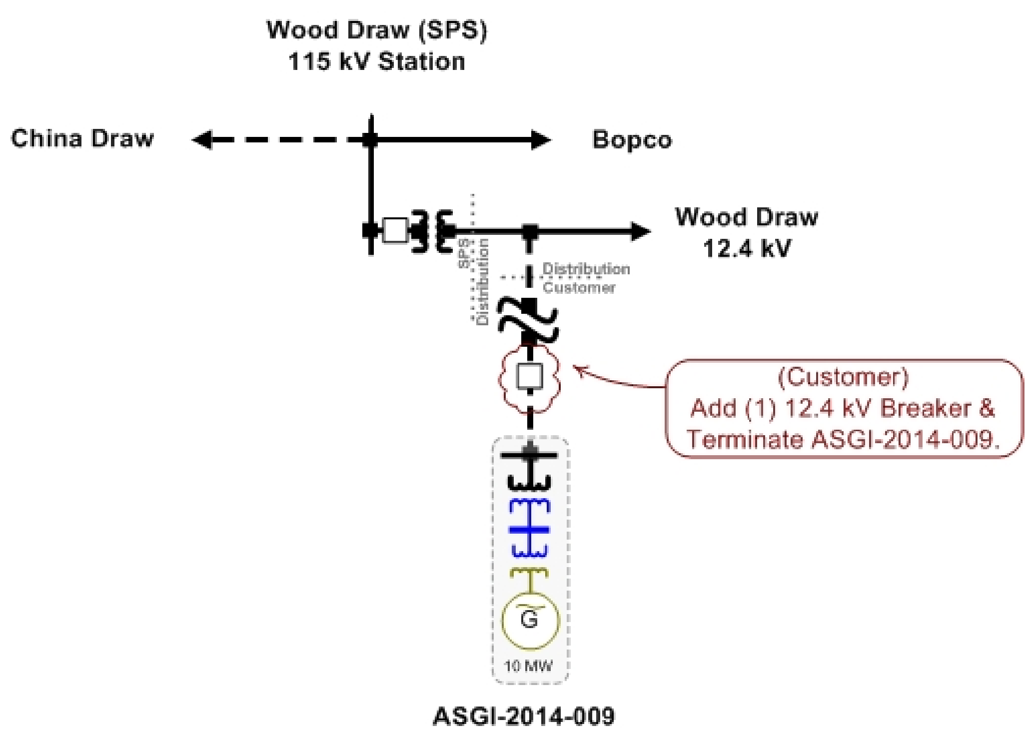
ASGI-2014-005
Estimated Interconnection Cost: $2,759,383*



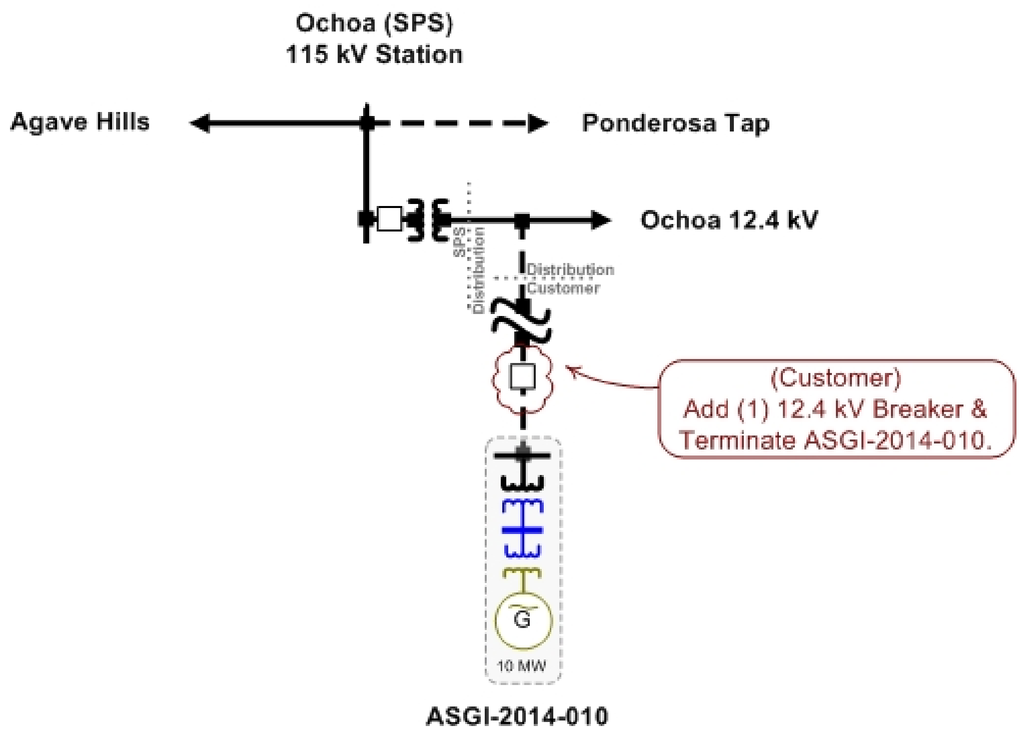
ASGI-2014-008
Estimated Interconnection Cost: $2,799,543*



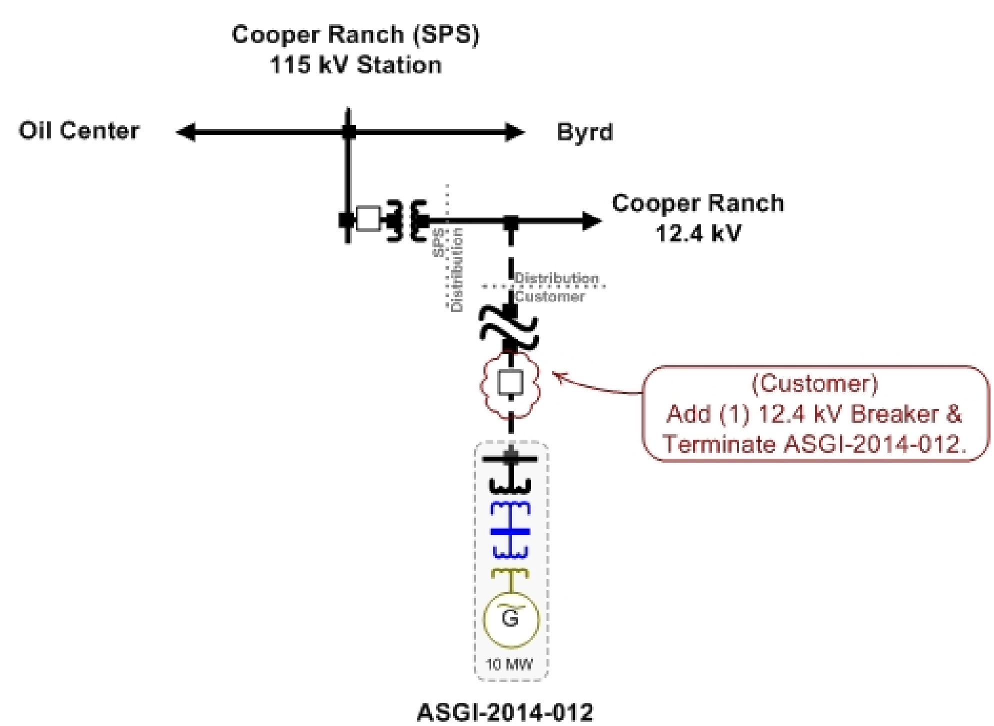
ASGI-2014-009
Estimated Interconnection Cost: $3,293,228*



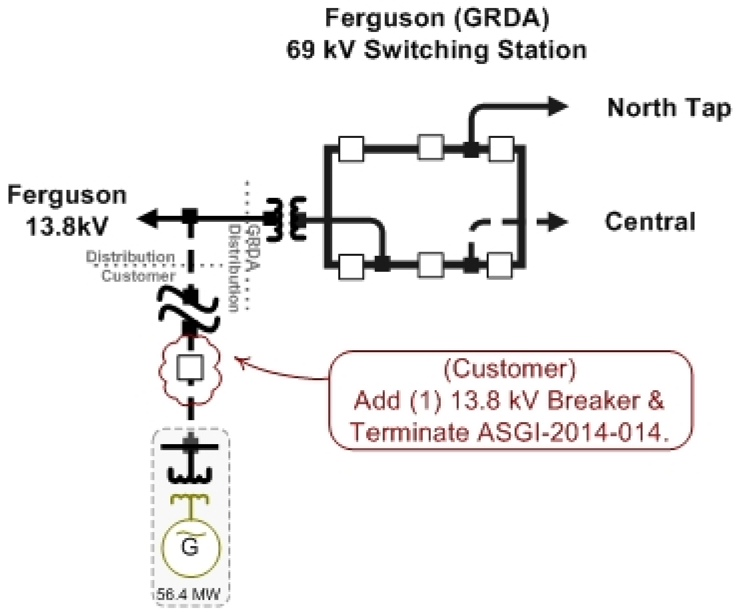
ASGI-2014-010
Estimated Interconnection Cost: $2,708,891*



ASGI-2014-012
Estimated Interconnection Cost: $2,672,441*

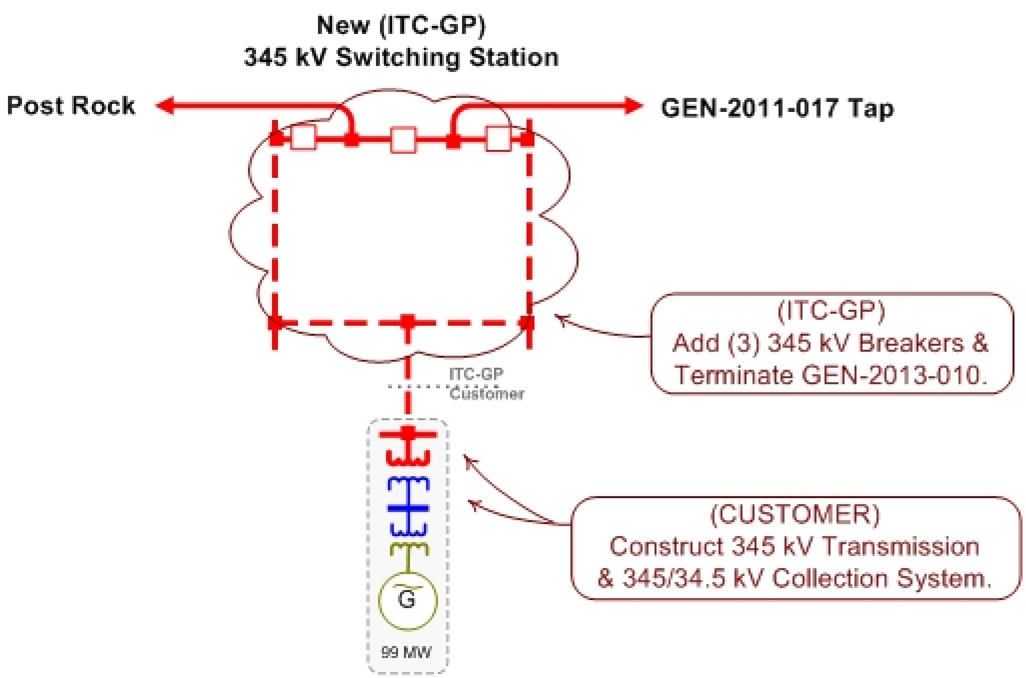


ASGI-2014-014
Estimated Interconnection Cost: $134,163*



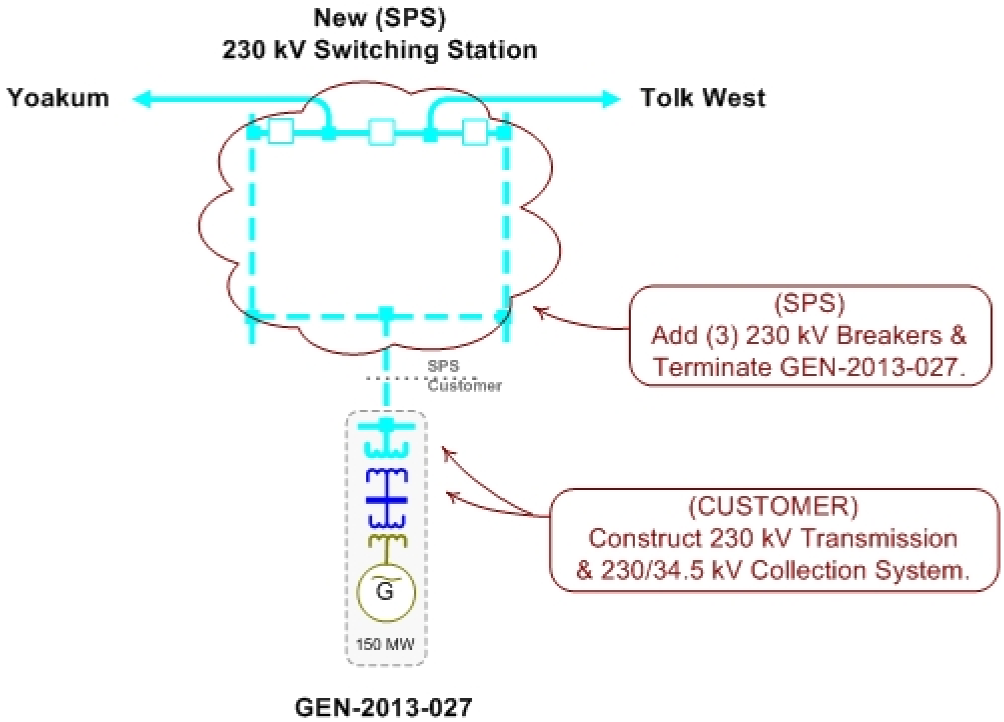
ASGI-2014-014

GEN-2013-010
Estimated Interconnection Cost: $11,216,355

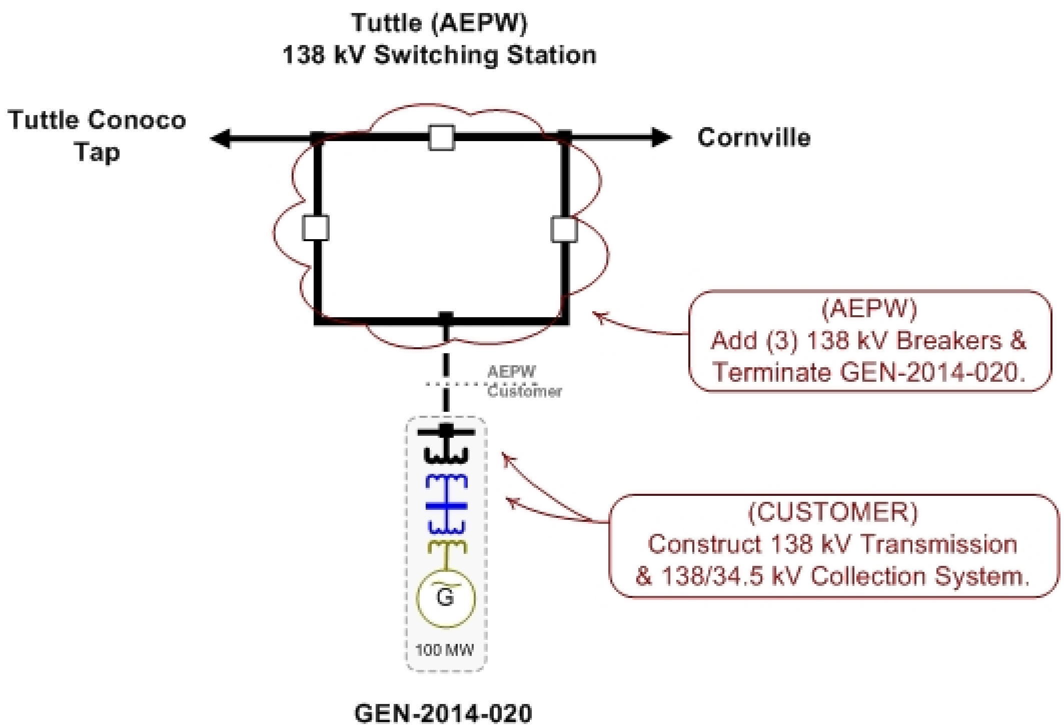


GEN-2013-010

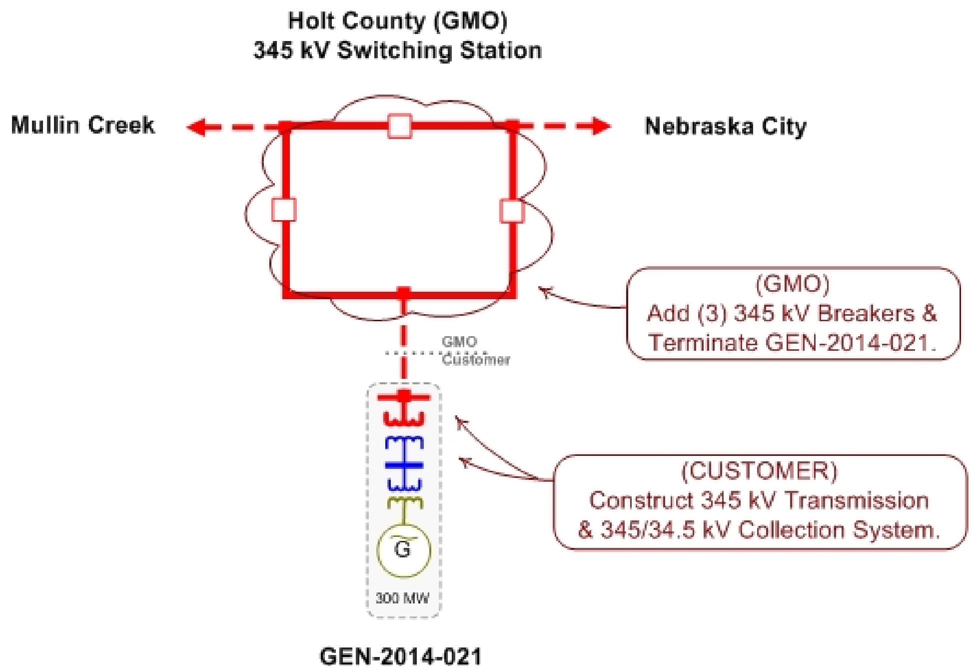
GEN-2013-027
Estimated Interconnection Cost: $5,744,592



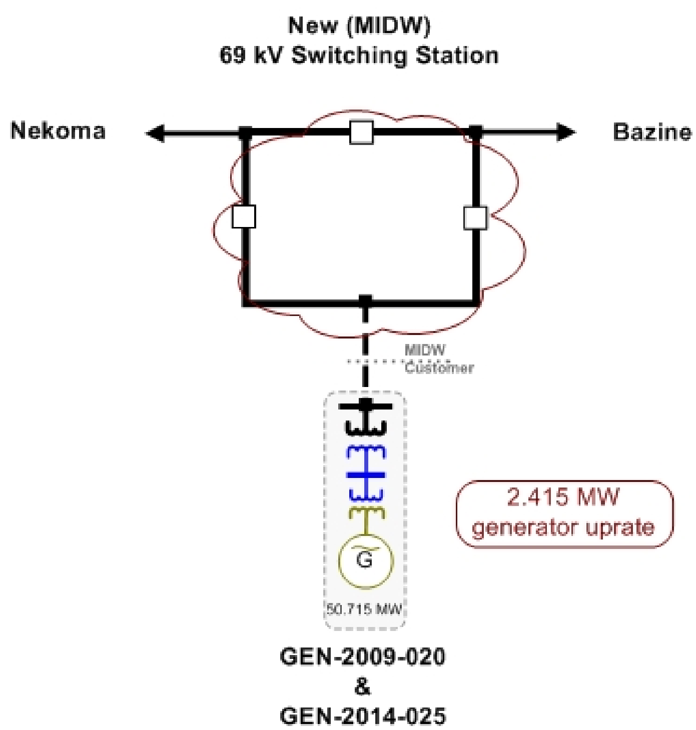
GEN-2014-020
Estimated Interconnection Cost: $6,457,000



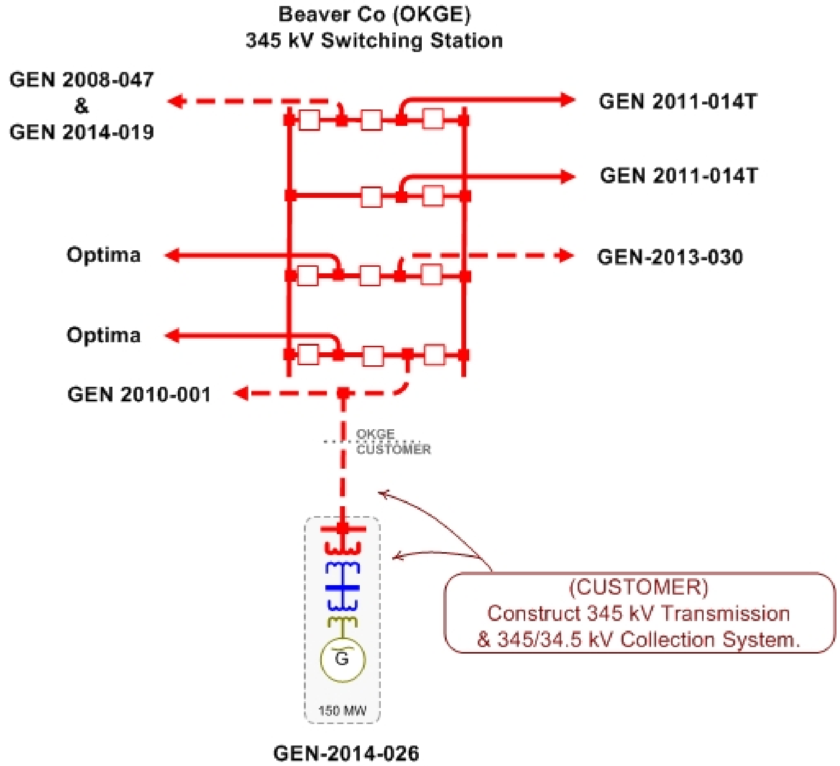
GEN-2014-021
Estimated Interconnection Cost: $18,262,000



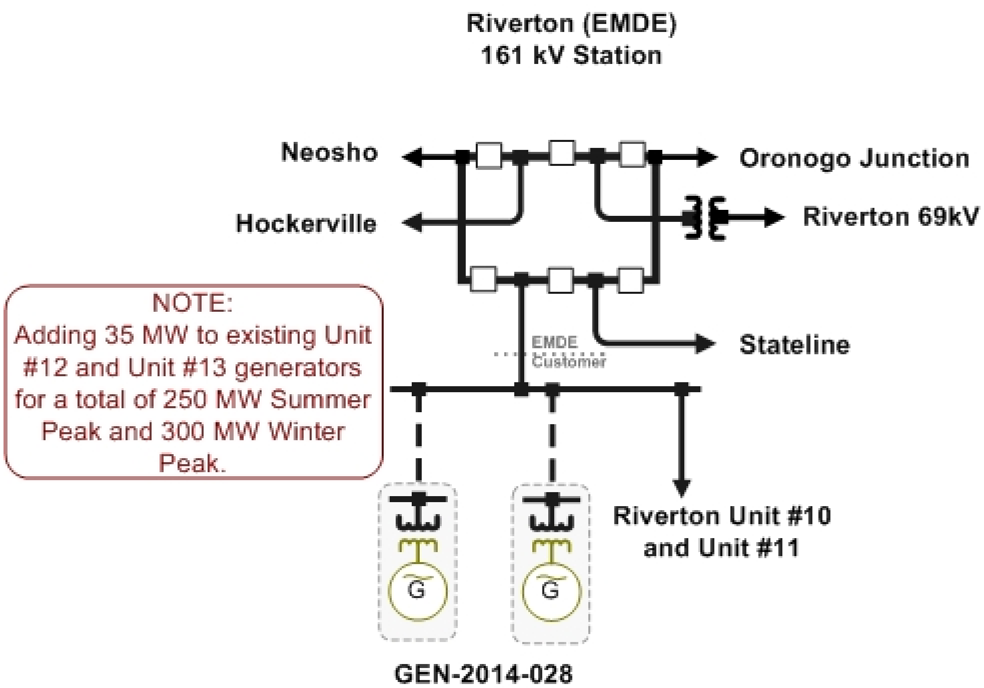
GEN-2014-025
Estimated Interconnection Cost: $0



GEN-2014-026
Estimated Interconnection Cost: $0

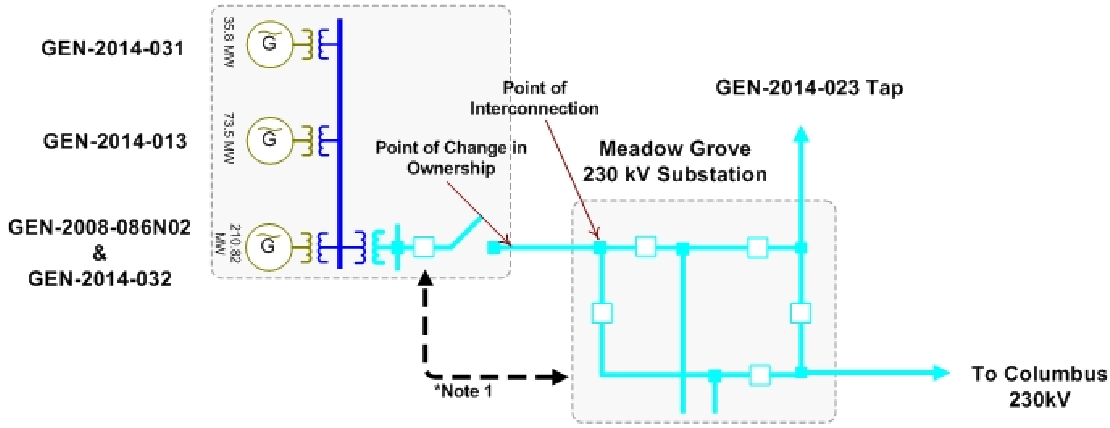


GEN-2014-028
Estimated Interconnection Cost: $0



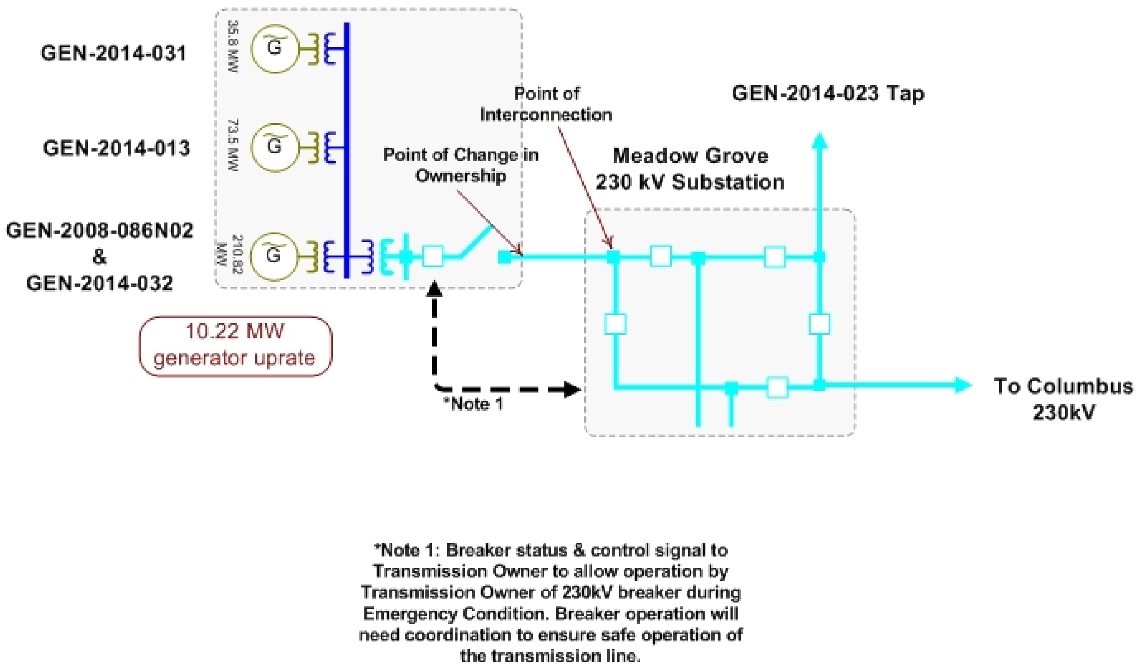
GEN-2014-031

Estimated Interconnection Cost: $100,000

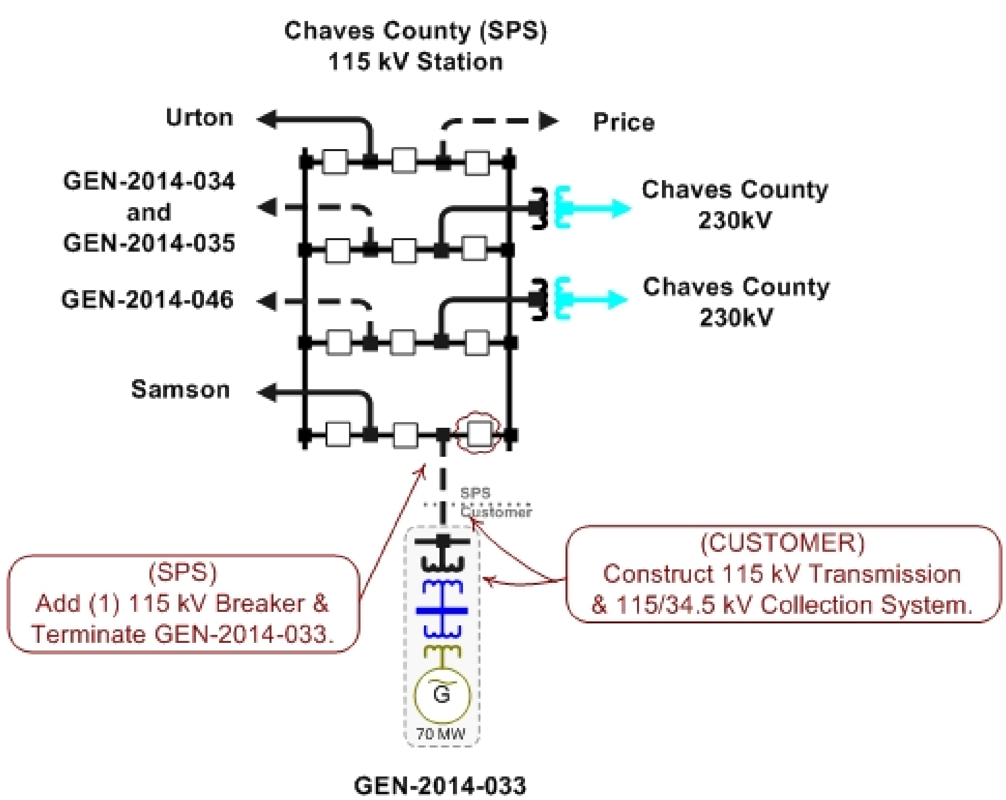


*Note 1: Breaker status & control signal to Transmission Owner to allow operation by Transmission Owner of 230kV breaker during Emergency Condition. Breaker operation will need coordination to ensure safe operation of the transmission line.

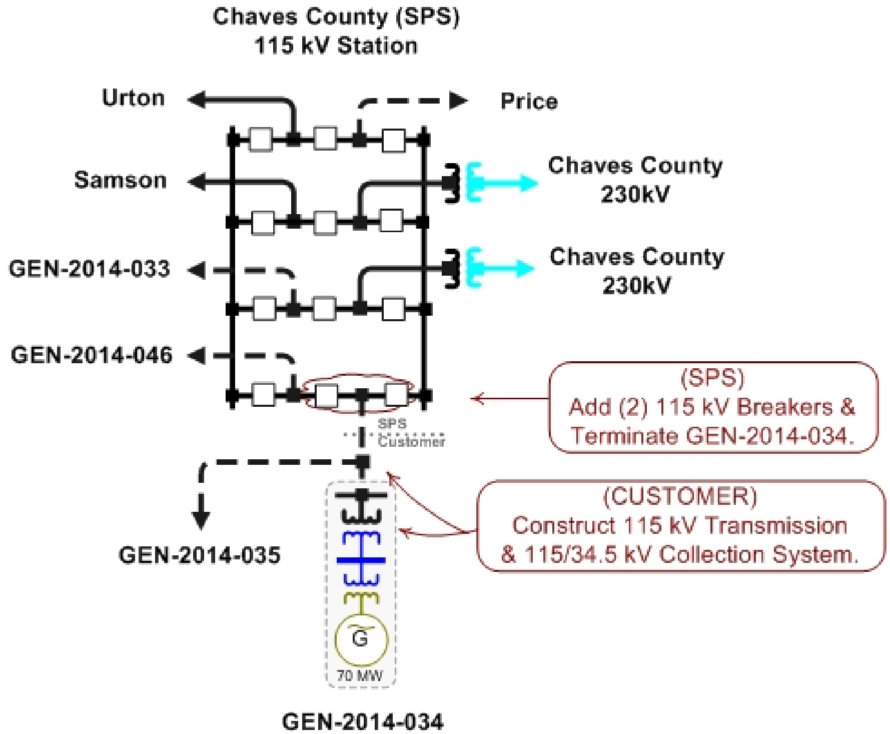
GEN-2014-032
Estimated Interconnection Cost: $100,000



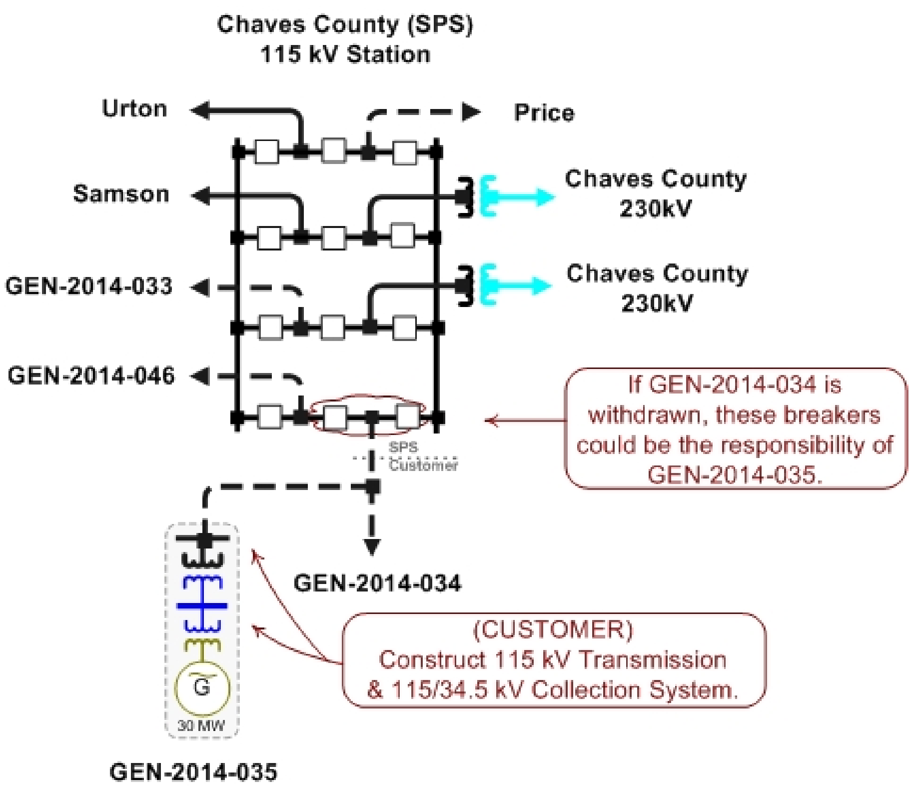
GEN-2014-033
Estimated Interconnection Cost: $1,830,343



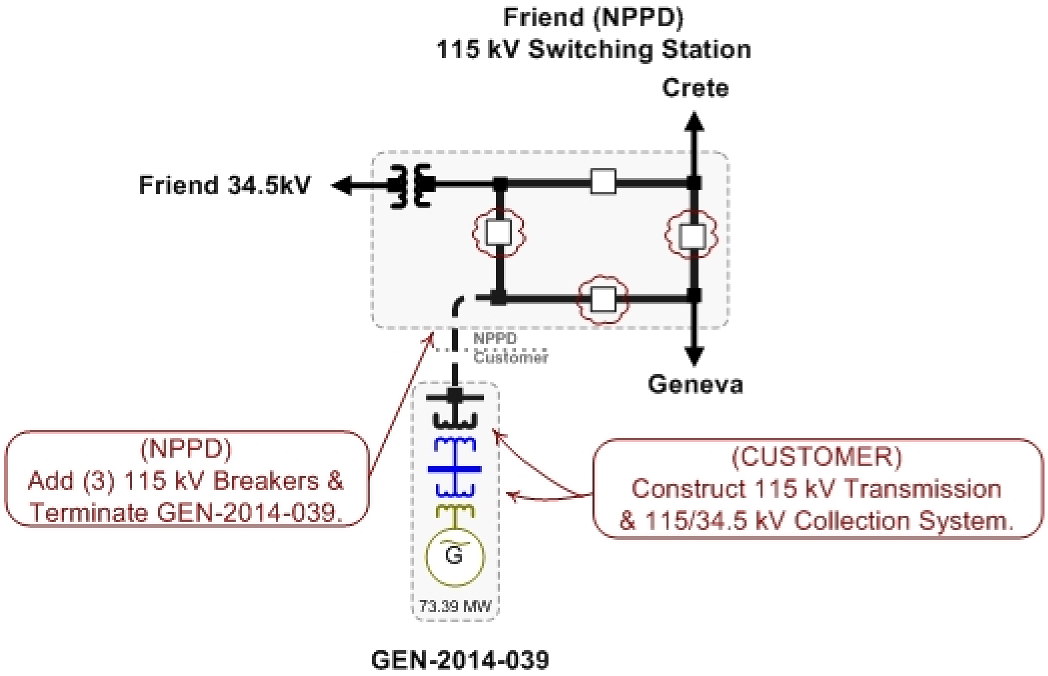
GEN-2014-034
Estimated Interconnection Cost: $997,430



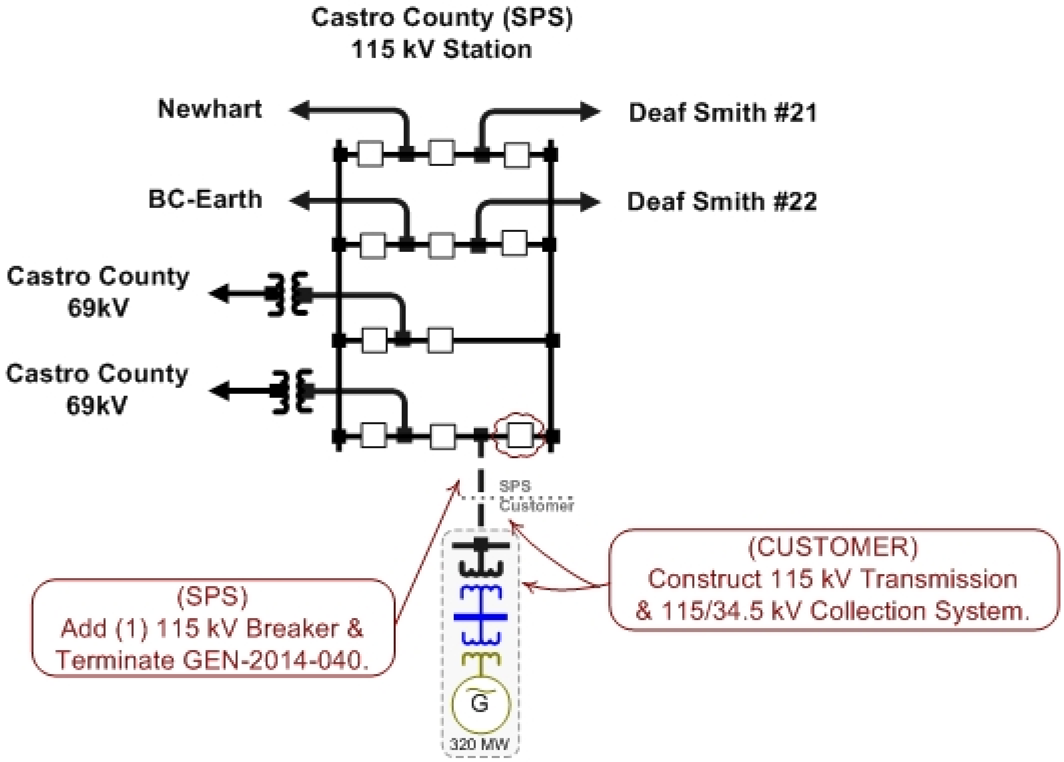
GEN-2014-035
Estimated Interconnection Cost: $0



GEN-2014-039
Estimated Interconnection Cost: $4,200,000

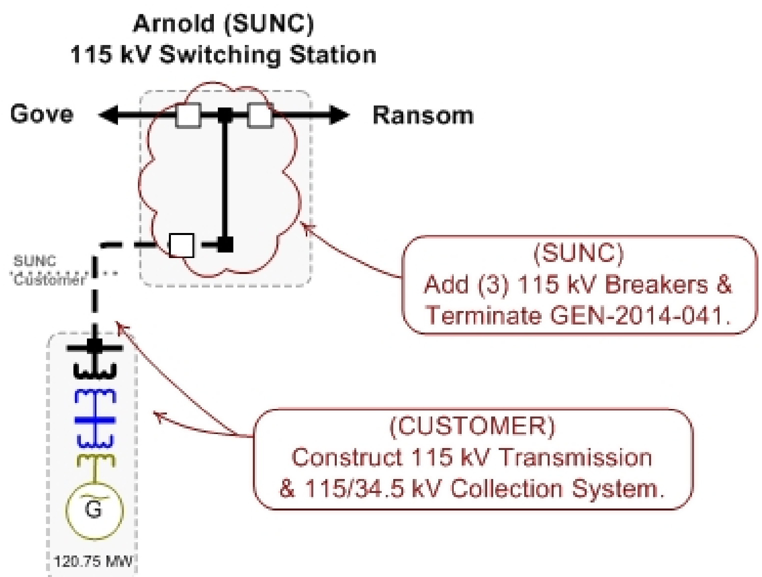


GEN-2014-040
Estimated Interconnection Cost: $1,250,017



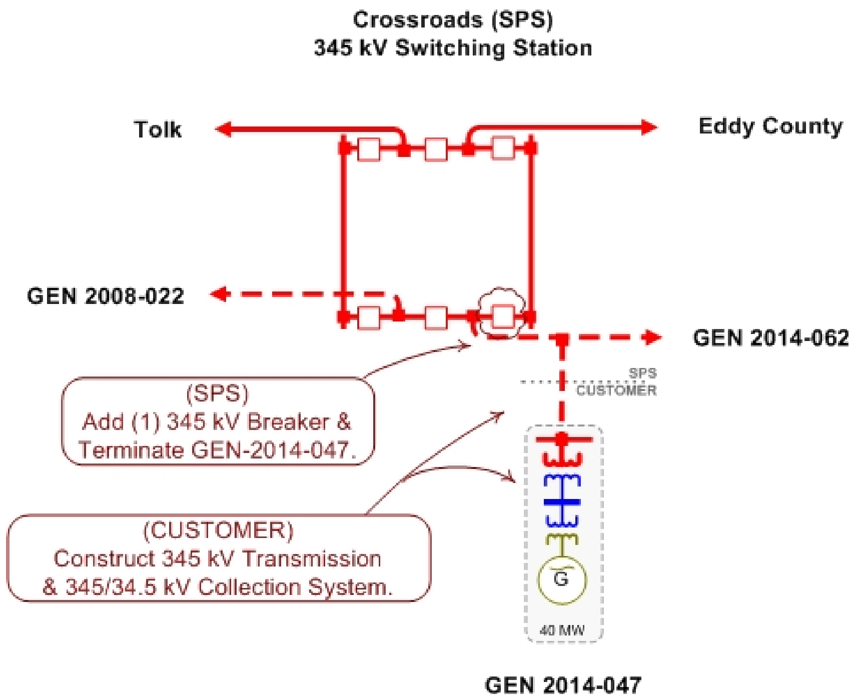
GEN-2014-040

GEN-2014-041
Estimated Interconnection Cost: $4,180,734

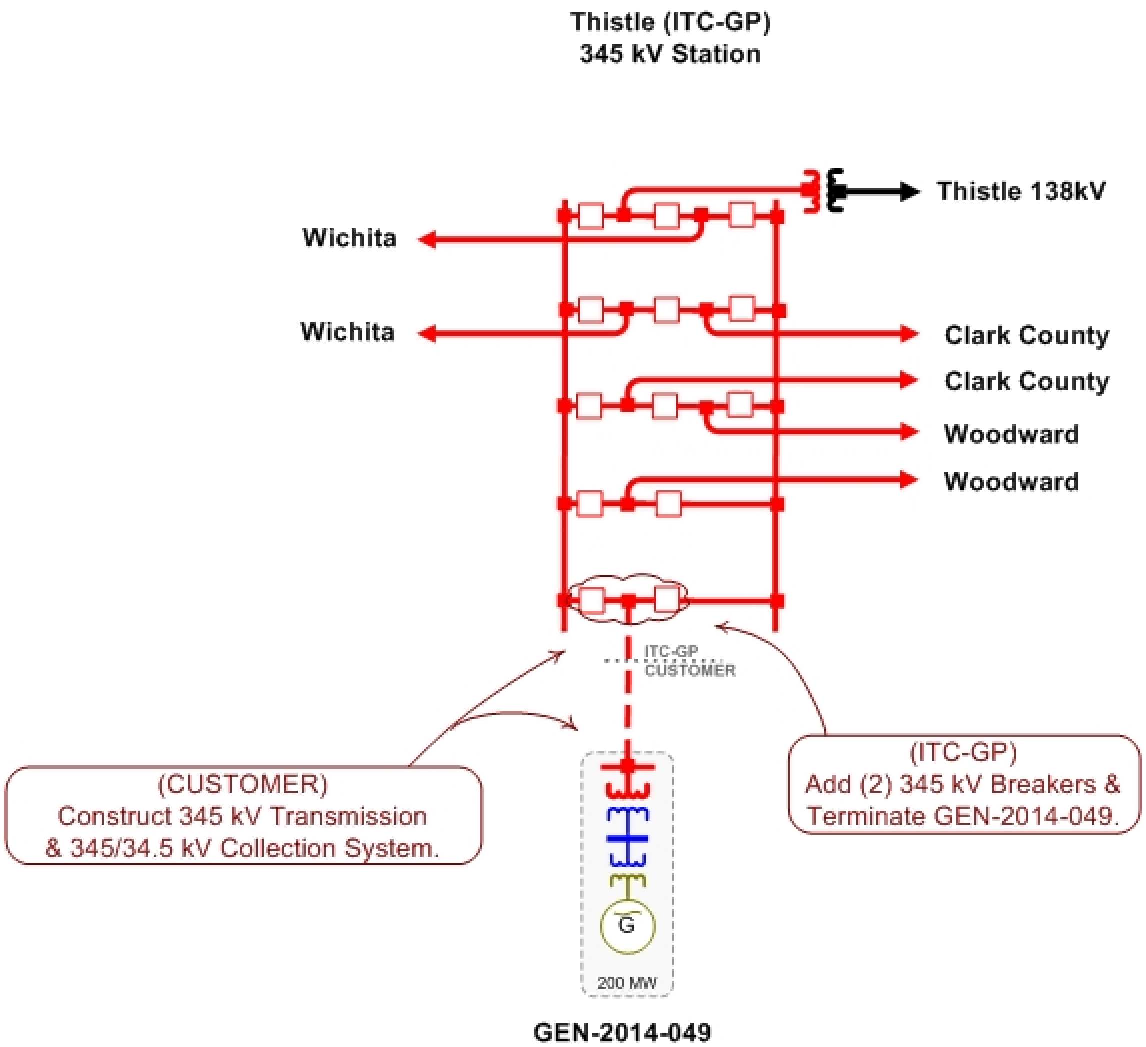


GEN-2014-041

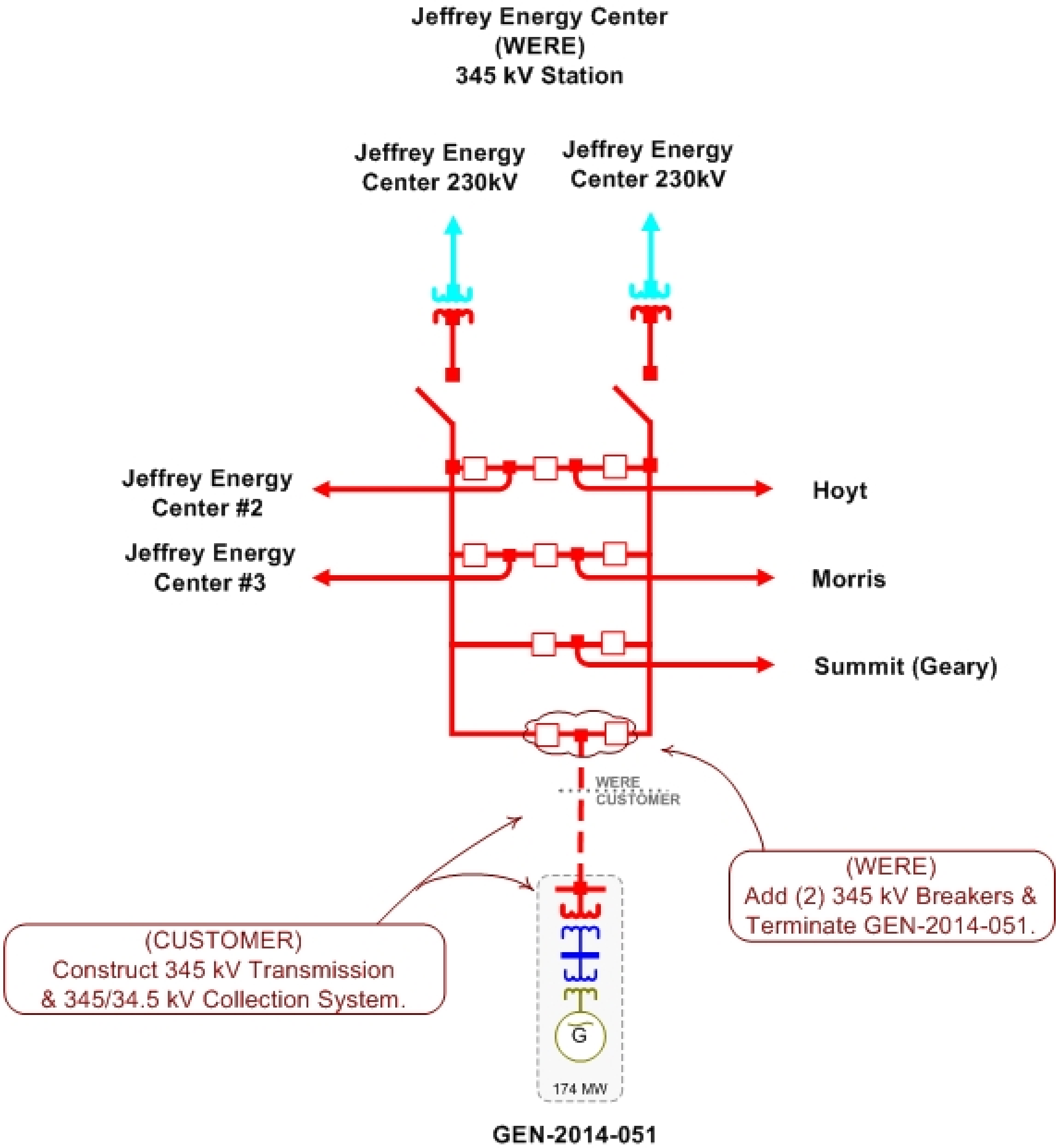
GEN-2014-047
Estimated Interconnection Cost: $2,827,005



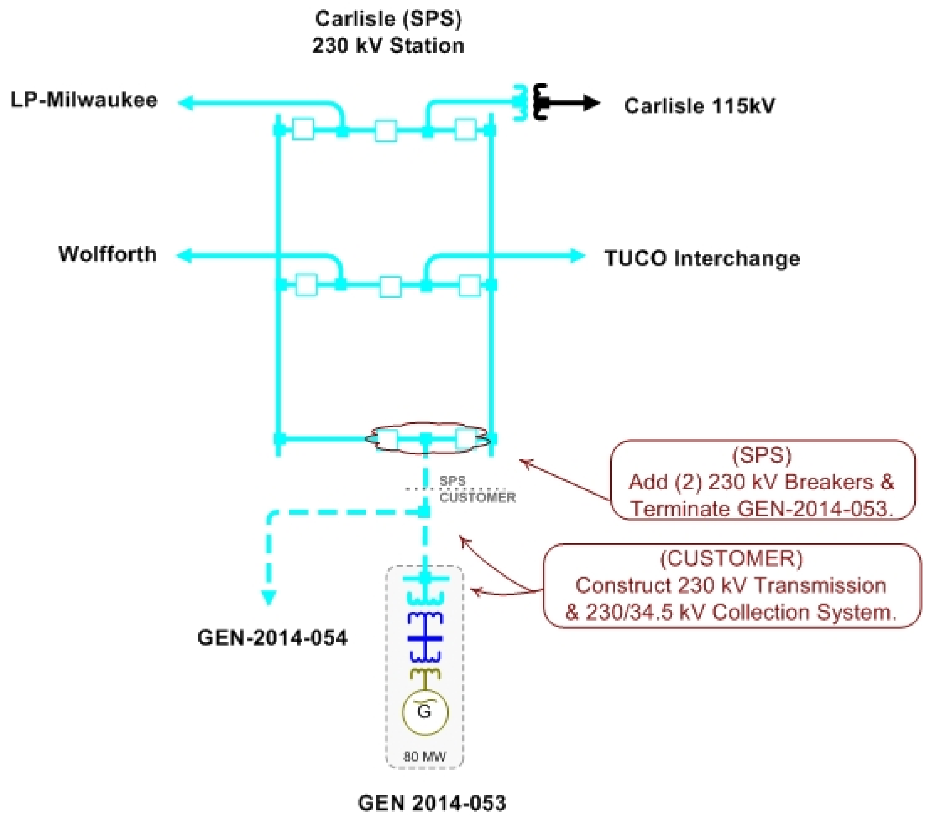
GEN-2014-049
Estimated Interconnection Cost: $3,923,113



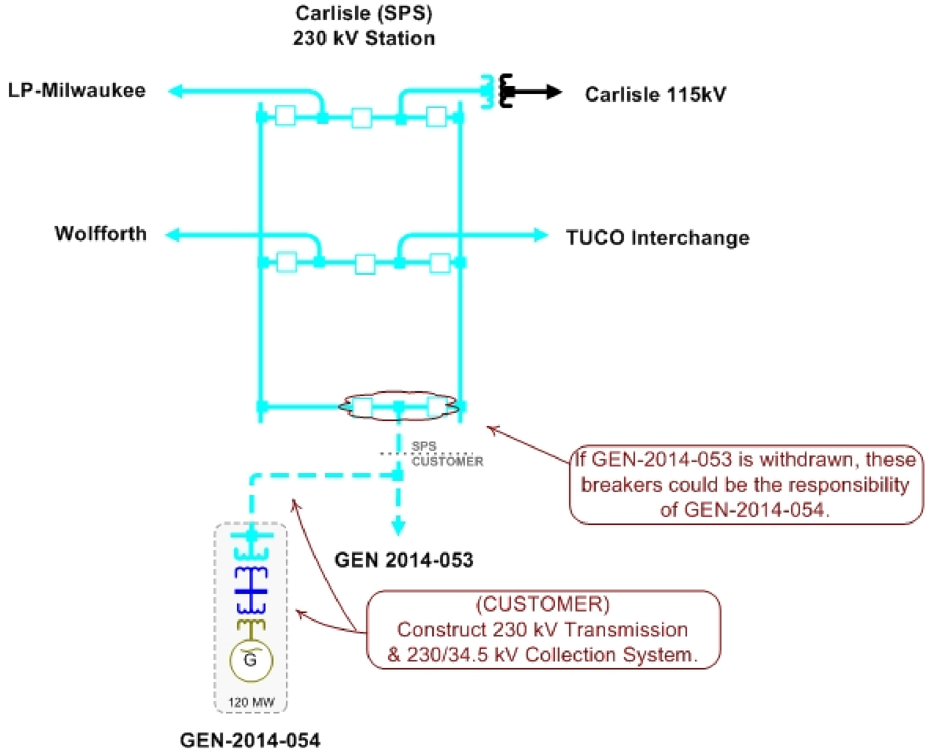
GEN-2014-051
Estimated Interconnection Cost: $10,739,421



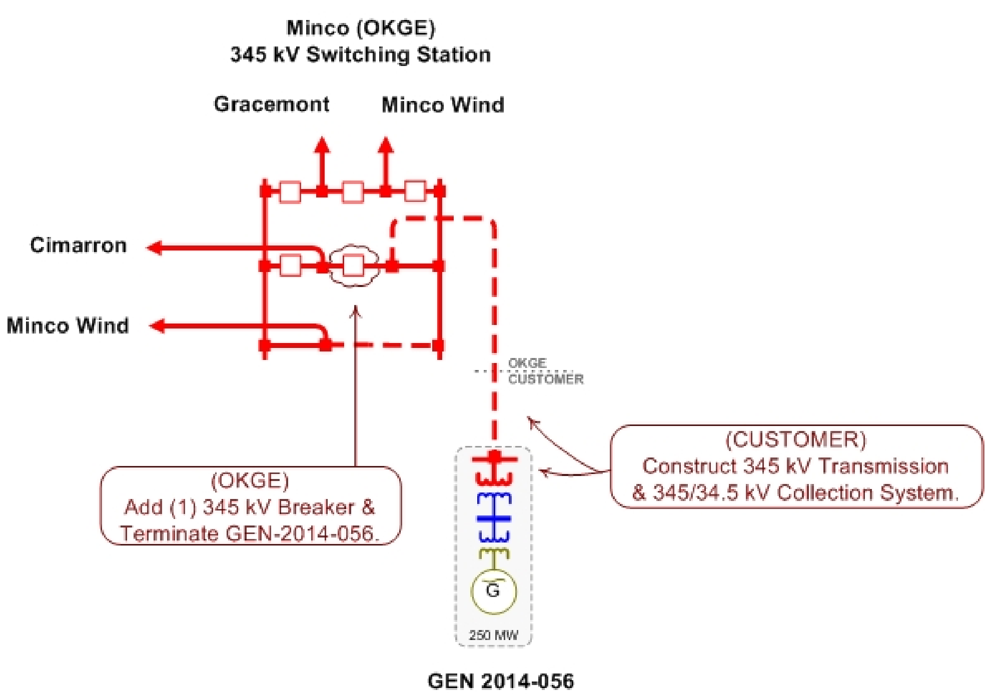
GEN-2014-053
Estimated Interconnection Cost: $2,480,324



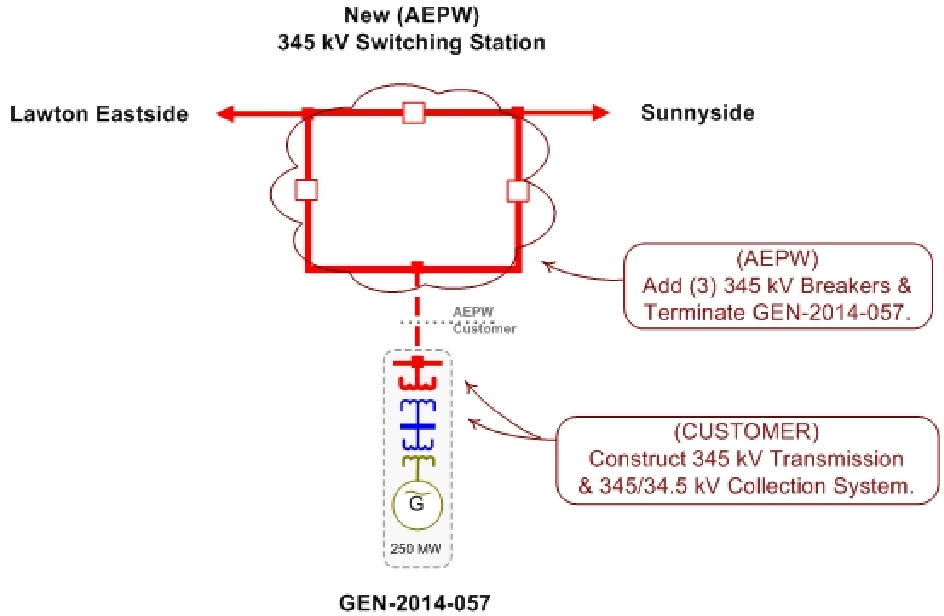
GEN-2014-054
Estimated Interconnection Cost: $0



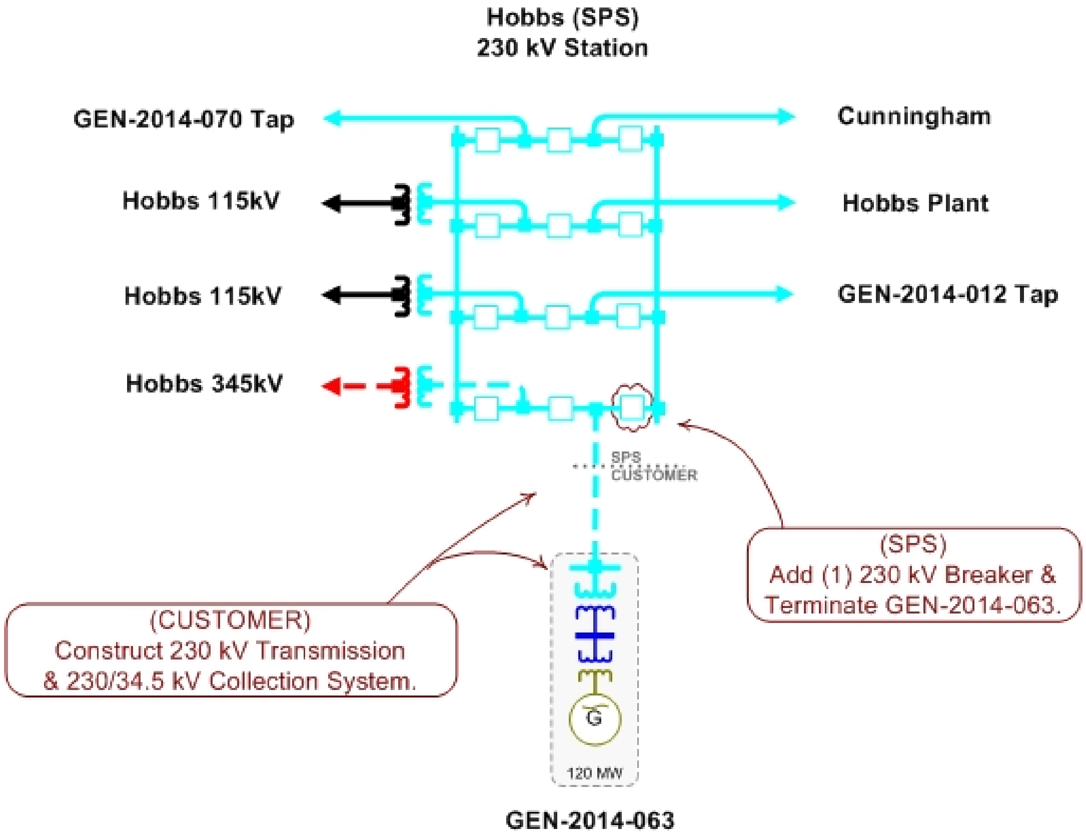
GEN-2014-056
Estimated Interconnection Cost: $2,250,100



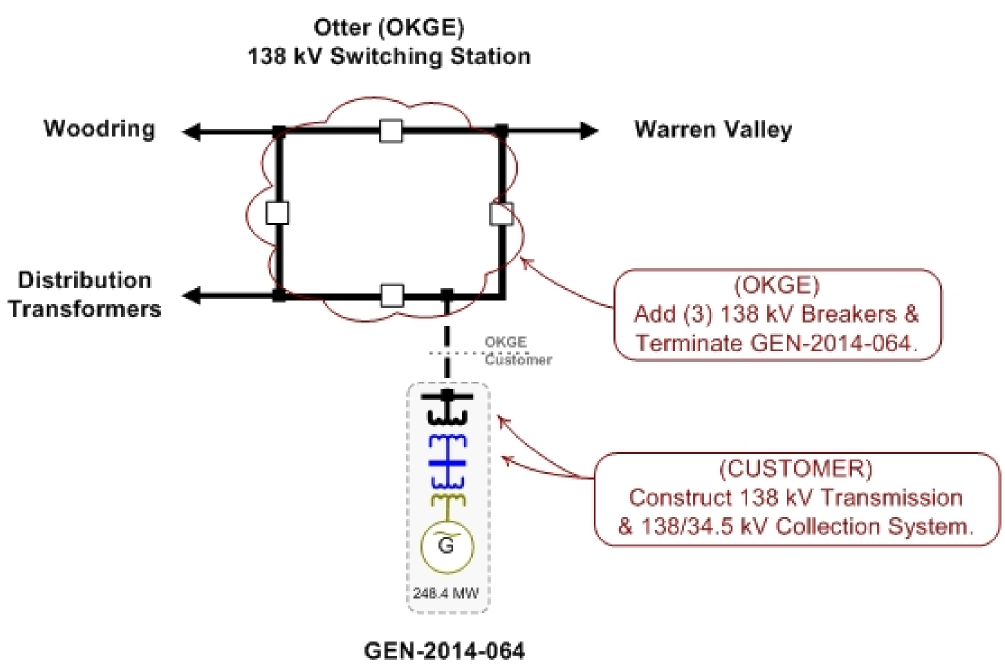
GEN-2014-057
Estimated Interconnection Cost: $19,433,500



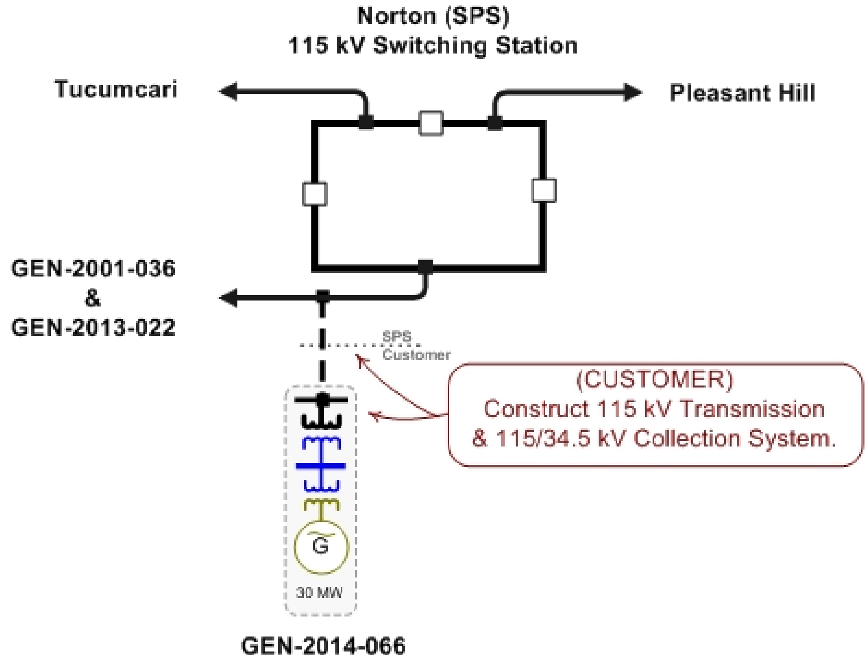
GEN-2014-063
Estimated Interconnection Cost: $1,231,574



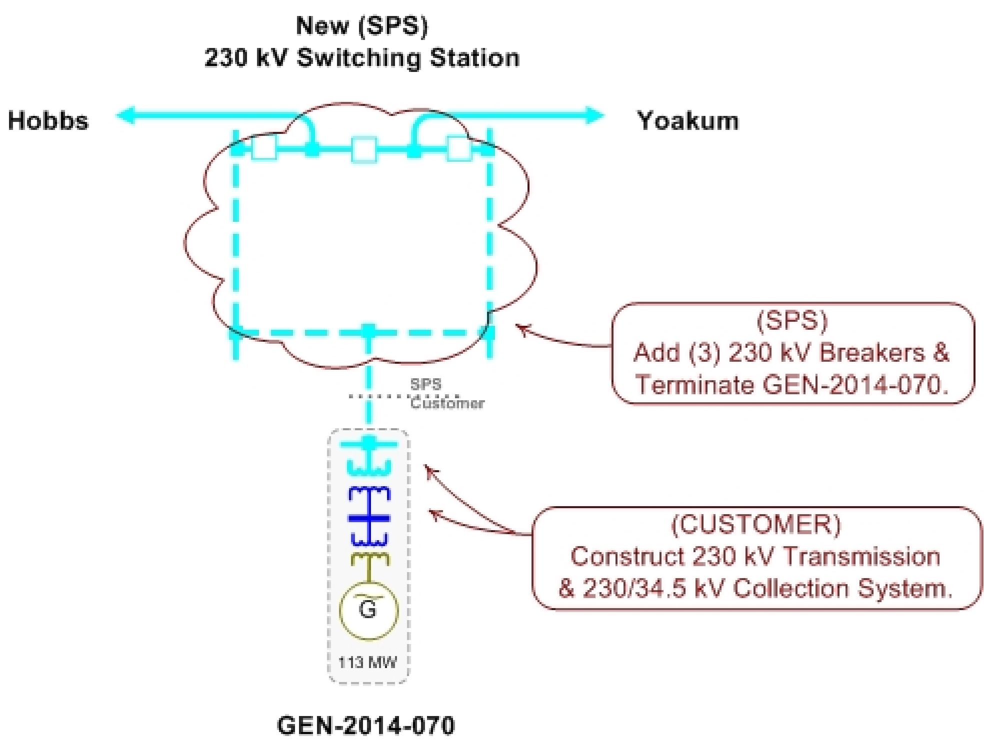
GEN-2014-064
Estimated Interconnection Cost: $3,217,651



GEN-2014-066
Estimated Interconnection Cost: $0



GEN-2014-070
Estimated Interconnection Cost: $5,743,650



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-2014-002			
ASGI-2014-002 Interconnection Costs See One-Line Diagram.	Current Study	$6,403,000	$6,403,000
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$1,216,136	$25,000,000
Norton - Pleasant Hill 230kV CKT 1 Convert 54 miles of 115kV from Norton - Pleasant Hill to 230kV.	Current Study	$24,924,623	$40,000,000
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$1,481,976	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$1,849,474	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$1,123,088	$18,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230/115 kV Ckt 1 Per HPILs SPP-NTC-200282 (Total Project E&C Cost Shown)	Previously Allocated		$3,508,346
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593

* 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 Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$36,998,297	

ASGI-2014-005

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
ASGI-2014-005 Interconnection Costs See One-Line Diagram. This cost includes SPS distribution costs.	Current Study	$2,759,383	$2,759,383
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$275,868	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$14,262	$1,000,000
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$330,532	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$190,022	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$86,387	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$8,063	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Kiowa - North Loving - China Draw 345/115kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$62,619,690
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280

* 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
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$3,664,517	

ASGI-2014-008

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
ASGI-2014-008 Interconnection Costs See One-Line Diagram. This cost includes SPS distribution costs.	Current Study	$2,799,543	$2,799,543
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$273,081	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$14,567	$1,000,000
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$327,644	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$210,592	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$101,192	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$8,050	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546

* 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
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$3,734,669	

ASGI-2014-009

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
ASGI-2014-009 Interconnection Costs See One-Line Diagram. This cost includes SPS distribution costs.	Current Study	$3,293,228	$3,293,228
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$276,936	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$14,144	$1,000,000
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$331,635	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$182,832	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$80,172	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$8,046	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
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
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$4,186,993	

ASGI-2014-010

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
ASGI-2014-010 Interconnection Costs See One-Line Diagram. This cost includes SPS distribution costs.	Current Study	$2,708,891	$2,708,891
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$276,911	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$14,147	$1,000,000
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$331,611	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$180,419	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$82,283	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$8,125	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$3,602,386	

ASGI-2014-012

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
ASGI-2014-012 Interconnection Costs See One-Line Diagram. This cost includes SPS distribution costs.	Current Study	$2,672,441	$2,672,441
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$276,593	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$14,187	$1,000,000
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$331,251	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$176,071	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$89,218	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$8,329	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$3,568,089	
ASGI-2014-014			
ASGI-2014-014 Interconnection Costs See One-Line Diagram.	Current Study	$134,164	$134,164
	Current Study Total	$134,164	
GEN-2013-010			
Clark County Reactive Power Support Install 100Mvar SVC at Clark County Substation.	Current Study	$9,436,156	$20,000,000
GEN-2013-010 Interconnection Costs See One-Line Diagram.	Current Study	$11,216,355	$11,216,355
Knoll - Postrock 230kV CKT 1 Rebuild approximately 1 mile of 230kV from Knoll - Post Rock.	Current Study	$150,000	$150,000
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Viola - Sumner County 138kV CKT 1 Per SPP 2014 ITP NT and SPP-NTC-200296 for 6/1/2019 in-service.	Previously Allocated		$51,513,963
	Current Study Total	$20,802,511	
GEN-2013-027			
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$3,798,651	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$269,676	$1,000,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2013-027 Interconnection Costs See One-line diagram	Current Study	$5,744,592	$5,744,592
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$4,605,805	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$5,770,553	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$3,186,586	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$120,378	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230/115 kV Ckt 1 Per HPILs SPP-NTC-200282 (Total Project E&C Cost Shown)	Previously Allocated		$3,508,346
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$23,496,241	
GEN-2014-020			
GEN-2014-020 Interconnection Costs See One-Line Diagram.	Current Study	$6,457,000	$6,457,000
	Current Study Total	$6,457,000	
GEN-2014-021			
GEN-2014-021 Interconnection Costs See One-Line Diagram.	Current Study	$18,262,000	$18,262,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Nashua 345/161/13.8KV Autotransformer CKT 1 Balanced Portfolio: Nashua/161/13.8 Autotransformer 345kV CKT 1 (Total Project E&C Cost Shown).	Previously Allocated		$4,230,000
Nebraska City - Sibley 345kV CKT 1 Priority Project: Nebraska City - Mullin Creek - Sibley 345kV circuit 1 (Total Project E&C Cost Shown).	Previously Allocated		$407,764,364
	Current Study Total	$18,262,000	
GEN-2014-025			
GEN-2014-025 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
Iatan - Nashua 345KV CKT 1 Balanced Portfolio: Iatan - Nashua 345kV CKT 1 (Total Project E&C Cost Shown).	Previously Allocated		$60,569,180
Nashua 345/161/13.8KV Autotransformer CKT 1 Balanced Portfolio: Nashua/161/13.8 Autotransformer 345kV CKT 1 (Total Project E&C Cost Shown).	Previously Allocated		$4,230,000
	Current Study Total	$0	
GEN-2014-026			
Beaver County 345kV Reactive Power Support Install 75Mvar SVC at Beaver County Substation.	Current Study	$15,000,000	$15,000,000
GEN-2014-026 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
FPL Switch - Mooreland 138kV CKT 1 Rebuild approximately 0.2 miles of 138kV line	Previously Allocated		$820,000
FPL Switch - Woodward 138kV CKT 1 Rebuild approximately 12 miles of 138kV line	Previously Allocated		$8,499,000
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 circuit from Woodward - Tatonga 345kV	Previously Allocated		$71,876,622
	Current Study Total	$15,000,000	
GEN-2014-028			
GEN-2014-028 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
	Current Study Total	$0	
GEN-2014-031			
GEN-2014-031 Interconnection Costs See One-Line Diagram.	Current Study	$100,000	$100,000
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
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
Twin Church - Dixon County 230kV Increase conductor clearances to accommodate 320MVA facility rating	Previously Allocated		$100,000
	Current Study Total	$100,000	
GEN-2014-032			
GEN-2014-032 Interconnection Costs See One-Line Diagram.	Current Study	$100,000	$100,000
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
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
Twin Church - Dixon County 230kV Increase conductor clearances to accommodate 320MVA facility rating	Previously Allocated		$100,000
	Current Study Total	$100,000	
GEN-2014-033			
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$1,827,928	$25,000,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$106,531	$1,000,000
GEN-2014-033 Interconnection Costs See One-Line Diagram.	Current Study	$1,830,343	$1,830,343
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$2,206,820	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$2,032,361	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$1,112,324	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$54,910	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$9,171,217	

GEN-2014-034

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$1,827,928	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$106,531	$1,000,000
GEN-2014-034 Interconnection Costs See One-Line Diagram.	Current Study	$997,430	$997,430
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$2,206,820	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$2,032,361	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$1,112,324	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$54,910	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$8,338,304	

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2014-035			
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$783,398	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$45,656	$1,000,000
GEN-2014-035 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$945,780	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$871,012	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$476,710	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$23,533	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
	Current Study Total	$3,146,089	
GEN-2014-039			
GEN-2014-039 Interconnection Costs See One-Line Diagram.	Current Study	$4,200,000	$4,200,000
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
Hoskins - Neligh 345/115kV Projects Per SPP 2014 ITP NT and NTC 200253 for 6/1/2016 in-service.	Previously Allocated		$98,697,720
Twin Church - Dixon County 230kV Increase conductor clearances to accommodate 320MVA facility rating	Previously Allocated		$100,000
	Current Study Total	$4,200,000	
GEN-2014-040			
GEN-2014-040 Interconnection Costs See One-Line Diagram.	Current Study	$1,250,017	$1,250,017
	Current Study Total	$1,250,017	
GEN-2014-041			
Arnold - Ransom 115kV CKT 1 Replace terminal equipment to achieve at least a 600 amp rating.	Current Study	$3,000,000	$3,000,000
GEN-2014-041 Interconnection Costs See One-Line Diagram.	Current Study	$4,180,734	$4,180,734
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Ellsworth - Mullergren 115kV CKT 1 Per SPP 2012 NT and SPP-NTC-200173 for 6/1/2015 in-service(Total Project E&C Cost Shown).	Previously Allocated		$19,459,597
Iatan - Nashua 345KV CKT 1 Balanced Portfolio: Iatan - Nashua 345kV CKT 1 (Total Project E&C Cost Shown).	Previously Allocated		$60,569,180
Nashua 345/161/13.8KV Autotransformer CKT 1 Balanced Portfolio: Nashua/161/13.8 Autotransformer 345kV CKT 1 (Total Project E&C Cost Shown).	Previously Allocated		$4,230,000
	Current Study Total	$7,180,734	
GEN-2014-047			

* 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 125Mvar SVC at Border Substation.	Current Study	$1,019,743	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$69,932	$1,000,000
GEN-2014-047 Interconnection Costs See One-Line Diagram.	Current Study	$2,827,005	$2,827,005
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$1,235,256	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$1,472,495	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$795,909	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$31,587	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230/115 kV Ckt 1 Per HPILs SPP-NTC-200282 (Total Project E&C Cost Shown)	Previously Allocated		$3,508,346
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$7,451,926	

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2014-049			
Clark County Reactive Power Support Install 100Mvar SVC at Clark County Substation.	Current Study	$10,563,844	$20,000,000
GEN-2014-049 Interconnection Costs See One-Line Diagram.	Current Study	$3,923,113	$3,923,113
Harper - Milan Tap 138kV CKT 1 Rebuild approximately 22 miles of 138kV line	Current Study	$9,613,332	$9,613,332
Milan Tap - Clearwater 138kV CKT 1 Rebuild approximately 12 miles of 138kV line	Current Study	$18,000,000	$18,000,000
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$1,480,238
Clearwater - Viola 138kV CKT 1 Per SPP 2013 ITP NT and SPP-NTC-200213 for 6/1/2018 in-service.	Previously Allocated		$40,525,225
FPL Switch - Woodward 138kV CKT 1 Rebuild approximately 12 miles of 138kV line	Previously Allocated		$8,499,000
Gill - Viola 138kV CKT 1 Per SPP 2013 ITP NT and SPP-NTC-200213 for 6/1/2018 in-service.	Previously Allocated		$22,234,744
Viola - Sumner County 138kV CKT 1 Per SPP 2014 ITP NT and SPP-NTC-200296 for 6/1/2019 in-service.	Previously Allocated		$51,513,963
Viola 345/138 kV Transformer CKT 1 Per SPP 2013 ITP NT and SPP-NTC-200213 for 6/1/2018 in-service.	Previously Allocated		$15,402,744
	Current Study Total	$42,100,289	
GEN-2014-051			
GEN-2014-051 Interconnection Costs See One-Line Diagram.	Current Study	$10,739,421	$10,739,421
Iatan - Nashua 345KV CKT 1 Balanced Portfolio: Iatan - Nashua 345kV CKT 1 (Total Project E&C Cost Shown).	Previously Allocated		$60,569,180
Nashua 345/161/13.8KV Autotransformer CKT 1 Balanced Portfolio: Nashua/161/13.8 Autotransformer 345kV CKT 1 (Total Project E&C Cost Shown).	Previously Allocated		$4,230,000
	Current Study Total	$10,739,421	
GEN-2014-053			

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$2,383,455	$25,000,000
Carlisle 230/115/13kV Transformer CKT 1 Replace existing Carlisle 230/115/13kV Transformer circuit #1.	Current Study	$2,000,000	$5,000,000
GEN-2014-053 Interconnection Costs See One-Line Diagram.	Current Study	$2,480,324	$2,480,324
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$2,816,911	$30,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$2,796,815	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$191,288	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Hobbs Interchange - Kiowa 345kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$65,989,591
Kiowa - North Loving - China Draw 345/115kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$62,619,690
Kiowa - Road Runner 345/230/115kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$21,560,659
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$12,668,793	

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2014-054			
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$3,575,183	$25,000,000
Carlisle 230/115/13kV Transformer CKT 1 Replace existing Carlisle 230/115/13kV Transformer circuit #1.	Current Study	$3,000,000	$5,000,000
GEN-2014-054 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$4,225,366	$30,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$4,195,222	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$286,931	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Hobbs Interchange - Kiowa 345kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$65,989,591
Kiowa - North Loving - China Draw 345/115kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$62,619,690
Kiowa - Road Runner 345/230/115kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$21,560,659
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
	Current Study Total	$15,282,703	
GEN-2014-056			
GEN-2014-056 Interconnection Costs See One-Line Diagram.	Current Study	$2,250,100	$2,250,100
	Current Study Total	$2,250,100	
GEN-2014-057			
GEN-2014-057 Interconnection Costs See One-Line Diagram.	Current Study	$19,433,500	$19,433,500
	Current Study Total	$19,433,500	
GEN-2014-063			
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$3,320,795	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$170,160	$1,000,000
GEN-2014-063 Interconnection Costs See One-Line Diagram.	Current Study	$1,231,574	$1,231,574
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$3,976,798	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$2,135,495	$20,000,000
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$1,027,137	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$98,572	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
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
Kiowa - North Loving - China Draw 345/115kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$62,619,690
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230/115 kV Ckt 1 Per HPILs SPP-NTC-200282 (Total Project E&C Cost Shown)	Previously Allocated		$3,508,346
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$11,960,529	
GEN-2014-064			
GEN-2014-064 Interconnection Costs See One-Line Diagram.	Current Study	$3,217,651	$3,217,651
Fairfax 138/69kV CKT 1 Per AECI Affected System Study for DISIS-2012-002	Previously Allocated		$2,200,000
Remington - Fairfax 138KV CKT 1 Increase conductor clearance	Previously Allocated		$400,000
	Current Study Total	$3,217,651	
GEN-2014-066			
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$735,566	$25,000,000
GEN-2014-066 Interconnection Costs See One-Line Diagram.	Current Study	$0	$0
Norton - Pleasant Hill 230kV CKT 1 Convert 54 miles of 115kV from Norton - Pleasant Hill to 230kV.	Current Study	$15,075,377	$40,000,000
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$896,356	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$1,118,634	$20,000,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$679,287	$18,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Livingston Ridge - Sage Brush - Lagarto - Cardinal 115kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$37,316,546
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230/115 kV Ckt 1 Per HPILs SPP-NTC-200282 (Total Project E&C Cost Shown)	Previously Allocated		$3,508,346
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$18,505,220	

GEN-2014-070

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Border 345kV Reactive Power Support Install 125Mvar SVC at Border Substation.	Current Study	$3,131,826	$25,000,000
Deaf Smith - Plant X 230kV CKT 1 Replace wave trap at Deaf Smith	Current Study	$160,208	$1,000,000
GEN-2014-070 Interconnection Costs See One-Line Diagram.	Current Study	$5,743,650	$5,743,650
Oklaunion 345kV Reactive Power Support Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.	Current Study	$3,749,440	$30,000,000
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Current Study	$1,777,680	$20,000,000

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Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
TUCO 2 Substation Upgrade 345/230kV Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 230kV.	Current Study	$1,055,347	$18,000,000
TUCO Interchange - TUCO 2 230kV CKT 1 Replace wave trap at TUCO	Current Study	$97,281	$1,000,000
Agave Hill 115kV Reactive Power Support Build Agave Hill 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
China Draw 115kV Reactive Power Support Build China Draw SVC (+200Mvar/-50Mvar) per 2015 ITPNT.	Previously Allocated		$17,142,313
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357
Hobbs Interchange - Kiowa 345kV CKT 1 Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$65,989,591
Kiowa - North Loving - China Draw 345/115kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$62,619,690
Ochoa 115kV Reactive Power Support Build Ochoa 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$1,619,280
Potash Junction 230/115 kV Ckt 1 Per HPILs SPP-NTC-200282 (Total Project E&C Cost Shown)	Previously Allocated		$3,508,346
Potash Junction 230kV Reactive Power Support Build Potash Junction 100Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$6,465,875
Road Runner 115kV Reactive Power Support Build Road Runner SVC (+200Mvar/-50Mvar) and 28.8Mvar Capacitor bank per 2015 ITPNT.	Previously Allocated		$18,761,593
TUCO Interchange - Yoakum - Hobbs 345/230kV Projects Per HPILs SPP-NTC-200283 (Total Project E&C Cost Shown)	Previously Allocated		$237,543,568
	Current Study Total	$15,715,433	
	TOTAL CURRENT STUDY COSTS:	**$332,718,791**	

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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

Upgrade			Total
Arnold - Ransom 115kV CKT 1			**$3,000,000**
Replace terminal equipment to achieve at least a 600 amp rating.			
	GEN-2014-041	$3,000,000	
	Total Allocated Costs	**$3,000,000**	
ASGI-2014-002 Interconnection Costs			**$6,403,000**
See One-Line Diagram.			
	ASGI-2014-002	$6,403,000	
	Total Allocated Costs	**$6,403,000**	
ASGI-2014-005 Interconnection Costs			**$2,759,383**
See One-Line Diagram. This cost includes SPS distribution costs.			
	ASGI-2014-005	$2,759,383	
	Total Allocated Costs	**$2,759,383**	
ASGI-2014-008 Interconnection Costs			**$2,799,543**
See One-Line Diagram. This cost includes SPS distribution costs.			
	ASGI-2014-008	$2,799,543	
	Total Allocated Costs	**$2,799,543**	
ASGI-2014-009 Interconnection Costs			**$3,293,228**
See One-Line Diagram. This cost includes SPS distribution costs.			
	ASGI-2014-009	$3,293,228	
	Total Allocated Costs	**$3,293,228**	
ASGI-2014-010 Interconnection Costs			**$2,708,891**
See One-Line Diagram. This cost includes SPS distribution costs.			
	ASGI-2014-010	$2,708,891	
	Total Allocated Costs	**$2,708,891**	
ASGI-2014-012 Interconnection Costs			**$2,672,441**
See One-Line Diagram. This cost includes SPS distribution costs.			
	ASGI-2014-012	$2,672,441	
	Total Allocated Costs	**$2,672,441**	

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ASGI-2014-014 Interconnection Costs — $134,164

See One-Line Diagram.

ASGI-2014-014	$134,164
Total Allocated Costs	**$134,164**

Beaver County 345kV Reactive Power Support — $15,000,000

Install 75Mvar SVC at Beaver County Substation.

GEN-2014-026	$15,000,000
Total Allocated Costs	**$15,000,000**

Border 345kV Reactive Power Support — $25,000,000

Install 125Mvar SVC at Border Substation.

ASGI-2014-002	$1,216,136
ASGI-2014-005	$275,868
ASGI-2014-008	$273,081
ASGI-2014-009	$276,936
ASGI-2014-010	$276,911
ASGI-2014-012	$276,593
GEN-2013-027	$3,798,651
GEN-2014-033	$1,827,928
GEN-2014-034	$1,827,928
GEN-2014-035	$783,398
GEN-2014-047	$1,019,743
GEN-2014-053	$2,383,455
GEN-2014-054	$3,575,183
GEN-2014-063	$3,320,795
GEN-2014-066	$735,566
GEN-2014-070	$3,131,826
Total Allocated Costs	**$25,000,000**

Carlisle 230/115/13kV Transformer CKT 1 — $5,000,000

Replace existing Carlisle 230/115/13kV Transformer circuit #1.

GEN-2014-053	$2,000,000
GEN-2014-054	$3,000,000
Total Allocated Costs	**$5,000,000**

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

Clark County Reactive Power Support			**$20,000,000**
Install 100Mvar SVC at Clark County Substation.			
	GEN-2013-010	$9,436,156	
	GEN-2014-049	$10,563,844	
	Total Allocated Costs	**$20,000,000**	
Deaf Smith - Plant X 230kV CKT 1			**$1,000,000**
Replace wave trap at Deaf Smith			
	ASGI-2014-005	$14,262	
	ASGI-2014-008	$14,567	
	ASGI-2014-009	$14,144	
	ASGI-2014-010	$14,147	
	ASGI-2014-012	$14,187	
	GEN-2013-027	$269,676	
	GEN-2014-033	$106,531	
	GEN-2014-034	$106,531	
	GEN-2014-035	$45,656	
	GEN-2014-047	$69,932	
	GEN-2014-063	$170,160	
	GEN-2014-070	$160,208	
	Total Allocated Costs	**$1,000,000**	
GEN-2013-010 Interconnection Costs			**$11,216,355**
See One-Line Diagram.			
	GEN-2013-010	$11,216,355	
	Total Allocated Costs	**$11,216,355**	
GEN-2013-027 Interconnection Costs			**$5,744,592**
See One-line diagram			
	GEN-2013-027	$5,744,592	
	Total Allocated Costs	**$5,744,592**	
GEN-2014-020 Interconnection Costs			**$6,457,000**
See One-Line Diagram.			
	GEN-2014-020	$6,457,000	
	Total Allocated Costs	**$6,457,000**	

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

GEN-2014-021 Interconnection Costs		**$18,262,000**
See One-Line Diagram.		
GEN-2014-021	$18,262,000	
Total Allocated Costs	**$18,262,000**	
GEN-2014-025 Interconnection Costs		**$0**
See One-Line Diagram.		
GEN-2014-025	$0	
Total Allocated Costs	**$0**	
GEN-2014-026 Interconnection Costs		**$0**
See One-Line Diagram.		
GEN-2014-026	$0	
Total Allocated Costs	**$0**	
GEN-2014-028 Interconnection Costs		**$0**
See One-Line Diagram.		
GEN-2014-028	$0	
Total Allocated Costs	**$0**	
GEN-2014-031 Interconnection Costs		**$100,000**
See One-Line Diagram.		
GEN-2014-031	$100,000	
Total Allocated Costs	**$100,000**	
GEN-2014-032 Interconnection Costs		**$100,000**
See One-Line Diagram.		
GEN-2014-032	$100,000	
Total Allocated Costs	**$100,000**	
GEN-2014-033 Interconnection Costs		**$1,830,343**
See One-Line Diagram.		
GEN-2014-033	$1,830,343	
Total Allocated Costs	**$1,830,343**	
GEN-2014-034 Interconnection Costs		**$997,430**
See One-Line Diagram.		
GEN-2014-034	$997,430	
Total Allocated Costs	**$997,430**	

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

GEN-2014-035 Interconnection Costs			**$0**
See One-Line Diagram.			
	GEN-2014-035	$0	
	Total Allocated Costs	**$0**	
GEN-2014-039 Interconnection Costs			**$4,200,000**
See One-Line Diagram.			
	GEN-2014-039	$4,200,000	
	Total Allocated Costs	**$4,200,000**	
GEN-2014-040 Interconnection Costs			**$1,250,017**
See One-Line Diagram.			
	GEN-2014-040	$1,250,017	
	Total Allocated Costs	**$1,250,017**	
GEN-2014-041 Interconnection Costs			**$4,180,734**
See One-Line Diagram.			
	GEN-2014-041	$4,180,734	
	Total Allocated Costs	**$4,180,734**	
GEN-2014-047 Interconnection Costs			**$2,827,005**
See One-Line Diagram.			
	GEN-2014-047	$2,827,005	
	Total Allocated Costs	**$2,827,005**	
GEN-2014-049 Interconnection Costs			**$3,923,113**
See One-Line Diagram.			
	GEN-2014-049	$3,923,113	
	Total Allocated Costs	**$3,923,113**	
GEN-2014-051 Interconnection Costs			**$10,739,421**
See One-Line Diagram.			
	GEN-2014-051	$10,739,421	
	Total Allocated Costs	**$10,739,421**	
GEN-2014-053 Interconnection Costs			**$2,480,324**
See One-Line Diagram.			
	GEN-2014-053	$2,480,324	
	Total Allocated Costs	**$2,480,324**	

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

GEN-2014-054 Interconnection Costs			**$0**
See One-Line Diagram.			
	GEN-2014-054	$0	
	Total Allocated Costs	**$0**	
GEN-2014-056 Interconnection Costs			**$2,250,100**
See One-Line Diagram.			
	GEN-2014-056	$2,250,100	
	Total Allocated Costs	**$2,250,100**	
GEN-2014-057 Interconnection Costs			**$19,433,500**
See One-Line Diagram.			
	GEN-2014-057	$19,433,500	
	Total Allocated Costs	**$19,433,500**	
GEN-2014-063 Interconnection Costs			**$1,231,574**
See One-Line Diagram.			
	GEN-2014-063	$1,231,574	
	Total Allocated Costs	**$1,231,574**	
GEN-2014-064 Interconnection Costs			**$3,217,651**
See One-Line Diagram.			
	GEN-2014-064	$3,217,651	
	Total Allocated Costs	**$3,217,651**	
GEN-2014-066 Interconnection Costs			**$0**
See One-Line Diagram.			
	GEN-2014-066	$0	
	Total Allocated Costs	**$0**	
GEN-2014-070 Interconnection Costs			**$5,743,650**
See One-Line Diagram.			
	GEN-2014-070	$5,743,650	
	Total Allocated Costs	**$5,743,650**	
Harper - Milan Tap 138kV CKT 1			**$9,613,332**
Rebuild approximately 22 miles of 138kV line			
	GEN-2014-049	$9,613,332	
	Total Allocated Costs	**$9,613,332**	

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

Knoll - Postrock 230kV CKT 1			$150,000
Rebuild approximately 1 mile of 230kV from Knoll - Post Rock.			
	GEN-2013-010	$150,000	
	Total Allocated Costs	**$150,000**	

Milan Tap - Clearwater 138kV CKT 1			$18,000,000
Rebuild approximately 12 miles of 138kV line			
	GEN-2014-049	$18,000,000	
	Total Allocated Costs	**$18,000,000**	

Norton - Pleasant Hill 230kV CKT 1			$40,000,000
Convert 54 miles of 115kV from Norton - Pleasant Hill to 230kV.			
	ASGI-2014-002	$24,924,623	
	GEN-2014-066	$15,075,377	
	Total Allocated Costs	**$40,000,000**	

Oklaunion 345kV Reactive Power Support			$30,000,000
Install 150Mvar Capacitor Bank(s) and 150Mvar SVC at Oklaunion.			
	ASGI-2014-002	$1,481,976	
	ASGI-2014-005	$330,532	
	ASGI-2014-008	$327,644	
	ASGI-2014-009	$331,635	
	ASGI-2014-010	$331,611	
	ASGI-2014-012	$331,251	
	GEN-2013-027	$4,605,805	
	GEN-2014-033	$2,206,820	
	GEN-2014-034	$2,206,820	
	GEN-2014-035	$945,780	
	GEN-2014-047	$1,235,256	
	GEN-2014-053	$2,816,911	
	GEN-2014-054	$4,225,366	
	GEN-2014-063	$3,976,798	
	GEN-2014-066	$896,356	
	GEN-2014-070	$3,749,440	
	Total Allocated Costs	**$30,000,000**	

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

Tolk - Plant X 230kV CKT 3 **$20,000,000**

Build a 3rd circuit betweek Tolk - Plant X 230kV

ASGI-2014-002	$1,849,474
ASGI-2014-005	$190,022
ASGI-2014-008	$210,592
ASGI-2014-009	$182,832
ASGI-2014-010	$180,419
ASGI-2014-012	$176,071
GEN-2013-027	$5,770,553
GEN-2014-033	$2,032,361
GEN-2014-034	$2,032,361
GEN-2014-035	$871,012
GEN-2014-047	$1,472,495
GEN-2014-063	$2,135,495
GEN-2014-066	$1,118,634
GEN-2014-070	$1,777,680
Total Allocated Costs	**$20,000,000**

TUCO 2 Substation Upgrade 345/230kV **$18,000,000**

Tap Border-TUCO approximately 2 miles from TUCO and build TUCO 2 345kV substation and add 345/230/13.2kV transformer and tie on TUCO-Swisher 2

ASGI-2014-002	$1,123,088
ASGI-2014-005	$86,387
ASGI-2014-008	$101,192
ASGI-2014-009	$80,172
ASGI-2014-010	$82,283
ASGI-2014-012	$89,218
GEN-2013-027	$3,186,586
GEN-2014-033	$1,112,324
GEN-2014-034	$1,112,324
GEN-2014-035	$476,710
GEN-2014-047	$795,909
GEN-2014-053	$2,796,815
GEN-2014-054	$4,195,222
GEN-2014-063	$1,027,137
GEN-2014-066	$679,287
GEN-2014-070	$1,055,347
Total Allocated Costs	**$18,000,000**

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

TUCO Interchange - TUCO 2 230kV CKT 1 **$1,000,000**

Replace wave trap at TUCO

ASGI-2014-005	$8,063
ASGI-2014-008	$8,050
ASGI-2014-009	$8,046
ASGI-2014-010	$8,125
ASGI-2014-012	$8,329
GEN-2013-027	$120,378
GEN-2014-033	$54,910
GEN-2014-034	$54,910
GEN-2014-035	$23,533
GEN-2014-047	$31,587
GEN-2014-053	$191,288
GEN-2014-054	$286,931
GEN-2014-063	$98,572
GEN-2014-070	$97,281
Total Allocated Costs	**$1,000,000**

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

G: Power Flow Analysis (Constraints Used For Mitigation)

See next page.

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	0	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	122.4142	BASE CASE
FDNS	06ALL	0	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	121.1784	BASE CASE
FDNS	06ALL	0	15G	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	118.3519	BASE CASE
FDNS	06ALL	0	15SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	111.204	BASE CASE
FDNS	06ALL	0	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	108.965	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	0	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.7839	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	0	20WP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	165	177	1	107.608	BASE CASE
FDNS	06ALL	0	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.4427	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	0	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	106.4968	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	0	15G	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	103.8871	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	0	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	102.8845	GEN562414 1-G13-022 0.4800
FDNS	06ALL	0	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	101.3988	GEN562414 1-G13-022 0.4800
FDNS	06ALL	0	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	100.8017	GEN562614 1-G14_066_3 0.8000
FDNS	06ALL	0	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40109	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40063	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.32816	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40451	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40407	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28573	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.33115	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.31233	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_002	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.40073	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_002	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.40073	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	ASGI_14_002	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.26825	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	ASGI_14_002	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.26825	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_002	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.39561	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	ASGI_14_002	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.39561	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	122.4131	BASE CASE
FDNS	06ALL	2	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	121.1802	BASE CASE
FDNS	06ALL	2	15G	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	118.3468	BASE CASE
FDNS	06ALL	2	15SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	111.2045	BASE CASE
FDNS	06ALL	2	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	108.9645	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	2	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.7831	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	2	20WP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	165	177	1	107.6061	BASE CASE
FDNS	06ALL	2	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.4426	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	2	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	106.4967	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	2	15G	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	103.8861	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	2	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	102.8839	GEN562414 1-G13-022 0.4800
FDNS	06ALL	2	25SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	101.3988	GEN562414 1-G13-022 0.4800
FDNS	06ALL	2	20SP	ASGI_14_002	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	100.8013	GEN562614 1-G14_066_3 0.8000
FDNS	06ALL	2	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40079	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40034	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.32887	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40421	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40378	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28566	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.33187	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_002	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.3123	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_005	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20221	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	15SP	ASGI_14_005	-	Non-Converged Contingency	159	160	0.08565	-	INTREPDW_TP3115.00 - POTASH JUNCTION INTERCHANGE 115KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.29195	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.2913	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.19973	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.29469	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.29405	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.37261	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.20168	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.23344	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	0	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42234	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42234	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41695	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41695	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	ASGI_14_005	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20117	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	2	15SP	ASGI_14_005	-	Non-Converged Contingency	159	160	0.08565	-	INTREPDW_TP3115.00 - POTASH JUNCTION INTERCHANGE 115KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.29165	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.29101	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.2	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.29439	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.29376	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.37254	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.20195	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_005	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.23341	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20716	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21548	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.2012	121.1439	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	15G	ASGI_14_005	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.19604	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_008	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20337	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	0	15SP	ASGI_14_008	-	Non-Converged Contingency	159	160	0.05327	-	INTREPDW_TP3115.00 - POTASH JUNCTION INTERCHANGE 115KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.30647	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.30573	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.22034	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.3093	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30858	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38546	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.22246	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.24354	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_008	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42111	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_008	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42111	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_008	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41574	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	ASGI_14_008	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41574	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	ASGI_14_008	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20233	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNSLock-Blown up	06ALL	2	15SP	ASGI_14_008	-	Non-Converged Contingency	159	160	0.05328	-	INTREPDW_TP3115.00 - POTASH JUNCTION INTERCHANGE 115KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.30616	143.3436	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.30544	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.22065	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.309	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30829	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38539	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.22278	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_008	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.24351	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_008	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20464	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	ASGI_14_008	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21294	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	ASGI_14_008	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.19871	121.1439	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15SP	ASGI_14_009	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20095	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27706	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27645	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.27969	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.2791	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.35907	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.22304	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42361	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42361	142.5274	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	0	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.4182	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.4182	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	ASGI_14_009	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19991	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27676	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27616	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.27939	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.27881	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.359	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	15SP	ASGI_14_009	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.223	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20979	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21813	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20379	121.1439	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	15G	ASGI_14_009	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.19774	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_010	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20044	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27106	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27047	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.27365	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.27307	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.35361	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.21885	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42413	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42413	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41871	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41871	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	ASGI_14_010	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.1994	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27076	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.27018	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.27335	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.27278	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.35354	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	15SP	ASGI_14_010	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.21882	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21085	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.2192	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20484	121.1439	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	15G	ASGI_14_010	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.19842	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_012	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19931	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.2575	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.25695	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.26	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.25946	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.34133	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.20938	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42528	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42528	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41985	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.41985	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	ASGI_14_012	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19827	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.2572	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.25665	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.25969	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.25916	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.34126	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	15SP	ASGI_14_012	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.20935	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21323	130.8826	SPP-SWPS-01

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	2	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.2216	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20719	121.1439	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	15G	ASGI_14_012	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.19995	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	03ALL	0	25SP	G13_010	FROM->TO	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1	726.6	726.6	0.28527	100.9286	G13-010T 345.00 - POST ROCK 345KV CKT 1
FDNS	03ALL	0	15SP	G13_010	TO->FROM	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1	328	398	0.20536	107.4029	AXTELL - POST ROCK 345KV CKT 1
FDNS	03ALL	0	15G	G13_010	TO->FROM	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1	328	398	0.20567	103.0748	AXTELL - POST ROCK 345KV CKT 1
FDNS	03ALL	0	20SP	G13_010	TO->FROM	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1	328	398	0.20515	101.9268	AXTELL - POST ROCK 345KV CKT 1
FDNS	03ALL	0	20WP	G13_010	TO->FROM	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1	328	398	0.20456	100.8923	AXTELL - POST ROCK 345KV CKT 1
FDNSLock-Blown up	03ALL	0	20WP	G13_010	-	Non-Converged Contingency	726.6	726.6	0.14835	-	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	03ALL	0	20WP	G13_010	-	Non-Converged Contingency	-	-	0.1176	-	SPP-SWPS-05
FDNS	03ALL	2	25SP	G13_010	FROM->TO	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1	726.6	726.6	0.28518	100.8793	G13-010T 345.00 - POST ROCK 345KV CKT 1
FDNSLock-Blown up	03ALL	2	20WP	G13_010	-	Non-Converged Contingency	726.6	726.6	0.14828	-	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	03ALL	2	20WP	G13_010	-	Non-Converged Contingency	-	-	0.11757	-	SPP-SWPS-05
FDNS	03ALL	3	25SP	G13_010	FROM->TO	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1	726.6	726.6	0.28515	100.932	G13-010T 345.00 - POST ROCK 345KV CKT 1
FDNSLock-Blown up	03ALL	3	20WP	G13_010	-	Non-Converged Contingency	1793	1793	0.49113	-	G13-010T 345.00 - POST ROCK 345KV CKT 1
FDNSLock-Blown up	03ALL	3	20WP	G13_010	-	Non-Converged Contingency	726.6	726.6	0.14831	-	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	03ALL	3	20WP	G13_010	-	Non-Converged Contingency	-	-	0.1177	-	SPP-SWPS-05
FDNS	06ALL	0	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20371	101.6847	SPP-SWPS-01
FDNS	06ALL	0	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.22276	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20118	100.9331	SPSCONT-01
FDNS	06ALL	0	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20118	100.8658	OKLAUNION - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.43121	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G13_027	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.43069	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40225	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43599	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43548	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.59076	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40701	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.33262	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G13_027	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41342	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G13_027	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41342	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G13_027	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.25465	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G13_027	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.25465	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G13_027	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40814	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G13_027	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40814	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20182	101.1758	SPP-SWPS-01
FDNS	06ALL	2	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.22172	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20071	100.8738	SPSCONT-01
FDNS	06ALL	2	15SP	G13_027	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20071	100.738	OKLAUNION - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	2	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.43091	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G13_027	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.4304	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40291	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43569	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43519	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.59069	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40768	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G13_027	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.33259	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	G13_027	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.19537	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	02ALL	0	15G	G14_026	FROM->TO	FPL SWITCH - MOORELAND 138KV CKT 1	268	287	0.05771	100.187	BASE CASE
FDNS	02ALL	0	15G	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.05771	194.9868	BASE CASE
FDNS	02ALL	0	15SP	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.0619	149.3549	BASE CASE
FDNS	02ALL	0	20SP	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.06359	129.1335	BASE CASE
FDNS	02ALL	0	20WP	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	171	185	0.0647	125.5817	BASE CASE
FDNSLock-Blown up	02ALL	0	15G	G14_026	-	Non-Converged Contingency	956	1052	0.21571	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	02ALL	0	15G	G14_026	-	Non-Converged Contingency	956	1052	0.21571	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	02ALL	0	15G	G14_026	-	Non-Converged Contingency	-	-	0.21571	-	SPP-SWPS-05
FDNSLock-Blown up	02ALL	0	15SP	G14_026	-	Non-Converged Contingency	956	1052	0.2222	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	02ALL	0	15SP	G14_026	-	Non-Converged Contingency	956	1052	0.2222	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNSLock-Blown up	02ALL	0	15SP	G14_026	-	Non-Converged Contingency	-	-	0.2222	-	SPP-SWPS-05
FDNSLock-Blown up	02ALL	0	20WP	G14_026	-	Non-Converged Contingency	987	1083	0.21757	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	02ALL	0	20WP	G14_026	-	Non-Converged Contingency	956	1052	0.21757	-	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	02ALL	0	20WP	G14_026	-	Non-Converged Contingency	-	-	0.21757	-	SPP-SWPS-05
FDNS	02ALL	2	15G	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.05773	188.0113	SPP-SWPS-05
FDNS	02ALL	2	15SP	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.0619	134.9004	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNS	02ALL	2	20SP	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.06359	118.6089	SPP-SWPS-05
FDNS	02ALL	2	20WP	G14_026	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	171	185	0.06471	114.0216	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNS	02ALL	3	15G	G14_026	FROM->TO	FPL SWITCH - MOORELAND 138KV CKT 1	268	287	0.06443	112.514	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	02ALL	3	15G	G14_026	-	Non-Converged Contingency	956	1052	0.21553	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	02ALL	3	15G	G14_026	-	Non-Converged Contingency	-	-	0.21553	-	SPP-SWPS-05
FDNSLock-Blown up	02ALL	4	15G	G14_026	-	Non-Converged Contingency	956	1052	0.21552	-	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
FDNSLock-Blown up	02ALL	4	15G	G14_026	-	Non-Converged Contingency	-	-	0.21552	-	SPP-SWPS-05
FDNS	06ALL	0	15SP	G14_033	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20278	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.3626	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G14_033	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.36202	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.298	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36582	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36525	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38451	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30075	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28296	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_033	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41478	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_033	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41478	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_033	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.19617	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_033	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.19617	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_033	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40948	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_033	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40948	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	G14_033	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20175	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.3623	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G14_033	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.36173	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.29849	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36551	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36496	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38444	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30125	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_033	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28293	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	G14_033	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20065	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15SP	G14_034	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20278	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.3626	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G14_034	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.36202	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.298	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36582	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36525	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38451	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30075	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28296	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_034	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41478	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_034	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41478	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_034	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.19617	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_034	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.19617	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_034	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40948	126.5626	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	15G	G14_034	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40948	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	G14_034	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20175	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.3623	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G14_034	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.36173	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.29849	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36551	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36496	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38444	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30125	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_034	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28293	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	G14_034	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20065	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15SP	G14_035	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20278	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.3626	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G14_035	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.36202	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.298	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36582	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36525	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38451	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30075	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28296	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_035	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41478	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_035	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.41478	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_035	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.19617	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_035	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.19617	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_035	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40948	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_035	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40948	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	G14_035	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.20175	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.3623	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G14_035	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.36173	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.29849	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36551	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.36496	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.38444	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.30125	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_035	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28293	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	G14_035	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20065	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	04ALL	0	15G	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	147.8397	ARNOLD - GOVE 115KV CKT 1
FDNS	04ALL	0	15SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	147.4967	ARNOLD - GOVE 115KV CKT 1
FDNS	04ALL	0	20WP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	147.215	ARNOLD - GOVE 115KV CKT 1
FDNS	04ALL	0	20SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	146.7171	ARNOLD - GOVE 115KV CKT 1
FDNS	04ALL	0	15G	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	145.4172	GOVE - GRINNELL 115KV CKT 1
FDNS	04ALL	0	20WP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	145.038	GOVE - GRINNELL 115KV CKT 1
FDNS	04ALL	0	25SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	144.5358	ARNOLD - GOVE 115KV CKT 1
FDNS	04ALL	0	15SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	144.3766	GOVE - GRINNELL 115KV CKT 1
FDNS	04ALL	0	20SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	143.0975	GOVE - GRINNELL 115KV CKT 1
FDNS	04ALL	0	15G	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	141.9652	GRINNELL - PHEASANT RUN 115KV CKT 1
FDNS	04ALL	0	25SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	140.4636	GOVE - GRINNELL 115KV CKT 1
FDNS	04ALL	0	15SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	140.164	GRINNELL - PHEASANT RUN 115KV CKT 1
FDNS	04ALL	0	20WP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	139.826	GRINNELL - PHEASANT RUN 115KV CKT 1
FDNS	04ALL	0	20SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	136.1624	GRINNELL - PHEASANT RUN 115KV CKT 1
FDNS	04ALL	0	25SP	G14_041	FROM->TO	ARNOLD - RANSOM 115KV CKT 1	79.7	79.7	1	131.3516	GRINNELL - PHEASANT RUN 115KV CKT 1
FDNS	06ALL	0	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.2013	101.6847	SPP-SWPS-01
FDNS	06ALL	0	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.22014	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19878	100.9331	SPSCONT-01
FDNS	06ALL	0	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19878	100.8658	OKLAUNION - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	0	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.43033	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G14_047	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.42985	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS	06ALL	0	20SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.38839	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43404	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43358	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.56659	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.3919	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.32909	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_047	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.413	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_047	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.413	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_047	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.23908	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_047	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.23908	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_047	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40772	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_047	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.40772	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19941	101.1758	SPP-SWPS-01
FDNS	06ALL	2	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.21911	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.1983	100.8738	SPSCONT-01
FDNS	06ALL	2	15SP	G14_047	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.1983	100.738	OKLAUNION - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	2	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.43003	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G14_047	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.42956	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.38901	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43374	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.43329	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.56652	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.39252	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_047	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.32906	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	03ALL	0	15G	G14_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03098	116.8331	BASE CASE
FDNS	03ALL	0	15G	G14_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.03504	163.1589	BASE CASE
FDNS	03ALL	0	15SP	G14_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.03969	113.0745	BASE CASE
FDNS	03ALL	0	15G	G14_049	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	138.6	143.4	0.03098	101.8193	BASE CASE
FDNS	03ALL	0	15SP	G14_049	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	127.2	136.7	0.0316	100.9658	BASE CASE
FDNSLock-Blown up	03ALL	0	20WP	G14_049	-	Non-Converged Contingency	726.6	726.6	0.07701	-	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNS	03ALL	2	15G	G14_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.03499	162.9695	BASE CASE
FDNS	03ALL	2	15SP	G14_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	133	153	0.03964	112.9442	BASE CASE
FDNS	03ALL	2	15G	G14_049	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	138.6	143.4	0.03243	107.1611	BASE CASE
FDNS	03ALL	2	15SP	G14_049	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	127.2	136.7	0.03307	106.001	BASE CASE
FDNSLock-Blown up	03ALL	2	20WP	G14_049	-	Non-Converged Contingency	726.6	726.6	0.07693	-	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNSLock-Blown up	03ALL	3	20WP	G14_049	-	Non-Converged Contingency	1793	1793	0.07813	-	G13-010T 345.00 - POST ROCK 345KV CKT 1
FDNSLock-Blown up	03ALL	3	20WP	G14_049	-	Non-Converged Contingency	726.6	726.6	0.07697	-	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
FDNS	06ALL	0	25SP	G14_053	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24149	109.5352	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	25SP	G14_053	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24149	106.0635	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_053	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.49909	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_053	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.49909	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_053	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42969	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_053	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42969	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_053	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.49271	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_053	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.49271	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	25SP	G14_053	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24062	109.5031	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	25SP	G14_053	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24062	106.0317	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.37444	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.38404	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.36634	121.1439	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	20WP	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	329	361	0.34141	106.7793	SPP-SWPS-01
FDNS	06ALL	2	15G	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.30654	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	329	361	0.34321	104.6618	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.30881	102.332	OKLAUNION - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	2	15G	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.30881	102.3108	SPSCONT-01
FDNS	06ALL	2	15G	G14_053	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.3684	101.2102	TUCO INTERCHANGE - TUCO_2 345.00 345KV CKT 1
FDNS	0	0	25SP	G14_053	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.2415	100.9566	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	0	2	25SP	G14_053	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24064	101.4622	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	25SP	G14_054	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24149	109.5352	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	25SP	G14_054	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24149	106.0635	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_054	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.49909	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_054	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.49909	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_054	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42969	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_054	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42969	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_054	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.49271	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_054	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.49271	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	25SP	G14_054	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24062	109.5031	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	25SP	G14_054	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24062	106.0317	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.37444	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.38404	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.36634	121.1439	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	20WP	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	329	361	0.34141	106.7793	SPP-SWPS-01
FDNS	06ALL	2	15G	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.30654	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	20WP	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	329	361	0.34321	104.6618	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.30881	102.332	OKLAUNION - TUCO INTERCHANGE 345KV CKT 1
FDNS	06ALL	2	15G	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.30881	102.3108	SPSCONT-01
FDNS	06ALL	2	15G	G14_054	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.3684	101.2102	TUCO INTERCHANGE - TUCO_2 345.00 345KV CKT 1
FDNS	0	0	25SP	G14_054	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.2415	100.9566	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	0	2	25SP	G14_054	FROM->TO	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1	168	168	0.24064	101.4622	CARLISLE INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15SP	G14_063	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19984	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.25987	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G14_063	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.25934	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.26239	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.26187	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.34439	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.21126	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_063	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42493	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_063	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.42493	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_063	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.4195	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_063	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.4195	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	G14_063	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19879	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.25956	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G14_063	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.25905	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.26208	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.26158	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.34432	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	15SP	G14_063	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.21122	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	2	15G	G14_063	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21249	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	G14_063	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.22085	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	G14_063	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20645	121.1439	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	15G	G14_063	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.1995	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	122.4142	BASE CASE
FDNS	06ALL	0	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	121.1784	BASE CASE
FDNS	06ALL	0	15G	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	118.3519	BASE CASE
FDNS	06ALL	0	15SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	111.204	BASE CASE
FDNS	06ALL	0	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	108.965	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	0	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.7839	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	0	20WP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	165	177	1	107.608	BASE CASE
FDNS	06ALL	0	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.4427	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	0	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	106.4968	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	0	15G	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	103.8871	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	0	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	102.8845	GEN562414 1-G13-022 0.4800
FDNS	06ALL	0	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	101.3988	GEN562414 1-G13-022 0.4800
FDNS	06ALL	0	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	100.8017	GEN562614 1-G14_066_3 0.8000
FDNS	06ALL	0	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40109	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G14_066	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40063	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	20SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.32816	103.226	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40451	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40407	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28573	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	20SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.33115	104.0781	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.31233	99.9	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15G	G14_066	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.40073	147.2896	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_066	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.40073	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_066	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.26825	107.5865	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	20WP	G14_066	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.26825	105.2426	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_066	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.39561	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_066	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.39561	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	122.4131	BASE CASE
FDNS	06ALL	2	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	121.1802	BASE CASE
FDNS	06ALL	2	15G	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	118.3468	BASE CASE
FDNS	06ALL	2	15SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	111.2045	BASE CASE
FDNS	06ALL	2	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	108.9645	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	2	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.7831	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	2	20WP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	165	177	1	107.6061	BASE CASE
FDNS	06ALL	2	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	107.4426	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	2	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	106.4967	GEN524471 1-QUAY_CNTY 113.800
FDNS	06ALL	2	15G	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	103.8861	GEN560759 1-ASGI13_02_3 0.6900
FDNS	06ALL	2	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	102.8839	GEN562414 1-G13-022 0.4800
FDNS	06ALL	2	25SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	101.3988	GEN562414 1-G13-022 0.4800
FDNS	06ALL	2	20SP	G14_066	FROM->TO	Norton Switching Station - PLEASANT HILL 115KV CKT 1	159	160	1	100.8013	GEN562614 1-G14_066_3 0.8000
FDNS	06ALL	2	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40079	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G14_066	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.40034	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	20SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.32887	103.3399	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40421	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.40378	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.28566	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	20SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.33187	104.193	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_066	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.3123	99.8	TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1
FDNS	06ALL	0	15SP	G14_070	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.19745	101.4471	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	0	15SP	G14_070	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.22089	143.4526	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15G	G14_070	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.22038	112.5946	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	0	15SP	G14_070	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.22316	144.5288	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15G	G14_070	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.22265	113.4411	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	0	15SP	G14_070	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.3108	108.978	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	0	15G	G14_070	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.4278	147.2896	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	0	15G	G14_070	FROM->TO	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1	560	560	0.4278	142.5274	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	0	15G	G14_070	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.42234	126.5626	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	0	15G	G14_070	FROM->TO	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2	560	644	0.42234	122.0184	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15SP	G14_070	TO->FROM	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1	319	351	0.1964	101.095	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15SP	G14_070	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.22059	143.3436	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15G	G14_070	TO->FROM	PLANT X STATION - TOLK STATION EAST 230KV CKT 2	478	502	0.22008	112.2708	PLANT X STATION - TOLK STATION WEST 230KV CKT 1
FDNS	06ALL	2	15SP	G14_070	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.22285	144.419	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15G	G14_070	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.22236	113.1153	PLANT X STATION - TOLK STATION EAST 230KV CKT 2
FDNS	06ALL	2	15SP	G14_070	TO->FROM	PLANT X STATION - TOLK STATION WEST 230KV CKT 1	478	502	0.31072	108.9591	TOLK STATION EAST - TOLK STATION TAP 230KV CKT @1
FDNS	06ALL	2	15G	G14_070	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21837	130.8826	SPP-SWPS-01
FDNS	06ALL	2	15G	G14_070	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.22678	129.2689	TUCO INTERCHANGE (GE M1022338) 345/230/13.2KV TRANSFORMER CKT 1
FDNS	06ALL	2	15G	G14_070	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.21226	121.1439	TUCO INTERCHANGE (SIEM 8743066) 345/230/13.2KV TRANSFORMER CKT 2
FDNS	06ALL	2	15G	G14_070	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.20335	105.5497	NEWHART 230 - PLANT X STATION 230KV CKT 1
FDNS	06ALL	2	15G	G14_070	FROM->TO	TUCO INTERCHANGE - TUCO_2 230.00 230KV CKT 1	319	351	0.19966	101.2102	TUCO INTERCHANGE - TUCO_2 345.00 345KV CKT 1

H: Power Flow Analysis (Other Constraints Not Requiring Mitigation)

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

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

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

J: Group 6 Dynamic Stability Analysis Report

See MEPPI Cluster study report and SPP Stand-alone study report on next page

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Southwest Power Pool, Inc. (SPP)

DISIS-2014-002-1 (Group 06) Definitive Impact Re-Study

Final Report

PXE-1039
Revision #00

May 2015

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

Title: **DISIS-2014-002-1 (Group 6) Definitive Impact Re-Study: Final Report PXE-1039**
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EXECUTIVE SUMMARY

SPP requested a Definitive Interconnection System Impact Re-Study (DISIS-2014-002-1) for DISIS-2014-002 to account for withdrawals in the Interconnection Queue after the initial completion of the original study. 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-2013-027	150	Siemens 2.3 MW and 2.415 MW	Tap Tolk to Yoakum 230kV (562480)
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-2014-053	80	GE 2.0MW WTG	Carlisle 230kV
GEN-2014-054	120	GE 2.0MW WTG	Carlisle 230kV
GEN-2014-063	120	Vestas V110 2.0MW VCSS	Hobbs 230kV
GEN-2014-066	30	AE 1000NX 1.0MW PV inverter	Norton 115kV
GEN-2014-070	116	GE 4.0MW inverter	Tap Hobbs - Yoakum 230kV
ASGI-2014-002	49.6	SMA 1.6MVA 630CP-US inverters	Santa Rosa tap - Tucumcari 69kV line
ASGI-2014-005	10	Solar PV inverter	Strata 69 kV - bus 528046
ASGI-2014-008	10	Solar PV inverter	South Loving 69 kV - bus 528218
ASGI-2014-009	10	Solar PV inverter	Wood Draw 115 kV - bus 528228
ASGI-2014-010	10	Solar PV inverter	Ochoa 115 kV - bus 528232
ASGI-2014-012	10	Solar PV inverter	Cooper Ranch 115 kV - bus 528554

SUMMARY OF STABILITY ANALYSIS

The Stability Analysis determined that there were multiple contingencies that resulted in system instability, generation tripping offline, or bus voltages below 0.7 p.u. or above 1.2 p.u. for the 2015 Summer Peak, 2015 Winter Peak, and 2025 Summer Peak conditions when all generation interconnection requests were at 100% output. The following contingencies required system upgrades in order to achieve system stability and recover within SPP criteria:

- FLT48-3PH
- FLT49-3PH
- FLT50-3PH
- FLT52-SB
- FLT62-3PH
- FLT63-SB
- FLT64-3PH
- FLT65-SB
- FLT66-3PH
- FLT67-3PH
- FLT68-SB
- FLT69-PO
- FLT70-SB
- FLT99-3PH
- FLT100-3PH
- FLT101-3PH
- FLT102-3PH
- FLT103-3PH
- FLT104-3PH
- FLT105-3PH
- FLT106-3PH
- FLT107-3PH
- FLT108-3PH
- FLT122-3PH
- FLT129-3PH (2015SP and 2015WP)
- FLT130-3PH (2015SP and 2015WP)

In order to mitigate all voltage violations and the contingencies that resulted in system instability, the following upgrades[1] were implemented as discussed with SPP:

- Conversion and rebuild of the existing Norton-Pleasant Hill 115 kV line to a 230 kV circuit
- Add a 230/115kV transformer at Norton
- Model corrections at Caprock wind farm[2]
- Add an additional 18 Mvar fast switched capacitor at the Caprock Wind 34.5kV bus
- Add additional switched capacitors on the GEN-2014-066 34.5kV bus and apply the extended ride-through option
- Apply extended ride-through option for GEN-2014-047

[1] SPP indicated additional upgrades were added to the models before they were provided to MEPPI.

[2] Model corrections included modeling the Caprock wind farm on a 600 V bus and modeling the plant's reactive compensation equipment including switch shunts, fast switched shunts, and dynamic reactive devices on the 34.5kV bus

- Add additional switched capacitors and an 8 Mvar STATCOM on the ASGI-2014-002 34.5kV bus
- Add 150 Mvar of capacitor banks to the OKU 345kV bus
- Add a +150/-0 Mvar SVC to regulate the OKU 345kV bus
- Remove the 50 Mvar capacitor bank from the Border 345kV bus[3]
- Add a +125/-0 Mvar SVC to regulate the Border 345kV bus

After implementing the above upgrades, the contingency analysis was re-simulated for all contingencies. With the new 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.

[3] SPP initially added the 50 Mvar capacitor bank at Border in order to solve the powerflow model prior to the withdrawal of GEN-2014-062 from the SPP queue. After the withdrawal of GEN-2014-062 (200.1 MW on the Tolk to Eddy County 345 kV line) the 50 Mvar capacitor bank was no longer needed for the powerflow solution.

SUMMARY OF THE SHORT CIRCUIT ANALYSIS

The short circuit analysis was performed on the 2025 Summer Peak power flow for all study projects. Refer to Table ES-2 for a list of maximum fault currents observed for each study project.

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

Ref. No.	Study Project	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
1	GEN-2013-027	32.35	HOBBS_INT	115
2	GEN-2014-033	10.80	EDDY_NTH	115
3	GEN-2014-034			
4	GEN-2014-035			
5	GEN-2014-047	29.15	CUNNINHAM	115
6	GEN-2014-053	35.10	LP-COOK	69
7	GEN-2014-054			
8	GEN-2014-063	32.35	HOBBS_INT	115
9	GEN-2014-066	28.93	TOLK_WEST	230
10	GEN-2014-070	32.35	HOBBS_INT	115
11	ASGI-2014-002	28.93	TOLK_WEST	230
12	ASGI-2014-005	15.27	POTASH_JCT	115
13	ASGI-2014-008	15.27	POTASH_JCT	115
14	ASGI-2014-009	15.27	POTASH_JCT	115
15	ASGI-2014-010	15.27	POTASH_JCT	115
16	ASGI-2014-012	32.35	HOBBS_INT	115

SUMMARY OF POWER FACTOR ANALYSIS

Study Generator GEN-2013-027

The Power Factor Analysis shows that GEN-2013-027 has a power factor range of 0.966 leading (absorbing) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.959 leading (absorbing) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.969 leading (absorbing) to 1.0 (unity) for 2025 Summer Peak conditions.

Study Generators GEN-2014-033, GEN-2014-034, and GEN-2014-035 (Chaves County)

The Power Factor Analysis shows that the Chaves County generation has a power factor range of 0.967 to 0.992 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.980 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.986 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generator GEN-2014-047

The Power Factor Analysis shows that the GEN-2014-047 has a power factor range of 0.993 lagging (supplying) to 1.0 unity for 2015 Summer Peak conditions, a power factor range of 0.985 lagging (supplying) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.990 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generators GEN-2014-053 and GEN-2014-054 (Carlisle)

The Power Factor Analysis shows that the Carlisle generation has a power factor range of 0.945 leading (absorbing) to 1.0 unity for 2015 Summer Peak conditions, a power factor range of 0.941 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.699 to 0.941 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator GEN-2014-063

The Power Factor Analysis shows that the GEN-2014-063 has a power factor range of 0.972 to 0.999 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.986 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.695 to 0.996 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator GEN-2014-066

The Power Factor Analysis shows that the GEN-2014-066 has a power factor range of 0.929 lagging (supplying) to 0.992 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.950 to 0.990 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.878 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generator GEN-2014-070

The Power Factor Analysis shows that the GEN-2014-070 has a power factor range of 0.94 leading (absorbing) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.943 leading (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.894 to 0.898 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-002

The Power Factor Analysis shows that the ASGI-2014-002 has a power factor range of 0.946 to 0.992 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.964 lagging (supplying) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.905 to 0.978 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-005

The Power Factor Analysis shows that the ASGI-2014-005 has a power factor range of 0.473 lagging (supplying) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.563 to 0.989 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.345 lagging (supplying) to 0.872 leading (absorbing) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-008

The Power Factor Analysis shows that the ASGI-2014-008 has a power factor range of 0.904 lagging (supplying) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.859 lagging (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.783 lagging (supplying) to 1.0 (unity) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-009

The Power Factor Analysis shows that the ASGI-2014-009 has a power factor range of 0184 to 0.631 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.256 lagging (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.051 to 0.116 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-010

The Power Factor Analysis shows that the ASGI-2014-010 has a power factor range of 0.119 to 0.971 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.143 to 0.998 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.034 to 0.127 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-012

The Power Factor Analysis shows that the ASGI-2014-012 has a power factor range of 0.255 lagging (supplying) to 0.923 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.4461 to 0.999 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.084 to 0.765 leading (absorbing) for 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 GEN-2013-027, GEN-2014-047, GEN-2014-053, GEN-2014-054, GEN-2014-063, and GEN-2014-070 for each season. The maximum reactance needed for zero Mvar flow was 12.2 Mvar for GEN-2014-047 (Tap Tolk – Eddy County 345 kV). The minimum reactance needed for zero Mvar flow was 0.3 Mvar for GEN-2014-070 (Tap Hobbs - Yoakum 230 kV).

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SECTION 1: OBJECTIVES

The objective of this report is to provide Southwest Power Pool, Inc. (SPP) with the deliverables for the "DISIS-2014-002-1 (Group 6) Definitive Impact Study." SPP requested a study for the Interconnection System Impact Study for sixteen (16) generation interconnections for 2015 Summer Peak, 2015 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, Inc. PSS/E power system simulation program Version 32.2.0 was used for this study. SPP provided the stability database cases for 2015 Summer Peak, 2015 Winter Peak, and 2025 Summer Peak conditions and a list of contingencies to be examined. Table 2-1 and 2-2 lists the interconnecting projects and previously queued projects, respectively.

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 2-10. Note that the one-line diagrams represent the 2015 Summer Peak case.

Table 2-1
Interconnection Projects Evaluated

Request	Size (MW)	Generator Model	Point of Interconnection
GEN-2013-027	150	Siemens 2.3 MW and 2.415 MW	Tap Tolk to Yoakum 230kV (562480)
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-2014-053	80	GE 2.0MW WTG	Carlisle 230kV
GEN-2014-054	120	GE 2.0MW WTG	Carlisle 230kV
GEN-2014-063	120	Vestas V110 2.0MW VCSS	Hobbs 230kV
GEN-2014-066	30	AE 1000NX 1.0MW PV inverter	Norton 115kV
GEN-2014-070	116	GE 4.0MW inverter	Tap Hobbs - Yoakum 230kV
ASGI-2014-002	49.6	SMA 1.6MVA 630CP-US inverters	Santa Rosa tap - Tucumcari 69kV line
ASGI-2014-005	10	Solar PV inverter	Strata 69 kV - bus 528046
ASGI-2014-008	10	Solar PV inverter	South Loving 69 kV - bus 528218
ASGI-2014-009	10	Solar PV inverter	Wood Draw 115 kV - bus 528228
ASGI-2014-010	10	Solar PV inverter	Ochoa 115 kV - bus 528232
ASGI-2014-012	10	Solar PV inverter	Cooper Ranch 115 kV - bus 528554

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	GE 2.5MW	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-2012-009	15 MW increase (Pgen=165MW)	GENROU	Mustang 230kV (527151)
GEN-2012-010	15 MW increase (Pgen=165MW)	GENROU	Mustang 230kV (527151)
GEN-2012-020	478	GE 1.68MW	Tuco 230kV (525830)
GEN-2012-034	7 MW increase (Pgen=172MW)	GENROU	Mustang 230kV (527151)
GEN-2012-035	7 MW increase (Pgen=172MW)	GENROU	Mustang 230kV (527151)
GEN-2012-036	7 MW increase (Pgen=172MW Summer/185MW Winter)	GENROU	Mustang 230kV (527151)
GEN-2012-037	196 Summer 203 Winter	GENROU	Tuco 345kV (525832)

Table 2-2 (Continued)
Previously Queued Nearby Interconnection Projects Included

Request	Size (MW)	Generator Model	Point of Interconnection
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	Vestas V82 1.65MW (583283)	FE-Clovis 115kV (524808)
ASGI-2013-006	2	Gamesa G114 2MW (583813)	Erskine 115kV (526109)
GEN-2013-022	25	Solaron 500kW (583313)	Caprock 115kV (524486)
GEN-2014-012	186 Summer 225 Winter	GENROU (528607)	Tap Hobbs to Andrews 230kV in 2015 Tap Hobbs to Andrews 345kV in 2025
ASGI-2014-001	2.3	GE 107m 2.3MW (583816)	Erskine 69kV (526109)

In the models provided by SPP, several solar (PV inverter) requests were represented with external capacitor banks[4]. Table 2-3 indicates the switched shunts required to achieve unity voltage in all seasonal cases provided. Additional reactive equipment may be required 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.

Table 2-3
Switched Shunt Requirements

Request	Switched Shunt (Mvar)		
	2015SP	2015WP	2025SP
GEN-2014-033	2.4	3.6	7.2
GEN-2014-034	2.4	3.6	7.2
GEN-2014-035	1.2	2.4	3.6
GEN-2014-066	33.6	33.6	33.6
ASGI-2014-002	4.8	4.8	4.8
ASGI-2014-005	1.2	1.2	2.4
ASGI-2014-009	2.4	1.2	9.0
ASGI-2014-010	2.4	1.2	11.4
ASGI-2014-012	0.6	0.0	4.8

[4] SPP noted that unity voltage at the inverter terminals was necessary for flat initialization of the dynamic model.

SPP requested the following changes be made for the re-study of "DISIS-2014-002-1 (Group 6) Definitive Impact Study" to reflect any system changes since the previous study was completed:

- 2015 Summer (15SP_updates.idv) and Winter (15WP_updates.idv) Peak Cases
  - Establish the GEN-2014-012 Point of Interconnection on the Hobbs – Andres 230 kV line.
  - Move GEN-2013-022 from Caprock Wind 34.5 kV to Caprock 115 kV bus.
  - Turn off 50 Mvar capacitor bank at Border 345 kV.
- 2025 Summer (25SP_updates.idv) Peak Case
  - Move GEN-2013-022 from Caprock Wind 34.5 kV to Caprock 115 kV bus.
  - Turn off 50 Mvar capacitor bank at Border 345 kV.

Note SPP provided .idv files shown above to model the changes for each case.

The Stability Analysis determined the impacts of the new interconnecting projects on the stability and voltage recovery of the nearby systems 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 2-4.

A Short Circuit Analysis was performed on the 2025 Summer Peak study year for each study generator in the Cluster Scenario. 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 2-4 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 wind or solar farm interconnections that interconnect to a 345 kV or 230 kV bus. This analysis determined if reactor support is needed to have an Mvar flow of approximately zero at the point of interconnection (POI).

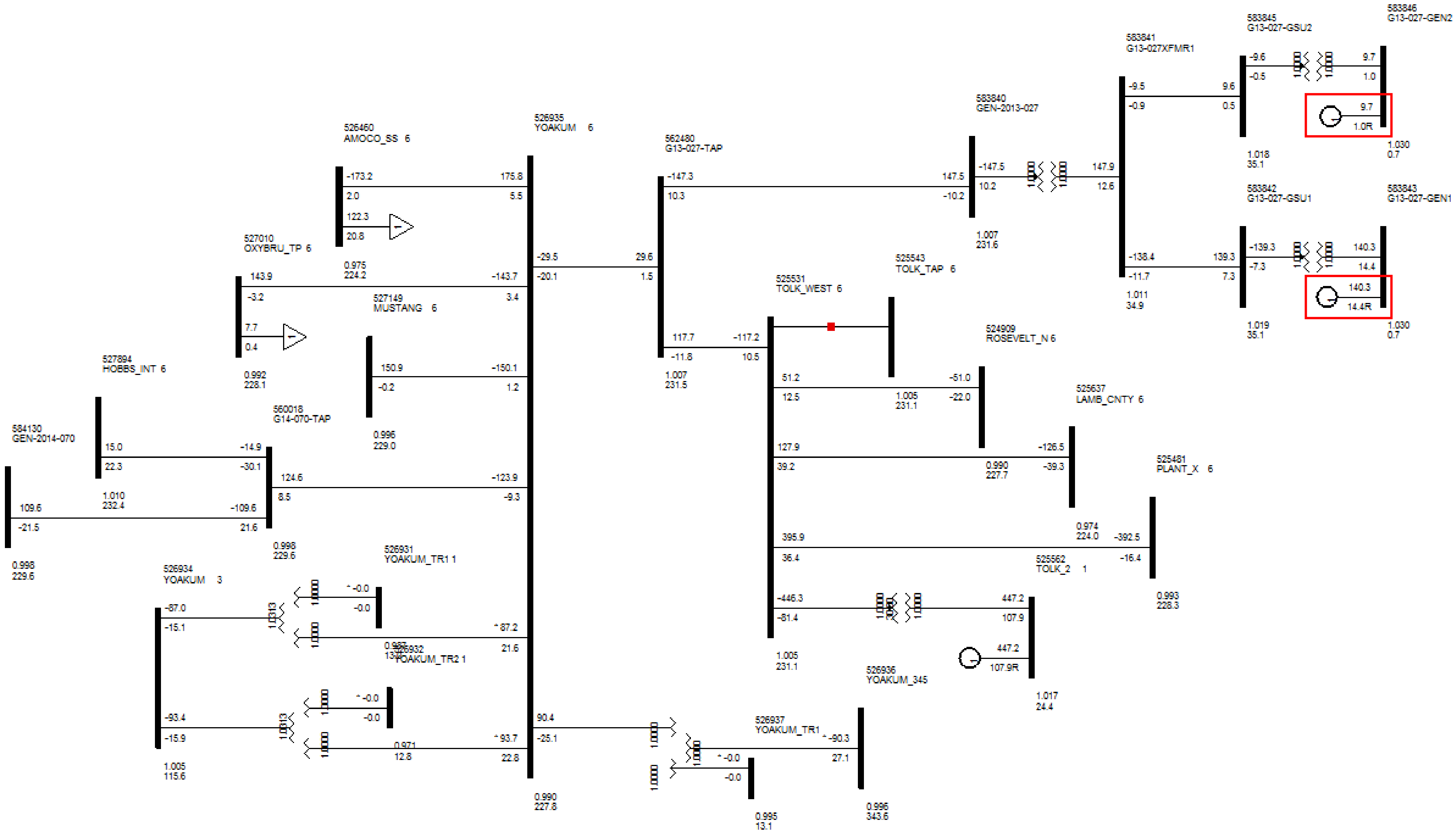

Figure 2-1. Power flow one-line diagram for interconnection project at the Tap Tolk to Yoakum 230 kV POI (GEN-2013-027).

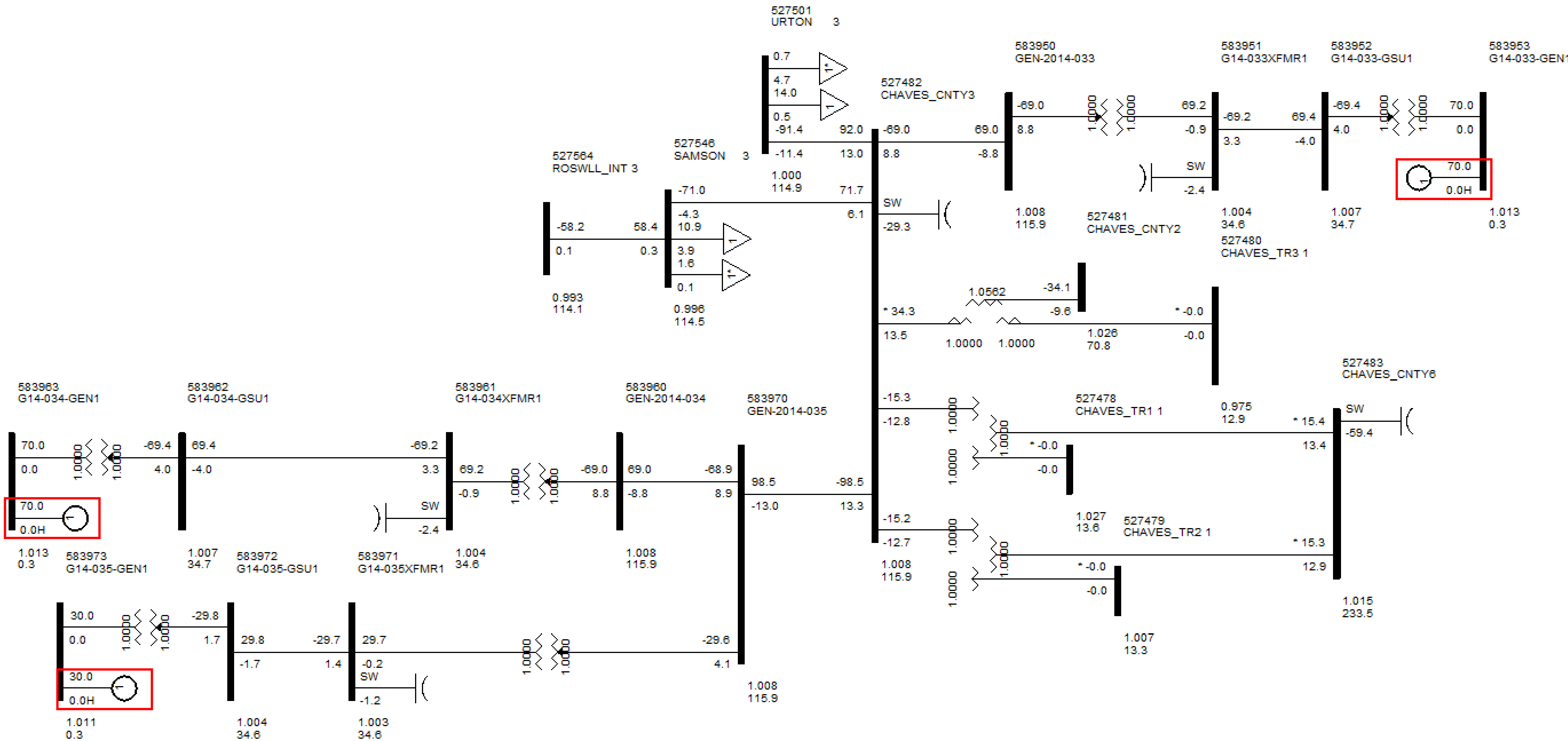

Figure 2-2. Power flow one-line diagram for interconnection projects at the Chaves County 115 kV POI (GEN-2014-033, GEN-2014-034, and GEN-2014-035).

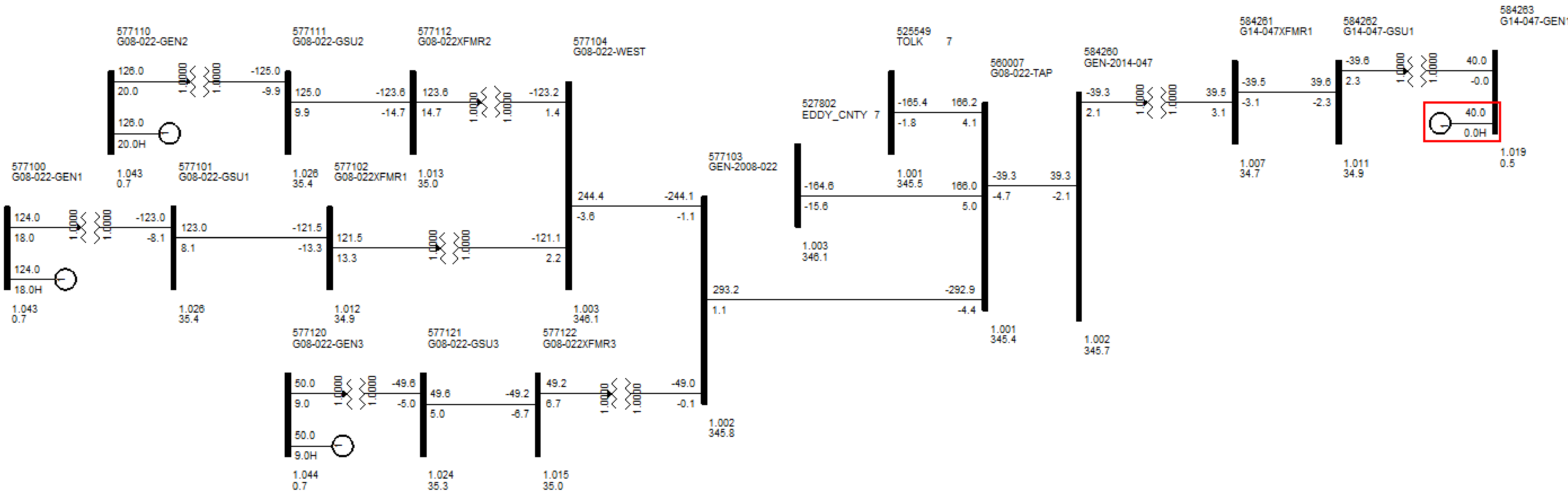

Figure 2-3. Power flow one-line diagram for interconnection project at the Tap Tolk – Eddy County 345 kV POI (GEN-2014-047).

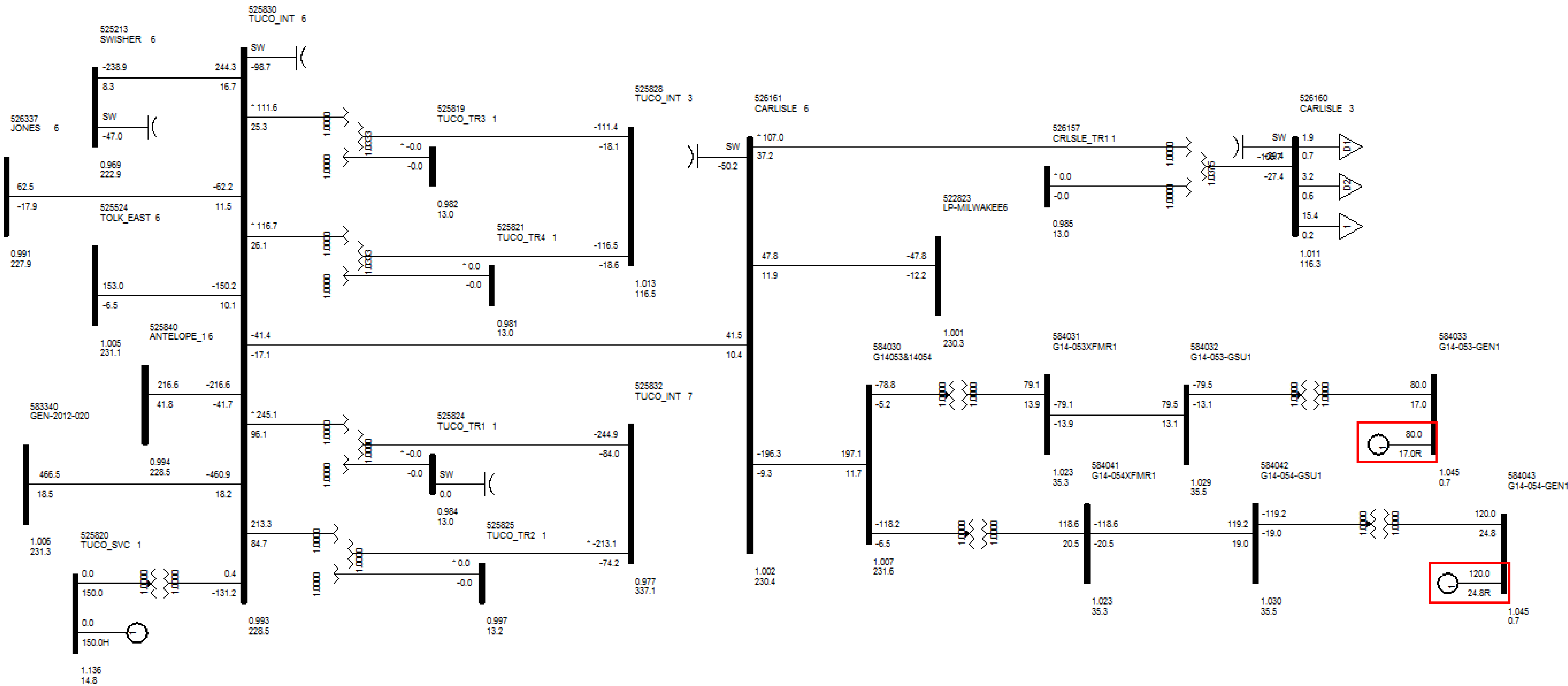

Figure 2-4. Power flow one-line diagram for interconnection project at the Carlisle 230 kV POI (GEN-2014-053 and GEN-2014-054).

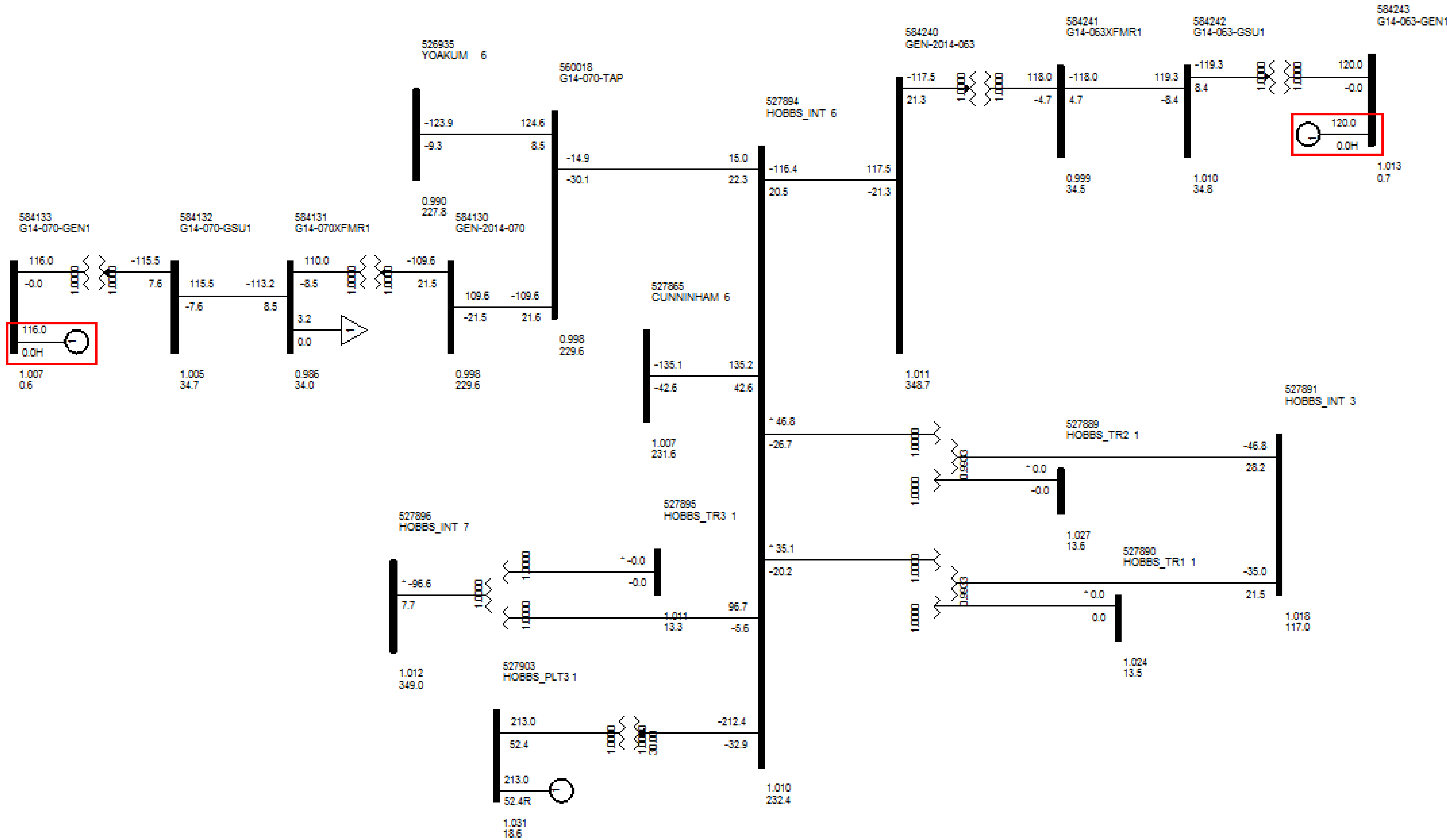

Figure 2-5. Power flow one-line diagram for interconnection project at the Hobbs 230 kV POI and the Hobbs to Yoakum 230 kV POI (GEN-2014-063 and GEN-2014-070).

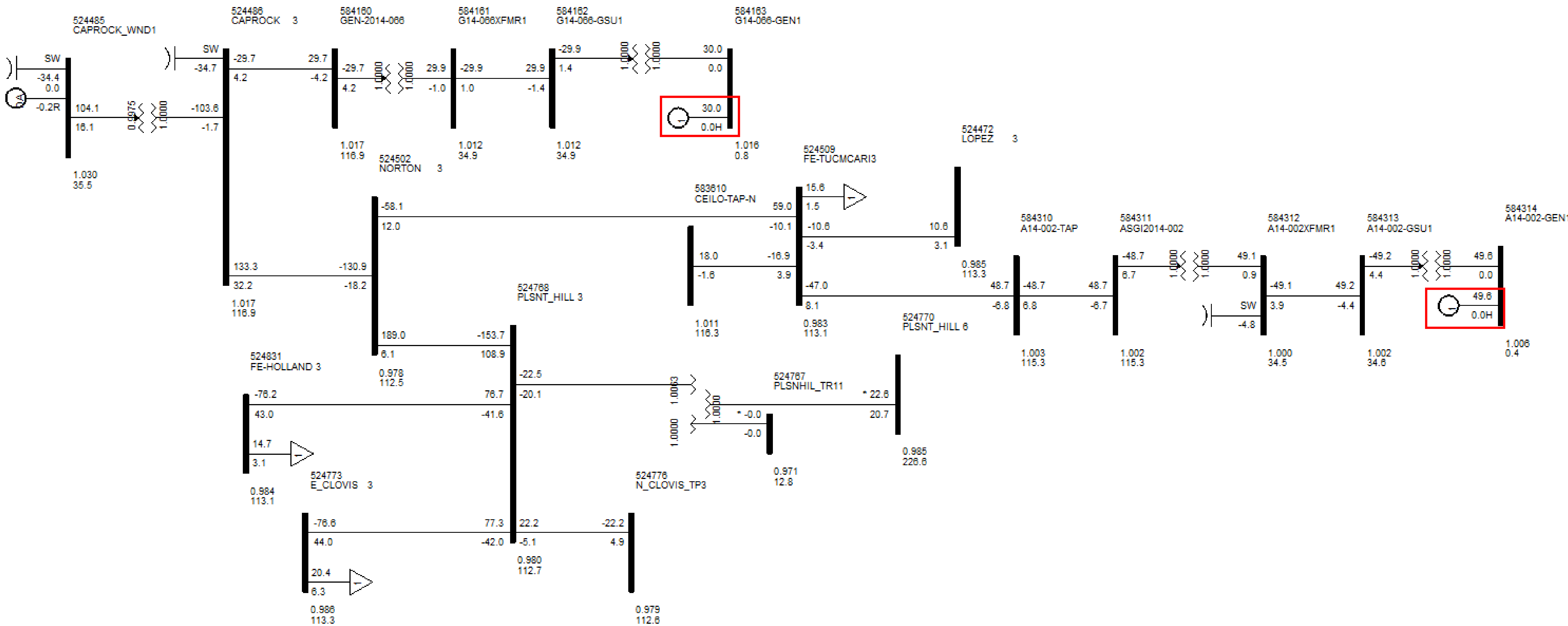

Figure 2-6. Power flow one-line diagram for interconnection project at the Norton 115 kV and Santa Rosa Tap – Tucumcari 69 kV POIs (GEN-2014-066 and ASGI-2014-002).

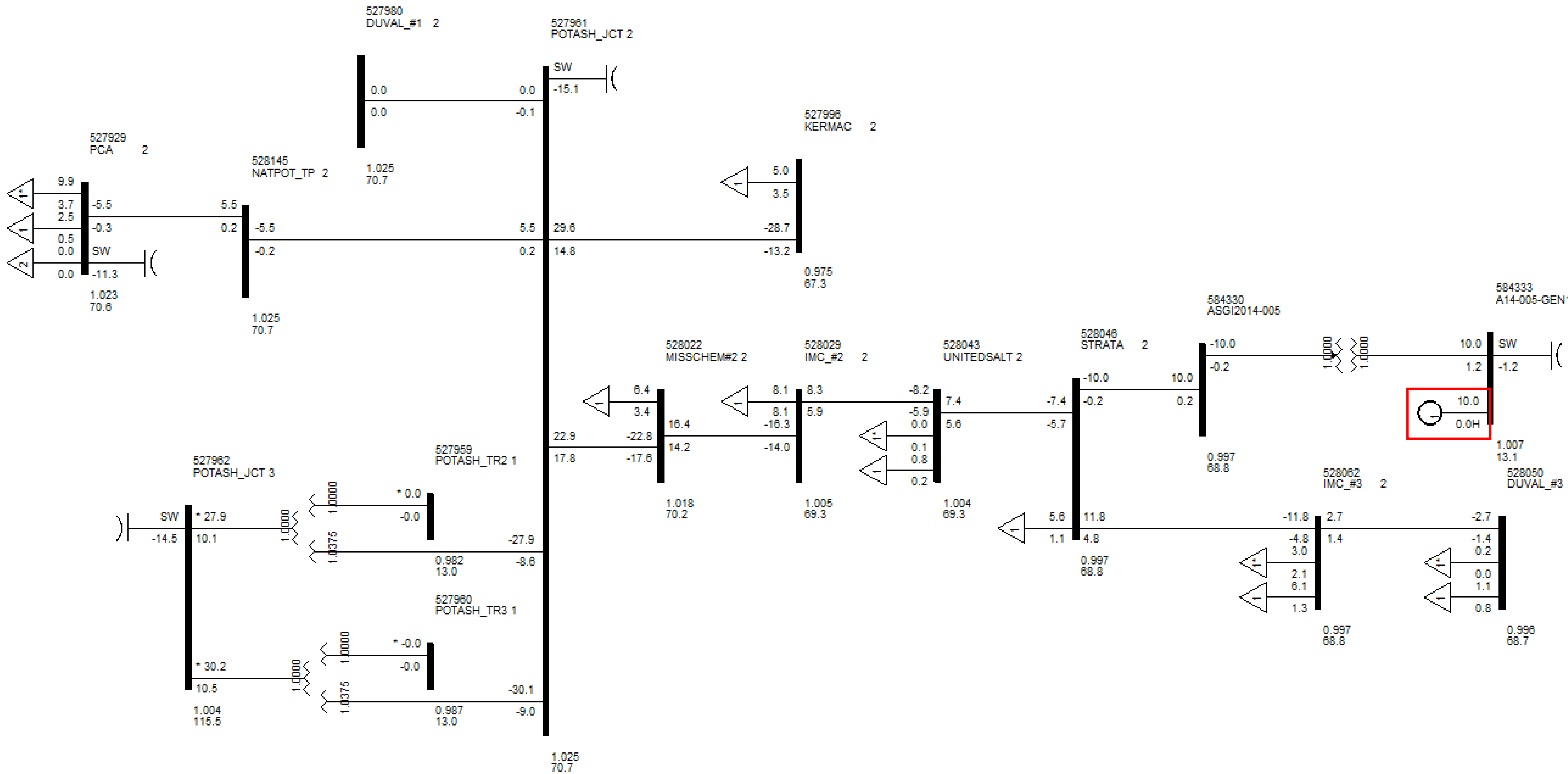

Figure 2-7. Power flow one-line diagram for interconnection project at the Strata 69 kV POI (ASGI-2014-005).

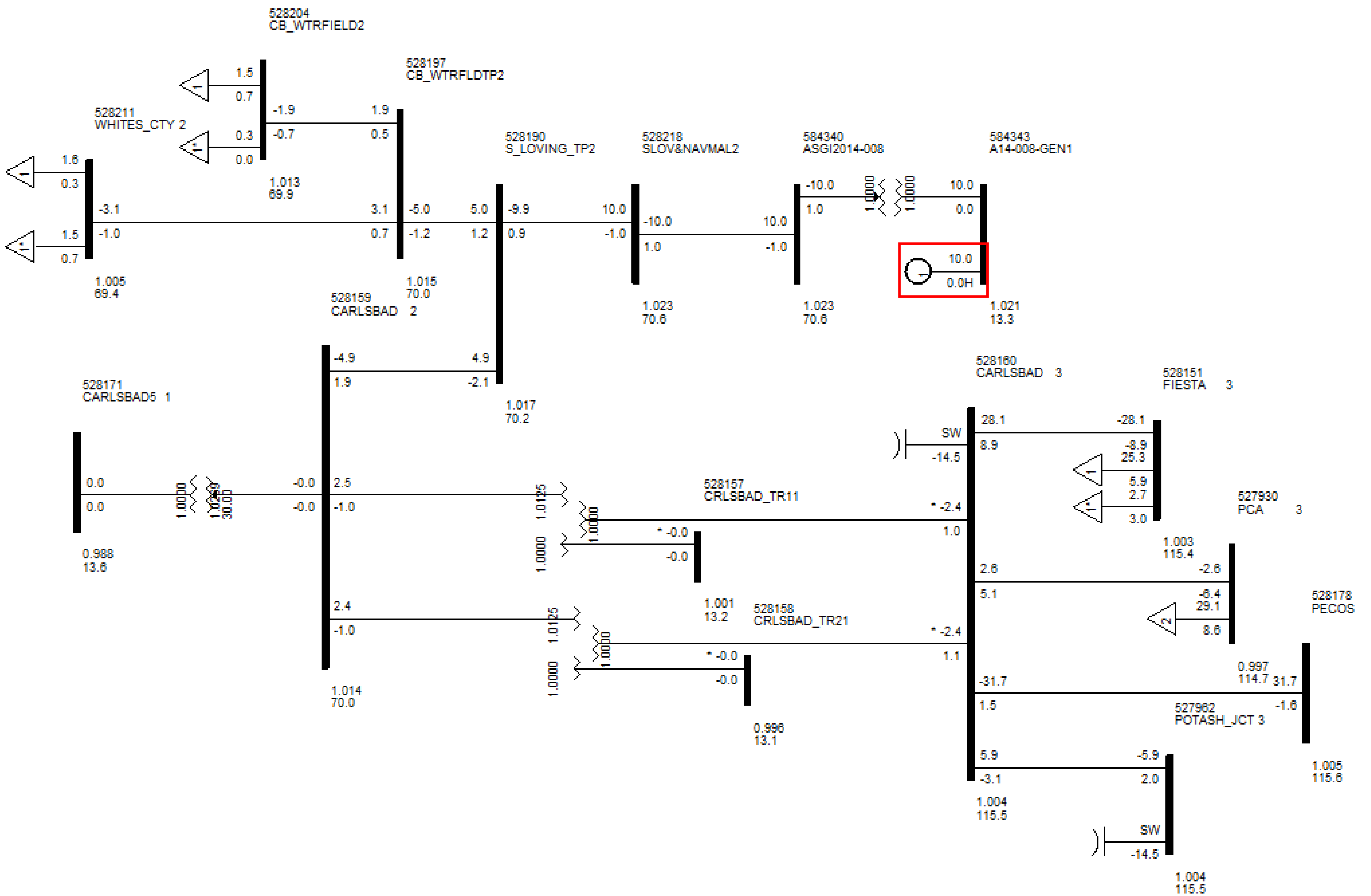

Figure 2-8. Power flow one-line diagram for interconnection project at the South Loving 69 kV POI (ASGI-2014-008).

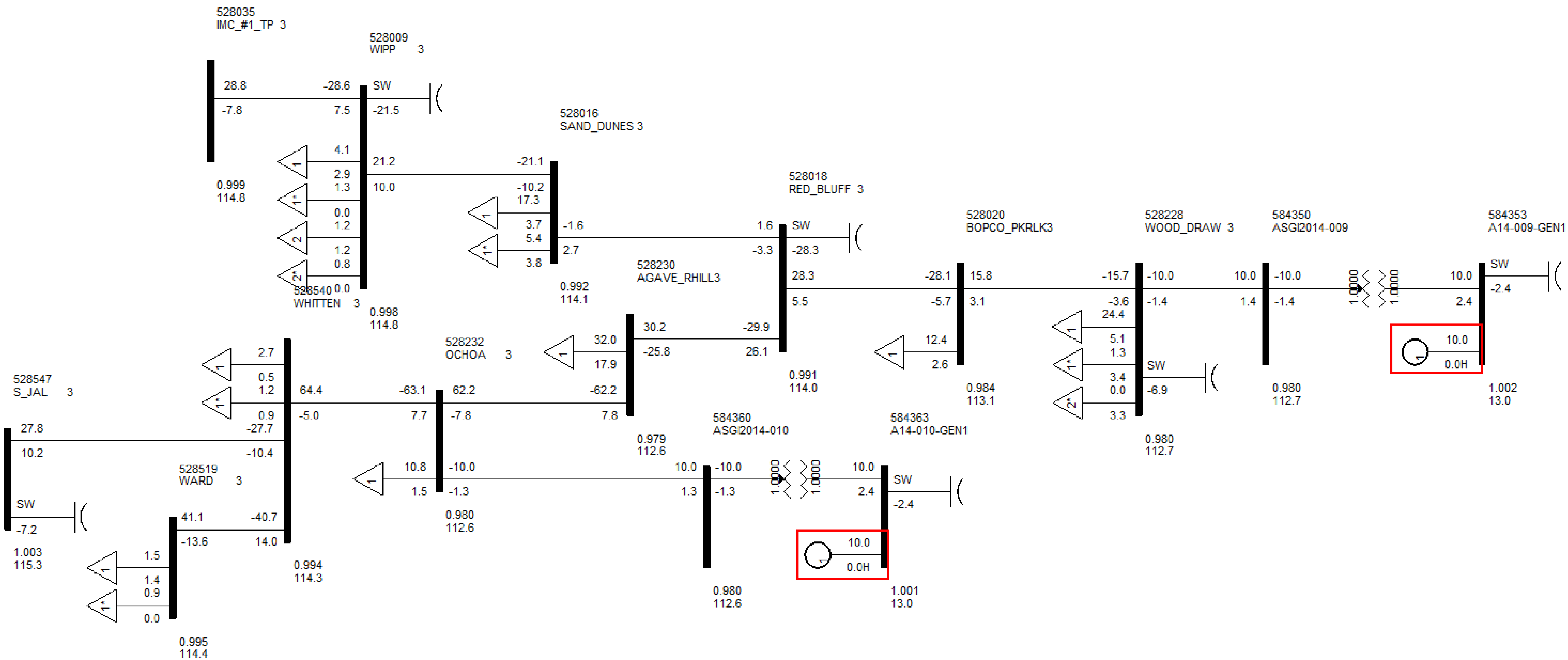

Figure 2-9. Power flow one-line diagram for interconnection project at the Wood Draw 115 kV and Ochoa 115 kV POIs (ASGI-2014-009 and ASGI-2014-010).

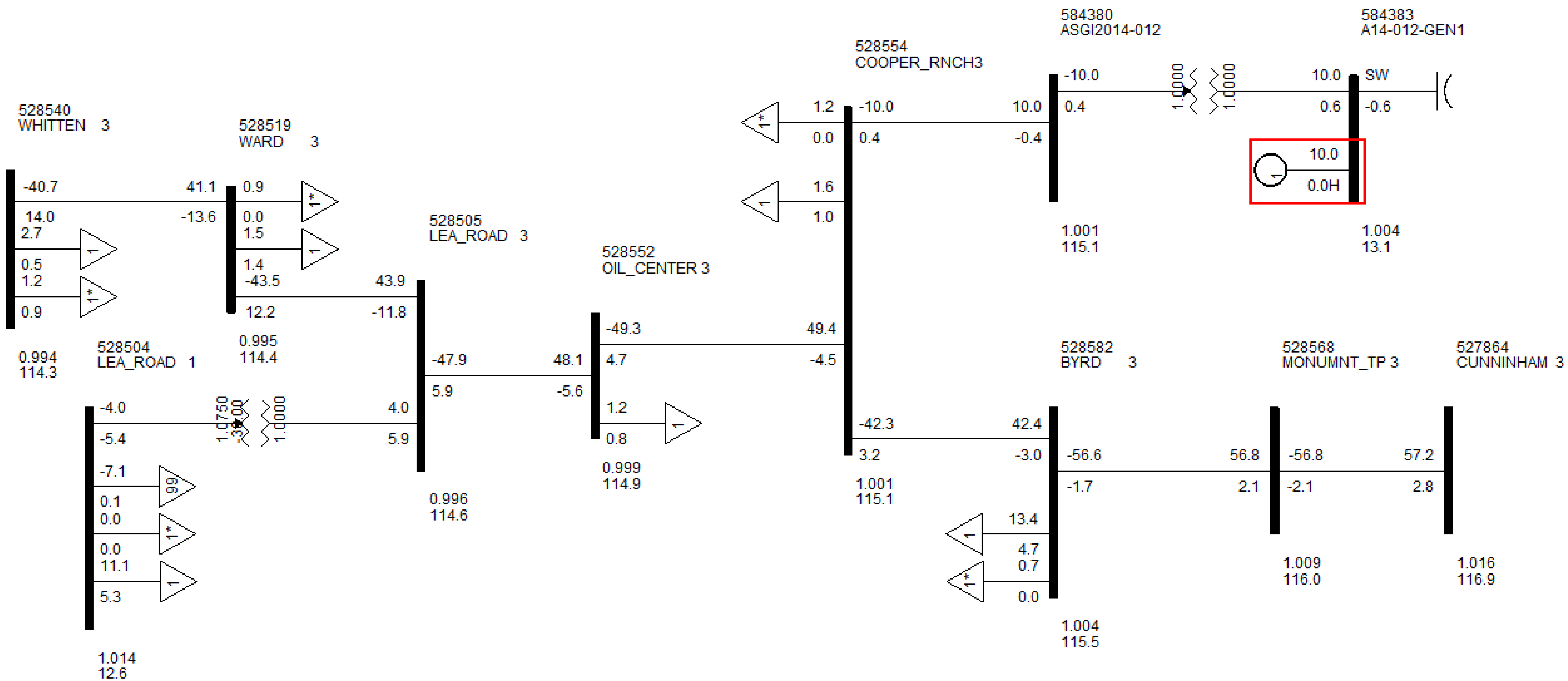

Figure 2-10. Power flow one-line diagram for interconnection project at the Cooper Ranch 115 kV POI (ASGI-2014-012).

Table 2-4
Case List with Contingency Description

Cont. No.	Cont. Name	Description
1	FLT01-3PH	**3 phase fault on Chaves County 115kV (527482) to Samson 115kV (527546) CKT 1, near Chaves County.**
		a. Apply fault at the Chaves County 115kV 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 115kV (527482) to Urton 115kV (527546) CKT 1, near Chaves County.**
		a. Apply fault at the Chaves County 11kV 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 115kV (527482) to Chaves County 230kV (527483) to Chaves County 13.2kV (527478) XFMR CKT 1, near Chaves County 115kV.**
		a. Apply fault at the Chaves County 115kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
4	FLT04-3PH	**3 phase fault on the Eddy North 115kV (527798) to Eddy South 230kV (527800) to Eddy 13.2kV (527797) XFMR CKT 1, near Eddy North 115kV.**
		a. Apply fault at the Eddy North 115kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
5	FLT05-3PH	**3 phase fault on Chaves County 230kV (527483) to San Juan Tap 230kV (524885) CKT 1, near Chaves County.**
		a. Apply fault at the Chaves 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.
6	FLT06-3PH	**3 phase fault on Chaves County 230kV (527483) to Eddy North 230kV (527799) CKT 1, near Chaves County.**
		a. Apply fault at the Chaves 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.
7	FLT07-3PH	**3 phase fault on the Eddy North 230kV (527799) to Eddy South 115kV (527793) to Eddy 13.2kV (527795) XFMR CKT 2, near Eddy North 230kV.**
		a. Apply fault at the Eddy North 230kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
8	FLT08-3PH	**3 phase fault on the Eddy North 230kV (527799) to Eddy County 345kV (527802) to Eddy 13.2kV (527796) XFMR CKT 1, near Eddy North 230kV.**
		a. Apply fault at the Eddy North 230kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
9	FLT09-3PH	**3 phase fault on Eddy South 230kV (527800) to Cunningham 230kV (527865) CKT 1, near Eddy South.**
		a. Apply fault at the Eddy South 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.
10	FLT10-3PH	**3 phase fault on Eddy South 230kV (527800) to 7 Rivers 230kV (528095) CKT 1, near Eddy South.**
		a. Apply fault at the Eddy South 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.
11	FLT11-3PH	**3 phase fault on the 7Rivers 230kV (528095) to 7Rivers 115kV (528094) to 7Rivers 13.2kV (528090) XFMR CKT 1, near 7Rivers 230kV.**
		a. Apply fault at the 7Rivers 230kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
12	FLT12-3PH	**3 phase fault on the Pecos 230kV (528179) to Pecos 115kV (528178) to Pecos 13.2kV (528176) XFMR CKT 1, near Pecos 230kV.**
		a. Apply fault at the Pecos 230kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
13	FLT13-3PH	**3 phase fault on the Potash 230kV (527963) to Potash 115kV (527962) to Potash 13.2kV (527958) XFMR CKT 1, near Potash 230kV.**
		a. Apply fault at the Potash 230kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
14	FLT14-3PH	**3 phase fault on Cunningham 230kV (527865) to Potash Jct 230kV (527963) CKT 1, near Cunnigham.**
		a. Apply fault at the Cunningham 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.
15	FLT15-3PH	**3 phase fault on Cunningham 230kV (527865) to Hobbs 230kV (527894) CKT 1, near Cunnigham.**
		a. Apply fault at the Cunningham 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.
16	FLT16-3PH	**3 phase fault on the Cunningham 230kV (527865) to Cunningham 115kV (527864) to Cunningham 13.2kV (527863) XFMR CKT 1, near Cunningham 230kV.**
		a. Apply fault at the Cunningham 230kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
17	FLT17-3PH	**REMOVED**
18	FLT18-3PH	**3 phase fault on Potash Jct 69kV (527961) to NATPOT Tap 69kV (528022) CKT 1, near Potash Jct.**
		a. Apply fault at the Potash Jct 69kV 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.
19	FLT19-3PH	**REMOVED**
20	FLT20-3PH	**3 phase fault on Strata 69kV (528046) to IMC#3 69kV (528043) CKT 1, near Strata.**
		a. Apply fault at the Strata 69kV 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.
21	FLT21-3PH	**3 phase fault on the Carlsbad 69kV (528159) to Carlsbad 115kV (528160) to Carlsbad 13.2kV (528157) XFMR CKT 1, near Carlsbad 69kV.**
		a. Apply fault at the Carlsbad 69kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
22	FLT22-3PH	**3 phase fault on Potash Jct 115kV (527962) to PCA 115kV (527930) CKT 1, near Potash Jct.**
		a. Apply fault at the Potash Jct 115kV 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.
23	FLT23-3PH	**3 phase fault on Potash Jct 115kV (527962) to Carlsbad 115kV (528160) CKT 1, near Potash Jct.**
		a. Apply fault at the Potash Jct 115kV 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.
24	FLT24-3PH	**3 phase fault on Potash Jct 115kV (527962) to Intrepdw Tap 115kV (527999) CKT 1, near Potash Jct.**
		a. Apply fault at the Potash Jct 115kV 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.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
25	FLT25-3PH	**3 phase fault on the Potash Jct 115kV (527962) to Potash Jct 69kV (527961) to Potash Jct 13.2kV (527959) XFMR CKT 1, near Potash Jct 115kV.**
		a. Apply fault at the Potash Jct 115kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
26	FLT26-3PH	**REMOVED**
27	FLT27-3PH	**REMOVED**
28	FLT28-3PH	**3 phase fault on Red Bluff (A14-009) 115kV (528018) to Sand Dunes 115kV (528016) CKT 1, near Red Bluff.**
		a. Apply fault at the Red Bluff 115kV 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 Red Bluff (A14-009) 115kV (528018) to Road Runner 115kV (528025) CKT 1, near Red Bluff.**
		a. Apply fault at the Red Bluff 115kV 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.
30	FLT30-3PH	**3 phase fault on Road Runner 115kV (528025) to Agave 115kV (528230) CKT 1, near Road Runner.**
		a. Apply fault at the Road Runner 115kV 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 the Road Runner 115kV (528025) to Road Runner 230kV (528027) Road Runner 13.2kV (528023) XFMR CKT 1, near Road Runner 115kV.**
		a. Apply fault at the Road Runner 115kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
32	FLT32-3PH	**3 phase fault on Ochoa 115kV (528232) to Agave 115kV (528230) CKT 1, near Ochoa**
		a. Apply fault at the Ochoa 115kV 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.
33	FLT33-3PH	**3 phase fault on Ochoa 115kV (528232) to Whitten 115kV (528540) CKT 1, near Ochoa**
		a. Apply fault at the Ochoa 115kV 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 Whitten 115kV (528540) to Ward 115kV (528519) CKT 1, near Whitten**
		a. Apply fault at the Whitten 115kV 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.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
35	FLT35-3PH	**3 phase fault on Whitten 115kV (528540) to S_Jal 115kV (528547) CKT 1, near Whitten**
		a. Apply fault at the Whitten 115kV 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 Cooper Ranch 115kV (528554) to Oil Center 115kV (528552) CKT 1, near Cooper Ranch**
		a. Apply fault at the Cooper Ranch 115kV 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 Cooper Ranch 115kV (528554) to Byrd 115kV (528582) CKT 1, near Cooper Ranch**
		a. Apply fault at the Cooper Ranch 115kV 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.
38	FLT38-3PH	**3 phase fault on Cunningham 115kV (527864) to Hobbs 115kV (527891) CKT 1, near Cunningham.**
		a. Apply fault at the Cunningham 115kV 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.
39	FLT39-3PH	**3 phase fault on Cunningham 115kV (527864) to Buckeye Tap 115kV (528348) CKT 1, near Cunningham.**
		a. Apply fault at the Cunningham 115kV 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	FLT40-3PH	**3 phase fault on Cunningham 115kV (527864) to Maddox 115kV (528355) CKT 1, near Cunningham.**
		a. Apply fault at the Cunningham 115kV 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	FLT41-3PH	**3 phase fault on Cunningham 115kV (527864) to Quahada 115kV (528394) CKT 1, near Cunningham.**
		a. Apply fault at the Cunningham 115kV 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	FLT42-3PH	**3 phase fault on Cunningham 115kV (527864) to Monument Tap 115kV (528568) CKT 1, near Cunningham.**
		a. Apply fault at the Cunningham 115kV 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.
43	FLT43-3PH	**3 phase fault on Quahada 115kV (528394) to PCA 115kV (527930) CKT 1, near Quahada.**
		a. Apply fault at the Quahada 115kV 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	FLT44-3PH	**3 phase fault on Quahada 115kV (528394) to LEA National 115kV (528399) CKT 1, near Quahada.**
		a. Apply fault at the Quahada 115kV 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.
45	FLT45-3PH	**3 phase fault on Maddox 115kV (528355) to Pearle 115kV (528392) CKT 1, near Maddox.**
		a. Apply fault at the Maddox 115kV 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.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
46	FLT46-3PH	**3 phase fault on Maddox 115kV (528355) to Sanger SW 115kV (528463) CKT 1, near Maddox.**
		a. Apply fault at the Maddox 115kV 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.
47	FLT47-3PH	**3 phase fault on Maddox 115kV (528355) to Monument 115kV (528491) CKT 1, near Maddox.**
		a. Apply fault at the Maddox 115kV 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.
48	FLT48-3PH	**3 phase fault on G08-022 Tap 345kV (560007) to Eddy County 345kV (527802) CKT 1, near G08-022 Tap.**
		a. Apply fault at the G08-022 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.
49	FLT49-3PH	**3 phase fault on G08-022 Tap 345kV (560007) to Tolk 345kV (525549) CKT 1, near G08-022 Tap.**
		a. Apply fault at the G08-022 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.
50	FLT50-3PH	**3 phase fault on the Tolk Tap 230kV (525543) to Tolk 345kV (525549) to Tolk 13.2kV (525537) XFMR CKT 1, near Tolk Tap 230kV.**
		a. Apply fault at the Tolk Tap 230kV bus.
		b. Clear fault after 5 cycles and trip the faulted transformer.
51	FLT51-3PH	3 phase fault on the GEN-2013-027 (562480) to Tolk West (525531) 230 kV line, near GEN-2013-027.
		a. Apply fault at the GEN-2013-027 230 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-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. At 5 cycles, open GEN-2013-027 end of the faulted line.
		c. At 15 cycles, clear the fault and open Tolk West end of the line in (b) and trip Tolk West (525531) to Plant X (525481) 230 kV line.
53	FLT53-3PH	**3 phase fault on the GEN-2013-027 (562480) to Yoakum (526935) 230 kV line, near GEN-2013-027.**
		a. Apply fault at the GEN-2013-027 230 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	FLT54-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 230kV bus.
		b. At 5 cycles, open GEN-2013-027 end of the faulted line.
		c. At 15 cycles, 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.
55	FLT55-3PH	**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.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
56	FLT56-3PH	**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.
57	FLT57-3PH	**3 phase fault on the Yoakum (526935) to Mustang (527149) 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.
58	FLT58-3PH	**3 phase fault on the Yoakum (526935) to G14-070-TAP (560018) 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.
59	FLT59-3PH	**3 phase fault on the Yoakum 230 kV (526935) to Yoakum 115 kV (526934)/13.2 kV (526934) transformer circuit #1, near Yoakum.**
		a. Apply fault at the Yoakum 230 kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer and remove fault.
60	FLT60-PO	**(Prior Outage) Yoakum (526935) – Amoco-SS (526460) 230 kV out of service then 3 phase fault on the Yoakum 230 kV (526935) to Yoakum 115 kV (526934)/13.2 kV (526934) transformer circuit #1, near Yoakum.**
		Switch Yoakum (526935) – Amoco-SS (526460) out of service then solve.
		a. Apply fault at the Yoakum 230 kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer and remove fault.
61	FLT61-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 230kV bus.
		b. At 5 cycles, open Amoco-SS end of the faulted line.
		c. At 15 cycles, clear the fault and trip Yoakum 230 kV (526935) bus.
62	FLT62-3PH	**3 phase fault on Tolk West 230kV (525531) to Roosevelt 230kV (524909) CKT 1, near Tolk West.**
		a. Apply fault at the Tolk West 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.
63	FLT63-SB	**Single phase fault with stuck breaker on the Tolk West (525531) to Roosevelt N (524909) 230 kV line, near Tolk West.**
		a. Apply fault at the Tolk West 230 kV bus.
		b. At 5 cycles, open Roosevelt N end of the faulted line.
		c. At 15 cycles, clear the fault and open Tolk West end of the line in (b) and trip Tolk West (525531) to Plant X (525481) 230 kV circuit #1 line.
64	FLT64-3PH	**3 phase fault 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. 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.
65	FLT65-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. At 5 cycles, open Plant X end of the faulted line.
		c. At 15 cycles, clear the fault and open Tolk West end of the line in (b) and trip Tolk West (525531) to Tolk Tap (525543) 230 kV bus tie line.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
66	FLT66-3PH	**3 phase fault on the Tolk 345 kV (525549) to Tolk Tap 230 kV (525543)/ 13.2 kV (525537) transformer, near Tolk 345 kV.**
		a. Apply fault at the Tolk 345 kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
67	FLT67-3PH	**3 phase fault on the Tolk West (525531) to Lamb Co (525637) 230 kV line, near Tolk West.**
		a. Apply fault at the Tolk West 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.
68	FLT68-SB	**Single phase fault with stuck breaker on the Tolk West (525531) to Lamb Co (525637) 230 kV line, near Tolk West.**
		a. Apply fault at the Tolk West 230 kV bus.
		b. At 5 cycles, open Lamb Co end of the faulted line.
		c. At 15 cycles, and then clear the fault and open Tolk West end of the line in (b) and trip Tolk West (525531) to Plant X (525481) 230 kV circuit #1 line.
69	FLT69-PO	**(Prior Outage) Tolk West (525531) – Plant X (525481) 230 kV circuit #1 out of service then 3 phase fault on the Tolk East 230 kV (525524) to Plant X (525481) 230 kV circuit #2, near Tolk East.**
		Switch Tolk West (525531) – Plant X (525481) 230 kV circuit #1 out of service then solve.
		a. Apply fault at the Tolk East 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
70	FLT70-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. At 5 cycles, open Plant X end of the faulted line.
		c. At 15 cycles, clear the fault and open Tolk West end of the line in (b) and trip Tolk East (525524) to TUCO (525830) 230 kV line.
71	FLT71-3PH	**3 phase fault on the SP-Erskine (526109) to Indiana (526146) 115kV line, near SP-Erskine.**
		a. Apply fault at the near SP-Erskine 115kV 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	FLT72-3PH	**3 phase fault on the SP-Erskine (526109) to Carlisle (526160) 115kV line, near SP-Erskine.**
		a. Apply fault at the near SP-Erskine 115kV 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	FLT73-3PH	**3 phase fault on the Tuco (525828) to Hale County (525454) 115kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 115kV 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	FLT74-3PH	**3 phase fault on the Tuco (525828) to Floyd County (525780) 115kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 115kV 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	FLT75-3PH	**3 phase fault on the Tuco (525828) to Stanton West (526076) 115kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 115kV 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 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
76	FLT76-3PH	**3 phase fault on the Tuco (525828) to Lubbock West (526298) 115kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 115kV 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.
77	FLT77-3PH	**3 phase fault on the Carlisle (526160) to LP-Doud Tap (526126) 115kV line circuit 1, near Carlisle.**
		a. Apply fault at the Carlisle 115kV 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.
78	FLT78-3PH	**3 phase fault on the Carlisle (526160) to Murphy (526192) 115kV line circuit 1, near Carlisle.**
		a. Apply fault at the Carlisle 115kV 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.
79	FLT79-3PH	**3 phase fault on the Carlisle (526161) to LP-Milwaukee (526823) 230kV line circuit 1, near Carlisle.**
		a. Apply fault at the Carlisle 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
80	FLT80-3PH	**3 phase fault on the Carlisle (526161) to Tuco (52830) 230kV line circuit 1, near Carlisle.**
		a. Apply fault at the Carlisle 115kV 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.
81	FLT81-3PH	**3 phase fault on the Carlisle (526160) 115kV to Carlisle (526161) 230kV/(526167) 13.2kV ckt 1 transformer at the 115kV bus.**
		a. Apply fault at the Carlisle 115kV bus.
		b. Clear fault after 5 cycles by tripping the transformer
82	FLT82-3PH	**3 phase fault on the Tuco (525828) 115kV to Tuco (525830) 230kV/(525821) 13.2kV ckt 1 transformer at the 115kV bus.**
		a. Apply fault at the Tuco 115kV bus.
		b. Clear fault after 5 cycles by tripping the transformer
83	FLT83-3PH	**3 phase fault on the LP-Milkaukee (522823) 230kV to LP-Milkaukee (522828) 69kV/(522827) 13.5kV ckt 1 transformer at the 230kV bus.**
		a. Apply fault at the LP-Milkaukee 230kV bus.
		b. Clear fault after 5 cycles by tripping the transformer
84	FLT84-3PH	**REMOVED**
85	FLT85-3PH	**REMOVED**
86	FLT86-3PH	**REMOVED**
87	FLT87-3PH	**3 phase fault on the Tuco (525832) to OKU (511456) 345kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
88	FLT88-3PH	**3 phase fault on the Tuco (525832) 345kV to Tuco (525830) 230kV/(525824) 13.2kV ckt 1 transformer at the 345kV bus.**
		a. Apply fault at the Tuco 345kV bus.
		b. Clear fault after 5 cycles by tripping the transformer

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
89	FLT89-3PH	**3 phase fault on the Tuco (525830) to Swisher (525213) 230kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 230kV 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	FLT90-3PH	**3 phase fault on the Tuco (525830) to Tolk East (525524) 230kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 230kV 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	FLT91-3PH	**3 phase fault on the Tuco (525830) to Jones (526337) 230kV line circuit 1, near Tuco.**
		a. Apply fault at the Tuco 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
92	FLT92-3PH	**3 phase fault on the Tuco (525830) 230kV to Tuco (525828) 115kV/(525821) 13.2kV ckt 1 transformer at the 230kV bus.**
		a. Apply fault at the Tuco 230kV bus.
		b. Clear fault after 5 cycles by tripping the transformer
93	FLT93-3PH	**3 phase fault on the Jones (526337) to LP-Holly (522870) 230kV line circuit 1, near Jones.**
		a. Apply fault at the Jones 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
94	FLT94-3PH	**3 phase fault on the Jones (526337) to Lubbock South (526269) 230kV line circuit 2, near Jones.**
		a. Apply fault at the Jones 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
95	FLT95-3PH	**3 phase fault on the Jones (526337) to Lubbock East (526299) 230kV line circuit 1, near Jones.**
		a. Apply fault at the Jones 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
96	FLT96-3PH	**3 phase fault on the Jones (526337) to Grassland (526677) 230kV line circuit 1, near Jones.**
		a. Apply fault at the Jones 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
97	FLT97-3PH	**3 phase fault on the Swisher (525213) to Amarillo South (524415) 230kV line circuit 1, near Swisher.**
		a. Apply fault at the Swisher 230kV 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	FLT98-PO	**(Prior Outage) TUCO (525830) 230kV to TUCO (525828) 115kV/(525819) 13.2kV transformer CKT 2. Then 3 phase fault on the TUCO (525830) 230kV to TUCO (525828) 115kV/(525821) 13.2kV transformer CKT 1, near TUCO 115kV.**
		a. Prior outage TUCO (525830) 230kV to TUCO (525828) 115kV/(525819) 13.2kV transformer CKT 2 (solve network for steady state solution).
		b. 3 phase fault on the TUCO (525830) 230kV to TUCO (525828) 115kV/(525821) 13.2kV transformer CKT 1, near TUCO 115kV.
		c. Leave fault on for 5 cycles, then trip the faulted transformer.
99	FLT99-3PH	**3 phase fault on the Norton (524502) to FE-Tucumcari (524509) 115kV line, near Norton.**
		a. Apply fault at the Norton 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
100	FLT100-3PH	**3 phase fault on the Pleasant Hill (524768) to E Clovis (524773) 115kV line, near Pleasant Hill.**
		a. Apply fault at the Pleasant Hill 115kV 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.
101	FLT101-3PH	**3 phase fault on the Pleasant Hill (524768) to N Clovis Tap (524776) 115kV line, near Pleasant Hill.**
		a. Apply fault at the Pleasant Hill 115kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
102	FLT102-3PH	**3 phase fault on the Pleasant Hill (524768) to FE-Holland (524773) 115kV line, near Pleasant Hill.**
		a. Apply fault at the Pleasant Hill 115kV 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	FLT103-3PH	**3 phase fault on the Pleasant Hill (524770) 230kV to Pleasant Hill (524768) 115kV/(524767) 13.2kV transformer, near Pleasant Hill 230kV.**
		a. Apply fault at the Pleasant Hill 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
104	FLT104-3PH	**3 phase fault on the Pleasant Hill (524770) to Oasis (524875) 230kV line, near Pleasant Hill.**
		a. Apply fault at the Pleasant Hill 230kV 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	FLT105-3PH	**3 phase fault on the Pleasant Hill (524770) to Roosevelt (524909) 230kV line, near Pleasant Hill.**
		a. Apply fault at the Pleasant Hill 230kV 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	FLT106-3PH	**3 phase fault on the Oasis (524875) 230kV to Oasis (524874) 115kV/(524872) 13.2kV transformer, near Oasis 230kV.**
		a. Apply fault at the Oasis 230kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
107	FLT107-3PH	3 phase fault on the FE-Clovis Int (524808) to N Clovis Tap (524776) 115kV line, near FE-Clovis Int.
		a. Apply fault at the near FE-Clovis Int 115kV 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	FLT108-3PH	**3 phase fault on the FE-Clovis Int (524808) to W Clovis (524784) 115kV line, near FE-Clovis Int.**
		a. Apply fault at the near FE-Clovis Int 115kV 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	FLT109-SB	**REMOVED**
110	FLT110-SB	**REMOVED**
111	FLT111-SB	**Single phase fault with stuck breaker on the Potash Jct (527962) to Carlsbad (528180) 115kV circuit #1 line, near Potash Jct.**
		a. Apply fault at the Potash Jct 115kV bus.
		b. At 5 cycles, open Carlsbad end of the faulted line.
		c. At 18 cycles, clear the fault and Potash Jct(527962) bus.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
112	FLT112-3PH	**3 phase fault on the Hobbs (527894) to G14-070-TAP (560018) 230 kV line, 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.
113	FLT113-3PH	**REMOVED**
114	FLT114-3PH	**REMOVED**
115	FLT115-3PH	**REMOVED**
116	FLT116-3PH	**REMOVED**
117	FLT117-3PH	**3 phase fault on the Tuco (525832) to Yoakam (526936) 345kV line circuit 1, near Tuco. (Only performed for 2025SP)**
		a. Apply fault at the Tuco (525832) 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
118	FLT118-3PH	**REMOVED**
119	FLT119-PO	**REMOVED**
120	FLT120-PO	**REMOVED**
121	FLT121-PO	**REMOVED**
122	FLT-122-3PH	**3 phase fault on the FE-Tucumcari (524509) to Lopez (524472) 1155 kV line, near FE-Tucumcari.**
		a. Apply fault at the FE-Tucumcari 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
123	FLT123-3PH	**REMOVED**
124	FLT124-3PH	**REMOVED**
125	FLT125-3PH	**REMOVED**
126	FLT126-3PH	**3 phase fault on the Potter County 345kV (523961) to 230kV (523959) to 13.2kV (523957) transformer, near Potter County 345kV.**
		a. Apply fault at the Potter County 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
127	FLT127-3PH	**3 phase fault on the Hobbs (527894) to GEN-2014-070-TAP (560018) 230 kV line, near GEN-2014-070-TAP.**
		a. Apply fault at the GEN-2014-070-TAP 230kV 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.
128	FLT128-3PH	**3 phase fault on the Yoakum (526935) to GEN-2014-070-TAP (560018) 230 kV line, near GEN-2014-070-TAP.**
		a. Apply fault at the GEN-2014-070-TAP 230kV 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.
129	FLT129-3PH	**3 phase fault on the Border (515458) to Tuco (525832) 345kV line circuit 1, near Border.**
		a. Apply fault at the Border 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
130	FLT130-3PH	**3 phase fault on the Border (515458) to Woodward (515375) 345kV line circuit 1, near Border.**
		a. Apply fault at the Border 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.

Table 2-4 (Continued)
Case List with Contingency Description

Cont. No.	Cont. Name	Description
131	FLT131-3PH	**3 phase fault on the Intrepid Tap (527999) to IMC#1 Tap (528035) 115kV line circuit 1, near Intrepid Tap.**
		a. Apply fault at the Intrepid Tap 115kV 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.
132	FLT132-3PH	**3 phase fault on the Potter County (523961) to Hitchland (523097) 345 kV line, near Potter County.**
		a. Apply fault at the Potter County 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
133	FLT133-3PH	**3 phase fault on the Hobbs (527894) to Gaines Tap (526811) 230 kV line in 2015 and Hobbs (527896) to Gaines Tap (528611) 345 kV in 2025, near Hobbs.**
		a. Apply fault at the Hobbs 230 kV (527894) bus in 2015 and 345kV (527896) bus in 2025.
		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.
134	FLT134-3PH	**3 phase fault on the Hobbs (527896) to Yoakum (526936) 345 kV line, near Hobbs.**
		a. Apply fault at the Hobbs 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted line.
		c. Wait 20 cycles, and then re-close the line in (b) back into the fault.
		d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
135	FLT135-3PH	**3 phase fault on the Hobbs (527896) 345kV to Hobbs (527894) 230kV to Hobbs (527895) 13.2kV transformer, near Hobbs 345kV.**
		a. Apply fault at the Hobbs 345kV bus.
		b. Clear fault after 5 cycles by tripping the faulted transformer.
136	FLT136-3PH	**3 phase fault on the Andrews (528604) to Gaines Tap (526811) 230 kV line in 2015 and Andrews (528604) to Gaines Tap (528611) 345 kV line in 2025, near Andrews.**
		a. Apply fault at the Andrews 230 kV (528604) bus in 2015 and 345 kV in 2025.
		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.

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:

- 2015 Summer Peak
- 2015 Winter 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 2-2 and 2-3 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 2-4 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 used for this analysis.

Table 3-1
Calculated Single-Phase Fault Impedances

Cont. No.*	Cont. Name	Single-Phase Fault Impedance (MVA)		
		2015 Summer	2015 Winter	2025 Summer
52	FLT52-SB	-6468.8	-6062.5	-7687.5
54	FLT54-SB	-3625	-2812.5	-4437.5
61	FLT61-SB	-3625	-2812.5	-4437.5
63	FLT63-SB	-6468.8	-6062.5	-7687.5
65	FLT65-SB	-6468.8	-6062.5	-7687.5
68	FLT68-SB	-6468.8	-6062.5	-7687.5
70	FLT70-SB	-6468.8	-6062.5	-7687.5
111	FLT111-SB	-1062.5	-1062.5	-1750.0

*Refer to Table 2-4 for a description of the contingency scenerio

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

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 that resulted in system instability, generation tripping offline, or low bus voltages below 0.7 p.u. for the 2015 Summer Peak, 2015 Winter Peak, and 2025 Summer Peak conditions 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 2-4. Table 3-2 is a summary of the stability results for the 2015 Summer Peak, 2015 Winter 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 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 0.9 p.u. If high or low voltages were observed the number of buses failing the voltage criteria is listed.

Table 3-2
Cluster Scenario: Stability Analysis Summary of Results for 2015 Summer, 2015 Winter, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery		Stable?	Voltage Recovery		Stable?	Voltage Recovery		Stable?
		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	No	No	Yes	No	No	Yes	No	No	Yes
2	FLT02-3PH	No	No	Yes	No	No	Yes	No	No	Yes
3	FLT03-3PH	No	No	Yes	No	No	Yes	No	No	Yes
4	FLT04-3PH	No	No	Yes	No	No	Yes	No	No	Yes
5	FLT05-3PH	No	No	Yes	No	No	Yes	No	No	Yes
6	FLT06-3PH	No	No	Yes	No	No	Yes	No	No	Yes
7	FLT07-3PH	No	No	Yes	No	No	Yes	No	No	Yes
8	FLT08-3PH	No	No	Yes	No	No	Yes	No	No	Yes
9	FLT09-3PH	No	No	Yes	No	No	Yes	No	No	Yes
10	FLT10-3PH	No	No	Yes	No	No	Yes	No	No	Yes
11	FLT11-3PH	No	No	Yes	No	No	Yes	No	No	Yes
12	FLT12-3PH	No	No	Yes	No	No	Yes	No	No	Yes
13	FLT13-3PH	No	No	Yes	No	No	Yes	No	No	Yes
14	FLT14-3PH	No	No	Yes	No	No	Yes	No	No	Yes
15	FLT15-3PH	No	No	Yes	No	No	Yes	No	No	Yes
16	FLT16-3PH	No	No	Yes	No	No	Yes	No	No	Yes
17	FLT17-3PH	Removed			Removed			Removed		
18	FLT18-3PH	No	No	Yes	No	No	Yes	No	No	Yes
19	FLT19-3PH	Removed			Removed			Removed		
20	FLT20-3PH	No	No	Yes	No	No	Yes	No	No	Yes

Table 3-2 (Continued)
Cluster Scenario: Stability Analysis Summary of Results for 2015 Winter, 2015 Summer, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery		Stable?	Voltage Recovery		Stable?	Voltage Recovery		Stable?
		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.	
21	FLT21-3PH	No	No	Yes	No	No	Yes	No	No	Yes
22	FLT22-3PH	No	No	Yes	No	No	Yes	No	No	Yes
23	FLT23-3PH	No	No	Yes	No	No	Yes	No	No	Yes
24	FLT24-3PH	No	No	Yes	No	No	Yes	No	No	Yes
25	FLT25-3PH	No	No	Yes	No	No	Yes	No	No	Yes
26	FLT26-3PH	Removed			Removed			Removed		
27	FLT27-3PH	Removed			Removed			Removed		
28	FLT28-3PH	No	No	Yes	No	No	Yes	No	No	Yes
29	FLT29-3PH	N/A			No	No	Yes	No	No	Yes
30	FLT30-3PH	N/A			No	No	Yes	No	No	Yes
31	FLT31-3PH	N/A			No	No	Yes	No	No	Yes
32	FLT32-3PH	No	No	Yes	No	No	Yes	No	No	Yes
33	FLT33-3PH	No	No	Yes	No	No	Yes	No	No	Yes
34	FLT34-3PH	No	No	Yes	No	No	Yes	No	No	Yes
35	FLT35-3PH	No	No	Yes	No	No	Yes	No	No	Yes
36	FLT36-3PH	No	No	Yes	No	No	Yes	No	No	Yes
37	FLT37-3PH	No	No	Yes	No	No	Yes	No	No	Yes
38	FLT38-3PH	No	No	Yes	No	No	Yes	No	No	Yes
39	FLT39-3PH	No	No	Yes	No	No	Yes	No	No	Yes
40	FLT40-3PH	No	No	Yes	No	No	Yes	No	No	Yes
41	FLT41-3PH	No	No	Yes	No	No	Yes	No	No	Yes
42	FLT42-3PH	No	No	Yes	No	No	Yes	No	No	Yes
43	FLT43-3PH	No	No	Yes	No	No	Yes	No	No	Yes
44	FLT44-3PH	No	No	Yes	No	No	Yes	No	No	Yes
45	FLT45-3PH	No	No	Yes	No	No	Yes	No	No	Yes
46	FLT46-3PH	No	No	Yes	No	No	Yes	No	No	Yes
47	FLT47-3PH	No	No	Yes	No	No	Yes	No	No	Yes
48	FLT48-3PH	Generation Trips			Generation Trips			Generation Trips		
49	FLT49-3PH	Generation Trips			Generation Trips			Generation Trips		
50	FLT50-3PH	Generation Trips			Generation Trips			Generation Trips		
51	FLT51-3PH	No	No	Yes	No	No	Yes	No	No	Yes
52	FLT52-SB	Generation Trips			Generation Trips			Generation Trips		
53	FLT53-3PH	No	No	Yes	No	No	Yes	No	No	Yes
54	FLT54-SB	No	No	Yes	No	No	Yes	No	No	Yes
55	FLT55-3PH	No	No	Yes	No	No	Yes	No	No	Yes
56	FLT56-3PH	No	No	Yes	No	No	Yes	No	No	Yes
57	FLT57-3PH	No	No	Yes	No	No	Yes	No	No	Yes
58	FLT58-3PH	No	No	Yes	No	No	Yes	No	No	Yes
59	FLT59-3PH	No	No	Yes	No	No	Yes	No	No	Yes
60	FLT60-PO	No	No	Yes	No	No	Yes	No	No	Yes
61	FLT61-SB	No	No	Yes	No	No	Yes	No	No	Yes
62	FLT62-3PH	Generation Trips			Generation Trips			Generation Trips		
63	FLT63-SB	Generation Trips			Generation Trips			Generation Trips		
64	FLT64-3PH	Generation Trips			Generation Trips			Generation Trips		
65	FLT65-SB	Generation Trips			Generation Trips			Generation Trips		
66	FLT66-3PH	Generation Trips			Generation Trips			Generation Trips		
67	FLT67-3PH	Generation Trips			Generation Trips			Generation Trips		
68	FLT68-SB	Generation Trips			Generation Trips			Generation Trips		
69	FLT69-PO	Generation Trips			Generation Trips			Generation Trips		
70	FLT70-SB	Generation Trips			Generation Trips			Generation Trips		
71	FLT71-3PH	No	No	Yes	No	No	Yes	No	No	Yes

Table 3-2 (Continued)
Cluster Scenario: Stability Analysis Summary of Results for 2015 Winter, 2015 Summer, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery		Stable?	Voltage Recovery		Stable?	Voltage Recovery		Stable?
		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.	
68	FLT68-SB	Generation Trips			Generation Trips			Generation Trips		
69	FLT69-PO	Generation Trips			Generation Trips			Generation Trips		
70	FLT70-SB	Generation Trips			Generation Trips			Generation Trips		
71	FLT71-3PH	No	No	Yes	No	No	Yes	No	No	Yes
72	FLT72-3PH	No	No	Yes	No	No	Yes	No	No	Yes
73	FLT73-3PH	No	No	Yes	No	No	Yes	No	No	Yes
74	FLT74-3PH	No	No	Yes	No	No	Yes	No	No	Yes
75	FLT75-3PH	No	No	Yes	No	No	Yes	No	No	Yes
76	FLT76-3PH	No	No	Yes	No	No	Yes	No	No	Yes
77	FLT77-3PH	No	No	Yes	No	No	Yes	No	No	Yes
78	FLT78-3PH	No	No	Yes	No	No	Yes	No	No	Yes
79	FLT79-3PH	No	No	Yes	No	No	Yes	No	No	Yes
80	FLT80-3PH	No	No	Yes	No	No	Yes	No	No	Yes
81	FLT81-3PH	No	No	Yes	No	No	Yes	No	No	Yes
82	FLT82-3PH	No	No	Yes	No	No	Yes	No	No	Yes
83	FLT83-3PH	No	No	Yes	No	No	Yes	No	No	Yes
84	FLT84-3PH	Removed			Removed			Removed		
85	FLT85-3PH	Removed			Removed			Removed		
86	FLT86-3PH	Removed			Removed			Removed		
87	FLT87-3PH	No	No	Yes	No	No	Yes	No	No	Yes
88	FLT88-3PH	No	No	Yes	No	No	Yes	No	No	Yes
89	FLT89-3PH	No	No	Yes	No	No	Yes	No	No	Yes
90	FLT90-3PH	No	No	Yes	No	No	Yes	No	No	Yes
91	FLT91-3PH	No	No	Yes	No	No	Yes	No	No	Yes
92	FLT92-3PH	No	No	Yes	No	No	Yes	No	No	Yes
93	FLT93-3PH	No	No	Yes	No	No	Yes	No	No	Yes
94	FLT94-3PH	No	No	Yes	No	No	Yes	No	No	Yes
95	FLT95-3PH	No	No	Yes	No	No	Yes	No	No	Yes
96	FLT96-3PH	No	No	Yes	No	No	Yes	No	No	Yes
97	FLT97-3PH	No	No	Yes	No	No	Yes	No	No	Yes
98	FLT98-PO	No	No	Yes	No	No	Yes	No	No	Yes
99	FLT99-3PH	Generation Trips			Generation Trips			Generation Trips		
100	FLT100-3PH	Generation Trips			Generation Trips			Generation Trips		
101	FLT101-3PH	Generation Trips			Generation Trips			Generation Trips		
102	FLT102-3PH	Generation Trips			Generation Trips			Generation Trips		
103	FLT103-3PH	Generation Trips			Generation Trips			Generation Trips		
104	FLT104-3PH	Generation Trips			Generation Trips			Generation Trips		
105	FLT105-3PH	Generation Trips			Generation Trips			Generation Trips		
106	FLT106-3PH	Generation Trips			Generation Trips			Generation Trips		
107	FLT107-3PH	Generation Trips			Generation Trips			Generation Trips		
108	FLT108-3PH	Generation Trips			Generation Trips			Generation Trips		
109	FLT109-SB	Removed			Removed			Removed		
110	FLT110-SB	Removed			Removed			Removed		
111	FLT111-SB	No	No	Yes	No	No	Yes	No	No	Yes
112	FLT112-3PH	No	No	Yes	No	No	Yes	No	No	Yes
113	FLT113-3PH	Removed			Removed			Removed		

Table 3-2 (Continued)
Cluster Scenario: Stability Analysis Summary of Results for 2015 Winter, 2015 Summer, and 2025 Summer Peak Conditions

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery			Voltage Recovery			Voltage Recovery		
		Less than .70 p.u.	Greater than 1.20 p.u.	Stable?	Less than .70 p.u.	Greater than 1.20 p.u.	Stable?	Less than .70 p.u.	Greater than 1.20 p.u.	Stable?
114	FLT114-3PH	Removed			Removed			Removed		
115	FLT115-3PH	Removed			Removed			Removed		
116	FLT116-3PH	Removed			Removed			Removed		
117	FLT117-3PH	N/A			N/A			Generation Trips		
118	FLT118-3PH	Removed			Removed			Removed		
119	FLT119-PO	Removed			Removed			Removed		
120	FLT120-PO	Removed			Removed			Removed		
121	FLT121-PO	Removed			Removed			Removed		
122	FLT122-3PH	Generation Trips			Generation Trips			Generation Trips		
123	FLT123-3PH	Removed			Removed			Removed		
124	FLT124-3PH	Removed			Removed			Removed		
125	FLT125-3PH	Removed			Removed			Removed		
126	FLT126-3PH	No	No	Yes	No	No	Yes	No	No	Yes
127	FLT127-3PH	No	No	Yes	No	No	Yes	No	No	Yes
128	FLT128-3PH	No	No	Yes	No	No	Yes	No	No	Yes
129	FLT129-3PH	No	No	Yes	Yes (1)	No	Yes	No	No	Yes
130	FLT130-3PH	No	No	Yes	Yes (1)	No	Yes	No	No	Yes
131	FLT131-3PH	No	No	Yes	No	No	Yes	No	No	Yes
132	FLT132-3PH	No	No	Yes	No	No	Yes	No	No	Yes
133	FLT133-3PH	No	No	Yes	No	No	Yes	No	No	Yes
134	FLT134-3PH	N/A			N/A			No	No	Yes
135	FLT135-3PH	N/A			N/A			No	No	Yes
136	FLT136-3PH	No	No	Yes	No	No	Yes	No	No	Yes

Several upgrades were required to resolve system violations. Normal three-phase faults and stuck breaker contingencies near the Tolk substation and Norton substation resulted in generation tripping offline (GEN-2014-047 and GEN-2014-066), which resulted in low and high bus voltages in the surrounding area. The following upgrades (Caprock Upgrade) were implemented to resolve system violations:

- Conversion and rebuild of the existing Norton-Pleasant Hill 115 kV line to a 230 kV circuit
- Add a 230/115kV transformer at Norton
- Model corrections at Caprock wind farm[5]
- Add an additional 18 Mvar fast switched capacitor at the Caprock Wind 34.5kV bus
- Add additional switched capacitors on the GEN-2014-066 34.5kV bus and apply the extended ride-through option
- Apply extended ride-through option for GEN-2014-047

[5] Model corrections included modeling the Caprock wind farm on a 600 V bus and modeling the plant's reactive compensation equipment including switch shunts, fast switched shunts, and dynamic reactive devices on the 34.5kV bus

- Add additional switched capacitors and an 8 Mvar STATCOM on the ASGI-2014-002 34.5kV bus

The listed Caprock Upgrades were required to mitigate violations for all study years and seasons.

Refer to Figure 3-1 for a comparison plot of the real power for GEN-2014-047 and GEN-2014-066 (Norton 115 kV) for FLT50-3PH for the 2015 Summer Peak case with and without system upgrades. Refer to Figure 3-2 for a comparison plot of select bus voltages for FLT62-3PH for the 2025 Summer Peak case with and without upgrades. With the required upgrades all generation remained stable and online. System recovery was improved for buses with low voltages less than 0.7 p.u. and the voltage recovery was determined to be acceptable.

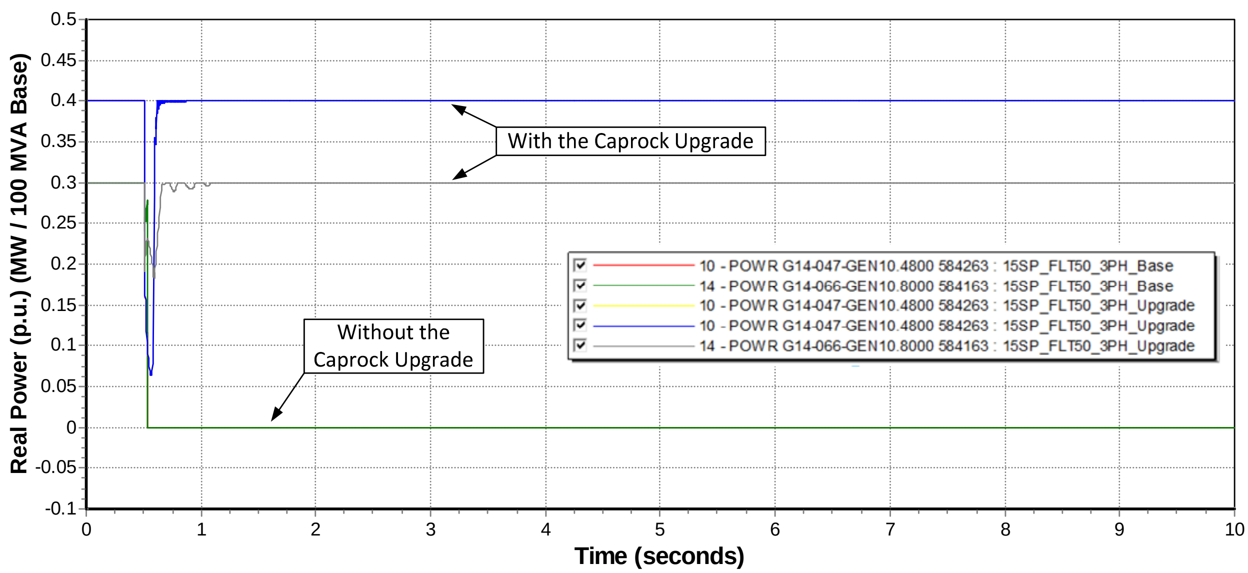

Figure 3-1. Comparison plot of real power of GEN-2014-047 and GEN-2014-066 for FLT50-3PH for the 2015 Summer Peak case with and without upgrades.

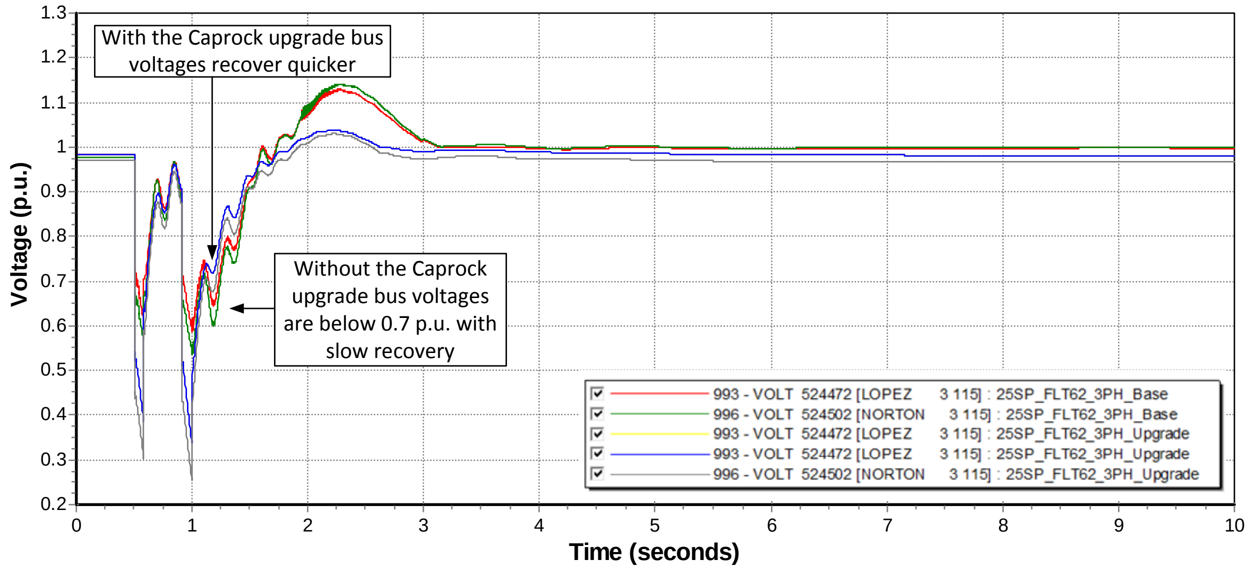

Figure 3-2. Comparison plot of select bus voltages for FLT62-3PH for the 2025 Summer Peak case with and without upgrades.

Contingency FLT87-3PH, a three-phase fault on the TUCO to OKU 345 kV line resulted in a low voltage recovery (final voltage less than 0.9 p.u.) for the Border 345 kV bus for 2015 Summer Peak and 2015 Winter Peak conditions. The 50 Mvar capacitor bank at the Border 345 kV substation was removed[6] and a +125/-0 Mvar SVC was placed to regulate the Border bus at 1.02 p.u. Refer to Figure 3-3 for a comparison plot of the voltage at the Border 345 kV bus for FLT87-3PH for 2015 Summer Peak conditions with and without the Border SVC.

[6] SPP initially added the 50 Mvar capacitor bank at Border in order to solve the powerflow model prior to thte withdrawal of GEN-2014-062 from the SPP queue. After the withdrawal of GEN-2014-062 (200.1 MW on the Tolk to Eddy County 345 kV line) the 50 Mvar capacitor bank was no longer needed for the power flow solution.

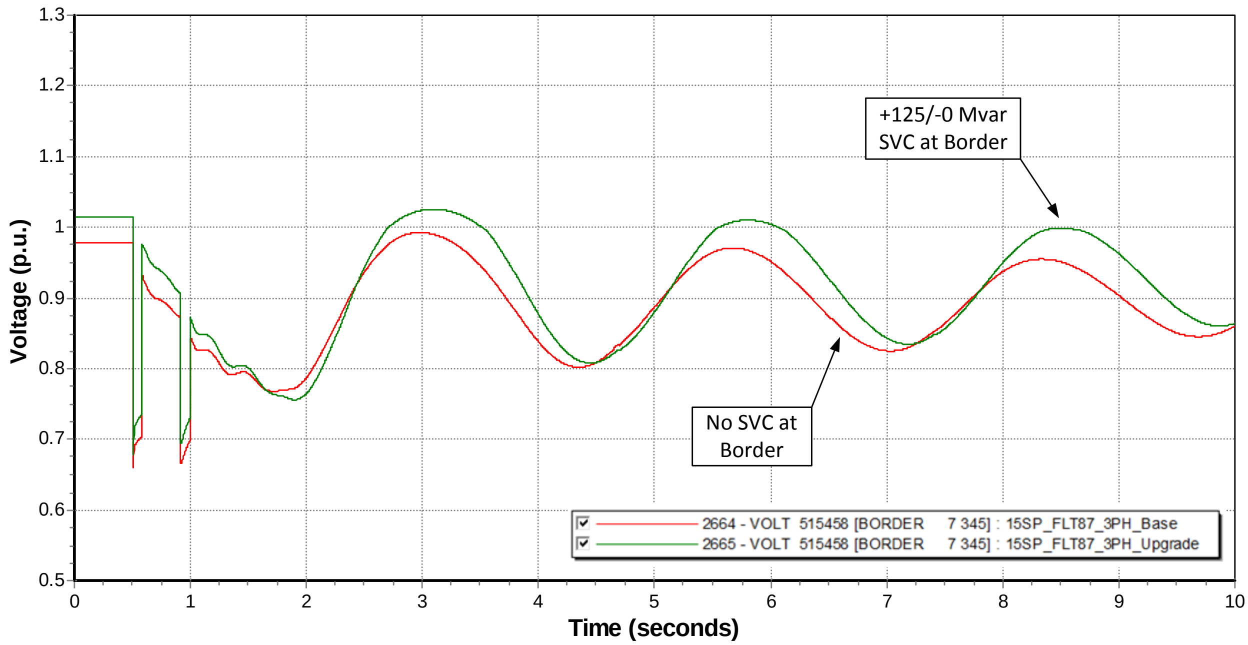

Figure 3-3. Comparison plot of the Border 345 kV bus for FLT87-3PH for the 2015 Summer Peak case with and without upgrades.

Contingency FLT129-3PH and FLT130-3PH, faults at the Border 345 kV substation resulted in low voltages near the OKU 345 kV bus. 150 Mvar of additional capacitor banks were added to the OKU 345 kV bus resulting in a total of 240 Mvar of capacitive support at the substation. A +150/-0 Mvar SVC was added to regulate the OKU bus at 1.00 p.u. which eliminated the low voltages. The capacitor bank and SVC were required to mitigate violations for the 2015 Summer Peak and 2015 Winter Peak cases.

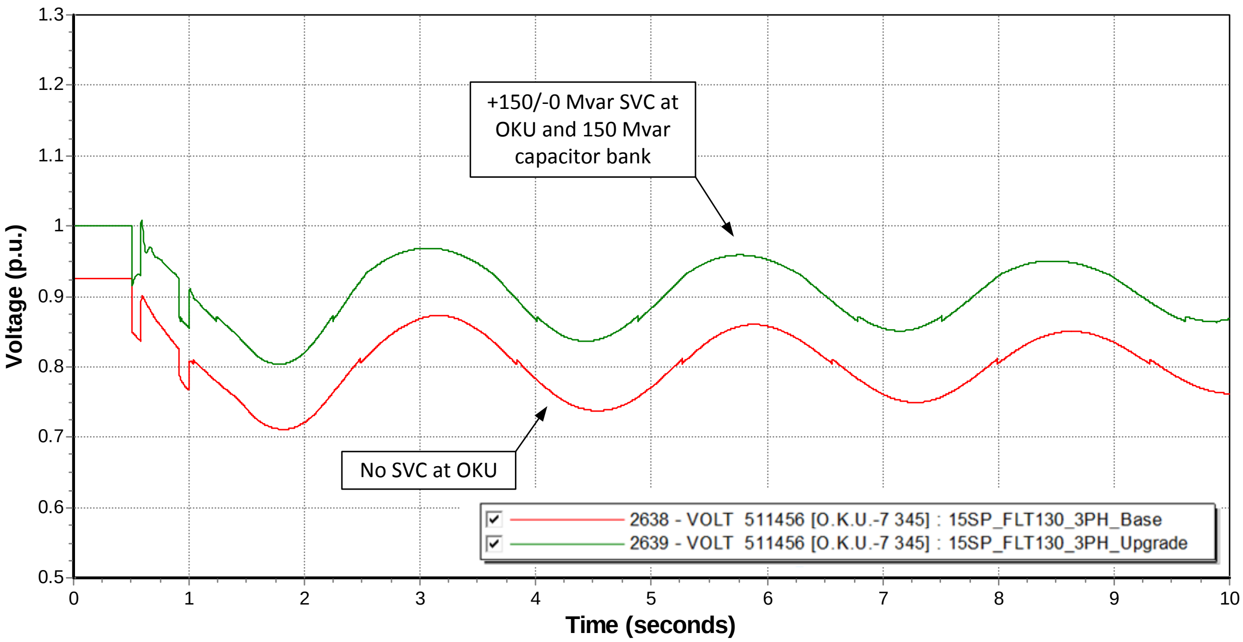

Figure 3-4. Comparison plot of the OKU 345 kV bus for FLT130-3PH for the 2015 Summer Peak case with and without upgrades.

After all required upgrades were implemented; the Stability Analysis was re-simulated to determine system stability. With the required upgrades, the Stability Analysis determined that that there was no wind turbine tripping or system instability as a result of interconnecting all study projects at 100% output. Refer to Table 3-3 for a summary of the Stability Analysis results with all upgrades implemented.

Table 3-3
Cluster Scenario: Stability Analysis Summary of Results for 2015 Winter, 2015 Summer, and 2025 Summer Peak Conditions with All Upgrades

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery		Stable?	Voltage Recovery		Stable?	Voltage Recovery		Stable?
		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	No	No	Yes	No	No	Yes	No	No	Yes
2	FLT02-3PH	No	No	Yes	No	No	Yes	No	No	Yes
3	FLT03-3PH	No	No	Yes	No	No	Yes	No	No	Yes
4	FLT04-3PH	No	No	Yes	No	No	Yes	No	No	Yes
5	FLT05-3PH	No	No	Yes	No	No	Yes	No	No	Yes
6	FLT06-3PH	No	No	Yes	No	No	Yes	No	No	Yes
7	FLT07-3PH	No	No	Yes	No	No	Yes	No	No	Yes
8	FLT08-3PH	No	No	Yes	No	No	Yes	No	No	Yes
9	FLT09-3PH	No	No	Yes	No	No	Yes	No	No	Yes
10	FLT10-3PH	No	No	Yes	No	No	Yes	No	No	Yes
11	FLT11-3PH	No	No	Yes	No	No	Yes	No	No	Yes
12	FLT12-3PH	No	No	Yes	No	No	Yes	No	No	Yes
13	FLT13-3PH	No	No	Yes	No	No	Yes	No	No	Yes
14	FLT14-3PH	No	No	Yes	No	No	Yes	No	No	Yes
15	FLT15-3PH	No	No	Yes	No	No	Yes	No	No	Yes
16	FLT16-3PH	No	No	Yes	No	No	Yes	No	No	Yes
17	FLT17-3PH	Removed			Removed			Removed		
18	FLT18-3PH	No	No	Yes	No	No	Yes	No	No	Yes
19	FLT19-3PH	Removed			Removed			Removed		
20	FLT20-3PH	No	No	Yes	No	No	Yes	No	No	Yes
21	FLT21-3PH	No	No	Yes	No	No	Yes	No	No	Yes
22	FLT22-3PH	No	No	Yes	No	No	Yes	No	No	Yes
23	FLT23-3PH	No	No	Yes	No	No	Yes	No	No	Yes
24	FLT24-3PH	No	No	Yes	No	No	Yes	No	No	Yes
25	FLT25-3PH	No	No	Yes	No	No	Yes	No	No	Yes
26	FLT26-3PH	Removed			Removed			Removed		
27	FLT27-3PH	Removed			Removed			Removed		
28	FLT28-3PH	No	No	Yes	No	No	Yes	No	No	Yes
29	FLT29-3PH	N/A			No	No	Yes	No	No	Yes
30	FLT30-3PH	N/A			No	No	Yes	No	No	Yes
31	FLT31-3PH	N/A			No	No	Yes	No	No	Yes
32	FLT32-3PH	No	No	Yes	No	No	Yes	No	No	Yes
33	FLT33-3PH	No	No	Yes	No	No	Yes	No	No	Yes
34	FLT34-3PH	No	No	Yes	No	No	Yes	No	No	Yes
35	FLT35-3PH	No	No	Yes	No	No	Yes	No	No	Yes
36	FLT36-3PH	No	No	Yes	No	No	Yes	No	No	Yes
37	FLT37-3PH	No	No	Yes	No	No	Yes	No	No	Yes
38	FLT38-3PH	No	No	Yes	No	No	Yes	No	No	Yes
39	FLT39-3PH	No	No	Yes	No	No	Yes	No	No	Yes
40	FLT40-3PH	No	No	Yes	No	No	Yes	No	No	Yes
41	FLT41-3PH	No	No	Yes	No	No	Yes	No	No	Yes
42	FLT42-3PH	No	No	Yes	No	No	Yes	No	No	Yes
43	FLT43-3PH	No	No	Yes	No	No	Yes	No	No	Yes
44	FLT44-3PH	No	No	Yes	No	No	Yes	No	No	Yes

Table 3-3 (Continued)
Cluster Scenario: Stability Analysis Summary of Results for 2015 Winter, 2015 Summer, and 2025 Summer Peak Conditions with All Upgrades

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery		Stable?	Voltage Recovery		Stable?	Voltage Recovery		Stable?
		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.	
45	FLT45-3PH	No	No	Yes	No	No	Yes	No	No	Yes
46	FLT46-3PH	No	No	Yes	No	No	Yes	No	No	Yes
47	FLT47-3PH	No	No	Yes	No	No	Yes	No	No	Yes
48	FLT48-3PH	No	No	Yes	No	No	Yes	No	No	Yes
49	FLT49-3PH	No	No	Yes	No	No	Yes	No	No	Yes
50	FLT50-3PH	No	No	Yes	Yes[1] (2)	No	Yes	Yes[1] (3)	No	Yes
51	FLT51-3PH	No	No	Yes	No	No	Yes	No	No	Yes
52	FLT52-SB	No	No	Yes	No	No	Yes	No	No	Yes
53	FLT53-3PH	No	No	Yes	No	No	Yes	No	No	Yes
54	FLT54-SB	No	No	Yes	No	No	Yes	No	No	Yes
55	FLT55-3PH	No	No	Yes	No	No	Yes	No	No	Yes
56	FLT56-3PH	No	No	Yes	No	No	Yes	No	No	Yes
57	FLT57-3PH	No	No	Yes	No	No	Yes	No	No	Yes
58	FLT58-3PH	No	No	Yes	No	No	Yes	No	No	Yes
59	FLT59-3PH	No	No	Yes	No	No	Yes	No	No	Yes
60	FLT60-PO	No	No	Yes	No	No	Yes	No	No	Yes
61	FLT61-SB	No	No	Yes	No	No	Yes	No	No	Yes
62	FLT62-3PH	Yes[1] (11)	No	Yes	Yes[1] (11)	No	Yes	Yes[1] (13)	No	Yes
63	FLT63-SB	No	No	Yes	No	No	Yes	No	No	Yes
64	FLT64-3PH	Yes[1] (11)	No	Yes	Yes[1] (11)	No	Yes	Yes[1] (12)	No	Yes
65	FLT65-SB	No	No	Yes	No	No	Yes	No	No	Yes
66	FLT66-3PH	No	No	Yes	No	No	Yes	No	No	Yes
67	FLT67-3PH	Yes[1] (11)	No	Yes	Yes[1] (11)	No	Yes	Yes[1] (11)	No	Yes
68	FLT68-SB	No	No	Yes	No	No	Yes	No	No	Yes
69	FLT69-PO	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes
70	FLT70-SB	No	No	Yes	No	No	Yes	No	No	Yes
71	FLT71-3PH	No	No	Yes	No	No	Yes	No	No	Yes
72	FLT72-3PH	No	No	Yes	No	No	Yes	No	No	Yes
73	FLT73-3PH	No	No	Yes	No	No	Yes	No	No	Yes
74	FLT74-3PH	No	No	Yes	No	No	Yes	No	No	Yes
75	FLT75-3PH	No	No	Yes	No	No	Yes	No	No	Yes
76	FLT76-3PH	No	No	Yes	No	No	Yes	No	No	Yes
77	FLT77-3PH	No	No	Yes	No	No	Yes	No	No	Yes
78	FLT78-3PH	No	No	Yes	No	No	Yes	No	No	Yes
79	FLT79-3PH	No	No	Yes	No	No	Yes	No	No	Yes
80	FLT80-3PH	No	No	Yes	No	No	Yes	No	No	Yes
81	FLT81-3PH	No	No	Yes	No	No	Yes	No	No	Yes
82	FLT82-3PH	No	No	Yes	No	No	Yes	No	No	Yes
83	FLT83-3PH	No	No	Yes	No	No	Yes	No	No	Yes
84	FLT84-3PH	Removed			Removed			Removed		
85	FLT85-3PH	Removed			Removed			Removed		

Note[1]: Low voltages were observed below 0.7 p.u. for multiple contingencies even with upgrades. The Caprock Upgrade helped improve the system recovery near the Caprock substation and the voltage recovery was determined to be acceptable.

Table 3-3 (Continued)
Cluster Scenario: Stability Analysis Summary of Results for 2015 Winter, 2015 Summer, and 2025 Summer Peak Conditions with All Upgrades

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery		Stable?	Voltage Recovery		Stable?	Voltage Recovery		Stable?
		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.	
86	FLT86-3PH	Removed			Removed			Removed		
87	FLT87-3PH	No	No	Yes	No	No	Yes	No	No	Yes
88	FLT88-3PH	No	No	Yes	No	No	Yes	No	No	Yes
89	FLT89-3PH	No	No	Yes	No	No	Yes	No	No	Yes
90	FLT90-3PH	No	No	Yes	No	No	Yes	No	No	Yes
91	FLT91-3PH	No	No	Yes	No	No	Yes	No	No	Yes
92	FLT92-3PH	No	No	Yes	No	No	Yes	No	No	Yes
93	FLT93-3PH	No	No	Yes	No	No	Yes	No	No	Yes
94	FLT94-3PH	No	No	Yes	No	No	Yes	No	No	Yes
95	FLT95-3PH	No	No	Yes	No	No	Yes	No	No	Yes
96	FLT96-3PH	No	No	Yes	No	No	Yes	No	No	Yes
97	FLT97-3PH	No	No	Yes	No	No	Yes	No	No	Yes
98	FLT98-PO	No	No	Yes	No	No	Yes	No	No	Yes
99	FLT99-3PH	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes
100	FLT100-3PH	No	No	Yes	No	No	Yes	No	No	Yes
101	FLT101-3PH	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes
102	FLT102-3PH	No	No	Yes	No	No	Yes	No	No	Yes
103	FLT103-3PH	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes	No	No	Yes
104	FLT104-3PH	Yes[1] (8)	No	Yes	Yes[1] (8)	No	Yes	Yes[1] (6)	No	Yes
105	FLT105-3PH	Yes[1] (8)	No	Yes	Yes[1] (8)	No	Yes	Yes[1] (6)	No	Yes
106	FLT106-3PH	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes	Yes[1] (2)	No	Yes
107	FLT107-3PH	No	No	Yes	No	No	Yes	No	No	Yes
108	FLT108-3PH	No	No	Yes	No	No	Yes	No	No	Yes
109	FLT109-SB	Removed			Removed			Removed		
110	FLT110-SB	Removed			Removed			Removed		
111	FLT111-SB	No	No	Yes	No	No	Yes	No	No	Yes
112	FLT112-3PH	No	No	Yes	No	No	Yes	No	No	Yes
113	FLT113-3PH	Removed			Removed			Removed		
114	FLT114-3PH	Removed			Removed			Removed		
115	FLT115-3PH	Removed			Removed			Removed		
116	FLT116-3PH	Removed			Removed			Removed		
117	FLT117-3PH	N/A			N/A			No	No	Yes
118	FLT118-3PH	Removed			Removed			Removed		
119	FLT119-PO	Removed			Removed			Removed		
120	FLT120-PO	Removed			Removed			Removed		
121	FLT121-PO	Removed			Removed			Removed		
122	FLT122-3PH	No	No	Yes	No	No	Yes	No	No	Yes
123	FLT123-3PH	Removed			Removed			Removed		
124	FLT124-3PH	Removed			Removed			Removed		

Note[1]: Low voltages were observed below 0.7 p.u. for multiple contingencies even with upgrades. The Caprock Upgrade helped improve the system recovery near the Caprock substation and the voltage recovery was determined to be acceptable.

Table 3-3 (Continued)
Cluster Scenario: Stability Analysis Summary of Results for 2015 Winter, 2015 Summer, and 2025 Summer Peak Conditions with All Upgrades

Cont. No.	Cont. Name	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Voltage Recovery		Stable?	Voltage Recovery		Stable?	Voltage Recovery		Stable?
		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.	
125	FLT125-3PH	Removed			Removed			Removed		
126	FLT126-3PH	No	No	Yes	No	No	Yes	No	No	Yes
127	FLT127-3PH	No	No	Yes	No	No	Yes	No	No	Yes
128	FLT128-3PH	No	No	Yes	No	No	Yes	No	No	Yes
129	FLT129-3PH	No	No	Yes	No	No	Yes	No	No	Yes
130	FLT130-3PH	No	No	Yes	No	No	Yes	No	No	Yes
131	FLT131-3PH	No	No	Yes	No	No	Yes	No	No	Yes
132	FLT132-3PH	No	No	Yes	No	No	Yes	No	No	Yes
133	FLT133-3PH	No	No	Yes	No	No	Yes	No	No	Yes
134	FLT134-3PH	N/A			N/A			No	No	Yes
135	FLT135-3PH	N/A			N/A			No	No	Yes
136	FLT136-3PH	No	No	Yes	No	No	Yes	No	No	Yes

Refer to Appendix B, Appendix C, and Appendix D for a complete set of plots for all contingencies for 2015 Summer Peak, 2015 Winter Peak, and 2025 Summer Peak conditions, respectively.

SECTION 4: SHORT CIRCUIT ANALYSIS

The objective of this task is to quantify the three-phase to ground fault currents for the 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

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

4.2 Short Circuit Results

The maximum fault current for each bus is provided for the 2015 Summer Peak, 2015 Winter Peak, and 2025 Summer Peak condition. The following tables show the short circuit results for the study generators:

- Table 4-1: Short Circuit Analysis for GEN-2013-027
- Table 4-2: Short Circuit Analysis for the Chaves County POI
- Table 4-3: Short Circuit Analysis for the GEN-2014-047
- Table 4-4: Short Circuit Analysis for the Carlisle POI
- Table 4-5: Short Circuit Analysis for GEN-2014-063
- Table 4-6: Short Circuit Analysis for GEN-2014-066
- Table 4-7: Short Circuit Analysis for GEN-2014-070
- Table 4-8: Short Circuit Analysis for ASGI-2014-002
- Table 4-9: Short Circuit Analysis for ASGI-2014-005
- Table 4-10: Short Circuit Analysis for ASGI-2014-008
- Table 4-11: Short Circuit Analysis for ASGI-2014-009

- Table 4-12: Short Circuit Analysis for ASGI-2014-010
- Table 4-13: Short Circuit Analysis for ASGI-2014-012

Table 4-1
Short Circuit Analysis for Study Project GEN-2013-027

Study Generator GEN-2013-027											
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)
562480	G13-027-TAP	230	9.91	525614	W_LITLFLDTP3	115	8.25	526036	LC-OPDYKE	115	5.77
525531	TOLK_WEST	230	28.93	560007	G08-022-TAP	345	5.30	526424	PACIFIC	115	8.84
526935	YOAKUM	230	17.61	525608	NEW_AMHERST3	115	5.32	526445	AMOCO_TP	115	9.88
583840	GEN-2013-027	230	8.87	526020	HOCKLEY	115	5.52	525018	EMULESH&VLY3	115	5.85
524909	ROSEVELT_N	230	9.13	527275	SEMINOLE	115	11.40	525414	LAMTON	115	7.94
525481	PLANT_X	230	27.78	527062	SHELL_CO2	115	15.66	525326	COX	115	6.03
525543	TOLK_TAP	230	28.93	527130	DENVER_N	115	20.53	525615	W_LITTLFLD	115	7.71
525637	LAMB_CNTY	230	5.61	527136	DENVER_S	115	20.53	527802	EDDY_CNTY	345	4.23
526460	AMOCO_SS	230	9.70	527202	SEAGRAVES	115	8.45	577103	GEN-2008-022	345	5.03
527010	OXYBRU_TP	230	13.95	527865	CUNNINHAM	230	16.90	584260	GEN-2014-047	345	4.30
527149	MUSTANG	230	15.60	584240	GEN-2014-063	345	3.13	525594	SUDANRURAL	115	4.78
560018	G14-070-TAP	230	9.29	527891	HOBBS_INT	115	32.35	526019	HOCKLEY	269	5.16
526934	YOAKUM	115	16.16	526736	TERRY_CNTY	115	10.10	527105	SAN_ANDS_TP3	115	16.29
526936	YOAKUM_345	345	9.25	526944	LG-PLAINS	115	7.34	527238	ROZ	115	9.26
524770	PLSNT_HILL	230	6.28	527018	BENNETT	115	12.96	527242	AMERADA	115	9.36
524911	ROSEVELT_S	230	9.13	527047	OXY_WILRD	115	10.37	527322	GAINES	115	8.53
524915	SW_4K33	230	9.13	511456	O.K.U.-7	345	5.05	527340	DOSS	115	7.14
524908	ROOSEVELT	115	10.35	515458	BORDER	345	5.00	527051	ODC_TP	115	12.98
524623	DEAFSMITH	230	8.00	527965	KIOWA	345	5.94	527080	EL_PASO	115	15.43
525461	NEWHART	230	10.88	528611	GAINESGENTP7	345	7.49	527286	XTO_RUSSEL	115	9.99
525524	TOLK_EAST	230	28.93	524885	SN_JUAN_TAP6	230	4.71	527036	SHELL_C2	115	12.70
526435	SUNDOWN	230	11.04	524874	OASIS	115	9.59	527262	SULPHUR	115	5.62
525480	PLANT_X	115	26.04	524502	NORTON	115	4.92	527800	EDDY_SOUTH	230	7.70
525549	TOLK	345	7.11	524773	E_CLOVIS	115	8.56	527963	POTASH_JCT	230	6.91
525636	LAMB_CNTY	115	9.69	524776	N_CLOVIS_TP3	115	6.48	527864	CUNNINHAM	115	29.15
526784	AMOCOWASSON6	230	13.85	524831	FE-HOLLAND	115	8.44	527363	HIGG	115	10.17
527151	GS-MUSTANG	230	15.60	524669	DS-#20	115	4.80	528334	LE-LOVINTON3	115	8.52
527276	SEMINOLE	230	7.25	524764	NORRIS_TP	115	10.40	528355	MADDOX	115	27.20
527146	MUSTANG	115	22.12	524838	FE-CLOVIS2	115	9.86	528435	MILLEN	115	11.59
527894	HOBBS_INT	230	18.37	525028	BAILEYCO	115	6.37	526491	LG-CLAUENE	115	7.72
584130	GEN-2014-070	230	9.17	524935	KILGORE	115	5.95	526352	LEHMAN	115	4.89
526792	PRENTICE	115	5.82	524977	MARKET_ST	115	5.52	527046	ARCO_WILRD	115	10.35
526928	LE-PLNSINT	115	9.14	524290	WILDOR2_JUS6	230	6.64	511468	L.E.S.-7	345	11.91
527041	ARCO_TP	115	12.87	524266	BUSHLAND	115	9.37	599891	OKLAUN	345	4.04
527194	LG-PLSHILL	115	7.46	524567	NE_HEREFORD3	115	9.47	515375	WWRDEHV7	345	20.16
525832	TUCO_INT	345	11.62	524597	PANDAHFD	115	8.28	583090	GEN-2011-049	345	4.54
527896	HOBBS_INT	345	9.61	524606	HEREFORD	115	10.61	528027	RDRUNNER	345	3.89
524875	OASIS	230	7.58	524734	DS-#21	115	9.61	528185	NLOV_PLT	345	4.63
560023	NORTON	230	3.32	523309	MOORE_CNTY	230	6.62	527962	POTASH_JCT	115	15.27
524768	PLSNT_HILL	115	9.44	523869	CHAN/TASCOS6	230	3.79	528604	ANDREWS	345	6.05
599955	PNM-DC6	230	9.13	523979	HARRNG_EST	230	26.13	528610	GAINES_GEN	345	6.94
524822	CURRY	115	10.43	524010	ROLLHILLS	230	19.38	525635	LAMB_CNTY	69	6.24
524924	PORTALES	115	7.26	523961	POTTER_CO	345	7.69	528626	LE-PLNSINT	69	3.56
524267	BUSHLAND	230	9.72	524415	AMA_SOUTH	230	13.42	524821	CURRY	69	4.33
524622	DEAFSMITH	115	11.82	525212	SWISHER	115	10.30	524923	PORTALES	69	7.13
523959	POTTER_CO	230	20.42	524746	CASTRO_CNTY3	115	10.19	525453	HALE_CNTY	69	6.96
525213	SWISHER	230	10.19	525124	HART_INDUST3	115	7.59	525607	NEW_AMHERST2	69	3.22

Table 4-1 (Continued)
Short Circuit Analysis for Study Project GEN-2013-027

Study Generator GEN-2013-027											
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)
525460	NEWHART	115	14.98	525192	KRESS_INT	115	11.18	526019	HOCKLEY	69	5.16
525830	TUCO_INT	230	21.93	525840	ANTELOPE_1	230	21.76	525620	LTFLD_S&CTY2	69	4.34
526525	WOLFFORTH	230	13.70	526161	CARLISLE	230	13.76	525650	LC-LITTLFLD2	69	5.17
526434	SUNDOWN	115	10.51	526337	JONES	230	21.04	525687	LC-LUMSCHAP2	69	4.82
525019	EMU&VLY_TP	115	6.43	583340	GEN-2012-020	230	9.06	527125	DENVER_CTY	69	8.59
525056	BC-EARTH	115	8.85	525828	TUCO_INT	115	19.92	527201	SEAGRAVES	69	5.38
525440	LC-S_OLTON	115	7.64	526269	LUBBCK_STH	230	19.05	526735	TERRY_CNTY	69	6.87
525454	HALE_CNTY	115	10.32	526524	WOLFFORTH	115	11.58	528740	LE-PLANS_TP2	69	2.74

Table 4-2
Short Circuit Analysis for Study Projects GEN-2014-033, GEN-2014-034, GEN-2014-035 (Chaves County)

Study Generators GEN-2014-033, GEN-2014-034, GEN-2014-035											
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)
527482	CHAVES_CNTY3	115	6.23	527564	ROSWLL_INT	115	5.24	527575	SW_4702	69	3.21
527501	URTON	115	5.28	583960	GEN-2014-034	115	5.79	527711	EAGLE_CREEK3	115	7.19
527508	PRICE	115	4.91	527534	BRASHER_TP	115	5.21	527793	EDDY_STH	115	10.80
527546	SAMSON	115	5.02	527541	CAPITAN	115	4.41	527828	CV-12MH	115	10.33
583950	GEN-2014-033	115	6.23	527597	TWEEDY	115	4.88	527800	EDDY_SOUTH	230	7.70
583970	GEN-2014-035	115	5.93	527563	ROSWLL_INT	69	3.52	527540	CAPITAN	69	2.21
527483	CHAVES_CNTY6	230	4.07	527536	BRASHER	115	4.78	527552	RIAC	69	2.99
527522	ROSWELL_CTY3	115	5.01	527798	EDDY_NTH	115	10.80	527589	CV-ORCHARD	69	2.00
527515	CV-PINE	115	4.56	527528	RIAC_TP	69	3.37				

Table 4-3
Short Circuit Analysis for Study Project GEN-2014-047

Study Generator GEN-2014-047

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)
560007	G08-022-TAP	345	5.30	527865	CUNNINHAM	230	16.90	583840	GEN-2013-027	230	8.87
525549	TOLK	345	7.11	528095	7-RIVERS	230	5.97	524875	OASIS	230	7.58
527802	EDDY_CNTY	345	4.23	527798	EDDY_NTH	115	10.80	524889	SN_JUAN_WND6	230	4.51
577103	GEN-2008-022	345	5.03	527821	CV-DAYTON	115	6.83	527501	URTON	115	5.28
584260	GEN-2014-047	345	4.30	528178	PECOS	115	11.36	527508	PRICE	115	4.91
525543	TOLK_TAP	230	28.93	524915	SW_4K33	230	9.13	527546	SAMSON	115	5.02
527799	EDDY_NORTH	230	7.70	599955	PNM-DC6	230	9.13	583950	GEN-2014-033	115	6.23
577104	G08-022-WEST	345	4.73	524623	DEAFSMITH	230	8.00	583970	GEN-2014-035	115	5.93
525524	TOLK_EAST	230	28.93	525461	NEWHART	230	10.88	527894	HOBBS_INT	230	18.37
525531	TOLK_WEST	230	28.93	526435	SUNDOWN	230	11.04	527963	POTASH_JCT	230	6.91
527483	CHAVES_CNTY6	230	4.07	525480	PLANT_X	115	26.04	527864	CUNNINHAM	115	29.15
527800	EDDY_SOUTH	230	7.70	525213	SWISHER	230	10.19	528179	PECOS	230	6.33
599960	EPTNP-D6	230	7.70	525840	ANTELOPE_1	230	21.76	528094	7-RIVERS	115	8.11
527793	EDDY_STH	115	10.80	526161	CARLISLE	230	13.76	527597	TWEEDY	115	4.88
524911	ROSEVELT_S	230	9.13	526337	JONES	230	21.04	527711	EAGLE_CREEK3	115	7.19
525481	PLANT_X	230	27.78	583340	GEN-2012-020	230	9.06	527828	CV-12MH	115	10.33
525830	TUCO_INT	230	21.93	525828	TUCO_INT	115	19.92	527786	ATOKA	115	6.93
524909	ROSEVELT_N	230	9.13	525832	TUCO_INT	345	11.62	528070	CV-AZMESA	115	7.29
525637	LAMB_CNTY	230	5.61	524770	PLSNT_HILL	230	6.28	528132	OCOTILLO	115	6.04
562480	G13-027-TAP	230	9.91	524908	ROOSEVELT	115	10.35	528137	N_CANAL	115	8.42
524885	SN_JUAN_TAP6	230	4.71	525636	LAMB_CNTY	115	9.69	528160	CARLSBAD	115	10.80
527482	CHAVES_CNTY3	115	6.23	526935	YOAKUM	230	17.61	528226	HOPI_SUB	115	6.74

Table 4-4
Short Circuit Analysis for Study Projects GEN-2014-053 and GEN-2014-054 (Carlisle)

Study Generators GEN-2014-053 and GEN-2014-054

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)
526161	CARLISLE	230	13.76	526676	GRASSLAND	115	6.17	525440	LC-S_OLTON	115	7.64
522823	LP-MILWAKEE6	230	13.32	525326	COX	115	6.03	525614	W_LITLFLDTP3	115	8.25
525830	TUCO_INT	230	21.93	525414	LAMTON	115	7.94	560007	G08-022-TAP	345	5.30
526525	WOLFFORTH	230	13.70	525453	HALE_CNTY	69	6.96	526656	LYNN_CNTY	115	5.66
584030	G14053&14054	230	8.28	562004	G11-025-TAP	115	5.83	526694	GRAHAM	115	2.68
522861	LP-SOUTHEST6	230	17.14	525779	FLOYD_CNTY	69	5.55	525272	KISER	115	5.15
522828	LP-MILWAKEE2	69	8.41	526146	INDIANA	115	9.71	525325	COX	69	3.39
525213	SWISHER	230	10.19	525926	CROSBY	115	5.14	525413	LAMTON	69	5.26
525524	TOLK_EAST	230	28.93	526297	LUBBCK_EST	69	8.07	525291	PLAINVW_TP	69	6.53
525840	ANTELOPE_1	230	21.76	525731	SP-ABERNTHY2	69	3.02	525298	S_PLAINVEW	69	2.59
526337	JONES	230	21.04	525738	HALECENTER	69	2.46	525432	SP-HALFWAY	69	5.90
583340	GEN-2012-020	230	9.06	525853	LH-WIL&ELLN2	69	2.58	581137	GEN-2011-025	115	5.83
525828	TUCO_INT	115	19.92	525885	SP-NEWDEAL	69	3.39	525769	BARWISE	69	3.89
525832	TUCO_INT	345	11.62	511468	L.E.S.-7	345	11.91	525790	FLOYDADA_TP2	69	2.55
526269	LUBBCK_STH	230	19.05	599891	OKLAUN	345	4.04	525811	LH-HARMONY	69	4.41
526435	SUNDOWN	230	11.04	515375	WWRDEHV7	345	20.16	526109	SP-ERSKINE	115	11.52
526524	WOLFFORTH	115	11.58	583090	GEN-2011-049	345	4.54	525925	CROSBY	69	4.87
522870	LP-HOLLY	230	16.93	527896	HOBBS_INT	345	9.61	526284	PLANTERS	69	6.34
522857	LP-SOUTHEST2	69	22.81	526935	YOAKUM	230	17.61	526310	CLUTTER	69	5.47
522822	LP-NORTHWST2	69	4.64	526213	ALLEN	115	10.77	526562	SLATON	69	2.48
522832	LP-VICKSBRG2	69	14.51	526602	SP-WOODROW	115	9.44	525724	COUNTYLINE	69	2.21
524415	AMA_SOUTH	230	13.42	526267	LUBBCK_STH	69	4.36	525745	LH-HALECTR	69	2.43
525461	NEWHART	230	10.88	526036	LC-OPDYKE	115	5.77	525860	SP-BECTON	69	2.29
525212	SWISHER	115	10.30	526424	PACIFIC	115	8.84	525892	WHITE&MONRO2	69	2.56
524911	ROSEVELT_S	230	9.13	526445	AMOCO_TP	115	9.88	515800	GRACMNT7	345	14.47

Table 4-4 (Continued)
Short Circuit Analysis for Study Projects GEN-2014-053 and GEN-2014-054 (Carlisle)

Study Generators GEN-2014-053 and GEN-2014-054											
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)
525481	PLANT_X	230	27.78	526469	SP-YUMA	69	3.01	560013	G14-057T	345	9.02
525543	TOLK_TAP	230	28.93	526481	SP-WOLF_TP	115	11.29	511467	L.E.S.-4	138	23.39
526299	LUBBCK_EST	230	13.50	526491	LG-CLAUENE	115	7.72	590001	OKLEHV24	138	4.79
526677	GRASSLAND	230	6.53	526792	PRENTICE	115	5.82	590003	OKLEHV14	138	4.80
525454	HALE_CNTY	115	10.32	527130	DENVER_N	115	20.53	539801	THISTLE7	345	15.77
525780	FLOYD_CNTY	115	6.61	527262	SULPHUR	115	5.62	560000	G11-14-TAP	345	13.96
526076	STANTON_W	115	9.29	526735	TERRY_CNTY	69	6.87	562075	G11-051-TAP	345	16.69
526298	LUBBCK_EST	115	15.48	522819	LP-NORTHEST2	69	13.14	579351	GEN-2007-062	345	8.56
525816	TUCO_INT2	69	4.67	522879	LP-WADSWRTH2	69	22.80	582019	GEN-2011-019	345	20.16
525826	TUCO_INT	69	7.91	522844	LP-COOP	69	22.02	582020	GEN-2011-020	345	20.16
511456	O.K.U.-7	345	5.05	522810	LP-ERSKINE	69	13.90	515376	WWRDEHV4	138	25.40
515458	BORDER	345	5.00	523551	HUTCHISON	230	7.19	527965	KIOWA	345	5.94
526936	YOAKUM_345	345	9.25	523771	GRAPEVINE	230	5.71	528611	GAINESGENTP7	345	7.49
526268	LUBBCK_STH	115	19.16	523977	HARRNG_WST	230	26.13	527894	HOBBS_INT	230	18.37
526460	AMOCO_SS	230	9.70	523978	HARRNG_MID	230	26.13	527010	OXYBRU_TP	230	13.95
526434	SUNDOWN	115	10.51	524043	NICHOLS	115	30.54	527149	MUSTANG	230	15.60
526475	YUMA_INT	115	11.09	524364	RANDALL	115	20.90	560018	G14-070-TAP	230	9.29
526736	TERRY_CNTY	115	10.10	524377	FARMERS	115	15.16	526934	YOAKUM	115	16.16
522866	LP-COOK	69	35.10	524397	ARROWHEAD	115	13.60	526236	LP-WHEELOCK3	115	8.62
522849	LP-CHALKER	69	14.13	524404	OWENSCORN	115	14.85	526243	SP-QUAKER	115	9.77
522853	LP-SLATON	69	22.20	524544	SPRING_DRW	115	6.37	526205	IVORY	69	3.94
522884	LP-OLIVER	69	12.57	523309	MOORE_CNTY	230	6.62	526256	IVORY_TP	69	3.94
522836	LP-THOMPSON2	69	13.09	523869	CHAN/TASCOS6	230	3.79	526020	HOCKLEY	115	5.52
522840	LP-MCCULLGH2	69	13.25	523979	HARRNG_EST	230	26.13	526361	COCHRAN	115	6.04
522875	LP-BRANDON	69	12.70	524010	ROLLHILLS	230	19.38	526452	AMOCO_CRYO	115	6.24
524044	NICHOLS	230	25.38	524267	BUSHLAND	230	9.72	526484	LG-LEVELAND3	115	8.93
524365	RANDALL	230	14.24	523961	POTTER_CO	345	7.69	526162	LP-DOUD_TP	115	11.82
524414	AMA_SOUTH	115	16.66	524746	CASTRO_CNTY3	115	10.19	526483	SP-WOLFORTH3	115	8.73
523959	POTTER_CO	230	20.42	525124	HART_INDUST3	115	7.59	527080	EL_PASO	115	15.43
525460	NEWHART	115	14.98	525179	TULIA_TP	115	6.29	527136	DENVER_S	115	20.53
525192	KRESS_INT	115	11.18	525225	KRESS_RURAL3	115	6.28	527146	MUSTANG	115	22.12
524909	ROSEVELT_N	230	9.13	525191	KRESS_INT	69	4.43	527286	XTO_RUSSEL	115	9.99
524915	SW_4K33	230	9.13	524770	PLSNT_HILL	230	6.28	527125	DENVER_CTY	69	8.59
599955	PNM-DC6	230	9.13	524908	ROOSEVELT	115	10.35	527202	SEAGRAVES	115	8.45
524623	DEAFSMITH	230	8.00	524875	OASIS	230	7.58	527212	DIAMONDBACK3	115	3.03
525531	TOLK_WEST	230	28.93	524622	DEAFSMITH	115	11.82	527261	SULPHUR	69	3.35
525480	PLANT_X	115	26.04	525637	LAMB_CNTY	230	5.61	526506	LG-DOCWEBR	69	4.90
525549	TOLK	345	7.11	562480	G13-027-TAP	230	9.91	526747	LG-BROWNFLD2	69	3.54
522888	LP-WADSWRTH6	230	12.60	525019	EMU&VLY_TP	115	6.43				
526679	CIRRUS_WND	230	5.07	525056	BC-EARTH	115	8.85				

Table 4-5
Short Circuit Analysis for Study Project GEN-2014-063

Study Project GEN-2014-063											
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)
527894	HOBBS_INT	230	18.37	528435	MILLEN	115	11.59	528151	FIESTA	115	9.43
527865	CUNNINHAM	230	16.90	528385	BUCKEYE	115	7.49	528159	CARLSBAD	69	4.39
560018	G14-070-TAP	230	9.29	528792	LE-TEXACO	115	7.23	527980	DUVAL_#1	69	5.68
584240	GEN-2014-063	345	3.13	528392	PEARLE	115	6.35	527996	KERMAC	69	2.94
527800	EDDY_SOUTH	230	7.70	528463	SANGER_SW	115	16.04	528022	MISSCHEM#2	69	6.61
527963	POTASH_JCT	230	6.91	528491	MONUMENT	115	15.52	528145	NATPOT_TP	69	8.54
527864	CUNNINHAM	115	29.15	528399	LEA_NATIONL3	115	6.84	528027	RDRUNNER	345	3.89
526935	YOAKUM	230	17.61	528420	ZIA	115	6.55	528185	NLOV_PLT	345	4.63
584130	GEN-2014-070	230	9.17	528582	BYRD	115	7.56	527284	RUSSELL	115	9.05
527799	EDDY_NORTH	230	7.70	526435	SUNDOWN	230	11.04	527286	XTO_RUSSEL	115	9.99
528095	7-RIVERS	230	5.97	526784	AMOCOWASSON6	230	13.85	527362	JOHNSON_DRW3	115	10.54
527798	EDDY_NTH	115	10.80	527151	GS-MUSTANG	230	15.60	528325	LE-WAITS	115	6.68
528179	PECOS	230	6.33	527276	SEMINOLE	230	7.25	528337	WILDCAT_WND	115	8.52
527962	POTASH_JCT	115	15.27	527146	MUSTANG	115	22.12	528618	LE-LOVINTON2	69	6.85
527891	HOBBS_INT	115	32.35	525531	TOLK_WEST	230	28.93	528442	NE_HOBBS	115	11.88
528348	BUCKEYE_TP	115	8.34	583840	GEN-2013-027	230	8.87	528341	LE-SANANDRS3	115	6.42
528355	MADDOX	115	27.20	526792	PRENTICE	115	5.82	528317	ENRON_TP	115	6.80
528394	QUAHADA	115	8.10	526928	LE-PLNSINT	115	9.14	528484	SW_4J44	115	11.16
528568	MONUMNT_TP	115	9.95	527041	ARCO_TP	115	12.87	528575	OXYPERMIAN	115	15.38
526460	AMOCO_SS	230	9.70	527194	LG-PLSHILL	115	7.46	528498	W_HOBBS	115	11.72
527010	OXYBRU_TP	230	13.95	525832	TUCO_INT	345	11.62	528406	MALJMAR1&2	115	3.22
527149	MUSTANG	230	15.60	527896	HOBBS_INT	345	9.61	525481	PLANT_X	230	27.78
562480	G13-027-TAP	230	9.91	524885	SN_JUAN_TAP6	230	4.71	526525	WOLFFORTH	230	13.70
526934	YOAKUM	115	16.16	527482	CHAVES_CNTY3	115	6.23	526434	SUNDOWN	115	10.51
526936	YOAKUM_345	345	9.25	527821	CV-DAYTON	115	6.83	527275	SEMINOLE	115	11.40
527483	CHAVES_CNTY6	230	4.07	560007	G08-022-TAP	345	5.30	527062	SHELL_CO2	115	15.66
599960	EPTNP-D6	230	7.70	528070	CV-AZMESA	115	7.29	527130	DENVER_N	115	20.53
527793	EDDY_STH	115	10.80	528109	CV-LAKEWOOD3	115	6.29	527136	DENVER_S	115	20.53
527802	EDDY_CNTY	345	4.23	528093	7-RIVERS	69	2.39	527202	SEAGRAVES	115	8.45
528094	7-RIVERS	115	8.11	527564	ROSWLL_INT	115	5.24	524909	ROSEVELT_N	230	9.13
527597	TWEEDY	115	4.88	527707	ARTESIA	115	6.62	525543	TOLK_TAP	230	28.93
527711	EAGLE_CREEK3	115	7.19	527715	NAVAJO_2TP	115	6.86	525637	LAMB_CNTY	230	5.61
527828	CV-12MH	115	10.33	527736	NAVAJO_5TP	115	6.82	526736	TERRY_CNTY	115	10.10
528178	PECOS	115	11.36	527786	ATOKA	115	6.93	526944	LG-PLAINS	115	7.34
527930	PCA	115	11.25	527710	EAGLE_CREEK2	69	2.31	528626	LE-PLNSINT	69	3.56
527999	INTREPDW_TP3	115	12.64	528132	OCOTILLO	115	6.04	527018	BENNETT	115	12.96
528160	CARLSBAD	115	10.80	528137	N_CANAL	115	8.42	527047	OXY_WILRD	115	10.37
527961	POTASH_JCT	69	8.59	528226	HOPI_SUB	115	6.74	511456	O.K.U.-7	345	5.05
527965	KIOWA	345	5.94	527929	PCA	69	6.18	515458	BORDER	345	5.00
527363	HIGG	115	10.17	528000	INTREPIDWST3	115	10.81	525830	TUCO_INT	230	21.93
528334	LE-LOVINTON3	115	8.52	528035	IMC_#1_TP	115	8.96	528611	GAINESGENTP7	345	7.49

Table 4-6
Short Circuit Analysis for Study Project GEN-2014-066

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	115	3.99	524831	FE-HOLLAND	115	8.44	524764	NORRIS_TP	115	10.40
524502	NORTON	115	4.92	524770	PLSNT_HILL	230	6.28	524908	ROOSEVELT	115	10.35
584160	GEN-2014-066	115	3.92	524477	CBELL_ST3	115	2.96	525028	BAILEYCO	115	6.37
524509	FE-TUCMCARI3	115	3.28	584311	ASGI2014-002	115	1.29	524821	CURRY	69	4.33
524768	PLSNT_HILL	115	9.44	524822	CURRY	115	10.43	524784	W_CLOVIS	115	5.76
560023	NORTON	230	3.32	524777	N_CLOVIS	115	5.92	583280	ASGI2012-002	115	1.05
524472	LOPEZ	115	2.98	524808	FE-CLVS_INT3	115	6.16	524885	SN_JUAN_TAP6	230	4.71
583610	CEILO-TAP-N	115	0.48	524838	FE-CLOVIS2	115	9.86	524915	SW_4K33	230	9.13
584310	A14-002-TAP	115	1.31	524875	OASIS	230	7.58	524874	OASIS	115	9.59
524773	E_CLOVIS	115	8.56	524909	ROSEVELT_N	230	9.13	524911	ROSEVELT_S	230	9.13
524776	N_CLOVIS_TP3	115	6.48	524669	DS-#20	115	4.80	525531	TOLK_WEST	230	28.93

Study Project GEN-2014-066

Table 4-7
Short Circuit Analysis for Study Project GEN-2014-070

Study Generator GEN-2014-070

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)
560018	G14-070-TAP	230	9.29	515458	BORDER	345	5.00	526735	TERRY_CNTY	69	6.87
526935	YOAKUM	230	17.61	525830	TUCO_INT	230	21.93	526352	LEHMAN	115	4.89
527894	HOBBS_INT	230	18.37	527799	EDDY_NORTH	230	7.70	528740	LE-PLANS_TP2	69	2.74
584130	GEN-2014-070	230	9.17	528095	7-RIVERS	230	5.97	527046	ARCO_WILRD	115	10.35
526460	AMOCO_SS	230	9.70	527798	EDDY_NTH	115	10.80	511468	L.E.S.-7	345	11.91
527010	OXYBRU_TP	230	13.95	528179	PECOS	230	6.33	599891	OKLAUN	345	4.04
527149	MUSTANG	230	15.60	527962	POTASH_JCT	115	15.27	515375	WWRDEHV7	345	20.16
562480	G13-027-TAP	230	9.91	528348	BUCKEYE_TP	115	8.34	583090	GEN-2011-049	345	4.54
526934	YOAKUM	115	16.16	528394	QUAHADA	115	8.10	525213	SWISHER	230	10.19
526936	YOAKUM_345	345	9.25	528568	MONUMNT_TP	115	9.95	525840	ANTELOPE_1	230	21.76
527865	CUNNINHAM	230	16.90	527284	RUSSELL	115	9.05	526337	JONES	230	21.04
584240	GEN-2014-063	345	3.13	527286	XTO_RUSSEL	115	9.99	583340	GEN-2012-020	230	9.06
527891	HOBBS_INT	115	32.35	527362	JOHNSON_DRW3	115	10.54	525828	TUCO_INT	115	19.92
527896	HOBBS_INT	345	9.61	528325	LE-WAITS	115	6.68	527483	CHAVES_CNTY6	230	4.07
526435	SUNDOWN	230	11.04	528337	WILDCAT_WND	115	8.52	599960	EPTNP-D6	230	7.70
526784	AMOCOWASSON6	230	13.85	528618	LE-LOVINTON2	69	6.85	527793	EDDY_STH	115	10.80
527151	GS-MUSTANG	230	15.60	528392	PEARLE	115	6.35	527802	EDDY_CNTY	345	4.23
527276	SEMINOLE	230	7.25	528463	SANGER_SW	115	16.04	528094	7-RIVERS	115	8.11
527146	MUSTANG	115	22.12	528491	MONUMENT	115	15.52	527597	TWEEDY	115	4.88
525531	TOLK_WEST	230	28.93	528442	NE_HOBBS	115	11.88	527711	EAGLE_CREEK3	115	7.19
583840	GEN-2013-027	230	8.87	528027	RDRUNNER	345	3.89	527828	CV-12MH	115	10.33
526792	PRENTICE	115	5.82	528185	NLOV_PLT	345	4.63	528178	PECOS	115	11.36
526928	LE-PLNSINT	115	9.14	528604	ANDREWS	345	6.05	527930	PCA	115	11.25
527041	ARCO_TP	115	12.87	528610	GAINES_GEN	345	6.94	527999	INTREPDW_TP3	115	12.64
527194	LG-PLSHILL	115	7.46	524623	DEAFSMITH	230	8.00	528160	CARLSBAD	115	10.80
525832	TUCO_INT	345	11.62	525461	NEWHART	230	10.88	527961	POTASH_JCT	69	8.59
527800	EDDY_SOUTH	230	7.70	525524	TOLK_EAST	230	28.93	528385	BUCKEYE	115	7.49
527963	POTASH_JCT	230	6.91	525480	PLANT_X	115	26.04	528792	LE-TEXACO	115	7.23
527864	CUNNINHAM	115	29.15	526161	CARLISLE	230	13.76	528399	LEA_NATIONL3	115	6.84
527363	HIGG	115	10.17	526269	LUBBCK_STH	230	19.05	528420	ZIA	115	6.55
528334	LE-LOVINTON3	115	8.52	526524	WOLFFORTH	115	11.58	528582	BYRD	115	7.56
528355	MADDOX	115	27.20	526036	LC-OPDYKE	115	5.77	527325	OXY_WSEM_TP3	115	8.45
528435	MILLEN	115	11.59	526424	PACIFIC	115	8.84	527360	MAPCO	115	10.30
527965	KIOWA	345	5.94	526445	AMOCO_TP	115	9.88	528413	TAYLOR	115	14.47
528611	GAINESGENTP7	345	7.49	527105	SAN_ANDS_TP3	115	16.29	528775	LE-ERF	115	10.54

Table 4-7 (Continued)
Short Circuit Analysis for Study Project GEN-2014-070

Study Generator GEN-2014-070

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)
525481	PLANT_X	230	27.78	527238	ROZ	115	9.26	527030	ALRDCRTZ_TP3	115	8.55
526525	WOLFFORTH	230	13.70	527242	AMERADA	115	9.36	528617	LE-WAITS	69	3.28
526434	SUNDOWN	115	10.51	527322	GAINES	115	8.53	528638	LE-SAUNDRTP2	69	3.54
527275	SEMINOLE	115	11.40	527340	DOSS	115	7.14	528667	LE-MHOON	69	4.37
527062	SHELL_CO2	115	15.66	527051	ODC_TP	115	12.98	528675	LE-FAMARISS2	69	3.25
527130	DENVER_N	115	20.53	527080	EL_PASO	115	15.43	528679	LE-REED	69	4.51
527136	DENVER_S	115	20.53	527125	DENVER_CTY	69	8.59	528699	LE-GRAY	69	3.99
527202	SEAGRAVES	115	8.45	527036	SHELL_C2	115	12.70	528317	ENRON_TP	115	6.80
524909	ROSEVELT_N	230	9.13	527262	SULPHUR	115	5.62	528484	SW_4J44	115	11.16
525543	TOLK_TAP	230	28.93	527201	SEAGRAVES	69	5.38	528575	OXYPERMIAN	115	15.38
525637	LAMB_CNTY	230	5.61	524770	PLSNT_HILL	230	6.28	528498	W_HOBBS	115	11.72
526736	TERRY_CNTY	115	10.10	524911	ROSEVELT_S	230	9.13	528025	RDRUNNER	115	8.61
526944	LG-PLAINS	115	7.34	524915	SW_4K33	230	9.13	528223	CHINA_DRAW	345	3.76
528626	LE-PLNSINT	69	3.56	524908	ROOSEVELT	115	10.35	528182	NORTH_LOVNG3	115	8.51
527018	BENNETT	115	12.96	525549	TOLK	345	7.11	528602	ANDREWS	115	9.67
527047	OXY_WILRD	115	10.37	525636	LAMB_CNTY	115	9.69				
511456	O.K.U.-7	345	5.05	526491	LG-CLAUENE	115	7.72				

Table 4-8
Short Circuit Analysis for Study Project ASGI-2014-002

Study Generator ASGI-2014-002

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)
524472	LOPEZ	115	2.98	524776	N_CLOVIS_TP3	115	6.48	524908	ROOSEVELT	115	10.35
524502	NORTON	115	4.92	524831	FE-HOLLAND	115	8.44	525028	BAILEYCO	115	6.37
583610	CEILO-TAP-N	115	0.48	524770	PLSNT_HILL	230	6.28	524821	CURRY	69	4.33
584310	A14-002-TAP	115	1.31	524822	CURRY	115	10.43	524784	W_CLOVIS	115	5.76
524477	CBELL_ST3	115	2.96	524777	N_CLOVIS	115	5.92	583280	ASGI2012-002	115	1.05
524486	CAPROCK	115	3.99	524808	FE-CLVS_INT3	115	6.16	524885	SN_JUAN_TAP6	230	4.71
524768	PLSNT_HILL	115	9.44	524838	FE-CLOVIS2	115	9.86	524915	SW_4K33	230	9.13
560023	NORTON	230	3.32	524875	OASIS	230	7.58	524874	OASIS	115	9.59
584311	ASGI2014-002	115	1.29	524909	ROSEVELT_N	230	9.13	524911	ROSEVELT_S	230	9.13
584160	GEN-2014-066	115	3.92	524669	DS-#20	115	4.80	525531	TOLK_WEST	230	28.93
524773	E_CLOVIS	115	8.56	524764	NORRIS_TP	115	10.40				

Table 4-9
Short Circuit Analysis for Study Project ASGI-2014-005

Study Generator ASGI-2014-005

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)
528046	STRATA	69	2.93	528050	DUVAL_#3	69	2.42	527996	KERMAC	69	2.94
528043	UNITEDSALT	69	4.05	528022	MISSCHEM#2	69	6.61	528145	NATPOT_TP	69	8.54
528062	IMC_#3	69	2.91	528056	IMC_#4	69	2.08	527962	POTASH_JCT	115	15.27
584330	ASGI2014-005	69	2.93	527961	POTASH_JCT	69	8.59				
528029	IMC_#2	69	4.21	527980	DUVAL_#1	69	5.68				

Table 4-10
Short Circuit Analysis for Study Project ASGI-2014-008

Study Generator ASGI-2014-008

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)
528218	SLOV&NAVMAL2	69	1.73	527930	PCA	115	11.25	527963	POTASH_JCT	230	6.91
528190	S_LOVING_TP2	69	2.72	527962	POTASH_JCT	115	15.27	527965	KIOWA	345	5.94
584340	ASGI2014-008	69	1.73	528151	FIESTA	115	9.43	527793	EDDY_STH	115	10.80
528159	CARLSBAD	69	4.39	528178	PECOS	115	11.36	528070	CV-AZMESA	115	7.29
528197	CB_WTRFLDTP2	69	2.40	528394	QUAHADA	115	8.10	528132	OCOTILLO	115	6.04
528160	CARLSBAD	115	10.80	527929	PCA	69	6.18	528137	N_CANAL	115	8.42
528204	CB_WTRFIELD2	69	1.75	527999	INTREPDW_TP3	115	12.64	528226	HOPI_SUB	115	6.74
528211	WHITES_CTY	69	1.24	527961	POTASH_JCT	69	8.59	528179	PECOS	230	6.33

Table 4-11
Short Circuit Analysis for Study Project ASGI-2014-009

Study Generator ASGI-2014-009

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)
528228	WOOD_DRAW	115	4.88	528192	SOUTH_LOVNG3	115	6.54	528232	OCHOA	115	5.94
528020	BOPCO_PKRLK3	115	5.39	528226	HOPI_SUB	115	6.74	527793	EDDY_STH	115	10.80
528222	CHINA_DRAW	115	7.49	528185	NLOV_PLT	345	4.63	528070	CV-AZMESA	115	7.29
584350	ASGI2014-009	115	4.88	528009	WIPP	115	6.55	528132	OCOTILLO	115	6.04
528018	RED_BLUFF	115	7.79	528040	BATTLE_AXE	115	3.41	528137	N_CANAL	115	8.42
528182	NORTH_LOVNG3	115	8.51	528230	AGAVE_RHILL3	115	5.98	528160	CARLSBAD	115	10.80
528246	YESO_HILLS	115	2.71	528027	RDRUNNER	345	3.89	528179	PECOS	230	6.33
528223	CHINA_DRAW	345	3.76	528178	PECOS	115	11.36	527896	HOBBS_INT	345	9.61
528016	SAND_DUNES	115	6.41	527965	KIOWA	345	5.94	527962	POTASH_JCT	115	15.27
528025	RDRUNNER	115	8.61	527953	LIVSTNRIDGE3	115	6.96				

Table 4-12
Short Circuit Analysis for Study Project ASGI-2014-010

Study Generator ASGI-2014-010

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)
528232	OCHOA	115	5.94	528027	RDRUNNER	345	3.89	528009	WIPP	115	6.55
528230	AGAVE_RHILL3	115	5.98	528519	WARD	115	4.97	528228	WOOD_DRAW	115	4.88
528239	PNDEROSATP	115	5.43	528547	S_JAL	115	5.19	527896	HOBBS_INT	345	9.61
584360	ASGI2014-010	115	5.94	528016	SAND_DUNES	115	6.41	528185	NLOV_PLT	345	4.63
528025	RDRUNNER	115	8.61	528020	BOPCO_PKRLK3	115	5.39	527962	POTASH_JCT	115	15.27
528240	PONDEROSA	115	3.92	527965	KIOWA	345	5.94	528552	OIL_CENTER	115	5.63
528540	WHITTEN	115	5.77	528505	LEA_ROAD	115	5.19	528596	CARDINAL	115	7.16
528018	RED_BLUFF	115	7.79	528526	TEAGUE	115	5.67	528564	TOBOSOFLATS3	115	3.17
528040	BATTLE_AXE	115	3.41	528561	DOLLARHIDE	115	4.08				

Table 4-13
Short Circuit Analysis for Study Project ASGI-2014-012

Study Generator ASGI-2014-012											
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)
528554	COOPER_RNCH3	115	6.08	528348	BUCKEYE_TP	115	8.34	528385	BUCKEYE	115	7.49
528552	OIL_CENTER	115	5.63	528355	MADDOX	115	27.20	528792	LE-TEXACO	115	7.23
528582	BYRD	115	7.56	528394	QUAHADA	115	8.10	528392	PEARLE	115	6.35
584380	ASGI2014-012	115	6.08	527865	CUNNINHAM	230	16.90	528463	SANGER_SW	115	16.04
528505	LEA_ROAD	115	5.19	528498	W_HOBBS	115	11.72	527930	PCA	115	11.25
528568	MONUMNT_TP	115	9.95	528239	PNDEROSATP	115	5.43	528399	LEA_NATIONL3	115	6.84
528519	WARD	115	4.97	528547	S_JAL	115	5.19	528420	ZIA	115	6.55
527864	CUNNINHAM	115	29.15	527363	HIGG	115	10.17	527800	EDDY_SOUTH	230	7.70
528491	MONUMENT	115	15.52	528334	LE-LOVINTON3	115	8.52	527963	POTASH_JCT	230	6.91
528540	WHITTEN	115	5.77	528435	MILLEN	115	11.59	528484	SW_4J44	115	11.16
527891	HOBBS_INT	115	32.35	527894	HOBBS_INT	230	18.37	528533	DRINKARD_TP3	115	7.60

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, or if the pre-project voltage is higher than 1.0 p.u., to maintain the pre-project voltage schedule.

The 2015 Summer Peak, 2015 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 2-3. 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 2-4 were then applied and the reactive power required to maintain the bus voltage was recorded.

5.1 Approach

Upgrades found to be necessary in the Stability Analysis were implemented for the Power Factor Analysis.

GEN-2013-027 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 149.96 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the GEN-2013-027 generator were disabled. The scheduled voltage for the POI was set to 1.00 p.u. for the 2015 Summer Peak condition and to 1.01 p.u. 2015 Winter Peak condition and to 1.00 p.u. for the 2025 Summer Peak condition.

GEN-2014-033, GEN-2014-034, and GEN-2014-035 were disabled and generators were placed at the study project's point of interconnect bus. The generators were modeled with PGEN = 70 MW for GEN-2014-033 and GEN-2014-034, and PGEN = 30 MW for GEN-2014-035. QMin = -9999 Mvar and QMax = 9999 Mvar for all generators. All buses and transformers connected from the study project's POI bus to the generators were disabled. The scheduled voltage was set to 1.00 p.u. for the POI for the 2015 Summer Peak condition and 1.01 for the 2015 Winter Peak condition and 1.00 p.u. for the 2025 Summer Peak condition.

GEN-2014-047 was disabled and generators were placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 40 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar for GEN-2014-047. All buses and transformers connected from the study project's POI bus to the generators were disabled. The scheduled voltage for the POI was set 1.0 p.u. for all study years.

GEN-2014-053 and GEN-2014-054 were disabled and generators were placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 80 MW for GEN-2014-053 and PGEN= 120 MW for GEN-2014-054. QMin = -9999 Mvar, and QMax = 9999 Mvar for both generators. All buses and transformers connected from the study project's POI bus to the generators were disabled. The scheduled voltage for the POI was set 1.0 p.u. for all study years.

GEN-2014-063 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 120 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the GEN-2014-063 generator were disabled. The scheduled voltage for the POI was set 1.01 p.u. for all study years.

GEN-2014-066 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 30 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the GEN-2014-066 generator were disabled. The scheduled voltage for the POI was set 1.00 p.u. for all study years.

GEN-2014-070 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 116 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the GEN-2014-070 generator were disabled. The scheduled voltage for the POI was set 1.00 p.u. for all study years.

ASGI-2014-002 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 49.6 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the ASGI-2014-002 generator were disabled. The scheduled voltage for the POI was set 1.00 p.u. for all study years.

ASGI-2014-005 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 10 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the ASGI-2014-005 generator were disabled. The scheduled voltage for the POI was set 1.00 p.u. for all study years.

ASGI-2014-008 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 10 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the ASGI-2014-008 generator were disabled. The scheduled voltage for the POI was set 1.02 p.u. for all study years.

ASGI-2014-009 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 10 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the ASGI-2014-009 generator were disabled. The scheduled voltage for the POI was set 1.00 p.u. for all study years.

ASGI-2014-010 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 10 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the ASGI-2014-010 generator were disabled. The scheduled voltage for the POI was set 1.00 p.u. for all study years.

ASGI-2014-012 was disabled and a generator was placed at the study project's point of interconnect bus. The generator was modeled with PGEN = 10 MW, QMin = -9999 Mvar, and QMax = 9999 Mvar. All buses and transformers connected from the study project's POI bus to the ASGI-2014-012 generator were disabled. The scheduled voltage for the POI was set 1.00 p.u. for all study years.

5.2 Power Factor Analysis Results

The power factor was calculated for the 2015 Summer Peak, 2015 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-2013-027
- Table 5-2: Power Factor Analysis for the Chaves County POI
- Table 5-3: Power Factor Analysis for GEN-2014-047
- Table 5-4: Power Factor Analysis for the Carlisle POI
- Table 5-5: Power Factor Analysis for GEN-2014-063
- Table 5-6: Power Factor Analysis for GEN-2014-066
- Table 5-7: Power Factor Analysis for GEN-2014-070
- Table 5-8: Power Factor Analysis for ASGI-2014-002
- Table 5-9: Power Factor Analysis for ASGI-2014-005
- Table 5-10: Power Factor Analysis for ASGI-2014-008
- Table 5-11: Power Factor Analysis for ASGI-2014-009
- Table 5-12: Power Factor Analysis for ASGI-2014-010
- Table 5-13: Power Factor Analysis for ASGI-2014-012

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-2013-027

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.977	Leading	32.54	0.977	Leading	33.04	0.991	Leading	19.97
1	FLT01-3PH	0.977	Leading	32.60	0.977	Leading	33.02	0.991	Leading	19.88
2	FLT02-3PH	0.977	Leading	32.60	0.977	Leading	33.01	0.991	Leading	19.84
3	FLT03-3PH	0.977	Leading	32.53	0.977	Leading	33.03	0.991	Leading	19.93
4	FLT04-3PH	0.977	Leading	32.65	0.977	Leading	33.01	0.992	Leading	19.54
5	FLT05-3PH	0.976	Leading	33.57	0.977	Leading	32.61	0.995	Leading	15.10
6	FLT06-3PH	0.977	Leading	32.78	0.977	Leading	32.85	0.992	Leading	18.58
7	FLT07-3PH	0.977	Leading	32.64	0.977	Leading	33.01	0.992	Leading	19.59
8	FLT08-3PH	0.973	Leading	35.57	0.980	Leading	30.80	1.000	Leading	1.49
9	FLT09-3PH	0.981	Leading	29.64	0.976	Leading	33.17	0.991	Leading	20.42
10	FLT10-3PH	0.977	Leading	32.78	0.977	Leading	32.80	0.994	Leading	16.11
11	FLT11-3PH	0.977	Leading	32.50	0.977	Leading	33.02	0.991	Leading	19.83
12	FLT12-3PH	0.978	Leading	32.32	0.977	Leading	33.01	0.992	Leading	19.59
13	FLT13-3PH	0.978	Leading	32.29	0.977	Leading	32.99	0.993	Leading	17.71
14	FLT14-3PH	0.981	Leading	30.03	0.977	Leading	33.02	0.992	Leading	18.89
15	FLT15-3PH	0.982	Leading	29.14	0.977	Leading	32.85	0.995	Leading	14.87
16	FLT16-3PH	0.977	Leading	32.57	0.977	Leading	32.93	0.991	Leading	19.69
17	FLT18-3PH	0.977	Leading	32.54	0.977	Leading	33.03	0.991	Leading	20.01
18	FLT20-3PH	0.978	Leading	32.24	0.977	Leading	33.00	0.991	Leading	20.60
19	FLT21-3PH	0.977	Leading	32.54	0.977	Leading	33.04	0.991	Leading	19.97
20	FLT22-3PH	0.977	Leading	32.54	0.977	Leading	33.04	0.991	Leading	20.11
21	FLT23-3PH	0.977	Leading	32.53	0.977	Leading	33.02	0.991	Leading	19.96
22	FLT24-3PH	0.977	Leading	32.58	0.977	Leading	33.00	0.992	Leading	18.92
23	FLT25-3PH	0.977	Leading	32.52	0.977	Leading	33.03	0.991	Leading	20.01
24	FLT28-3PH	0.977	Leading	32.48	0.977	Leading	33.04	0.991	Leading	19.94
25	FLT29-3PH	N/A	N/A	N/A	0.977	Leading	33.05	0.991	Leading	19.95
26	FLT30-3PH	N/A	N/A	N/A	0.977	Leading	33.10	0.991	Leading	20.21
27	FLT31-3PH	N/A	N/A	N/A	0.977	Leading	32.92	0.991	Leading	19.96
28	FLT32-3PH	0.978	Leading	32.09	0.976	Leading	33.15	0.991	Leading	20.00
29	FLT33-3PH	0.978	Leading	32.10	0.976	Leading	33.15	0.991	Leading	19.97
30	FLT34-3PH	0.977	Leading	32.45	0.977	Leading	33.08	0.992	Leading	19.25
31	FLT35-3PH	0.977	Leading	32.45	0.977	Leading	33.04	0.991	Leading	20.11
32	FLT36-3PH	0.977	Leading	32.40	0.977	Leading	33.08	0.992	Leading	18.50
33	FLT37-3PH	0.977	Leading	32.43	0.977	Leading	33.08	0.992	Leading	18.79
34	FLT38-3PH	0.977	Leading	32.52	0.977	Leading	33.04	0.991	Leading	19.99
35	FLT39-3PH	0.978	Leading	32.06	0.978	Leading	32.24	0.991	Leading	19.88
36	FLT40-3PH	0.977	Leading	32.54	0.977	Leading	33.02	0.991	Leading	19.95
37	FLT41-3PH	0.978	Leading	32.18	0.976	Leading	33.11	0.991	Leading	19.80
38	FLT42-3PH	0.978	Leading	32.35	0.977	Leading	33.09	0.993	Leading	18.38
39	FLT43-3PH	0.978	Leading	32.02	0.976	Leading	33.19	0.991	Leading	19.94
40	FLT44-3PH	0.977	Leading	32.47	0.977	Leading	33.06	0.991	Leading	19.99
41	FLT45-3PH	0.978	Leading	32.28	0.976	Leading	33.13	0.991	Leading	19.86
42	FLT46-3PH	0.979	Leading	31.52	0.979	Leading	31.14	0.992	Leading	19.10
43	FLT47-3PH	0.978	Leading	32.35	0.977	Leading	32.75	0.992	Leading	19.48
44	FLT48-3PH	0.973	Leading	35.58	0.980	Leading	30.80	1.000	Leading	1.49
45	FLT49-3PH	0.990	Leading	21.91	0.978	Leading	32.17	0.991	Leading	20.56

Table 5-1 (Continued)
Power Factor Analysis: GEN-2013-027

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.989	Leading	21.95	0.978	Leading	32.20	0.991	Leading	20.60
47	FLT51-3PH	1.000	Lagging	-1.00	1.000	Lagging	-0.87	1.000	Lagging	-1.25
48	FLT53-3PH	0.966	Leading	40.41	0.959	Leading	44.53	0.969	Leading	38.52
49	FLT55-3PH	0.989	Leading	22.29	0.971	Leading	36.99	0.989	Leading	22.21
50	FLT56-3PH	0.982	Leading	28.92	0.977	Leading	32.47	0.994	Leading	16.93
51	FLT57-3PH	0.982	Leading	28.54	0.978	Leading	32.02	0.994	Leading	16.64
52	FLT58-3PH	0.980	Leading	30.37	0.990	Leading	21.55	0.995	Leading	15.46
53	FLT59-3PH	0.977	Leading	32.91	0.976	Leading	33.59	0.990	Leading	21.69
54	FLT62-3PH	0.977	Leading	32.63	0.977	Leading	33.02	0.992	Leading	19.48
55	FLT64-3PH	0.978	Leading	32.23	0.980	Leading	30.57	0.992	Leading	18.48
56	FLT66-3PH	0.989	Leading	21.95	0.978	Leading	32.20	0.991	Leading	20.60
57	FLT67-3PH	0.979	Leading	31.44	0.979	Leading	31.08	0.994	Leading	17.08
58	FLT71-3PH	0.977	Leading	32.60	0.976	Leading	33.24	0.991	Leading	20.18
59	FLT72-3PH	0.977	Leading	32.64	0.976	Leading	33.35	0.991	Leading	20.34
60	FLT73-3PH	0.977	Leading	32.53	0.977	Leading	33.10	0.991	Leading	20.29
61	FLT74-3PH	0.977	Leading	32.54	0.977	Leading	33.01	0.991	Leading	20.08
62	FLT75-3PH	0.977	Leading	32.45	0.977	Leading	32.85	0.991	Leading	19.75
63	FLT76-3PH	0.977	Leading	32.52	0.977	Leading	33.02	0.991	Leading	19.98
64	FLT77-3PH	0.979	Leading	31.32	0.978	Leading	32.29	0.992	Leading	19.44
65	FLT78-3PH	0.977	Leading	32.87	0.976	Leading	33.36	0.991	Leading	20.47
66	FLT79-3PH	0.977	Leading	32.60	0.977	Leading	32.94	0.991	Leading	20.12
67	FLT80-3PH	0.977	Leading	32.57	0.976	Leading	33.56	0.992	Leading	19.57
68	FLT81-3PH	0.978	Leading	31.82	0.979	Leading	31.41	0.992	Leading	19.43
69	FLT82-3PH	0.977	Leading	32.48	0.977	Leading	32.96	0.991	Leading	19.96
70	FLT83-3PH	0.977	Leading	32.60	0.977	Leading	32.95	0.991	Leading	20.12
71	FLT87-3PH	0.979	Leading	31.59	0.975	Leading	34.27	0.989	Leading	22.25
72	FLT88-3PH	0.977	Leading	32.51	0.976	Leading	33.20	0.992	Leading	19.05
73	FLT89-3PH	0.978	Leading	32.34	0.976	Leading	33.63	0.990	Leading	21.47
74	FLT90-3PH	0.978	Leading	31.97	0.981	Leading	29.51	0.994	Leading	15.87
75	FLT91-3PH	0.978	Leading	32.33	0.977	Leading	32.91	0.991	Leading	19.96
76	FLT92-3PH	0.977	Leading	32.48	0.977	Leading	32.96	0.991	Leading	19.96
77	FLT93-3PH	0.977	Leading	32.48	0.977	Leading	32.99	0.991	Leading	19.94
78	FLT94-3PH	0.977	Leading	32.52	0.977	Leading	33.09	0.991	Leading	19.92
79	FLT95-3PH	0.978	Leading	32.32	0.977	Leading	32.98	0.991	Leading	19.79
80	FLT96-3PH	0.977	Leading	32.51	0.977	Leading	33.02	0.991	Leading	19.96
81	FLT97-3PH	0.977	Leading	32.41	0.977	Leading	33.07	0.991	Leading	20.01
82	FLT99-3PH	0.977	Leading	32.72	0.976	Leading	33.54	0.991	Leading	20.58
83	FLT100-3PH	0.977	Leading	32.53	0.977	Leading	33.03	0.991	Leading	19.96
84	FLT101-3PH	0.977	Leading	32.54	0.977	Leading	33.03	0.991	Leading	19.96
85	FLT102-3PH	0.977	Leading	32.53	0.977	Leading	33.03	0.991	Leading	19.96
86	FLT103-3PH	0.977	Leading	32.47	0.977	Leading	32.99	0.991	Leading	19.85
87	FLT104-3PH	0.977	Leading	32.55	0.977	Leading	33.02	0.991	Leading	19.92
88	FLT105-3PH	0.977	Leading	32.50	0.977	Leading	33.04	0.991	Leading	19.95
89	FLT106-3PH	0.977	Leading	32.40	0.977	Leading	32.94	0.991	Leading	19.96
90	FLT107-3PH	0.977	Leading	32.54	0.977	Leading	33.03	0.991	Leading	19.97

Table 5-1 (Continued)
Power Factor Analysis: GEN-2013-027

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	0.977	Leading	32.54	0.977	Leading	33.03	0.991	Leading	19.97
92	FLT112-3PH	0.982	Leading	28.49	0.986	Leading	25.24	0.995	Leading	14.74
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.996	Leading	13.56
94	FLT122-3PH	0.977	Leading	32.57	0.976	Leading	33.15	0.991	Leading	20.05
95	FLT126-3PH	0.977	Leading	32.53	0.977	Leading	32.56	0.992	Leading	19.53
96	FLT127-3PH	0.982	Leading	28.49	0.986	Leading	25.24	0.995	Leading	14.74
97	FLT128-3PH	0.980	Leading	30.37	0.990	Leading	21.55	0.995	Leading	15.46
98	FLT129-3PH	0.978	Leading	32.03	0.975	Leading	33.90	0.990	Leading	21.68
99	FLT130-3PH	0.978	Leading	31.93	0.975	Leading	33.99	0.989	Leading	22.02
100	FLT131-3PH	0.977	Leading	32.69	0.977	Leading	33.02	0.992	Leading	19.22
101	FLT132-3PH	0.977	Leading	32.53	0.977	Leading	32.47	0.992	Leading	19.26
102	FLT133-3PH	0.977	Leading	32.54	0.977	Leading	33.04	0.991	Leading	19.97
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.988	Leading	23.03
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.998	Leading	9.07
105	FLT136-3PH	0.977	Leading	32.54	0.977	Leading	33.04	0.991	Leading	20.22

Table 5-2
Power Factor Analysis: Chaves County POI

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.985	Leading	29.76	0.999	Leading	8.65	0.997	Leading	13.71
1	FLT01-3PH	0.986	Leading	28.78	0.999	Leading	8.87	0.998	Leading	11.71
2	FLT02-3PH	0.986	Leading	28.30	0.999	Leading	8.88	0.998	Leading	10.06
3	FLT03-3PH	0.992	Leading	21.53	1.000	Lagging	-0.35	0.999	Leading	6.14
4	FLT04-3PH	0.986	Leading	28.53	0.999	Leading	8.47	0.998	Leading	9.38
5	FLT05-3PH	0.983	Leading	32.05	0.998	Leading	9.59	0.995	Leading	17.21
6	FLT06-3PH	0.967	Leading	45.09	0.990	Leading	23.68	0.993	Leading	19.54
7	FLT07-3PH	0.986	Leading	28.76	0.999	Leading	8.59	0.998	Leading	9.86
8	FLT08-3PH	0.986	Leading	28.92	1.000	Leading	4.00	0.986	Lagging	-28.84
9	FLT09-3PH	0.986	Leading	29.24	0.999	Leading	8.09	1.000	Leading	3.08
10	FLT10-3PH	0.987	Leading	27.48	0.999	Leading	6.67	0.997	Leading	13.46
11	FLT11-3PH	0.986	Leading	29.02	0.999	Leading	7.26	0.998	Leading	11.78
12	FLT12-3PH	0.986	Leading	28.32	0.999	Leading	7.19	0.998	Leading	11.19
13	FLT13-3PH	0.986	Leading	29.15	0.999	Leading	8.59	0.996	Leading	15.28
14	FLT14-3PH	0.988	Leading	26.30	0.999	Leading	6.67	0.998	Lagging	-11.30
15	FLT15-3PH	0.985	Leading	29.77	0.999	Leading	8.03	0.998	Leading	10.86
16	FLT16-3PH	0.985	Leading	29.76	0.999	Leading	8.69	0.997	Leading	12.96
17	FLT18-3PH	0.985	Leading	29.75	0.999	Leading	8.65	0.997	Leading	13.69
18	FLT20-3PH	0.985	Leading	29.78	0.999	Leading	8.77	0.996	Leading	14.95
19	FLT21-3PH	0.985	Leading	29.75	0.999	Leading	8.65	0.997	Leading	13.71
20	FLT22-3PH	0.985	Leading	29.77	0.999	Leading	8.65	0.997	Leading	13.51
21	FLT23-3PH	0.985	Leading	29.75	0.999	Leading	8.88	0.997	Leading	13.00
22	FLT24-3PH	0.985	Leading	30.02	0.999	Leading	8.51	0.996	Leading	15.49
23	FLT25-3PH	0.985	Leading	29.74	0.999	Leading	8.63	0.997	Leading	13.59
24	FLT28-3PH	0.985	Leading	29.86	0.999	Leading	8.54	0.997	Leading	13.70
25	FLT29-3PH	N/A	N/A	N/A	0.999	Leading	8.69	0.997	Leading	13.71
26	FLT30-3PH	N/A	N/A	N/A	0.999	Leading	8.89	0.996	Leading	14.79
27	FLT31-3PH	N/A	N/A	N/A	0.999	Leading	8.89	0.998	Leading	11.74
28	FLT32-3PH	0.985	Leading	29.59	0.999	Leading	8.45	0.997	Leading	13.56
29	FLT33-3PH	0.985	Leading	29.63	0.999	Leading	8.47	0.997	Leading	13.71
30	FLT34-3PH	0.985	Leading	29.74	0.999	Leading	8.61	0.998	Leading	11.10
31	FLT35-3PH	0.985	Leading	29.75	0.999	Leading	8.60	0.997	Leading	13.51
32	FLT36-3PH	0.985	Leading	29.69	0.999	Leading	8.56	0.999	Leading	8.76
33	FLT37-3PH	0.985	Leading	29.72	0.999	Leading	8.59	0.998	Leading	9.53
34	FLT38-3PH	0.985	Leading	29.77	0.999	Leading	8.65	0.997	Leading	13.65
35	FLT39-3PH	0.985	Leading	29.68	0.999	Leading	8.67	0.996	Leading	14.33
36	FLT40-3PH	0.985	Leading	29.75	0.999	Leading	8.66	0.997	Leading	13.73
37	FLT41-3PH	0.985	Leading	29.72	0.999	Leading	8.41	0.998	Leading	10.90
38	FLT42-3PH	0.985	Leading	29.68	0.999	Leading	8.54	0.999	Leading	8.21
39	FLT43-3PH	0.984	Leading	30.29	0.999	Leading	8.60	0.998	Leading	11.86
40	FLT44-3PH	0.985	Leading	29.91	0.999	Leading	8.68	0.997	Leading	13.73
41	FLT45-3PH	0.985	Leading	29.72	0.999	Leading	8.49	0.998	Leading	10.80
42	FLT46-3PH	0.985	Leading	29.65	0.999	Leading	8.67	0.997	Leading	14.04
43	FLT47-3PH	0.985	Leading	29.72	0.999	Leading	8.65	0.997	Leading	13.33
44	FLT48-3PH	0.986	Leading	28.92	1.000	Leading	4.00	0.986	Lagging	-28.91
45	FLT49-3PH	0.992	Leading	21.54	0.999	Leading	6.60	0.999	Leading	6.79

Table 5-2 (Continued)
Power Factor Analysis: Chaves County POI

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
46	FLT50-3PH	0.992	Leading	21.59		0.999	Leading	6.66		0.998	Leading	9.83
47	FLT51-3PH	0.986	Leading	28.96		0.999	Leading	8.77		0.997	Leading	13.92
48	FLT53-3PH	0.985	Leading	29.66		0.999	Leading	8.31		0.999	Leading	8.28
49	FLT55-3PH	0.986	Leading	28.46		0.999	Leading	8.72		0.996	Leading	14.72
50	FLT56-3PH	0.985	Leading	29.72		0.999	Leading	8.65		0.997	Leading	13.67
51	FLT57-3PH	0.985	Leading	29.72		0.999	Leading	8.65		0.997	Leading	13.65
52	FLT58-3PH	0.986	Leading	28.27		0.999	Leading	8.34		0.997	Leading	14.26
53	FLT59-3PH	0.985	Leading	29.73		0.999	Leading	8.65		0.997	Leading	13.92
54	FLT62-3PH	0.986	Leading	28.33		0.999	Leading	6.38		0.998	Leading	11.88
55	FLT64-3PH	0.986	Leading	29.26		0.999	Leading	8.16		0.997	Leading	12.57
56	FLT66-3PH	0.992	Leading	21.59		0.999	Leading	6.66		0.998	Leading	9.83
57	FLT67-3PH	0.985	Leading	29.49		0.999	Leading	8.36		0.998	Leading	10.83
58	FLT71-3PH	0.985	Leading	29.73		0.999	Leading	8.65		0.997	Leading	13.75
59	FLT72-3PH	0.985	Leading	29.72		0.999	Leading	8.65		0.997	Leading	13.80
60	FLT73-3PH	0.985	Leading	29.70		0.999	Leading	8.65		0.997	Leading	13.97
61	FLT74-3PH	0.985	Leading	29.74		0.999	Leading	8.66		0.997	Leading	13.81
62	FLT75-3PH	0.985	Leading	29.76		0.999	Leading	8.65		0.997	Leading	13.59
63	FLT76-3PH	0.985	Leading	29.74		0.999	Leading	8.65		0.997	Leading	13.72
64	FLT77-3PH	0.985	Leading	29.70		0.999	Leading	8.64		0.997	Leading	13.51
65	FLT78-3PH	0.985	Leading	29.76		0.999	Leading	8.66		0.997	Leading	13.79
66	FLT79-3PH	0.985	Leading	29.77		0.999	Leading	8.65		0.997	Leading	13.73
67	FLT80-3PH	0.985	Leading	29.70		0.999	Leading	8.65		0.997	Leading	13.61
68	FLT81-3PH	0.985	Leading	29.79		0.999	Leading	8.63		0.997	Leading	13.58
69	FLT82-3PH	0.985	Leading	29.75		0.999	Leading	8.65		0.997	Leading	13.82
70	FLT83-3PH	0.985	Leading	29.77		0.999	Leading	8.65		0.997	Leading	13.75
71	FLT87-3PH	0.987	Leading	27.52		0.999	Leading	7.48		0.996	Leading	15.39
72	FLT88-3PH	0.985	Leading	29.62		0.999	Leading	8.58		0.997	Leading	13.00
73	FLT89-3PH	0.985	Leading	29.39		0.999	Leading	8.55		0.996	Leading	14.98
74	FLT90-3PH	0.985	Leading	29.29		0.999	Leading	8.27		0.998	Leading	10.58
75	FLT91-3PH	0.985	Leading	29.63		0.999	Leading	8.65		0.997	Leading	13.71
76	FLT92-3PH	0.985	Leading	29.75		0.999	Leading	8.65		0.997	Leading	13.82
77	FLT93-3PH	0.985	Leading	29.75		0.999	Leading	8.65		0.997	Leading	13.69
78	FLT94-3PH	0.985	Leading	29.76		0.999	Leading	8.65		0.997	Leading	13.69
79	FLT95-3PH	0.985	Leading	29.71		0.999	Leading	8.63		0.997	Leading	13.80
80	FLT96-3PH	0.985	Leading	29.75		0.999	Leading	8.65		0.997	Leading	13.71
81	FLT97-3PH	0.985	Leading	29.27		0.999	Leading	8.42		0.997	Leading	13.73
82	FLT99-3PH	0.982	Leading	32.64		0.997	Leading	12.42		0.994	Leading	18.30
83	FLT100-3PH	0.985	Leading	29.41		0.999	Leading	8.28		0.997	Leading	13.32
84	FLT101-3PH	0.985	Leading	29.50		0.999	Leading	8.43		0.997	Leading	13.30
85	FLT102-3PH	0.985	Leading	29.41		0.999	Leading	8.31		0.997	Leading	13.33
86	FLT103-3PH	0.987	Leading	27.33		0.999	Leading	6.43		0.998	Leading	10.69
87	FLT104-3PH	0.986	Leading	28.97		0.999	Leading	7.31		0.997	Leading	13.13
88	FLT105-3PH	0.987	Leading	28.17		0.999	Leading	6.86		0.998	Leading	11.55
89	FLT106-3PH	0.986	Leading	28.73		0.998	Leading	10.37		0.997	Leading	12.44
90	FLT107-3PH	0.985	Leading	29.67		0.999	Leading	8.59		0.997	Leading	13.59

Table 5-2 (Continued)
Power Factor Analysis: Chaves County POI

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	0.985	Leading	30.08	0.999	Leading	8.88	0.997	Leading	14.10
92	FLT112-3PH	0.986	Leading	29.24	0.999	Leading	8.74	0.998	Leading	11.76
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.998	Leading	9.67
94	FLT122-3PH	0.985	Leading	30.20	0.998	Leading	9.69	0.997	Leading	13.49
95	FLT126-3PH	0.985	Leading	29.93	0.999	Leading	8.74	0.997	Leading	13.36
96	FLT127-3PH	0.986	Leading	29.24	0.999	Leading	8.74	0.998	Leading	11.76
97	FLT128-3PH	0.986	Leading	28.27	0.999	Leading	8.34	0.997	Leading	14.26
98	FLT129-3PH	0.986	Leading	28.57	0.999	Leading	7.94	0.996	Leading	15.13
99	FLT130-3PH	0.986	Leading	28.36	0.999	Leading	7.83	0.996	Leading	15.25
100	FLT131-3PH	0.985	Leading	29.92	0.999	Leading	8.48	0.996	Leading	15.33
101	FLT132-3PH	0.985	Leading	30.01	0.999	Leading	8.79	0.997	Leading	13.20
102	FLT133-3PH	0.985	Leading	29.76	0.999	Leading	8.65	0.997	Leading	13.71
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.998	Lagging	-10.82
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	1.000	Leading	1.87
105	FLT136-3PH	0.985	Leading	29.76	0.999	Leading	8.65	0.998	Leading	10.15

Table 5-3
Power Factor Analysis: GEN-2014-047

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
1	FLT01-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-1.99
2	FLT02-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-2.10
3	FLT03-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
4	FLT04-3PH	1.000	Lagging	-0.73	1.000	Leading	1.18	0.999	Lagging	-1.89
5	FLT05-3PH	1.000	Lagging	-0.62	1.000	Leading	1.10	0.995	Lagging	-4.02
6	FLT06-3PH	1.000	Lagging	-0.68	1.000	Leading	1.15	0.997	Lagging	-3.29
7	FLT07-3PH	1.000	Lagging	-0.73	1.000	Leading	1.18	0.999	Lagging	-1.89
8	FLT08-3PH	0.999	Leading	1.47	0.997	Leading	3.26	0.998	Leading	2.23
9	FLT09-3PH	1.000	Lagging	-0.60	1.000	Leading	1.16	0.996	Lagging	-3.46
10	FLT10-3PH	1.000	Lagging	-0.77	1.000	Leading	1.16	0.999	Lagging	-1.33
11	FLT11-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.85
12	FLT12-3PH	1.000	Lagging	-0.72	1.000	Leading	1.18	0.999	Lagging	-2.10
13	FLT13-3PH	1.000	Lagging	-0.73	1.000	Leading	1.18	0.999	Lagging	-1.67
14	FLT14-3PH	1.000	Lagging	-0.85	1.000	Leading	1.15	0.991	Lagging	-5.48
15	FLT15-3PH	1.000	Lagging	-0.60	1.000	Leading	1.14	0.999	Lagging	-2.16
16	FLT16-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.92
17	FLT18-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
18	FLT20-3PH	1.000	Lagging	-0.73	1.000	Leading	1.18	0.999	Lagging	-1.87
19	FLT21-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
20	FLT22-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
21	FLT23-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.93
22	FLT24-3PH	1.000	Lagging	-0.75	1.000	Leading	1.18	0.999	Lagging	-1.68
23	FLT25-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.94
24	FLT28-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-1.94
25	FLT29-3PH	N/A	N/A	N/A	1.000	Leading	1.18	0.999	Lagging	-1.96
26	FLT30-3PH	N/A	N/A	N/A	1.000	Leading	1.18	0.999	Lagging	-1.94
27	FLT31-3PH	N/A	N/A	N/A	1.000	Leading	1.18	0.999	Lagging	-1.88
28	FLT32-3PH	1.000	Lagging	-0.68	1.000	Leading	1.18	0.999	Lagging	-1.96
29	FLT33-3PH	1.000	Lagging	-0.68	1.000	Leading	1.18	0.999	Lagging	-1.95
30	FLT34-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-2.13
31	FLT35-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-1.95
32	FLT36-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.998	Lagging	-2.41
33	FLT37-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.998	Lagging	-2.30
34	FLT38-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
35	FLT39-3PH	1.000	Lagging	-0.72	1.000	Leading	1.18	0.999	Lagging	-1.88
36	FLT40-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
37	FLT41-3PH	1.000	Lagging	-0.68	1.000	Leading	1.18	0.998	Lagging	-2.20
38	FLT42-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.998	Lagging	-2.47
39	FLT43-3PH	1.000	Lagging	-0.67	1.000	Leading	1.18	0.999	Lagging	-2.09
40	FLT44-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-1.96
41	FLT45-3PH	1.000	Lagging	-0.69	1.000	Leading	1.18	0.998	Lagging	-2.21
42	FLT46-3PH	1.000	Lagging	-0.73	1.000	Leading	1.18	0.999	Lagging	-1.88
43	FLT47-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.92
44	FLT48-3PH	0.999	Lagging	-1.54	1.000	Leading	0.25	1.000	Lagging	-0.78
45	FLT49-3PH	0.998	Lagging	-2.80	0.998	Lagging	-2.80	0.998	Lagging	-2.83

Table 5-3 (Continued)
Power Factor Analysis: GEN-2014-047

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
46	FLT50-3PH	0.993	Lagging	-4.71		0.985	Lagging	-7.10		0.999	Lagging	-2.19
47	FLT51-3PH	1.000	Lagging	-1.01		1.000	Leading	1.17		0.999	Lagging	-1.92
48	FLT53-3PH	1.000	Lagging	-0.74		1.000	Leading	1.16		0.997	Lagging	-2.87
49	FLT55-3PH	1.000	Lagging	-1.06		1.000	Leading	1.16		0.999	Lagging	-1.83
50	FLT56-3PH	1.000	Lagging	-0.72		1.000	Leading	1.18		0.999	Lagging	-1.93
51	FLT57-3PH	1.000	Lagging	-0.72		1.000	Leading	1.18		0.999	Lagging	-1.93
52	FLT58-3PH	1.000	Lagging	-1.17		1.000	Leading	0.85		0.999	Lagging	-1.87
53	FLT59-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.93
54	FLT62-3PH	1.000	Lagging	-0.70		1.000	Leading	1.18		0.999	Lagging	-2.10
55	FLT64-3PH	1.000	Lagging	-0.67		1.000	Leading	1.18		0.999	Lagging	-2.10
56	FLT66-3PH	0.993	Lagging	-4.71		0.985	Lagging	-7.10		0.999	Lagging	-2.19
57	FLT67-3PH	1.000	Lagging	-0.68		1.000	Leading	1.18		0.999	Lagging	-2.15
58	FLT71-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
59	FLT72-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.94
60	FLT73-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.92
61	FLT74-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.94
62	FLT75-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.96
63	FLT76-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
64	FLT77-3PH	1.000	Lagging	-0.72		1.000	Leading	1.18		0.999	Lagging	-1.97
65	FLT78-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
66	FLT79-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
67	FLT80-3PH	1.000	Lagging	-0.72		1.000	Leading	1.18		0.999	Lagging	-1.96
68	FLT81-3PH	1.000	Lagging	-0.70		1.000	Leading	1.18		0.999	Lagging	-1.96
69	FLT82-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.94
70	FLT83-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
71	FLT87-3PH	1.000	Lagging	-0.75		1.000	Leading	1.18		0.999	Lagging	-1.67
72	FLT88-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-2.03
73	FLT89-3PH	1.000	Lagging	-0.73		1.000	Leading	1.18		0.999	Lagging	-1.80
74	FLT90-3PH	1.000	Lagging	-0.65		1.000	Leading	1.17		0.998	Lagging	-2.42
75	FLT91-3PH	1.000	Lagging	-0.73		1.000	Leading	1.18		0.999	Lagging	-1.95
76	FLT92-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.94
77	FLT93-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
78	FLT94-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
79	FLT95-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.93
80	FLT96-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
81	FLT97-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.94
82	FLT99-3PH	1.000	Lagging	-0.70		1.000	Leading	1.18		0.999	Lagging	-1.94
83	FLT100-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
84	FLT101-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
85	FLT102-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
86	FLT103-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.94
87	FLT104-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.97
88	FLT105-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95
89	FLT106-3PH	1.000	Lagging	-0.72		1.000	Leading	1.18		0.999	Lagging	-1.90
90	FLT107-3PH	1.000	Lagging	-0.71		1.000	Leading	1.18		0.999	Lagging	-1.95

Table 5-3 (Continued)
Power Factor Analysis: GEN-2014-047

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
92	FLT112-3PH	1.000	Lagging	-0.87	1.000	Leading	1.07	0.998	Lagging	-2.20
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.998	Lagging	-2.39
94	FLT122-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
95	FLT126-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-1.99
96	FLT127-3PH	1.000	Lagging	-0.87	1.000	Leading	1.07	0.998	Lagging	-2.20
97	FLT128-3PH	1.000	Lagging	-1.17	1.000	Leading	0.85	0.999	Lagging	-1.87
98	FLT129-3PH	1.000	Lagging	-0.73	1.000	Leading	1.18	0.999	Lagging	-1.76
99	FLT130-3PH	1.000	Lagging	-0.74	1.000	Leading	1.18	0.999	Lagging	-1.72
100	FLT131-3PH	1.000	Lagging	-0.73	1.000	Leading	1.18	0.999	Lagging	-1.73
101	FLT132-3PH	1.000	Lagging	-0.70	1.000	Leading	1.18	0.999	Lagging	-2.01
102	FLT133-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.999	Lagging	-1.95
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.990	Lagging	-5.70
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.997	Lagging	-3.16
105	FLT136-3PH	1.000	Lagging	-0.71	1.000	Leading	1.18	0.998	Lagging	-2.20

Table 5-4
Power Factor Analysis: Carlisle POI

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
0	Base	1.000	Lagging	-0.70		1.000	Leading	1.84		0.779	Lagging	-96.73
1	FLT01-3PH	1.000	Lagging	-0.76		1.000	Leading	1.81		0.778	Lagging	-96.76
2	FLT02-3PH	1.000	Lagging	-0.83		1.000	Leading	1.77		0.778	Lagging	-96.77
3	FLT03-3PH	1.000	Lagging	-0.79		1.000	Leading	1.76		0.779	Lagging	-96.74
4	FLT04-3PH	1.000	Lagging	-0.75		1.000	Leading	1.84		0.778	Lagging	-96.90
5	FLT05-3PH	1.000	Lagging	-0.63		1.000	Leading	1.73		0.772	Lagging	-98.73
6	FLT06-3PH	1.000	Lagging	-0.74		1.000	Leading	2.04		0.777	Lagging	-97.29
7	FLT07-3PH	1.000	Lagging	-0.74		1.000	Leading	1.85		0.778	Lagging	-96.88
8	FLT08-3PH	1.000	Lagging	-0.12		1.000	Leading	1.60		0.754	Lagging	-104.54
9	FLT09-3PH	1.000	Lagging	-0.95		1.000	Leading	1.93		0.779	Lagging	-96.56
10	FLT10-3PH	1.000	Lagging	-1.32		1.000	Leading	1.25		0.773	Lagging	-98.60
11	FLT11-3PH	1.000	Lagging	-0.82		1.000	Leading	1.65		0.778	Lagging	-96.77
12	FLT12-3PH	1.000	Lagging	-1.17		1.000	Leading	1.52		0.778	Lagging	-96.91
13	FLT13-3PH	1.000	Lagging	-1.37		1.000	Leading	1.85		0.775	Lagging	-97.89
14	FLT14-3PH	1.000	Lagging	-1.22		1.000	Leading	1.63		0.776	Lagging	-97.39
15	FLT15-3PH	1.000	Lagging	-0.89		1.000	Leading	2.05		0.770	Lagging	-99.58
16	FLT16-3PH	1.000	Lagging	-0.67		1.000	Leading	1.84		0.778	Lagging	-96.86
17	FLT18-3PH	1.000	Lagging	-0.71		1.000	Leading	1.85		0.779	Lagging	-96.71
18	FLT20-3PH	1.000	Lagging	-1.52		1.000	Leading	1.22		0.780	Lagging	-96.34
19	FLT21-3PH	1.000	Lagging	-0.71		1.000	Leading	1.84		0.779	Lagging	-96.73
20	FLT22-3PH	1.000	Lagging	-0.68		1.000	Leading	1.86		0.779	Lagging	-96.68
21	FLT23-3PH	1.000	Lagging	-0.72		1.000	Leading	1.80		0.779	Lagging	-96.73
22	FLT24-3PH	1.000	Lagging	-1.38		1.000	Leading	1.74		0.777	Lagging	-97.24
23	FLT25-3PH	1.000	Lagging	-0.77		1.000	Leading	1.80		0.779	Lagging	-96.71
24	FLT28-3PH	1.000	Lagging	-0.72		1.000	Leading	1.84		0.779	Lagging	-96.74
25	FLT29-3PH	N/A	N/A	N/A		1.000	Leading	1.89		0.779	Lagging	-96.74
26	FLT30-3PH	N/A	N/A	N/A		1.000	Leading	2.02		0.779	Lagging	-96.69
27	FLT31-3PH	N/A	N/A	N/A		1.000	Leading	1.39		0.778	Lagging	-96.85
28	FLT32-3PH	1.000	Lagging	-0.82		1.000	Leading	1.87		0.779	Lagging	-96.71
29	FLT33-3PH	1.000	Lagging	-0.79		1.000	Leading	1.87		0.779	Lagging	-96.73
30	FLT34-3PH	1.000	Lagging	-0.75		1.000	Leading	1.85		0.778	Lagging	-96.99
31	FLT35-3PH	1.000	Lagging	-0.68		1.000	Leading	1.86		0.779	Lagging	-96.66
32	FLT36-3PH	1.000	Lagging	-0.85		1.000	Leading	1.78		0.777	Lagging	-97.32
33	FLT37-3PH	1.000	Lagging	-0.82		1.000	Leading	1.80		0.777	Lagging	-97.19
34	FLT38-3PH	1.000	Lagging	-0.70		1.000	Leading	1.85		0.779	Lagging	-96.72
35	FLT39-3PH	1.000	Lagging	-1.23		1.000	Leading	1.40		0.777	Lagging	-97.10
36	FLT40-3PH	1.000	Lagging	-0.70		1.000	Leading	1.85		0.778	Lagging	-96.75
37	FLT41-3PH	1.000	Lagging	-0.82		1.000	Leading	1.74		0.778	Lagging	-96.77
38	FLT42-3PH	1.000	Lagging	-0.92		1.000	Leading	1.73		0.776	Lagging	-97.39
39	FLT43-3PH	1.000	Lagging	-0.72		1.000	Leading	1.82		0.779	Lagging	-96.71
40	FLT44-3PH	1.000	Lagging	-0.69		1.000	Leading	1.85		0.779	Lagging	-96.72
41	FLT45-3PH	1.000	Lagging	-0.82		1.000	Leading	1.77		0.779	Lagging	-96.72
42	FLT46-3PH	1.000	Lagging	-1.26		1.000	Leading	1.30		0.776	Lagging	-97.64
43	FLT47-3PH	1.000	Lagging	-0.85		1.000	Leading	1.72		0.778	Lagging	-97.05
44	FLT48-3PH	1.000	Lagging	-0.11		1.000	Leading	1.61		0.754	Lagging	-104.54
45	FLT49-3PH	1.000	Lagging	-1.66		1.000	Leading	2.23		0.779	Lagging	-96.50

Table 5-4 (Continued)
Power Factor Analysis: Carlisle POI

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
46	FLT50-3PH	1.000	Lagging	-1.62		1.000	Leading	2.32		0.779	Lagging	-96.48
47	FLT51-3PH	1.000	Lagging	-2.16		1.000	Leading	1.77		0.778	Lagging	-97.03
48	FLT53-3PH	1.000	Lagging	-1.44		1.000	Leading	0.36		0.768	Lagging	-100.07
49	FLT55-3PH	0.999	Lagging	-5.90		1.000	Lagging	-0.22		0.759	Lagging	-103.03
50	FLT56-3PH	1.000	Lagging	-1.18		1.000	Leading	1.80		0.775	Lagging	-97.76
51	FLT57-3PH	1.000	Lagging	-1.24		1.000	Leading	1.74		0.775	Lagging	-97.91
52	FLT58-3PH	1.000	Lagging	-1.03		1.000	Leading	0.19		0.772	Lagging	-98.90
53	FLT59-3PH	1.000	Lagging	-1.30		1.000	Leading	1.47		0.771	Lagging	-99.09
54	FLT62-3PH	1.000	Lagging	-0.83		1.000	Leading	1.70		0.778	Lagging	-96.91
55	FLT64-3PH	0.999	Lagging	-4.37		1.000	Lagging	-1.33		0.780	Lagging	-96.31
56	FLT66-3PH	1.000	Lagging	-1.62		1.000	Leading	2.32		0.779	Lagging	-96.48
57	FLT67-3PH	1.000	Lagging	-3.16		1.000	Leading	0.42		0.758	Lagging	-103.32
58	FLT71-3PH	1.000	Leading	2.79		0.999	Leading	4.65		0.822	Lagging	-83.22
59	FLT72-3PH	0.999	Leading	4.60		0.999	Leading	6.18		0.840	Lagging	-77.46
60	FLT73-3PH	1.000	Lagging	-0.37		1.000	Leading	1.27		0.781	Lagging	-95.92
61	FLT74-3PH	1.000	Lagging	-0.42		1.000	Leading	0.63		0.779	Lagging	-96.68
62	FLT75-3PH	0.999	Lagging	-3.96		1.000	Lagging	-0.59		0.768	Lagging	-100.03
63	FLT76-3PH	1.000	Lagging	-0.75		1.000	Leading	1.08		0.779	Lagging	-96.65
64	FLT77-3PH	0.990	Leading	17.18		0.998	Leading	7.79		0.786	Lagging	-94.35
65	FLT78-3PH	0.990	Leading	16.86		0.994	Leading	13.10		0.872	Lagging	-67.40
66	FLT79-3PH	0.993	Leading	14.00		0.991	Leading	15.79		0.930	Lagging	-47.33
67	FLT80-3PH	1.000	Lagging	-2.70		1.000	Lagging	-1.59		0.737	Lagging	-110.13
68	FLT81-3PH	0.945	Leading	41.43		0.941	Leading	43.23		0.941	Lagging	-43.12
69	FLT82-3PH	1.000	Lagging	-2.90		1.000	Leading	0.81		0.754	Lagging	-104.55
70	FLT83-3PH	0.993	Leading	14.30		0.991	Leading	16.09		0.866	Lagging	-69.16
71	FLT87-3PH	0.976	Lagging	-26.85		0.994	Lagging	-13.23		0.777	Lagging	-97.31
72	FLT88-3PH	1.000	Lagging	-0.69		1.000	Leading	2.44		0.776	Lagging	-97.52
73	FLT89-3PH	1.000	Leading	1.00		1.000	Lagging	-1.98		0.775	Lagging	-97.71
74	FLT90-3PH	1.000	Leading	3.68		1.000	Leading	2.43		0.778	Lagging	-96.99
75	FLT91-3PH	0.999	Leading	4.34		1.000	Leading	2.60		0.778	Lagging	-96.78
76	FLT92-3PH	1.000	Lagging	-2.90		1.000	Leading	0.81		0.754	Lagging	-104.55
77	FLT93-3PH	0.999	Lagging	-5.53		0.999	Lagging	-5.13		0.788	Lagging	-93.74
78	FLT94-3PH	1.000	Lagging	-1.09		1.000	Leading	2.28		0.786	Lagging	-94.37
79	FLT95-3PH	0.997	Lagging	-9.45		0.999	Lagging	-6.40		0.699	Lagging	-122.85
80	FLT96-3PH	1.000	Lagging	-1.51		1.000	Leading	1.39		0.776	Lagging	-97.59
81	FLT97-3PH	0.997	Lagging	-8.75		1.000	Lagging	-3.66		0.778	Lagging	-96.90
82	FLT99-3PH	1.000	Leading	3.31		0.999	Leading	5.78		0.779	Lagging	-96.74
83	FLT100-3PH	1.000	Lagging	-0.74		1.000	Leading	1.84		0.779	Lagging	-96.74
84	FLT101-3PH	1.000	Lagging	-0.75		1.000	Leading	1.82		0.779	Lagging	-96.73
85	FLT102-3PH	1.000	Lagging	-0.74		1.000	Leading	1.85		0.779	Lagging	-96.73
86	FLT103-3PH	1.000	Lagging	-1.02		1.000	Leading	1.84		0.778	Lagging	-96.77
87	FLT104-3PH	1.000	Lagging	-0.77		1.000	Leading	1.79		0.778	Lagging	-96.76
88	FLT105-3PH	1.000	Lagging	-0.78		1.000	Leading	1.78		0.779	Lagging	-96.74
89	FLT106-3PH	1.000	Lagging	-1.06		1.000	Leading	1.36		0.779	Lagging	-96.72
90	FLT107-3PH	1.000	Lagging	-0.72		1.000	Leading	1.84		0.779	Lagging	-96.73

Table 5-4 (Continued)
Power Factor Analysis: Carlisle POI

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
91	FLT108-3PH	1.000	Lagging	-0.71		1.000	Leading	1.84		0.779	Lagging	-96.73
92	FLT112-3PH	1.000	Lagging	-1.39		1.000	Leading	0.55		0.770	Lagging	-99.52
93	FLT117-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.767	Lagging	-100.47
94	FLT122-3PH	1.000	Leading	0.02		1.000	Leading	2.77		0.779	Lagging	-96.74
95	FLT126-3PH	0.997	Lagging	-8.88		0.998	Lagging	-7.57		0.778	Lagging	-96.79
96	FLT127-3PH	1.000	Lagging	-1.39		1.000	Leading	0.55		0.770	Lagging	-99.52
97	FLT128-3PH	1.000	Lagging	-1.03		1.000	Leading	0.19		0.772	Lagging	-98.90
98	FLT129-3PH	0.986	Lagging	-20.35		0.993	Lagging	-14.47		0.778	Lagging	-97.03
99	FLT130-3PH	0.984	Lagging	-21.62		0.993	Lagging	-14.77		0.777	Lagging	-97.10
100	FLT131-3PH	1.000	Lagging	-0.82		1.000	Leading	1.88		0.777	Lagging	-97.11
101	FLT132-3PH	0.996	Lagging	-11.31		0.996	Lagging	-10.10		0.778	Lagging	-96.81
102	FLT133-3PH	1.000	Lagging	-0.70		1.000	Leading	1.84		0.779	Lagging	-96.73
103	FLT134-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.779	Lagging	-96.43
104	FLT135-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.762	Lagging	-102.03
105	FLT136-3PH	1.000	Lagging	-0.70		1.000	Leading	1.84		0.778	Lagging	-97.03

Table 5-5
Power Factor Analysis: GEN-2014-063

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.993	Leading	13.80	0.997	Leading	9.75	0.829	Lagging	-80.92
1	FLT01-3PH	0.993	Leading	13.83	0.997	Leading	9.79	0.828	Lagging	-81.27
2	FLT02-3PH	0.993	Leading	13.82	0.997	Leading	9.79	0.827	Lagging	-81.48
3	FLT03-3PH	0.993	Leading	13.78	0.997	Leading	9.72	0.829	Lagging	-81.05
4	FLT04-3PH	0.994	Leading	13.73	0.997	Leading	9.73	0.821	Lagging	-83.44
5	FLT05-3PH	0.993	Leading	14.65	0.996	Leading	11.18	0.819	Lagging	-84.20
6	FLT06-3PH	0.993	Leading	14.00	0.996	Leading	10.72	0.823	Lagging	-82.91
7	FLT07-3PH	0.994	Leading	13.74	0.997	Leading	9.73	0.822	Lagging	-83.15
8	FLT08-3PH	0.991	Leading	16.34	0.994	Leading	13.55	0.754	Lagging	-104.60
9	FLT09-3PH	0.996	Leading	10.07	0.998	Leading	7.66	0.816	Lagging	-84.93
10	FLT10-3PH	0.994	Leading	13.66	0.997	Leading	9.67	0.783	Lagging	-95.21
11	FLT11-3PH	0.994	Leading	13.63	0.997	Leading	9.57	0.821	Lagging	-83.30
12	FLT12-3PH	0.994	Leading	13.14	0.997	Leading	9.30	0.815	Lagging	-85.24
13	FLT13-3PH	0.995	Leading	11.75	0.997	Leading	8.69	0.742	Lagging	-108.40
14	FLT14-3PH	0.998	Leading	8.26	0.999	Leading	3.92	0.732	Lagging	-111.54
15	FLT15-3PH	0.980	Leading	24.54	0.987	Leading	19.56	0.696	Lagging	-123.91
16	FLT16-3PH	0.995	Leading	11.82	0.998	Leading	7.54	0.823	Lagging	-82.72
17	FLT18-3PH	0.993	Leading	13.79	0.997	Leading	9.73	0.831	Lagging	-80.36
18	FLT20-3PH	0.994	Leading	13.63	0.997	Leading	9.54	0.841	Lagging	-77.33
19	FLT21-3PH	0.993	Leading	13.79	0.997	Leading	9.75	0.829	Lagging	-80.92
20	FLT22-3PH	0.993	Leading	14.03	0.997	Leading	9.94	0.839	Lagging	-77.84
21	FLT23-3PH	0.993	Leading	13.78	0.997	Leading	9.66	0.830	Lagging	-80.68
22	FLT24-3PH	0.996	Leading	11.32	0.997	Leading	9.51	0.787	Lagging	-93.92
23	FLT25-3PH	0.993	Leading	13.77	0.997	Leading	9.71	0.829	Lagging	-80.92
24	FLT28-3PH	0.993	Leading	13.79	0.997	Leading	9.88	0.828	Lagging	-81.24
25	FLT29-3PH	N/A	N/A	N/A	0.997	Leading	9.62	0.828	Lagging	-81.12
26	FLT30-3PH	N/A	N/A	N/A	0.997	Leading	9.59	0.847	Lagging	-75.19
27	FLT31-3PH	N/A	N/A	N/A	0.998	Leading	7.86	0.828	Lagging	-81.22
28	FLT32-3PH	0.993	Leading	14.61	0.996	Leading	10.57	0.829	Lagging	-80.89
29	FLT33-3PH	0.993	Leading	14.64	0.996	Leading	10.54	0.829	Lagging	-80.92
30	FLT34-3PH	0.993	Leading	14.25	0.996	Leading	10.45	0.784	Lagging	-95.06
31	FLT35-3PH	0.994	Leading	13.57	0.997	Leading	9.39	0.836	Lagging	-78.83
32	FLT36-3PH	0.993	Leading	13.98	0.996	Leading	10.27	0.761	Lagging	-102.21
33	FLT37-3PH	0.993	Leading	14.09	0.996	Leading	10.26	0.768	Lagging	-100.09
34	FLT38-3PH	0.993	Leading	14.23	0.996	Leading	10.12	0.838	Lagging	-78.00
35	FLT39-3PH	0.994	Leading	13.50	0.997	Leading	9.00	0.820	Lagging	-83.83
36	FLT40-3PH	0.994	Leading	13.70	0.997	Leading	9.62	0.829	Lagging	-80.87
37	FLT41-3PH	0.993	Leading	14.76	0.996	Leading	10.54	0.808	Lagging	-87.52
38	FLT42-3PH	0.993	Leading	13.97	0.996	Leading	10.29	0.755	Lagging	-104.09
39	FLT43-3PH	0.992	Leading	15.60	0.996	Leading	11.21	0.819	Lagging	-84.10
40	FLT44-3PH	0.993	Leading	14.14	0.997	Leading	10.01	0.829	Lagging	-80.86
41	FLT45-3PH	0.993	Leading	14.54	0.996	Leading	10.43	0.819	Lagging	-84.13
42	FLT46-3PH	0.994	Leading	12.94	0.998	Leading	8.16	0.819	Lagging	-83.96
43	FLT47-3PH	0.994	Leading	13.43	0.997	Leading	9.35	0.815	Lagging	-85.34
44	FLT48-3PH	0.991	Leading	16.34	0.994	Leading	13.55	0.754	Lagging	-104.66
45	FLT49-3PH	0.999	Leading	5.06	1.000	Leading	1.76	0.825	Lagging	-82.27

Table 5-5 (Continued)
Power Factor Analysis: GEN-2014-063

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.999	Leading	5.10	1.000	Leading	1.85	0.827	Lagging	-81.55
47	FLT51-3PH	0.996	Leading	10.53	0.998	Leading	7.85	0.825	Lagging	-82.11
48	FLT53-3PH	0.996	Leading	10.67	0.999	Leading	4.52	0.822	Lagging	-83.12
49	FLT55-3PH	0.992	Leading	15.66	0.995	Leading	12.31	0.832	Lagging	-79.90
50	FLT56-3PH	0.996	Leading	11.18	0.997	Leading	9.28	0.819	Lagging	-84.17
51	FLT57-3PH	0.996	Leading	10.89	0.997	Leading	8.95	0.817	Lagging	-84.55
52	FLT58-3PH	0.982	Leading	23.20	0.992	Leading	14.84	0.882	Lagging	-64.15
53	FLT59-3PH	0.993	Leading	14.31	0.997	Leading	10.03	0.833	Lagging	-79.84
54	FLT62-3PH	0.993	Leading	13.86	0.997	Leading	9.70	0.828	Lagging	-81.24
55	FLT64-3PH	0.995	Leading	12.63	0.998	Leading	8.37	0.828	Lagging	-81.18
56	FLT66-3PH	0.999	Leading	5.10	1.000	Leading	1.85	0.827	Lagging	-81.55
57	FLT67-3PH	0.995	Leading	12.25	0.997	Leading	8.56	0.822	Lagging	-83.01
58	FLT71-3PH	0.993	Leading	13.96	0.997	Leading	9.89	0.830	Lagging	-80.64
59	FLT72-3PH	0.993	Leading	14.03	0.997	Leading	9.96	0.830	Lagging	-80.52
60	FLT73-3PH	0.993	Leading	13.89	0.997	Leading	9.78	0.829	Lagging	-80.86
61	FLT74-3PH	0.993	Leading	13.81	0.997	Leading	9.73	0.829	Lagging	-80.90
62	FLT75-3PH	0.994	Leading	13.72	0.997	Leading	9.63	0.829	Lagging	-81.00
63	FLT76-3PH	0.993	Leading	13.86	0.997	Leading	9.74	0.829	Lagging	-80.92
64	FLT77-3PH	0.994	Leading	13.14	0.997	Leading	9.22	0.828	Lagging	-81.38
65	FLT78-3PH	0.993	Leading	14.05	0.997	Leading	9.99	0.831	Lagging	-80.26
66	FLT79-3PH	0.993	Leading	13.77	0.997	Leading	9.70	0.830	Lagging	-80.72
67	FLT80-3PH	0.993	Leading	14.07	0.996	Leading	10.07	0.828	Lagging	-81.29
68	FLT81-3PH	0.994	Leading	13.03	0.997	Leading	8.62	0.827	Lagging	-81.60
69	FLT82-3PH	0.994	Leading	13.69	0.997	Leading	9.70	0.829	Lagging	-81.06
70	FLT83-3PH	0.993	Leading	13.77	0.997	Leading	9.70	0.830	Lagging	-80.78
71	FLT87-3PH	0.993	Leading	14.21	0.996	Leading	10.42	0.826	Lagging	-81.89
72	FLT88-3PH	0.993	Leading	13.87	0.997	Leading	9.85	0.826	Lagging	-81.95
73	FLT89-3PH	0.993	Leading	14.20	0.996	Leading	10.09	0.829	Lagging	-80.89
74	FLT90-3PH	0.995	Leading	11.84	0.998	Leading	7.79	0.825	Lagging	-82.15
75	FLT91-3PH	0.993	Leading	14.29	0.997	Leading	9.68	0.829	Lagging	-80.92
76	FLT92-3PH	0.994	Leading	13.69	0.997	Leading	9.70	0.829	Lagging	-81.06
77	FLT93-3PH	0.993	Leading	13.77	0.997	Leading	9.70	0.829	Lagging	-80.91
78	FLT94-3PH	0.994	Leading	13.73	0.997	Leading	9.80	0.829	Lagging	-80.93
79	FLT95-3PH	0.993	Leading	13.75	0.997	Leading	9.67	0.827	Lagging	-81.67
80	FLT96-3PH	0.993	Leading	13.78	0.997	Leading	9.73	0.829	Lagging	-80.93
81	FLT97-3PH	0.993	Leading	13.80	0.997	Leading	9.75	0.828	Lagging	-81.16
82	FLT99-3PH	0.993	Leading	14.13	0.996	Leading	10.23	0.830	Lagging	-80.64
83	FLT100-3PH	0.993	Leading	13.78	0.997	Leading	9.73	0.829	Lagging	-80.93
84	FLT101-3PH	0.993	Leading	13.79	0.997	Leading	9.75	0.829	Lagging	-80.93
85	FLT102-3PH	0.993	Leading	13.78	0.997	Leading	9.73	0.829	Lagging	-80.93
86	FLT103-3PH	0.994	Leading	13.69	0.997	Leading	9.67	0.828	Lagging	-81.13
87	FLT104-3PH	0.993	Leading	13.80	0.997	Leading	9.77	0.829	Lagging	-80.97
88	FLT105-3PH	0.993	Leading	13.76	0.997	Leading	9.70	0.829	Lagging	-81.05
89	FLT106-3PH	0.994	Leading	13.64	0.997	Leading	9.57	0.829	Lagging	-80.97
90	FLT107-3PH	0.993	Leading	13.79	0.997	Leading	9.74	0.829	Lagging	-80.92

Table 5-5 (Continued)
Power Factor Analysis: GEN-2014-063

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	0.993	Leading	13.80	0.997	Leading	9.75	0.829	Lagging	-80.92
92	FLT112-3PH	0.972	Leading	28.83	0.986	Leading	20.66	0.897	Lagging	-59.08
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.786	Lagging	-94.31
94	FLT122-3PH	0.993	Leading	13.86	0.997	Leading	9.86	0.829	Lagging	-80.88
95	FLT126-3PH	0.994	Leading	13.62	0.997	Leading	9.45	0.828	Lagging	-81.24
96	FLT127-3PH	0.972	Leading	28.83	0.986	Leading	20.66	0.897	Lagging	-59.08
97	FLT128-3PH	0.982	Leading	23.20	0.992	Leading	14.84	0.882	Lagging	-64.15
98	FLT129-3PH	0.993	Leading	14.19	0.996	Leading	10.21	0.828	Lagging	-81.30
99	FLT130-3PH	0.993	Leading	14.21	0.996	Leading	10.27	0.828	Lagging	-81.23
100	FLT131-3PH	0.995	Leading	12.57	0.997	Leading	9.78	0.794	Lagging	-91.74
101	FLT132-3PH	0.994	Leading	13.59	0.997	Leading	9.41	0.827	Lagging	-81.46
102	FLT133-3PH	0.993	Leading	13.80	0.997	Leading	9.75	0.829	Lagging	-80.92
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.714	Lagging	-117.62
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.996	Leading	11.33
105	FLT136-3PH	0.993	Leading	13.80	0.997	Leading	9.75	0.848	Lagging	-75.07

Table 5-6
Power Factor Analysis: GEN-2014-066

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
0	Base	0.964	Lagging	-8.26		0.973	Lagging	-7.11		0.939	Lagging	-10.96
1	FLT01-3PH	0.964	Lagging	-8.32		0.973	Lagging	-7.13		0.939	Lagging	-11.01
2	FLT02-3PH	0.963	Lagging	-8.35		0.973	Lagging	-7.13		0.938	Lagging	-11.10
3	FLT03-3PH	0.965	Lagging	-8.21		0.974	Lagging	-7.01		0.940	Lagging	-10.91
4	FLT04-3PH	0.964	Lagging	-8.31		0.973	Lagging	-7.12		0.937	Lagging	-11.20
5	FLT05-3PH	0.929	Lagging	-11.94		0.950	Lagging	-9.86		0.882	Lagging	-16.01
6	FLT06-3PH	0.957	Lagging	-9.11		0.970	Lagging	-7.51		0.936	Lagging	-11.30
7	FLT07-3PH	0.964	Lagging	-8.30		0.973	Lagging	-7.11		0.937	Lagging	-11.17
8	FLT08-3PH	0.967	Lagging	-7.95		0.973	Lagging	-7.07		0.878	Lagging	-16.35
9	FLT09-3PH	0.966	Lagging	-8.05		0.974	Lagging	-7.04		0.931	Lagging	-11.80
10	FLT10-3PH	0.963	Lagging	-8.44		0.972	Lagging	-7.27		0.940	Lagging	-10.91
11	FLT11-3PH	0.964	Lagging	-8.29		0.973	Lagging	-7.17		0.938	Lagging	-11.06
12	FLT12-3PH	0.964	Lagging	-8.34		0.973	Lagging	-7.18		0.938	Lagging	-11.10
13	FLT13-3PH	0.964	Lagging	-8.32		0.973	Lagging	-7.11		0.940	Lagging	-10.93
14	FLT14-3PH	0.965	Lagging	-8.21		0.973	Lagging	-7.09		0.919	Lagging	-12.83
15	FLT15-3PH	0.966	Lagging	-8.02		0.974	Lagging	-7.01		0.938	Lagging	-11.14
16	FLT16-3PH	0.964	Lagging	-8.27		0.973	Lagging	-7.11		0.939	Lagging	-10.96
17	FLT18-3PH	0.964	Lagging	-8.26		0.973	Lagging	-7.11		0.939	Lagging	-10.96
18	FLT20-3PH	0.964	Lagging	-8.30		0.973	Lagging	-7.13		0.939	Lagging	-10.97
19	FLT21-3PH	0.964	Lagging	-8.26		0.973	Lagging	-7.11		0.939	Lagging	-10.96
20	FLT22-3PH	0.964	Lagging	-8.25		0.973	Lagging	-7.10		0.939	Lagging	-10.96
21	FLT23-3PH	0.964	Lagging	-8.26		0.973	Lagging	-7.10		0.939	Lagging	-10.97
22	FLT24-3PH	0.964	Lagging	-8.32		0.973	Lagging	-7.13		0.940	Lagging	-10.93
23	FLT25-3PH	0.964	Lagging	-8.26		0.973	Lagging	-7.11		0.939	Lagging	-10.95
24	FLT28-3PH	0.964	Lagging	-8.25		0.973	Lagging	-7.11		0.939	Lagging	-10.95
25	FLT29-3PH	N/A	N/A	N/A		0.973	Lagging	-7.10		0.939	Lagging	-10.96
26	FLT30-3PH	N/A	N/A	N/A		0.973	Lagging	-7.07		0.939	Lagging	-10.94
27	FLT31-3PH	N/A	N/A	N/A		0.973	Lagging	-7.13		0.939	Lagging	-11.03
28	FLT32-3PH	0.964	Lagging	-8.22		0.973	Lagging	-7.09		0.939	Lagging	-10.96
29	FLT33-3PH	0.964	Lagging	-8.22		0.973	Lagging	-7.09		0.939	Lagging	-10.96
30	FLT34-3PH	0.964	Lagging	-8.25		0.973	Lagging	-7.10		0.938	Lagging	-11.11
31	FLT35-3PH	0.964	Lagging	-8.25		0.973	Lagging	-7.10		0.939	Lagging	-10.96
32	FLT36-3PH	0.964	Lagging	-8.25		0.973	Lagging	-7.10		0.936	Lagging	-11.27
33	FLT37-3PH	0.964	Lagging	-8.25		0.973	Lagging	-7.10		0.937	Lagging	-11.21
34	FLT38-3PH	0.964	Lagging	-8.25		0.973	Lagging	-7.10		0.939	Lagging	-10.96
35	FLT39-3PH	0.964	Lagging	-8.29		0.973	Lagging	-7.13		0.940	Lagging	-10.94
36	FLT40-3PH	0.964	Lagging	-8.26		0.973	Lagging	-7.11		0.939	Lagging	-10.95
37	FLT41-3PH	0.964	Lagging	-8.22		0.973	Lagging	-7.10		0.938	Lagging	-11.13
38	FLT42-3PH	0.964	Lagging	-8.26		0.973	Lagging	-7.11		0.936	Lagging	-11.31
39	FLT43-3PH	0.965	Lagging	-8.17		0.973	Lagging	-7.08		0.938	Lagging	-11.07
40	FLT44-3PH	0.964	Lagging	-8.24		0.973	Lagging	-7.10		0.939	Lagging	-10.96
41	FLT45-3PH	0.964	Lagging	-8.24		0.973	Lagging	-7.10		0.937	Lagging	-11.14
42	FLT46-3PH	0.964	Lagging	-8.30		0.973	Lagging	-7.13		0.940	Lagging	-10.94
43	FLT47-3PH	0.964	Lagging	-8.27		0.973	Lagging	-7.11		0.939	Lagging	-10.95
44	FLT48-3PH	0.967	Lagging	-7.95		0.973	Lagging	-7.07		0.878	Lagging	-16.35
45	FLT49-3PH	0.944	Lagging	-10.49		0.963	Lagging	-8.41		0.935	Lagging	-11.39

Table 5-6 (Continued)
Power Factor Analysis: GEN-2014-066

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.944	Lagging	-10.48	0.963	Lagging	-8.39	0.937	Lagging	-11.14
47	FLT51-3PH	0.962	Lagging	-8.47	0.973	Lagging	-7.16	0.939	Lagging	-10.94
48	FLT53-3PH	0.964	Lagging	-8.29	0.973	Lagging	-7.07	0.934	Lagging	-11.50
49	FLT55-3PH	0.960	Lagging	-8.76	0.972	Lagging	-7.24	0.939	Lagging	-10.97
50	FLT56-3PH	0.964	Lagging	-8.27	0.973	Lagging	-7.10	0.939	Lagging	-10.95
51	FLT57-3PH	0.964	Lagging	-8.27	0.973	Lagging	-7.11	0.939	Lagging	-10.95
52	FLT58-3PH	0.960	Lagging	-8.77	0.969	Lagging	-7.62	0.940	Lagging	-10.93
53	FLT59-3PH	0.964	Lagging	-8.27	0.973	Lagging	-7.11	0.939	Lagging	-10.96
54	FLT62-3PH	0.958	Lagging	-8.95	0.960	Lagging	-8.78	0.921	Lagging	-12.67
55	FLT64-3PH	0.961	Lagging	-8.68	0.970	Lagging	-7.47	0.938	Lagging	-11.13
56	FLT66-3PH	0.944	Lagging	-10.48	0.963	Lagging	-8.39	0.937	Lagging	-11.14
57	FLT67-3PH	0.962	Lagging	-8.49	0.972	Lagging	-7.31	0.925	Lagging	-12.28
58	FLT71-3PH	0.964	Lagging	-8.28	0.973	Lagging	-7.11	0.939	Lagging	-10.95
59	FLT72-3PH	0.964	Lagging	-8.28	0.973	Lagging	-7.12	0.939	Lagging	-10.95
60	FLT73-3PH	0.964	Lagging	-8.30	0.973	Lagging	-7.11	0.939	Lagging	-10.95
61	FLT74-3PH	0.964	Lagging	-8.27	0.973	Lagging	-7.10	0.939	Lagging	-10.96
62	FLT75-3PH	0.964	Lagging	-8.26	0.973	Lagging	-7.10	0.939	Lagging	-10.96
63	FLT76-3PH	0.964	Lagging	-8.27	0.973	Lagging	-7.11	0.939	Lagging	-10.96
64	FLT77-3PH	0.964	Lagging	-8.29	0.973	Lagging	-7.10	0.939	Lagging	-10.97
65	FLT78-3PH	0.964	Lagging	-8.25	0.973	Lagging	-7.10	0.939	Lagging	-10.95
66	FLT79-3PH	0.964	Lagging	-8.25	0.973	Lagging	-7.10	0.939	Lagging	-10.95
67	FLT80-3PH	0.964	Lagging	-8.29	0.973	Lagging	-7.13	0.939	Lagging	-10.96
68	FLT81-3PH	0.964	Lagging	-8.24	0.973	Lagging	-7.10	0.939	Lagging	-10.97
69	FLT82-3PH	0.964	Lagging	-8.27	0.973	Lagging	-7.11	0.939	Lagging	-10.96
70	FLT83-3PH	0.964	Lagging	-8.25	0.973	Lagging	-7.10	0.939	Lagging	-10.96
71	FLT87-3PH	0.949	Lagging	-9.94	0.965	Lagging	-8.20	0.938	Lagging	-11.13
72	FLT88-3PH	0.963	Lagging	-8.36	0.973	Lagging	-7.18	0.939	Lagging	-11.00
73	FLT89-3PH	0.962	Lagging	-8.52	0.972	Lagging	-7.23	0.939	Lagging	-11.02
74	FLT90-3PH	0.961	Lagging	-8.68	0.972	Lagging	-7.31	0.936	Lagging	-11.32
75	FLT91-3PH	0.964	Lagging	-8.33	0.973	Lagging	-7.10	0.939	Lagging	-10.96
76	FLT92-3PH	0.964	Lagging	-8.27	0.973	Lagging	-7.11	0.939	Lagging	-10.96
77	FLT93-3PH	0.964	Lagging	-8.26	0.973	Lagging	-7.12	0.939	Lagging	-10.96
78	FLT94-3PH	0.964	Lagging	-8.25	0.973	Lagging	-7.10	0.939	Lagging	-10.96
79	FLT95-3PH	0.964	Lagging	-8.29	0.973	Lagging	-7.13	0.939	Lagging	-10.96
80	FLT96-3PH	0.964	Lagging	-8.26	0.973	Lagging	-7.11	0.939	Lagging	-10.96
81	FLT97-3PH	0.961	Lagging	-8.63	0.972	Lagging	-7.32	0.939	Lagging	-11.03
82	FLT99-3PH	0.992	Leading	3.80	0.973	Leading	7.15	1.000	Lagging	-0.42
83	FLT100-3PH	0.963	Lagging	-8.41	0.971	Lagging	-7.35	0.939	Lagging	-10.98
84	FLT101-3PH	0.967	Lagging	-7.95	0.975	Lagging	-6.88	0.943	Lagging	-10.57
85	FLT102-3PH	0.963	Lagging	-8.41	0.971	Lagging	-7.41	0.939	Lagging	-10.99
86	FLT103-3PH	0.955	Lagging	-9.28	0.957	Lagging	-9.04	0.939	Lagging	-11.02
87	FLT104-3PH	0.949	Lagging	-9.95	0.967	Lagging	-7.94	0.919	Lagging	-12.86
88	FLT105-3PH	0.945	Lagging	-10.36	0.955	Lagging	-9.37	0.912	Lagging	-13.49
89	FLT106-3PH	0.950	Lagging	-9.82	0.967	Lagging	-7.89	0.923	Lagging	-12.50
90	FLT107-3PH	0.964	Lagging	-8.25	0.972	Lagging	-7.20	0.940	Lagging	-10.88

Table 5-6 (Continued)
Power Factor Analysis: GEN-2014-066

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	0.963	Lagging	-8.42	0.972	Lagging	-7.25	0.937	Lagging	-11.17
92	FLT112-3PH	0.962	Lagging	-8.47	0.971	Lagging	-7.37	0.938	Lagging	-11.11
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.936	Lagging	-11.25
94	FLT122-3PH	0.979	Lagging	-6.27	0.990	Lagging	-4.25	0.946	Lagging	-10.29
95	FLT126-3PH	0.965	Lagging	-8.13	0.974	Lagging	-7.01	0.939	Lagging	-10.97
96	FLT127-3PH	0.962	Lagging	-8.47	0.971	Lagging	-7.37	0.938	Lagging	-11.11
97	FLT128-3PH	0.960	Lagging	-8.77	0.969	Lagging	-7.62	0.940	Lagging	-10.93
98	FLT129-3PH	0.957	Lagging	-9.14	0.968	Lagging	-7.78	0.938	Lagging	-11.08
99	FLT130-3PH	0.955	Lagging	-9.31	0.967	Lagging	-7.88	0.938	Lagging	-11.10
100	FLT131-3PH	0.964	Lagging	-8.28	0.973	Lagging	-7.12	0.940	Lagging	-10.94
101	FLT132-3PH	0.966	Lagging	-8.07	0.974	Lagging	-6.96	0.939	Lagging	-10.95
102	FLT133-3PH	0.964	Lagging	-8.26	0.973	Lagging	-7.11	0.939	Lagging	-10.96
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.917	Lagging	-13.03
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.931	Lagging	-11.72
105	FLT136-3PH	0.964	Lagging	-8.26	0.973	Lagging	-7.11	0.937	Lagging	-11.17

Table 5-7
Power Factor Analysis: GEN-2014-070

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.997	Lagging	-9.07	0.999	Leading	4.01	0.984	Lagging	-21.27
1	FLT01-3PH	0.997	Lagging	-8.95	0.999	Leading	4.11	0.983	Lagging	-21.44
2	FLT02-3PH	0.997	Lagging	-8.96	0.999	Leading	4.12	0.983	Lagging	-21.55
3	FLT03-3PH	0.997	Lagging	-9.11	0.999	Leading	3.95	0.984	Lagging	-21.32
4	FLT04-3PH	0.997	Lagging	-8.86	0.999	Leading	4.21	0.982	Lagging	-22.47
5	FLT05-3PH	0.998	Lagging	-6.72	0.998	Leading	6.96	0.975	Lagging	-26.40
6	FLT06-3PH	0.997	Lagging	-8.53	0.999	Leading	6.00	0.981	Lagging	-23.15
7	FLT07-3PH	0.997	Lagging	-8.88	0.999	Leading	4.19	0.982	Lagging	-22.33
8	FLT08-3PH	1.000	Lagging	-1.87	0.995	Leading	11.76	0.905	Lagging	-54.45
9	FLT09-3PH	0.991	Lagging	-15.72	1.000	Leading	0.98	0.982	Lagging	-22.28
10	FLT10-3PH	0.997	Lagging	-8.67	0.999	Leading	4.88	0.962	Lagging	-32.95
11	FLT11-3PH	0.997	Lagging	-9.19	0.999	Leading	3.79	0.982	Lagging	-22.28
12	FLT12-3PH	0.997	Lagging	-9.72	1.000	Leading	3.46	0.981	Lagging	-22.93
13	FLT13-3PH	0.996	Lagging	-9.99	1.000	Leading	3.67	0.960	Lagging	-33.67
14	FLT14-3PH	0.991	Lagging	-15.28	1.000	Lagging	-1.21	0.960	Lagging	-33.61
15	FLT15-3PH	0.987	Lagging	-18.75	1.000	Lagging	-3.18	0.894	Lagging	-58.00
16	FLT16-3PH	0.997	Lagging	-9.34	1.000	Leading	3.48	0.983	Lagging	-21.60
17	FLT18-3PH	0.997	Lagging	-9.07	0.999	Leading	4.01	0.984	Lagging	-21.17
18	FLT20-3PH	0.996	Lagging	-9.86	1.000	Leading	3.33	0.986	Lagging	-19.63
19	FLT21-3PH	0.997	Lagging	-9.07	0.999	Leading	4.00	0.984	Lagging	-21.27
20	FLT22-3PH	0.997	Lagging	-9.04	0.999	Leading	4.03	0.984	Lagging	-20.68
21	FLT23-3PH	0.997	Lagging	-9.10	0.999	Leading	4.02	0.984	Lagging	-21.09
22	FLT24-3PH	0.997	Lagging	-9.20	0.999	Leading	4.14	0.973	Lagging	-27.78
23	FLT25-3PH	0.997	Lagging	-9.13	0.999	Leading	3.96	0.984	Lagging	-21.32
24	FLT28-3PH	0.997	Lagging	-9.19	0.999	Leading	3.98	0.983	Lagging	-21.40
25	FLT29-3PH	N/A	N/A	N/A	0.999	Leading	3.89	0.983	Lagging	-21.40
26	FLT30-3PH	N/A	N/A	N/A	0.999	Leading	3.90	0.985	Lagging	-20.62
27	FLT31-3PH	N/A	N/A	N/A	1.000	Leading	3.52	0.980	Lagging	-23.48
28	FLT32-3PH	0.996	Lagging	-9.95	1.000	Leading	3.53	0.983	Lagging	-21.34
29	FLT33-3PH	0.996	Lagging	-9.92	1.000	Leading	3.54	0.984	Lagging	-21.27
30	FLT34-3PH	0.997	Lagging	-9.13	0.999	Leading	4.07	0.976	Lagging	-26.16
31	FLT35-3PH	0.997	Lagging	-9.36	0.999	Leading	3.69	0.984	Lagging	-20.80
32	FLT36-3PH	0.997	Lagging	-9.25	0.999	Leading	3.99	0.970	Lagging	-28.83
33	FLT37-3PH	0.997	Lagging	-9.20	0.999	Leading	4.00	0.972	Lagging	-28.02
34	FLT38-3PH	0.997	Lagging	-9.08	0.999	Leading	4.02	0.984	Lagging	-21.23
35	FLT39-3PH	0.996	Lagging	-10.82	1.000	Leading	1.21	0.982	Lagging	-22.18
36	FLT40-3PH	0.997	Lagging	-9.11	0.999	Leading	3.95	0.983	Lagging	-21.39
37	FLT41-3PH	0.997	Lagging	-9.68	1.000	Leading	3.57	0.981	Lagging	-23.23
38	FLT42-3PH	0.997	Lagging	-9.33	0.999	Leading	3.92	0.969	Lagging	-29.51
39	FLT43-3PH	0.996	Lagging	-9.81	1.000	Leading	3.65	0.981	Lagging	-22.63
40	FLT44-3PH	0.997	Lagging	-9.16	0.999	Leading	3.97	0.983	Lagging	-21.41
41	FLT45-3PH	0.997	Lagging	-9.46	0.999	Leading	3.89	0.981	Lagging	-23.21
42	FLT46-3PH	0.994	Lagging	-12.89	1.000	Lagging	-2.02	0.978	Lagging	-24.60
43	FLT47-3PH	0.997	Lagging	-9.69	1.000	Leading	3.12	0.980	Lagging	-23.34
44	FLT48-3PH	1.000	Lagging	-1.87	0.995	Leading	11.77	0.905	Lagging	-54.52
45	FLT49-3PH	0.965	Lagging	-31.38	0.994	Lagging	-12.54	0.984	Lagging	-21.33

Table 5-7 (Continued)
Power Factor Analysis: GEN-2014-070

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.966	Lagging	-31.29	0.994	Lagging	-12.34	0.984	Lagging	-20.99
47	FLT51-3PH	0.981	Lagging	-22.76	1.000	Lagging	-3.59	0.980	Lagging	-23.58
48	FLT53-3PH	0.985	Lagging	-20.62	0.995	Lagging	-11.26	0.978	Lagging	-24.89
49	FLT55-3PH	1.000	Lagging	-1.49	0.994	Leading	12.37	0.989	Lagging	-17.58
50	FLT56-3PH	0.987	Lagging	-19.06	1.000	Leading	2.97	0.971	Lagging	-28.69
51	FLT57-3PH	0.985	Lagging	-20.28	1.000	Leading	1.69	0.969	Lagging	-29.68
52	FLT58-3PH	0.940	Leading	42.16	0.943	Leading	41.01	0.945	Leading	40.31
53	FLT59-3PH	0.999	Lagging	-5.98	0.999	Leading	5.44	0.989	Lagging	-17.58
54	FLT62-3PH	0.997	Lagging	-8.92	0.999	Leading	3.89	0.983	Lagging	-21.69
55	FLT64-3PH	0.994	Lagging	-13.01	1.000	Lagging	-0.19	0.983	Lagging	-21.59
56	FLT66-3PH	0.966	Lagging	-31.29	0.994	Lagging	-12.34	0.984	Lagging	-20.99
57	FLT67-3PH	0.992	Lagging	-14.56	1.000	Leading	0.28	0.977	Lagging	-25.54
58	FLT71-3PH	0.997	Lagging	-8.53	0.999	Leading	4.47	0.985	Lagging	-20.63
59	FLT72-3PH	0.997	Lagging	-8.31	0.999	Leading	4.70	0.985	Lagging	-20.36
60	FLT73-3PH	0.997	Lagging	-8.78	0.999	Leading	4.10	0.984	Lagging	-21.09
61	FLT74-3PH	0.997	Lagging	-9.03	0.999	Leading	3.95	0.984	Lagging	-21.21
62	FLT75-3PH	0.997	Lagging	-9.34	1.000	Leading	3.65	0.983	Lagging	-21.45
63	FLT76-3PH	0.997	Lagging	-8.87	0.999	Leading	3.97	0.984	Lagging	-21.27
64	FLT77-3PH	0.995	Lagging	-11.80	1.000	Leading	2.28	0.982	Lagging	-22.22
65	FLT78-3PH	0.998	Lagging	-8.12	0.999	Leading	4.87	0.986	Lagging	-19.78
66	FLT79-3PH	0.997	Lagging	-9.13	0.999	Leading	3.90	0.984	Lagging	-20.81
67	FLT80-3PH	0.998	Lagging	-8.19	0.999	Leading	4.95	0.982	Lagging	-22.09
68	FLT81-3PH	0.995	Lagging	-11.84	1.000	Leading	0.26	0.981	Lagging	-22.68
69	FLT82-3PH	0.997	Lagging	-9.44	0.999	Leading	3.87	0.983	Lagging	-21.52
70	FLT83-3PH	0.997	Lagging	-9.12	0.999	Leading	3.90	0.984	Lagging	-20.91
71	FLT87-3PH	0.997	Lagging	-8.73	0.999	Leading	5.43	0.984	Lagging	-21.25
72	FLT88-3PH	0.997	Lagging	-8.86	0.999	Leading	4.27	0.982	Lagging	-22.52
73	FLT89-3PH	0.998	Lagging	-7.90	0.999	Leading	4.93	0.984	Lagging	-20.71
74	FLT90-3PH	0.991	Lagging	-15.45	1.000	Lagging	-1.79	0.980	Lagging	-23.50
75	FLT91-3PH	0.998	Lagging	-7.51	0.999	Leading	3.81	0.984	Lagging	-21.27
76	FLT92-3PH	0.997	Lagging	-9.44	0.999	Leading	3.87	0.983	Lagging	-21.52
77	FLT93-3PH	0.997	Lagging	-9.19	0.999	Leading	3.82	0.984	Lagging	-21.26
78	FLT94-3PH	0.997	Lagging	-9.28	0.999	Leading	4.25	0.984	Lagging	-21.30
79	FLT95-3PH	0.997	Lagging	-9.31	1.000	Leading	3.67	0.982	Lagging	-22.47
80	FLT96-3PH	0.997	Lagging	-9.14	0.999	Leading	3.95	0.984	Lagging	-21.30
81	FLT97-3PH	0.997	Lagging	-9.14	0.999	Leading	3.93	0.983	Lagging	-21.49
82	FLT99-3PH	0.998	Lagging	-8.02	0.999	Leading	5.31	0.984	Lagging	-20.84
83	FLT100-3PH	0.997	Lagging	-9.13	0.999	Leading	3.96	0.984	Lagging	-21.27
84	FLT101-3PH	0.997	Lagging	-9.08	0.999	Leading	4.01	0.984	Lagging	-21.28
85	FLT102-3PH	0.997	Lagging	-9.13	0.999	Leading	3.98	0.984	Lagging	-21.27
86	FLT103-3PH	0.997	Lagging	-9.38	0.999	Leading	3.84	0.983	Lagging	-21.37
87	FLT104-3PH	0.997	Lagging	-9.05	0.999	Leading	4.04	0.984	Lagging	-21.32
88	FLT105-3PH	0.997	Lagging	-9.16	0.999	Leading	3.90	0.984	Lagging	-21.30
89	FLT106-3PH	0.997	Lagging	-9.52	1.000	Leading	3.56	0.984	Lagging	-21.24
90	FLT107-3PH	0.997	Lagging	-9.09	0.999	Leading	3.99	0.984	Lagging	-21.27

Table 5-7 (Continued)
Power Factor Analysis: GEN-2014-070

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	0.997	Lagging	-9.07	0.999	Leading	4.01	0.984	Lagging	-21.27
92	FLT112-3PH	0.969	Lagging	-29.67	0.996	Lagging	-10.61	0.912	Lagging	-52.13
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.957	Lagging	-35.33
94	FLT122-3PH	0.997	Lagging	-8.88	0.999	Leading	4.31	0.984	Lagging	-21.21
95	FLT126-3PH	0.997	Lagging	-9.64	1.000	Leading	3.15	0.983	Lagging	-21.71
96	FLT127-3PH	0.969	Lagging	-29.67	0.996	Lagging	-10.61	0.912	Lagging	-52.13
97	FLT128-3PH	0.940	Leading	42.16	0.943	Leading	41.01	0.945	Leading	40.31
98	FLT129-3PH	0.998	Lagging	-8.10	0.999	Leading	5.01	0.984	Lagging	-20.96
99	FLT130-3PH	0.998	Lagging	-8.05	0.999	Leading	5.12	0.984	Lagging	-20.77
100	FLT131-3PH	0.997	Lagging	-8.83	0.999	Leading	4.21	0.975	Lagging	-26.69
101	FLT132-3PH	0.996	Lagging	-9.74	1.000	Leading	3.01	0.982	Lagging	-22.00
102	FLT133-3PH	0.997	Lagging	-9.07	0.999	Leading	4.01	0.984	Lagging	-21.27
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.929	Lagging	-46.18
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.921	Lagging	-49.23
105	FLT136-3PH	0.997	Lagging	-9.07	0.999	Leading	4.01	0.984	Lagging	-20.81

Table 5-8
Power Factor Analysis: ASGI-2014-002

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.968	Lagging	-12.77	0.978	Lagging	-10.50	0.946	Lagging	-17.05
1	FLT01-3PH	0.968	Lagging	-12.84	0.978	Lagging	-10.53	0.945	Lagging	-17.13
2	FLT02-3PH	0.968	Lagging	-12.87	0.978	Lagging	-10.53	0.945	Lagging	-17.15
3	FLT03-3PH	0.969	Lagging	-12.71	0.979	Lagging	-10.39	0.946	Lagging	-16.93
4	FLT04-3PH	0.968	Lagging	-12.83	0.978	Lagging	-10.52	0.944	Lagging	-17.27
5	FLT05-3PH	0.946	Lagging	-17.02	0.964	Lagging	-13.67	0.908	Lagging	-22.83
6	FLT06-3PH	0.964	Lagging	-13.70	0.978	Lagging	-10.48	0.943	Lagging	-17.54
7	FLT07-3PH	0.968	Lagging	-12.82	0.978	Lagging	-10.51	0.945	Lagging	-17.23
8	FLT08-3PH	0.970	Lagging	-12.40	0.978	Lagging	-10.46	0.905	Lagging	-23.37
9	FLT09-3PH	0.970	Lagging	-12.52	0.979	Lagging	-10.43	0.940	Lagging	-17.97
10	FLT10-3PH	0.967	Lagging	-12.98	0.978	Lagging	-10.70	0.946	Lagging	-16.99
11	FLT11-3PH	0.968	Lagging	-12.81	0.978	Lagging	-10.58	0.945	Lagging	-17.17
12	FLT12-3PH	0.968	Lagging	-12.86	0.978	Lagging	-10.59	0.945	Lagging	-17.23
13	FLT13-3PH	0.968	Lagging	-12.85	0.978	Lagging	-10.51	0.946	Lagging	-16.96
14	FLT14-3PH	0.969	Lagging	-12.69	0.978	Lagging	-10.48	0.933	Lagging	-19.19
15	FLT15-3PH	0.970	Lagging	-12.48	0.979	Lagging	-10.39	0.944	Lagging	-17.28
16	FLT16-3PH	0.968	Lagging	-12.78	0.978	Lagging	-10.51	0.946	Lagging	-17.07
17	FLT18-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.50	0.946	Lagging	-17.05
18	FLT20-3PH	0.968	Lagging	-12.82	0.978	Lagging	-10.53	0.946	Lagging	-17.01
19	FLT21-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.50	0.946	Lagging	-17.05
20	FLT22-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.946	Lagging	-17.05
21	FLT23-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.50	0.946	Lagging	-17.08
22	FLT24-3PH	0.968	Lagging	-12.85	0.978	Lagging	-10.53	0.946	Lagging	-16.95
23	FLT25-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.51	0.946	Lagging	-17.05
24	FLT28-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.51	0.946	Lagging	-17.05
25	FLT29-3PH	N/A	N/A	N/A	0.978	Lagging	-10.49	0.946	Lagging	-17.05
26	FLT30-3PH	N/A	N/A	N/A	0.978	Lagging	-10.46	0.946	Lagging	-17.03
27	FLT31-3PH	N/A	N/A	N/A	0.978	Lagging	-10.53	0.945	Lagging	-17.16
28	FLT32-3PH	0.969	Lagging	-12.73	0.978	Lagging	-10.48	0.946	Lagging	-17.05
29	FLT33-3PH	0.969	Lagging	-12.72	0.978	Lagging	-10.48	0.946	Lagging	-17.05
30	FLT34-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.945	Lagging	-17.24
31	FLT35-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.946	Lagging	-17.05
32	FLT36-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.944	Lagging	-17.35
33	FLT37-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.944	Lagging	-17.28
34	FLT38-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.946	Lagging	-17.05
35	FLT39-3PH	0.968	Lagging	-12.81	0.978	Lagging	-10.53	0.946	Lagging	-17.02
36	FLT40-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.50	0.946	Lagging	-17.05
37	FLT41-3PH	0.969	Lagging	-12.73	0.978	Lagging	-10.50	0.944	Lagging	-17.27
38	FLT42-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.50	0.944	Lagging	-17.40
39	FLT43-3PH	0.969	Lagging	-12.66	0.978	Lagging	-10.47	0.945	Lagging	-17.20
40	FLT44-3PH	0.969	Lagging	-12.75	0.978	Lagging	-10.50	0.946	Lagging	-17.05
41	FLT45-3PH	0.969	Lagging	-12.74	0.978	Lagging	-10.50	0.944	Lagging	-17.28
42	FLT46-3PH	0.968	Lagging	-12.82	0.978	Lagging	-10.54	0.946	Lagging	-17.02
43	FLT47-3PH	0.968	Lagging	-12.78	0.978	Lagging	-10.51	0.946	Lagging	-17.05
44	FLT48-3PH	0.970	Lagging	-12.40	0.978	Lagging	-10.46	0.905	Lagging	-23.37
45	FLT49-3PH	0.955	Lagging	-15.42	0.972	Lagging	-12.04	0.943	Lagging	-17.49

Table 5-8 (Continued)
Power Factor Analysis: ASGI-2014-002

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.955	Lagging	-15.40	0.972	Lagging	-12.02	0.945	Lagging	-17.18
47	FLT51-3PH	0.967	Lagging	-13.02	0.978	Lagging	-10.56	0.946	Lagging	-17.03
48	FLT53-3PH	0.968	Lagging	-12.81	0.978	Lagging	-10.46	0.942	Lagging	-17.63
49	FLT55-3PH	0.966	Lagging	-13.37	0.978	Lagging	-10.67	0.946	Lagging	-17.01
50	FLT56-3PH	0.968	Lagging	-12.78	0.978	Lagging	-10.50	0.946	Lagging	-17.04
51	FLT57-3PH	0.968	Lagging	-12.79	0.978	Lagging	-10.50	0.946	Lagging	-17.04
52	FLT58-3PH	0.965	Lagging	-13.38	0.976	Lagging	-11.12	0.946	Lagging	-17.02
53	FLT59-3PH	0.968	Lagging	-12.79	0.978	Lagging	-10.51	0.946	Lagging	-17.05
54	FLT62-3PH	0.965	Lagging	-13.40	0.970	Lagging	-12.33	0.934	Lagging	-18.91
55	FLT64-3PH	0.966	Lagging	-13.27	0.977	Lagging	-10.93	0.944	Lagging	-17.27
56	FLT66-3PH	0.955	Lagging	-15.40	0.972	Lagging	-12.02	0.945	Lagging	-17.18
57	FLT67-3PH	0.967	Lagging	-13.05	0.977	Lagging	-10.74	0.936	Lagging	-18.63
58	FLT71-3PH	0.968	Lagging	-12.79	0.978	Lagging	-10.51	0.946	Lagging	-17.05
59	FLT72-3PH	0.968	Lagging	-12.79	0.978	Lagging	-10.52	0.946	Lagging	-17.04
60	FLT73-3PH	0.968	Lagging	-12.82	0.978	Lagging	-10.51	0.946	Lagging	-17.04
61	FLT74-3PH	0.968	Lagging	-12.78	0.978	Lagging	-10.50	0.946	Lagging	-17.05
62	FLT75-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.50	0.946	Lagging	-17.06
63	FLT76-3PH	0.968	Lagging	-12.78	0.978	Lagging	-10.51	0.946	Lagging	-17.05
64	FLT77-3PH	0.968	Lagging	-12.80	0.978	Lagging	-10.50	0.946	Lagging	-17.06
65	FLT78-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.946	Lagging	-17.04
66	FLT79-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.946	Lagging	-17.05
67	FLT80-3PH	0.968	Lagging	-12.80	0.978	Lagging	-10.53	0.946	Lagging	-17.06
68	FLT81-3PH	0.969	Lagging	-12.75	0.978	Lagging	-10.49	0.946	Lagging	-17.06
69	FLT82-3PH	0.968	Lagging	-12.78	0.978	Lagging	-10.50	0.946	Lagging	-17.05
70	FLT83-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.946	Lagging	-17.05
71	FLT87-3PH	0.958	Lagging	-14.78	0.973	Lagging	-11.80	0.945	Lagging	-17.20
72	FLT88-3PH	0.968	Lagging	-12.89	0.978	Lagging	-10.59	0.945	Lagging	-17.11
73	FLT89-3PH	0.967	Lagging	-13.08	0.978	Lagging	-10.65	0.946	Lagging	-17.06
74	FLT90-3PH	0.966	Lagging	-13.27	0.977	Lagging	-10.74	0.943	Lagging	-17.50
75	FLT91-3PH	0.968	Lagging	-12.86	0.978	Lagging	-10.49	0.946	Lagging	-17.05
76	FLT92-3PH	0.968	Lagging	-12.78	0.978	Lagging	-10.50	0.946	Lagging	-17.05
77	FLT93-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.51	0.946	Lagging	-17.05
78	FLT94-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.50	0.946	Lagging	-17.05
79	FLT95-3PH	0.968	Lagging	-12.80	0.978	Lagging	-10.54	0.946	Lagging	-17.06
80	FLT96-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.51	0.946	Lagging	-17.05
81	FLT97-3PH	0.966	Lagging	-13.21	0.977	Lagging	-10.75	0.945	Lagging	-17.13
82	FLT99-3PH	0.968	Lagging	-12.77	0.978	Lagging	-10.51	0.946	Lagging	-17.04
83	FLT100-3PH	0.968	Lagging	-12.94	0.977	Lagging	-10.78	0.946	Lagging	-17.07
84	FLT101-3PH	0.970	Lagging	-12.39	0.979	Lagging	-10.24	0.948	Lagging	-16.59
85	FLT102-3PH	0.968	Lagging	-12.94	0.977	Lagging	-10.86	0.945	Lagging	-17.09
86	FLT103-3PH	0.963	Lagging	-13.94	0.968	Lagging	-12.76	0.945	Lagging	-17.09
87	FLT104-3PH	0.959	Lagging	-14.68	0.975	Lagging	-11.41	0.933	Lagging	-19.18
88	FLT105-3PH	0.957	Lagging	-15.10	0.967	Lagging	-13.05	0.928	Lagging	-19.89
89	FLT106-3PH	0.959	Lagging	-14.63	0.974	Lagging	-11.43	0.935	Lagging	-18.89
90	FLT107-3PH	0.968	Lagging	-12.76	0.978	Lagging	-10.61	0.946	Lagging	-16.96

Table 5-8 (Continued)
Power Factor Analysis: ASGI-2014-002

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
91	FLT108-3PH	0.967	Lagging	-12.97		0.978	Lagging	-10.68		0.945	Lagging	-17.24
92	FLT112-3PH	0.967	Lagging	-13.02		0.977	Lagging	-10.82		0.945	Lagging	-17.25
93	FLT117-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.944	Lagging	-17.32
94	FLT122-3PH	0.992	Lagging	-6.47		0.998	Lagging	-3.00		0.978	Lagging	-10.65
95	FLT126-3PH	0.969	Lagging	-12.61		0.979	Lagging	-10.38		0.946	Lagging	-17.06
96	FLT127-3PH	0.967	Lagging	-13.02		0.977	Lagging	-10.82		0.945	Lagging	-17.25
97	FLT128-3PH	0.965	Lagging	-13.38		0.976	Lagging	-11.12		0.946	Lagging	-17.02
98	FLT129-3PH	0.963	Lagging	-13.82		0.975	Lagging	-11.30		0.945	Lagging	-17.14
99	FLT130-3PH	0.962	Lagging	-14.02		0.974	Lagging	-11.43		0.945	Lagging	-17.16
100	FLT131-3PH	0.968	Lagging	-12.80		0.978	Lagging	-10.52		0.946	Lagging	-16.97
101	FLT132-3PH	0.969	Lagging	-12.54		0.979	Lagging	-10.33		0.946	Lagging	-17.04
102	FLT133-3PH	0.968	Lagging	-12.77		0.978	Lagging	-10.50		0.946	Lagging	-17.05
103	FLT134-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.931	Lagging	-19.44
104	FLT135-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.941	Lagging	-17.88
105	FLT136-3PH	0.968	Lagging	-12.77		0.978	Lagging	-10.50		0.945	Lagging	-17.23

Table 5-9
Power Factor Analysis: ASGI-2014-005

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
1	FLT01-3PH	0.981	Lagging	-1.97	0.941	Lagging	-3.58	0.683	Lagging	-10.70
2	FLT02-3PH	0.980	Lagging	-2.01	0.941	Lagging	-3.61	0.679	Lagging	-10.82
3	FLT03-3PH	0.982	Lagging	-1.93	0.941	Lagging	-3.60	0.686	Lagging	-10.62
4	FLT04-3PH	0.977	Lagging	-2.20	0.943	Lagging	-3.52	0.661	Lagging	-11.35
5	FLT05-3PH	0.981	Lagging	-1.99	0.942	Lagging	-3.57	0.670	Lagging	-11.07
6	FLT06-3PH	0.981	Lagging	-1.98	0.938	Lagging	-3.70	0.656	Lagging	-11.49
7	FLT07-3PH	0.978	Lagging	-2.14	0.944	Lagging	-3.50	0.664	Lagging	-11.25
8	FLT08-3PH	0.973	Lagging	-2.37	0.930	Lagging	-3.96	0.459	Lagging	-19.38
9	FLT09-3PH	0.958	Lagging	-2.98	0.935	Lagging	-3.78	0.646	Lagging	-11.83
10	FLT10-3PH	0.784	Lagging	-7.91	0.705	Lagging	-10.05	0.498	Lagging	-17.39
11	FLT11-3PH	0.975	Lagging	-2.28	0.924	Lagging	-4.13	0.656	Lagging	-11.50
12	FLT12-3PH	0.891	Lagging	-5.10	0.850	Lagging	-6.19	0.666	Lagging	-11.21
13	FLT13-3PH	0.473	Lagging	-18.63	0.777	Lagging	-8.11	0.388	Lagging	-23.72
14	FLT14-3PH	0.583	Lagging	-13.93	0.563	Lagging	-14.67	0.414	Lagging	-21.97
15	FLT15-3PH	0.953	Lagging	-3.18	0.917	Lagging	-4.34	0.565	Lagging	-14.59
16	FLT16-3PH	0.985	Lagging	-1.77	0.946	Lagging	-3.43	0.689	Lagging	-10.53
17	FLT18-3PH	0.987	Lagging	-1.60	0.887	Lagging	-5.22	0.867	Lagging	-5.74
18	FLT20-3PH	0.828	Leading	6.77	0.917	Leading	4.35	0.872	Leading	5.62
19	FLT21-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.686	Lagging	-10.60
20	FLT22-3PH	1.000	Leading	0.17	0.975	Lagging	-2.28	0.708	Lagging	-9.98
21	FLT23-3PH	0.978	Lagging	-2.12	0.880	Lagging	-5.40	0.707	Lagging	-9.99
22	FLT24-3PH	0.928	Leading	4.02	0.955	Lagging	-3.12	0.754	Lagging	-8.70
23	FLT25-3PH	0.867	Lagging	-5.76	0.878	Lagging	-5.45	0.504	Lagging	-17.14
24	FLT28-3PH	0.994	Lagging	-1.07	0.889	Lagging	-5.16	0.681	Lagging	-10.75
25	FLT29-3PH	N/A	N/A	N/A	0.942	Lagging	-3.55	0.691	Lagging	-10.47
26	FLT30-3PH	N/A	N/A	N/A	0.989	Lagging	-1.49	0.780	Lagging	-8.02
27	FLT31-3PH	N/A	N/A	N/A	0.896	Lagging	-4.95	0.583	Lagging	-13.94
28	FLT32-3PH	0.868	Lagging	-5.73	0.899	Lagging	-4.88	0.690	Lagging	-10.50
29	FLT33-3PH	0.881	Lagging	-5.36	0.903	Lagging	-4.74	0.686	Lagging	-10.60
30	FLT34-3PH	0.971	Lagging	-2.46	0.935	Lagging	-3.80	0.586	Lagging	-13.82
31	FLT35-3PH	0.969	Lagging	-2.54	0.931	Lagging	-3.92	0.679	Lagging	-10.81
32	FLT36-3PH	0.958	Lagging	-2.99	0.922	Lagging	-4.20	0.530	Lagging	-16.01
33	FLT37-3PH	0.968	Lagging	-2.61	0.929	Lagging	-4.00	0.547	Lagging	-15.30
34	FLT38-3PH	0.983	Lagging	-1.86	0.943	Lagging	-3.52	0.686	Lagging	-10.60
35	FLT39-3PH	0.982	Lagging	-1.95	0.942	Lagging	-3.57	0.688	Lagging	-10.55
36	FLT40-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.52	0.686	Lagging	-10.60
37	FLT41-3PH	0.933	Lagging	-3.86	0.857	Lagging	-6.02	0.615	Lagging	-12.81
38	FLT42-3PH	0.954	Lagging	-3.13	0.916	Lagging	-4.37	0.516	Lagging	-16.62
39	FLT43-3PH	0.999	Leading	0.39	0.923	Lagging	-4.17	0.692	Lagging	-10.42
40	FLT44-3PH	0.995	Lagging	-1.00	0.948	Lagging	-3.36	0.701	Lagging	-10.17
41	FLT45-3PH	0.951	Lagging	-3.25	0.889	Lagging	-5.16	0.599	Lagging	-13.36
42	FLT46-3PH	0.980	Lagging	-2.05	0.941	Lagging	-3.59	0.674	Lagging	-10.95
43	FLT47-3PH	0.980	Lagging	-2.02	0.941	Lagging	-3.60	0.663	Lagging	-11.29
44	FLT48-3PH	0.973	Lagging	-2.37	0.930	Lagging	-3.96	0.458	Lagging	-19.40
45	FLT49-3PH	0.992	Lagging	-1.28	0.949	Lagging	-3.31	0.658	Lagging	-11.45

Table 5-9 (Continued)
Power Factor Analysis: ASGI-2014-005

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.992	Lagging	-1.28	0.949	Lagging	-3.31	0.673	Lagging	-11.00
47	FLT51-3PH	0.976	Lagging	-2.23	0.941	Lagging	-3.58	0.684	Lagging	-10.66
48	FLT53-3PH	0.982	Lagging	-1.94	0.944	Lagging	-3.49	0.670	Lagging	-11.09
49	FLT55-3PH	0.975	Lagging	-2.26	0.941	Lagging	-3.59	0.689	Lagging	-10.52
50	FLT56-3PH	0.982	Lagging	-1.93	0.943	Lagging	-3.53	0.679	Lagging	-10.82
51	FLT57-3PH	0.982	Lagging	-1.93	0.943	Lagging	-3.53	0.678	Lagging	-10.85
52	FLT58-3PH	0.979	Lagging	-2.09	0.941	Lagging	-3.60	0.687	Lagging	-10.58
53	FLT59-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.53	0.689	Lagging	-10.52
54	FLT62-3PH	0.982	Lagging	-1.91	0.942	Lagging	-3.55	0.686	Lagging	-10.61
55	FLT64-3PH	0.984	Lagging	-1.84	0.943	Lagging	-3.52	0.686	Lagging	-10.61
56	FLT66-3PH	0.992	Lagging	-1.28	0.949	Lagging	-3.31	0.673	Lagging	-11.00
57	FLT67-3PH	0.983	Lagging	-1.85	0.943	Lagging	-3.52	0.680	Lagging	-10.79
58	FLT71-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.687	Lagging	-10.58
59	FLT72-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.687	Lagging	-10.57
60	FLT73-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.686	Lagging	-10.60
61	FLT74-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
62	FLT75-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
63	FLT76-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.686	Lagging	-10.60
64	FLT77-3PH	0.982	Lagging	-1.91	0.943	Lagging	-3.54	0.685	Lagging	-10.63
65	FLT78-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.688	Lagging	-10.55
66	FLT79-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.687	Lagging	-10.59
67	FLT80-3PH	0.982	Lagging	-1.91	0.943	Lagging	-3.54	0.685	Lagging	-10.62
68	FLT81-3PH	0.983	Lagging	-1.88	0.943	Lagging	-3.53	0.685	Lagging	-10.64
69	FLT82-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.61
70	FLT83-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.687	Lagging	-10.59
71	FLT87-3PH	0.981	Lagging	-1.97	0.942	Lagging	-3.57	0.682	Lagging	-10.72
72	FLT88-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.684	Lagging	-10.67
73	FLT89-3PH	0.982	Lagging	-1.93	0.942	Lagging	-3.55	0.686	Lagging	-10.62
74	FLT90-3PH	0.984	Lagging	-1.79	0.944	Lagging	-3.51	0.680	Lagging	-10.79
75	FLT91-3PH	0.982	Lagging	-1.93	0.943	Lagging	-3.54	0.686	Lagging	-10.60
76	FLT92-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.61
77	FLT93-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
78	FLT94-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
79	FLT95-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.684	Lagging	-10.65
80	FLT96-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
81	FLT97-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.54	0.686	Lagging	-10.62
82	FLT99-3PH	0.982	Lagging	-1.92	0.943	Lagging	-3.53	0.687	Lagging	-10.58
83	FLT100-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
84	FLT101-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
85	FLT102-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60
86	FLT103-3PH	0.982	Lagging	-1.90	0.942	Lagging	-3.55	0.685	Lagging	-10.64
87	FLT104-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.55	0.686	Lagging	-10.60
88	FLT105-3PH	0.982	Lagging	-1.90	0.943	Lagging	-3.55	0.686	Lagging	-10.60
89	FLT106-3PH	0.983	Lagging	-1.88	0.943	Lagging	-3.52	0.686	Lagging	-10.60
90	FLT107-3PH	0.983	Lagging	-1.89	0.943	Lagging	-3.54	0.686	Lagging	-10.60

Table 5-9(Continued)
Power Factor Analysis: ASGI-2014-005

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
91	FLT108-3PH	0.983	Lagging	-1.89		0.943	Lagging	-3.54		0.686	Lagging	-10.60
92	FLT112-3PH	0.981	Lagging	-1.97		0.942	Lagging	-3.55		0.678	Lagging	-10.85
93	FLT117-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.640	Lagging	-12.02
94	FLT122-3PH	0.983	Lagging	-1.89		0.943	Lagging	-3.54		0.686	Lagging	-10.60
95	FLT126-3PH	0.983	Lagging	-1.88		0.943	Lagging	-3.53		0.686	Lagging	-10.62
96	FLT127-3PH	0.981	Lagging	-1.97		0.942	Lagging	-3.55		0.678	Lagging	-10.85
97	FLT128-3PH	0.979	Lagging	-2.09		0.941	Lagging	-3.60		0.687	Lagging	-10.58
98	FLT129-3PH	0.982	Lagging	-1.95		0.942	Lagging	-3.56		0.684	Lagging	-10.66
99	FLT130-3PH	0.981	Lagging	-1.95		0.942	Lagging	-3.56		0.684	Lagging	-10.66
100	FLT131-3PH	0.991	Leading	1.35		0.914	Lagging	-4.45		0.751	Lagging	-8.80
101	FLT132-3PH	0.983	Lagging	-1.88		0.943	Lagging	-3.53		0.685	Lagging	-10.63
102	FLT133-3PH	0.983	Lagging	-1.89		0.943	Lagging	-3.54		0.686	Lagging	-10.60
103	FLT134-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.407	Lagging	-22.42
104	FLT135-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.345	Lagging	-27.18
105	FLT136-3PH	0.983	Lagging	-1.89		0.943	Lagging	-3.54		0.583	Lagging	-13.94

Table 5-10
Power Factor Analysis: ASGI-2014-008

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
1	FLT01-3PH	0.991	Leading	1.36	1.000	Lagging	-0.07	1.000	Lagging	-0.26
2	FLT02-3PH	0.991	Leading	1.32	1.000	Lagging	-0.10	0.999	Lagging	-0.38
3	FLT03-3PH	0.990	Leading	1.40	1.000	Lagging	-0.09	1.000	Lagging	-0.13
4	FLT04-3PH	0.994	Leading	1.14	1.000	Lagging	-0.01	0.995	Lagging	-0.99
5	FLT05-3PH	0.990	Leading	1.40	1.000	Lagging	0.00	0.999	Lagging	-0.46
6	FLT06-3PH	0.991	Leading	1.36	1.000	Lagging	-0.16	0.995	Lagging	-1.04
7	FLT07-3PH	0.993	Leading	1.20	1.000	Leading	0.02	0.996	Lagging	-0.87
8	FLT08-3PH	0.993	Leading	1.17	1.000	Lagging	-0.26	0.830	Lagging	-6.73
9	FLT09-3PH	0.997	Leading	0.78	1.000	Lagging	-0.15	0.990	Lagging	-1.41
10	FLT10-3PH	0.951	Lagging	-3.23	0.892	Lagging	-5.06	0.873	Lagging	-5.60
11	FLT11-3PH	0.998	Leading	0.71	0.992	Lagging	-1.23	0.983	Lagging	-1.88
12	FLT12-3PH	0.904	Lagging	-4.74	0.859	Lagging	-5.95	0.990	Lagging	-1.40
13	FLT13-3PH	0.970	Lagging	-2.49	0.994	Lagging	-1.09	0.972	Lagging	-2.43
14	FLT14-3PH	0.904	Lagging	-4.72	0.870	Lagging	-5.66	0.783	Lagging	-7.95
15	FLT15-3PH	0.996	Leading	0.92	0.999	Lagging	-0.35	0.983	Lagging	-1.85
16	FLT16-3PH	0.989	Leading	1.49	1.000	Leading	0.02	1.000	Lagging	-0.15
17	FLT18-3PH	0.990	Leading	1.43	1.000	Lagging	-0.05	1.000	Lagging	-0.18
18	FLT20-3PH	0.982	Leading	1.90	0.999	Leading	0.36	0.999	Leading	0.54
19	FLT21-3PH	0.996	Leading	0.90	1.000	Lagging	-0.10	0.999	Lagging	-0.34
20	FLT22-3PH	0.990	Leading	1.41	1.000	Lagging	-0.06	0.998	Lagging	-0.58
21	FLT23-3PH	0.990	Leading	1.42	0.994	Leading	1.06	0.997	Lagging	-0.78
22	FLT24-3PH	0.947	Leading	3.40	1.000	Lagging	-0.17	1.000	Lagging	-0.06
23	FLT25-3PH	0.990	Leading	1.40	1.000	Lagging	-0.13	1.000	Lagging	-0.25
24	FLT28-3PH	0.985	Leading	1.73	0.999	Lagging	-0.52	1.000	Lagging	-0.16
25	FLT29-3PH	N/A	N/A	N/A	1.000	Lagging	0.00	1.000	Lagging	-0.06
26	FLT30-3PH	N/A	N/A	N/A	0.997	Leading	0.75	0.996	Leading	0.89
27	FLT31-3PH	N/A	N/A	N/A	1.000	Leading	0.18	0.987	Lagging	-1.65
28	FLT32-3PH	1.000	Leading	0.12	0.998	Lagging	-0.65	1.000	Lagging	-0.07
29	FLT33-3PH	1.000	Leading	0.25	0.998	Lagging	-0.59	1.000	Lagging	-0.10
30	FLT34-3PH	0.992	Leading	1.24	1.000	Lagging	-0.15	0.989	Lagging	-1.48
31	FLT35-3PH	0.993	Leading	1.22	1.000	Lagging	-0.20	1.000	Lagging	-0.20
32	FLT36-3PH	0.994	Leading	1.06	1.000	Lagging	-0.31	0.969	Lagging	-2.56
33	FLT37-3PH	0.993	Leading	1.19	1.000	Lagging	-0.21	0.976	Lagging	-2.23
34	FLT38-3PH	0.990	Leading	1.45	1.000	Lagging	-0.02	1.000	Lagging	-0.11
35	FLT39-3PH	0.990	Leading	1.42	1.000	Lagging	-0.04	1.000	Lagging	-0.07
36	FLT40-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
37	FLT41-3PH	0.998	Leading	0.67	0.995	Lagging	-1.04	0.993	Lagging	-1.22
38	FLT42-3PH	0.995	Leading	1.04	0.999	Lagging	-0.39	0.962	Lagging	-2.85
39	FLT43-3PH	0.974	Leading	2.31	0.999	Lagging	-0.34	1.000	Lagging	-0.29
40	FLT44-3PH	0.984	Leading	1.80	1.000	Leading	0.04	1.000	Leading	0.04
41	FLT45-3PH	0.996	Leading	0.89	0.998	Lagging	-0.70	0.990	Lagging	-1.41
42	FLT46-3PH	0.991	Leading	1.37	1.000	Lagging	-0.04	1.000	Lagging	-0.22
43	FLT47-3PH	0.990	Leading	1.39	1.000	Lagging	-0.05	0.999	Lagging	-0.36
44	FLT48-3PH	0.993	Leading	1.17	1.000	Lagging	-0.26	0.829	Lagging	-6.74
45	FLT49-3PH	0.985	Leading	1.75	1.000	Leading	0.06	0.994	Lagging	-1.07

Table 5-10 (Continued)
Power Factor Analysis: ASGI-2014-008

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.985	Leading	1.75	1.000	Leading	0.06	0.998	Lagging	-0.62
47	FLT51-3PH	0.992	Leading	1.26	1.000	Lagging	-0.04	1.000	Lagging	-0.13
48	FLT53-3PH	0.990	Leading	1.42	1.000	Lagging	-0.01	0.998	Lagging	-0.57
49	FLT55-3PH	0.992	Leading	1.24	1.000	Lagging	-0.04	1.000	Lagging	-0.07
50	FLT56-3PH	0.990	Leading	1.42	1.000	Lagging	-0.02	1.000	Lagging	-0.19
51	FLT57-3PH	0.990	Leading	1.42	1.000	Lagging	-0.02	1.000	Lagging	-0.20
52	FLT58-3PH	0.992	Leading	1.30	1.000	Lagging	-0.05	1.000	Lagging	-0.10
53	FLT59-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.07
54	FLT62-3PH	0.990	Leading	1.43	1.000	Lagging	-0.04	1.000	Lagging	-0.15
55	FLT64-3PH	0.989	Leading	1.47	1.000	Lagging	-0.02	1.000	Lagging	-0.16
56	FLT66-3PH	0.985	Leading	1.75	1.000	Leading	0.06	0.998	Lagging	-0.62
57	FLT67-3PH	0.989	Leading	1.46	1.000	Lagging	-0.02	1.000	Lagging	-0.28
58	FLT71-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
59	FLT72-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.09
60	FLT73-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
61	FLT74-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
62	FLT75-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
63	FLT76-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
64	FLT77-3PH	0.990	Leading	1.43	1.000	Lagging	-0.02	1.000	Lagging	-0.11
65	FLT78-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.09
66	FLT79-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
67	FLT80-3PH	0.990	Leading	1.43	1.000	Lagging	-0.03	1.000	Lagging	-0.11
68	FLT81-3PH	0.990	Leading	1.45	1.000	Lagging	-0.02	1.000	Lagging	-0.12
69	FLT82-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.11
70	FLT83-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
71	FLT87-3PH	0.990	Leading	1.40	1.000	Lagging	-0.04	1.000	Lagging	-0.15
72	FLT88-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.15
73	FLT89-3PH	0.990	Leading	1.42	1.000	Lagging	-0.03	1.000	Lagging	-0.11
74	FLT90-3PH	0.989	Leading	1.49	1.000	Lagging	-0.02	0.999	Lagging	-0.33
75	FLT91-3PH	0.990	Leading	1.42	1.000	Lagging	-0.02	1.000	Lagging	-0.10
76	FLT92-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.11
77	FLT93-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
78	FLT94-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
79	FLT95-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.12
80	FLT96-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10
81	FLT97-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.11
82	FLT99-3PH	0.990	Leading	1.43	1.000	Lagging	-0.01	1.000	Lagging	-0.09
83	FLT100-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.10
84	FLT101-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.10
85	FLT102-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.10
86	FLT103-3PH	0.990	Leading	1.43	1.000	Lagging	-0.04	1.000	Lagging	-0.19
87	FLT104-3PH	0.990	Leading	1.44	1.000	Lagging	-0.03	1.000	Lagging	-0.10
88	FLT105-3PH	0.990	Leading	1.43	1.000	Lagging	-0.03	1.000	Lagging	-0.15
89	FLT106-3PH	0.990	Leading	1.44	1.000	Lagging	-0.01	1.000	Lagging	-0.12
90	FLT107-3PH	0.990	Leading	1.44	1.000	Lagging	-0.02	1.000	Lagging	-0.10

Table 5-10 (Continued)
Power Factor Analysis: ASGI-2014-008

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
91	FLT108-3PH	0.990	Leading	1.44		1.000	Lagging	-0.02		1.000	Lagging	-0.10
92	FLT112-3PH	0.991	Leading	1.39		1.000	Lagging	-0.02		1.000	Lagging	-0.28
93	FLT117-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.994	Lagging	-1.08
94	FLT122-3PH	0.990	Leading	1.44		1.000	Lagging	-0.02		1.000	Lagging	-0.10
95	FLT126-3PH	0.990	Leading	1.45		1.000	Lagging	-0.02		1.000	Lagging	-0.11
96	FLT127-3PH	0.991	Leading	1.39		1.000	Lagging	-0.02		1.000	Lagging	-0.28
97	FLT128-3PH	0.992	Leading	1.30		1.000	Lagging	-0.05		1.000	Lagging	-0.10
98	FLT129-3PH	0.990	Leading	1.41		1.000	Lagging	-0.03		1.000	Lagging	-0.12
99	FLT130-3PH	0.990	Leading	1.41		1.000	Lagging	-0.04		1.000	Lagging	-0.12
100	FLT131-3PH	0.970	Leading	2.51		0.999	Lagging	-0.47		1.000	Leading	0.07
101	FLT132-3PH	0.990	Leading	1.45		1.000	Lagging	-0.02		1.000	Lagging	-0.12
102	FLT133-3PH	0.990	Leading	1.44		1.000	Lagging	-0.02		1.000	Lagging	-0.10
103	FLT134-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.816	Lagging	-7.07
104	FLT135-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.803	Lagging	-7.42
105	FLT136-3PH	0.990	Leading	1.44		1.000	Lagging	-0.02		0.985	Lagging	-1.75

Table 5-11
Power Factor Analysis: ASGI-2014-009

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.89
1	FLT01-3PH	0.548	Lagging	-15.26	0.810	Lagging	-7.25	0.090	Lagging	-110.98
2	FLT02-3PH	0.547	Lagging	-15.29	0.808	Lagging	-7.28	0.090	Lagging	-111.03
3	FLT03-3PH	0.549	Lagging	-15.21	0.810	Lagging	-7.24	0.090	Lagging	-110.93
4	FLT04-3PH	0.541	Lagging	-15.53	0.806	Lagging	-7.34	0.089	Lagging	-112.28
5	FLT05-3PH	0.545	Lagging	-15.37	0.803	Lagging	-7.43	0.089	Lagging	-112.09
6	FLT06-3PH	0.548	Lagging	-15.27	0.802	Lagging	-7.45	0.089	Lagging	-112.27
7	FLT07-3PH	0.543	Lagging	-15.47	0.808	Lagging	-7.30	0.089	Lagging	-112.07
8	FLT08-3PH	0.532	Lagging	-15.90	0.772	Lagging	-8.23	0.083	Lagging	-120.67
9	FLT09-3PH	0.512	Lagging	-16.78	0.783	Lagging	-7.93	0.089	Lagging	-112.42
10	FLT10-3PH	0.446	Lagging	-20.08	0.528	Lagging	-16.06	0.083	Lagging	-120.77
11	FLT11-3PH	0.541	Lagging	-15.55	0.806	Lagging	-7.34	0.088	Lagging	-113.09
12	FLT12-3PH	0.490	Lagging	-17.78	0.826	Lagging	-6.83	0.089	Lagging	-111.83
13	FLT13-3PH	0.316	Lagging	-29.97	0.725	Lagging	-9.50	0.075	Lagging	-133.56
14	FLT14-3PH	0.344	Lagging	-27.28	0.359	Lagging	-25.98	0.075	Lagging	-132.08
15	FLT15-3PH	0.490	Lagging	-17.81	0.739	Lagging	-9.12	0.084	Lagging	-118.89
16	FLT16-3PH	0.555	Lagging	-14.98	0.820	Lagging	-6.97	0.090	Lagging	-110.64
17	FLT18-3PH	0.551	Lagging	-15.13	0.808	Lagging	-7.30	0.090	Lagging	-110.43
18	FLT20-3PH	0.582	Lagging	-13.99	0.850	Lagging	-6.19	0.092	Lagging	-107.69
19	FLT21-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.19	0.090	Lagging	-110.89
20	FLT22-3PH	0.631	Lagging	-12.30	0.865	Lagging	-5.81	0.094	Lagging	-106.29
21	FLT23-3PH	0.548	Lagging	-15.26	0.756	Lagging	-8.65	0.091	Lagging	-109.94
22	FLT24-3PH	0.184	Lagging	-53.40	0.554	Lagging	-15.03	0.070	Lagging	-143.08
23	FLT25-3PH	0.551	Lagging	-15.16	0.807	Lagging	-7.32	0.090	Lagging	-111.06
24	FLT28-3PH	0.586	Lagging	-13.83	1.000	Lagging	-0.19	0.097	Lagging	-103.08
25	FLT29-3PH	N/A	N/A	N/A	0.968	Lagging	-2.59	0.115	Lagging	-86.17
26	FLT30-3PH	N/A	N/A	N/A	0.827	Leading	6.81	0.116	Lagging	-85.41
27	FLT31-3PH	N/A	N/A	N/A	0.256	Lagging	-37.76	0.051	Lagging	-195.24
28	FLT32-3PH	0.413	Lagging	-22.07	0.803	Lagging	-7.42	0.097	Lagging	-102.63
29	FLT33-3PH	0.420	Lagging	-21.62	0.810	Lagging	-7.23	0.090	Lagging	-110.89
30	FLT34-3PH	0.518	Lagging	-16.50	0.817	Lagging	-7.06	0.083	Lagging	-120.44
31	FLT35-3PH	0.495	Lagging	-17.54	0.793	Lagging	-7.67	0.088	Lagging	-112.99
32	FLT36-3PH	0.456	Lagging	-19.53	0.739	Lagging	-9.10	0.077	Lagging	-128.85
33	FLT37-3PH	0.488	Lagging	-17.91	0.769	Lagging	-8.32	0.079	Lagging	-126.73
34	FLT38-3PH	0.551	Lagging	-15.13	0.814	Lagging	-7.14	0.090	Lagging	-110.89
35	FLT39-3PH	0.548	Lagging	-15.28	0.809	Lagging	-7.27	0.090	Lagging	-110.97
36	FLT40-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.18	0.090	Lagging	-110.83
37	FLT41-3PH	0.497	Lagging	-17.47	0.712	Lagging	-9.85	0.087	Lagging	-114.86
38	FLT42-3PH	0.440	Lagging	-20.44	0.710	Lagging	-9.91	0.076	Lagging	-130.96
39	FLT43-3PH	0.562	Lagging	-14.71	0.755	Lagging	-8.70	0.090	Lagging	-111.05
40	FLT44-3PH	0.561	Lagging	-14.75	0.809	Lagging	-7.26	0.090	Lagging	-110.16
41	FLT45-3PH	0.514	Lagging	-16.70	0.748	Lagging	-8.87	0.086	Lagging	-115.72
42	FLT46-3PH	0.540	Lagging	-15.58	0.804	Lagging	-7.39	0.089	Lagging	-112.28
43	FLT47-3PH	0.539	Lagging	-15.63	0.803	Lagging	-7.43	0.088	Lagging	-113.17
44	FLT48-3PH	0.532	Lagging	-15.90	0.772	Lagging	-8.23	0.083	Lagging	-120.71
45	FLT49-3PH	0.579	Lagging	-14.09	0.839	Lagging	-6.48	0.090	Lagging	-111.13

Table 5-11 (Continued)
Power Factor Analysis: ASGI-2014-009

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.579	Lagging	-14.09	0.839	Lagging	-6.49	0.090	Lagging	-110.78
47	FLT51-3PH	0.537	Lagging	-15.72	0.806	Lagging	-7.34	0.090	Lagging	-111.03
48	FLT53-3PH	0.548	Lagging	-15.26	0.821	Lagging	-6.97	0.090	Lagging	-111.16
49	FLT55-3PH	0.535	Lagging	-15.77	0.804	Lagging	-7.39	0.090	Lagging	-110.65
50	FLT56-3PH	0.549	Lagging	-15.24	0.813	Lagging	-7.17	0.089	Lagging	-111.45
51	FLT57-3PH	0.549	Lagging	-15.24	0.813	Lagging	-7.17	0.089	Lagging	-111.51
52	FLT58-3PH	0.541	Lagging	-15.53	0.792	Lagging	-7.72	0.090	Lagging	-111.02
53	FLT59-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.64
54	FLT62-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.19	0.090	Lagging	-110.97
55	FLT64-3PH	0.552	Lagging	-15.10	0.815	Lagging	-7.11	0.090	Lagging	-110.85
56	FLT66-3PH	0.579	Lagging	-14.09	0.839	Lagging	-6.49	0.090	Lagging	-110.78
57	FLT67-3PH	0.552	Lagging	-15.11	0.814	Lagging	-7.13	0.090	Lagging	-111.13
58	FLT71-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.19	0.090	Lagging	-110.85
59	FLT72-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.19	0.090	Lagging	-110.83
60	FLT73-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.19	0.090	Lagging	-110.91
61	FLT74-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.90
62	FLT75-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.91
63	FLT76-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.89
64	FLT77-3PH	0.549	Lagging	-15.22	0.813	Lagging	-7.17	0.090	Lagging	-110.97
65	FLT78-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.79
66	FLT79-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.86
67	FLT80-3PH	0.549	Lagging	-15.21	0.811	Lagging	-7.21	0.090	Lagging	-110.97
68	FLT81-3PH	0.551	Lagging	-15.16	0.813	Lagging	-7.16	0.090	Lagging	-111.00
69	FLT82-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.95
70	FLT83-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.87
71	FLT87-3PH	0.547	Lagging	-15.31	0.808	Lagging	-7.30	0.089	Lagging	-111.43
72	FLT88-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.19	0.090	Lagging	-110.97
73	FLT89-3PH	0.549	Lagging	-15.24	0.811	Lagging	-7.22	0.090	Lagging	-111.05
74	FLT90-3PH	0.554	Lagging	-15.02	0.817	Lagging	-7.06	0.090	Lagging	-110.77
75	FLT91-3PH	0.548	Lagging	-15.25	0.812	Lagging	-7.18	0.090	Lagging	-110.89
76	FLT92-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.95
77	FLT93-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.19	0.090	Lagging	-110.89
78	FLT94-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.90
79	FLT95-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.19	0.090	Lagging	-110.99
80	FLT96-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.89
81	FLT97-3PH	0.550	Lagging	-15.20	0.812	Lagging	-7.19	0.090	Lagging	-110.95
82	FLT99-3PH	0.549	Lagging	-15.23	0.811	Lagging	-7.21	0.090	Lagging	-110.90
83	FLT100-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.89
84	FLT101-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.89
85	FLT102-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.89
86	FLT103-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.19	0.090	Lagging	-110.89
87	FLT104-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.19	0.090	Lagging	-110.90
88	FLT105-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.19	0.090	Lagging	-110.90
89	FLT106-3PH	0.551	Lagging	-15.16	0.813	Lagging	-7.15	0.090	Lagging	-110.87
90	FLT107-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.89

Table 5-11 (Continued)
Power Factor Analysis: ASGI-2014-009

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	0.550	Lagging	-15.18	0.812	Lagging	-7.18	0.090	Lagging	-110.89
92	FLT112-3PH	0.546	Lagging	-15.33	0.802	Lagging	-7.45	0.089	Lagging	-111.69
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.088	Lagging	-113.83
94	FLT122-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.19	0.090	Lagging	-110.89
95	FLT126-3PH	0.550	Lagging	-15.17	0.813	Lagging	-7.16	0.090	Lagging	-110.92
96	FLT127-3PH	0.546	Lagging	-15.33	0.802	Lagging	-7.45	0.089	Lagging	-111.69
97	FLT128-3PH	0.541	Lagging	-15.53	0.792	Lagging	-7.72	0.090	Lagging	-111.02
98	FLT129-3PH	0.548	Lagging	-15.27	0.809	Lagging	-7.26	0.090	Lagging	-111.23
99	FLT130-3PH	0.548	Lagging	-15.28	0.809	Lagging	-7.27	0.090	Lagging	-111.24
100	FLT131-3PH	0.292	Lagging	-32.69	0.877	Lagging	-5.49	0.073	Lagging	-136.47
101	FLT132-3PH	0.551	Lagging	-15.16	0.813	Lagging	-7.16	0.090	Lagging	-110.94
102	FLT133-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.090	Lagging	-110.89
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.081	Lagging	-123.65
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.065	Lagging	-154.13
105	FLT136-3PH	0.550	Lagging	-15.19	0.812	Lagging	-7.18	0.080	Lagging	-124.01

Table 5-12
Power Factor Analysis: ASGI-2014-010

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.02
1	FLT01-3PH	0.304	Lagging	-31.33	0.442	Lagging	-20.31	0.059	Lagging	-168.12
2	FLT02-3PH	0.304	Lagging	-31.38	0.441	Lagging	-20.36	0.059	Lagging	-168.17
3	FLT03-3PH	0.305	Lagging	-31.26	0.442	Lagging	-20.28	0.059	Lagging	-168.06
4	FLT04-3PH	0.300	Lagging	-31.78	0.437	Lagging	-20.56	0.059	Lagging	-169.56
5	FLT05-3PH	0.302	Lagging	-31.57	0.433	Lagging	-20.81	0.059	Lagging	-169.73
6	FLT06-3PH	0.304	Lagging	-31.36	0.435	Lagging	-20.72	0.059	Lagging	-169.35
7	FLT07-3PH	0.301	Lagging	-31.69	0.439	Lagging	-20.48	0.059	Lagging	-169.34
8	FLT08-3PH	0.294	Lagging	-32.53	0.406	Lagging	-22.52	0.056	Lagging	-177.08
9	FLT09-3PH	0.283	Lagging	-33.95	0.416	Lagging	-21.85	0.059	Lagging	-169.70
10	FLT10-3PH	0.258	Lagging	-37.45	0.282	Lagging	-34.03	0.056	Lagging	-177.81
11	FLT11-3PH	0.300	Lagging	-31.78	0.441	Lagging	-20.33	0.059	Lagging	-170.12
12	FLT12-3PH	0.275	Lagging	-34.93	0.470	Lagging	-18.78	0.059	Lagging	-169.52
13	FLT13-3PH	0.190	Lagging	-51.81	0.398	Lagging	-23.04	0.052	Lagging	-191.91
14	FLT14-3PH	0.198	Lagging	-49.48	0.186	Lagging	-52.74	0.053	Lagging	-190.11
15	FLT15-3PH	0.267	Lagging	-36.06	0.373	Lagging	-24.85	0.058	Lagging	-173.32
16	FLT16-3PH	0.309	Lagging	-30.82	0.453	Lagging	-19.69	0.060	Lagging	-167.32
17	FLT18-3PH	0.306	Lagging	-31.13	0.443	Lagging	-20.23	0.060	Lagging	-167.38
18	FLT20-3PH	0.322	Lagging	-29.40	0.475	Lagging	-18.55	0.061	Lagging	-164.36
19	FLT21-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.02
20	FLT22-3PH	0.345	Lagging	-27.20	0.489	Lagging	-17.84	0.061	Lagging	-162.48
21	FLT23-3PH	0.305	Lagging	-31.21	0.412	Lagging	-22.12	0.060	Lagging	-166.61
22	FLT24-3PH	0.119	Lagging	-83.34	0.303	Lagging	-31.47	0.048	Lagging	-208.68
23	FLT25-3PH	0.306	Lagging	-31.06	0.443	Lagging	-20.26	0.059	Lagging	-168.09
24	FLT28-3PH	0.369	Lagging	-25.18	0.731	Lagging	-9.34	0.063	Lagging	-157.39
25	FLT29-3PH	N/A	N/A	N/A	0.428	Lagging	-21.13	0.065	Lagging	-153.00
26	FLT30-3PH	N/A	N/A	N/A	0.314	Lagging	-30.26	0.074	Lagging	-134.58
27	FLT31-3PH	N/A	N/A	N/A	0.143	Lagging	-69.45	0.034	Lagging	-294.07
28	FLT32-3PH	0.971	Lagging	-2.45	0.998	Lagging	-0.61	0.127	Lagging	-77.94
29	FLT33-3PH	0.336	Lagging	-28.00	0.620	Lagging	-12.67	0.059	Lagging	-168.02
30	FLT34-3PH	0.316	Lagging	-29.98	0.490	Lagging	-17.78	0.060	Lagging	-167.70
31	FLT35-3PH	0.298	Lagging	-32.05	0.456	Lagging	-19.52	0.060	Lagging	-165.79
32	FLT36-3PH	0.262	Lagging	-36.84	0.393	Lagging	-23.40	0.053	Lagging	-189.13
33	FLT37-3PH	0.275	Lagging	-34.93	0.419	Lagging	-21.69	0.054	Lagging	-183.77
34	FLT38-3PH	0.306	Lagging	-31.11	0.445	Lagging	-20.10	0.059	Lagging	-167.78
35	FLT39-3PH	0.304	Lagging	-31.39	0.440	Lagging	-20.40	0.059	Lagging	-168.41
36	FLT40-3PH	0.305	Lagging	-31.25	0.443	Lagging	-20.21	0.059	Lagging	-168.10
37	FLT41-3PH	0.275	Lagging	-34.91	0.376	Lagging	-24.65	0.058	Lagging	-173.31
38	FLT42-3PH	0.241	Lagging	-40.25	0.351	Lagging	-26.69	0.051	Lagging	-193.95
39	FLT43-3PH	0.301	Lagging	-31.69	0.393	Lagging	-23.42	0.059	Lagging	-169.57
40	FLT44-3PH	0.310	Lagging	-30.67	0.441	Lagging	-20.33	0.060	Lagging	-167.42
41	FLT45-3PH	0.285	Lagging	-33.60	0.400	Lagging	-22.93	0.057	Lagging	-173.92
42	FLT46-3PH	0.298	Lagging	-32.08	0.433	Lagging	-20.82	0.059	Lagging	-170.30
43	FLT47-3PH	0.297	Lagging	-32.20	0.430	Lagging	-20.97	0.058	Lagging	-171.21
44	FLT48-3PH	0.294	Lagging	-32.53	0.406	Lagging	-22.52	0.056	Lagging	-177.09
45	FLT49-3PH	0.325	Lagging	-29.07	0.486	Lagging	-17.98	0.059	Lagging	-168.11

Table 5-12 (Continued)
Power Factor Analysis: ASGI-2014-010

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.325	Lagging	-29.07	0.486	Lagging	-17.99	0.059	Lagging	-167.91
47	FLT51-3PH	0.296	Lagging	-32.21	0.437	Lagging	-20.58	0.059	Lagging	-168.16
48	FLT53-3PH	0.304	Lagging	-31.37	0.453	Lagging	-19.67	0.059	Lagging	-168.12
49	FLT55-3PH	0.296	Lagging	-32.31	0.435	Lagging	-20.67	0.060	Lagging	-167.76
50	FLT56-3PH	0.304	Lagging	-31.32	0.444	Lagging	-20.15	0.059	Lagging	-168.73
51	FLT57-3PH	0.304	Lagging	-31.33	0.444	Lagging	-20.17	0.059	Lagging	-168.81
52	FLT58-3PH	0.299	Lagging	-31.86	0.423	Lagging	-21.39	0.059	Lagging	-168.19
53	FLT59-3PH	0.305	Lagging	-31.20	0.444	Lagging	-20.18	0.060	Lagging	-167.67
54	FLT62-3PH	0.305	Lagging	-31.25	0.444	Lagging	-20.21	0.059	Lagging	-168.13
55	FLT64-3PH	0.307	Lagging	-31.05	0.447	Lagging	-20.01	0.059	Lagging	-167.95
56	FLT66-3PH	0.325	Lagging	-29.07	0.486	Lagging	-17.99	0.059	Lagging	-167.91
57	FLT67-3PH	0.306	Lagging	-31.08	0.446	Lagging	-20.07	0.059	Lagging	-168.24
58	FLT71-3PH	0.305	Lagging	-31.24	0.444	Lagging	-20.21	0.059	Lagging	-167.98
59	FLT72-3PH	0.305	Lagging	-31.25	0.443	Lagging	-20.21	0.059	Lagging	-167.96
60	FLT73-3PH	0.305	Lagging	-31.24	0.444	Lagging	-20.21	0.059	Lagging	-168.04
61	FLT74-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.03
62	FLT75-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.18	0.059	Lagging	-168.03
63	FLT76-3PH	0.305	Lagging	-31.23	0.444	Lagging	-20.20	0.059	Lagging	-168.02
64	FLT77-3PH	0.305	Lagging	-31.28	0.444	Lagging	-20.17	0.059	Lagging	-168.09
65	FLT78-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-167.91
66	FLT79-3PH	0.305	Lagging	-31.21	0.444	Lagging	-20.18	0.059	Lagging	-167.99
67	FLT80-3PH	0.305	Lagging	-31.27	0.443	Lagging	-20.25	0.059	Lagging	-168.10
68	FLT81-3PH	0.305	Lagging	-31.18	0.445	Lagging	-20.13	0.059	Lagging	-168.13
69	FLT82-3PH	0.305	Lagging	-31.21	0.444	Lagging	-20.19	0.059	Lagging	-168.08
70	FLT83-3PH	0.305	Lagging	-31.21	0.444	Lagging	-20.18	0.059	Lagging	-168.00
71	FLT87-3PH	0.303	Lagging	-31.44	0.439	Lagging	-20.46	0.059	Lagging	-168.64
72	FLT88-3PH	0.305	Lagging	-31.24	0.443	Lagging	-20.22	0.059	Lagging	-168.11
73	FLT89-3PH	0.304	Lagging	-31.33	0.442	Lagging	-20.28	0.059	Lagging	-168.21
74	FLT90-3PH	0.308	Lagging	-30.90	0.449	Lagging	-19.90	0.059	Lagging	-167.84
75	FLT91-3PH	0.304	Lagging	-31.33	0.444	Lagging	-20.18	0.059	Lagging	-168.02
76	FLT92-3PH	0.305	Lagging	-31.21	0.444	Lagging	-20.19	0.059	Lagging	-168.08
77	FLT93-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.02
78	FLT94-3PH	0.305	Lagging	-31.21	0.444	Lagging	-20.19	0.059	Lagging	-168.03
79	FLT95-3PH	0.305	Lagging	-31.24	0.443	Lagging	-20.22	0.059	Lagging	-168.12
80	FLT96-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.02
81	FLT97-3PH	0.305	Lagging	-31.24	0.443	Lagging	-20.22	0.059	Lagging	-168.10
82	FLT99-3PH	0.304	Lagging	-31.30	0.442	Lagging	-20.28	0.059	Lagging	-168.04
83	FLT100-3PH	0.305	Lagging	-31.21	0.444	Lagging	-20.19	0.059	Lagging	-168.02
84	FLT101-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.03
85	FLT102-3PH	0.305	Lagging	-31.21	0.444	Lagging	-20.20	0.059	Lagging	-168.02
86	FLT103-3PH	0.305	Lagging	-31.20	0.444	Lagging	-20.19	0.059	Lagging	-168.02
87	FLT104-3PH	0.305	Lagging	-31.23	0.443	Lagging	-20.22	0.059	Lagging	-168.04
88	FLT105-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.19	0.059	Lagging	-168.03
89	FLT106-3PH	0.305	Lagging	-31.17	0.445	Lagging	-20.13	0.059	Lagging	-167.98
90	FLT107-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.02

Table 5-12 (Continued)
Power Factor Analysis: ASGI-2014-010

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
91	FLT108-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.02
92	FLT112-3PH	0.303	Lagging	-31.48	0.433	Lagging	-20.82	0.059	Lagging	-168.80
93	FLT117-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.058	Lagging	-171.25
94	FLT122-3PH	0.305	Lagging	-31.23	0.443	Lagging	-20.21	0.059	Lagging	-168.03
95	FLT126-3PH	0.305	Lagging	-31.18	0.445	Lagging	-20.15	0.059	Lagging	-168.05
96	FLT127-3PH	0.303	Lagging	-31.48	0.433	Lagging	-20.82	0.059	Lagging	-168.80
97	FLT128-3PH	0.299	Lagging	-31.86	0.423	Lagging	-21.39	0.059	Lagging	-168.19
98	FLT129-3PH	0.304	Lagging	-31.37	0.441	Lagging	-20.37	0.059	Lagging	-168.40
99	FLT130-3PH	0.304	Lagging	-31.39	0.440	Lagging	-20.39	0.059	Lagging	-168.42
100	FLT131-3PH	0.181	Lagging	-54.28	0.481	Lagging	-18.21	0.050	Lagging	-199.95
101	FLT132-3PH	0.305	Lagging	-31.18	0.445	Lagging	-20.14	0.059	Lagging	-168.07
102	FLT133-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.059	Lagging	-168.02
103	FLT134-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.056	Lagging	-177.56
104	FLT135-3PH	N/A	N/A	N/A	N/A	N/A	N/A	0.046	Lagging	-217.18
105	FLT136-3PH	0.305	Lagging	-31.22	0.444	Lagging	-20.20	0.051	Lagging	-194.43

Table 5-13
Power Factor Analysis: ASGI-2014-012

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
0	Base	0.847	Lagging	-6.29	0.987	Lagging	-1.64	0.151	Lagging	-65.33
1	FLT01-3PH	0.845	Lagging	-6.34	0.986	Lagging	-1.68	0.151	Lagging	-65.40
2	FLT02-3PH	0.844	Lagging	-6.35	0.986	Lagging	-1.70	0.151	Lagging	-65.47
3	FLT03-3PH	0.846	Lagging	-6.30	0.986	Lagging	-1.67	0.151	Lagging	-65.35
4	FLT04-3PH	0.835	Lagging	-6.58	0.984	Lagging	-1.81	0.150	Lagging	-66.05
5	FLT05-3PH	0.839	Lagging	-6.49	0.981	Lagging	-1.95	0.149	Lagging	-66.18
6	FLT06-3PH	0.844	Lagging	-6.35	0.983	Lagging	-1.87	0.150	Lagging	-65.95
7	FLT07-3PH	0.837	Lagging	-6.54	0.984	Lagging	-1.78	0.150	Lagging	-65.96
8	FLT08-3PH	0.819	Lagging	-7.01	0.965	Lagging	-2.71	0.140	Lagging	-70.53
9	FLT09-3PH	0.790	Lagging	-7.76	0.973	Lagging	-2.36	0.149	Lagging	-66.44
10	FLT10-3PH	0.763	Lagging	-8.47	0.874	Lagging	-5.55	0.143	Lagging	-69.07
11	FLT11-3PH	0.837	Lagging	-6.54	0.986	Lagging	-1.68	0.150	Lagging	-66.06
12	FLT12-3PH	0.798	Lagging	-7.56	0.992	Lagging	-1.25	0.149	Lagging	-66.47
13	FLT13-3PH	0.583	Lagging	-13.95	0.970	Lagging	-2.49	0.134	Lagging	-74.10
14	FLT14-3PH	0.591	Lagging	-13.67	0.621	Lagging	-12.62	0.133	Lagging	-74.45
15	FLT15-3PH	0.720	Lagging	-9.65	0.932	Lagging	-3.87	0.141	Lagging	-70.07
16	FLT16-3PH	0.860	Lagging	-5.94	0.992	Lagging	-1.27	0.153	Lagging	-64.44
17	FLT18-3PH	0.848	Lagging	-6.25	0.986	Lagging	-1.67	0.152	Lagging	-65.13
18	FLT20-3PH	0.866	Lagging	-5.76	0.993	Lagging	-1.17	0.154	Lagging	-64.11
19	FLT21-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.65	0.151	Lagging	-65.33
20	FLT22-3PH	0.882	Lagging	-5.34	0.993	Lagging	-1.18	0.154	Lagging	-64.19
21	FLT23-3PH	0.843	Lagging	-6.38	0.975	Lagging	-2.28	0.152	Lagging	-65.15
22	FLT24-3PH	0.255	Lagging	-37.93	0.811	Lagging	-7.21	0.116	Lagging	-85.40
23	FLT25-3PH	0.849	Lagging	-6.21	0.986	Lagging	-1.68	0.151	Lagging	-65.31
24	FLT28-3PH	0.826	Lagging	-6.82	0.996	Leading	0.89	0.151	Lagging	-65.43
25	FLT29-3PH	N/A	N/A	N/A	0.975	Lagging	-2.30	0.151	Lagging	-65.50
26	FLT30-3PH	N/A	N/A	N/A	0.719	Lagging	-9.66	0.111	Lagging	-89.52
27	FLT31-3PH	N/A	N/A	N/A	0.454	Lagging	-19.62	0.084	Lagging	-118.55
28	FLT32-3PH	0.923	Leading	4.18	0.906	Leading	4.67	0.163	Lagging	-60.49
29	FLT33-3PH	0.911	Leading	4.53	0.920	Leading	4.27	0.151	Lagging	-65.33
30	FLT34-3PH	0.916	Leading	4.38	0.938	Leading	3.68	0.765	Lagging	-8.42
31	FLT35-3PH	0.569	Lagging	-14.46	0.852	Lagging	-6.13	0.136	Lagging	-73.06
32	FLT36-3PH	0.578	Leading	14.12	0.631	Leading	12.29	0.652	Leading	11.64
33	FLT37-3PH	0.507	Lagging	-17.01	0.700	Lagging	-10.20	0.145	Lagging	-68.06
34	FLT38-3PH	0.851	Lagging	-6.16	0.988	Lagging	-1.55	0.152	Lagging	-64.95
35	FLT39-3PH	0.841	Lagging	-6.44	0.984	Lagging	-1.79	0.150	Lagging	-65.93
36	FLT40-3PH	0.844	Lagging	-6.35	0.986	Lagging	-1.70	0.151	Lagging	-65.57
37	FLT41-3PH	0.774	Lagging	-8.17	0.948	Lagging	-3.37	0.144	Lagging	-68.63
38	FLT42-3PH	0.354	Lagging	-26.40	0.446	Lagging	-20.08	0.123	Lagging	-80.58
39	FLT43-3PH	0.790	Lagging	-7.75	0.947	Lagging	-3.38	0.145	Lagging	-68.31
40	FLT44-3PH	0.847	Lagging	-6.28	0.984	Lagging	-1.79	0.151	Lagging	-65.52
41	FLT45-3PH	0.796	Lagging	-7.60	0.965	Lagging	-2.70	0.145	Lagging	-68.05
42	FLT46-3PH	0.816	Lagging	-7.09	0.976	Lagging	-2.23	0.148	Lagging	-67.03
43	FLT47-3PH	0.805	Lagging	-7.37	0.970	Lagging	-2.48	0.144	Lagging	-68.51
44	FLT48-3PH	0.819	Lagging	-7.02	0.965	Lagging	-2.72	0.140	Lagging	-70.56
45	FLT49-3PH	0.888	Lagging	-5.16	0.999	Lagging	-0.54	0.150	Lagging	-65.71

Table 5-13 (Continued)
Power Factor Analysis: ASGI-2014-012

Reference Number	Case	2015 Summer Peak			2015 Winter Peak			2025 Summer Peak		
		Power Factor		Q (MVAR)	Power Factor		Q (MVAR)	Power Factor		Q (MVAR)
46	FLT50-3PH	0.888	Lagging	-5.17	0.998	Lagging	-0.55	0.151	Lagging	-65.47
47	FLT51-3PH	0.825	Lagging	-6.85	0.984	Lagging	-1.83	0.151	Lagging	-65.41
48	FLT53-3PH	0.843	Lagging	-6.38	0.990	Lagging	-1.39	0.151	Lagging	-65.42
49	FLT55-3PH	0.823	Lagging	-6.89	0.983	Lagging	-1.87	0.151	Lagging	-65.29
50	FLT56-3PH	0.844	Lagging	-6.36	0.987	Lagging	-1.62	0.150	Lagging	-65.72
51	FLT57-3PH	0.844	Lagging	-6.37	0.987	Lagging	-1.63	0.150	Lagging	-65.75
52	FLT58-3PH	0.841	Lagging	-6.44	0.982	Lagging	-1.94	0.151	Lagging	-65.46
53	FLT59-3PH	0.847	Lagging	-6.27	0.987	Lagging	-1.63	0.152	Lagging	-65.13
54	FLT62-3PH	0.846	Lagging	-6.30	0.987	Lagging	-1.64	0.151	Lagging	-65.38
55	FLT64-3PH	0.850	Lagging	-6.19	0.988	Lagging	-1.55	0.151	Lagging	-65.30
56	FLT66-3PH	0.888	Lagging	-5.17	0.998	Lagging	-0.55	0.151	Lagging	-65.47
57	FLT67-3PH	0.850	Lagging	-6.21	0.988	Lagging	-1.58	0.151	Lagging	-65.42
58	FLT71-3PH	0.846	Lagging	-6.30	0.987	Lagging	-1.65	0.151	Lagging	-65.32
59	FLT72-3PH	0.846	Lagging	-6.31	0.987	Lagging	-1.65	0.151	Lagging	-65.32
60	FLT73-3PH	0.846	Lagging	-6.30	0.987	Lagging	-1.65	0.151	Lagging	-65.34
61	FLT74-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.64	0.151	Lagging	-65.33
62	FLT75-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.64	0.151	Lagging	-65.32
63	FLT76-3PH	0.846	Lagging	-6.30	0.987	Lagging	-1.64	0.151	Lagging	-65.33
64	FLT77-3PH	0.845	Lagging	-6.32	0.987	Lagging	-1.63	0.151	Lagging	-65.32
65	FLT78-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.65	0.151	Lagging	-65.30
66	FLT79-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.32
67	FLT80-3PH	0.845	Lagging	-6.32	0.986	Lagging	-1.67	0.151	Lagging	-65.34
68	FLT81-3PH	0.848	Lagging	-6.26	0.987	Lagging	-1.61	0.151	Lagging	-65.34
69	FLT82-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.33
70	FLT83-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.33
71	FLT87-3PH	0.842	Lagging	-6.42	0.985	Lagging	-1.77	0.151	Lagging	-65.50
72	FLT88-3PH	0.846	Lagging	-6.30	0.987	Lagging	-1.66	0.151	Lagging	-65.43
73	FLT89-3PH	0.844	Lagging	-6.35	0.986	Lagging	-1.68	0.151	Lagging	-65.38
74	FLT90-3PH	0.854	Lagging	-6.10	0.989	Lagging	-1.50	0.151	Lagging	-65.39
75	FLT91-3PH	0.844	Lagging	-6.35	0.987	Lagging	-1.64	0.151	Lagging	-65.33
76	FLT92-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.33
77	FLT93-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.65	0.151	Lagging	-65.33
78	FLT94-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.33
79	FLT95-3PH	0.846	Lagging	-6.30	0.987	Lagging	-1.65	0.151	Lagging	-65.40
80	FLT96-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.64	0.151	Lagging	-65.33
81	FLT97-3PH	0.846	Lagging	-6.30	0.987	Lagging	-1.66	0.151	Lagging	-65.36
82	FLT99-3PH	0.845	Lagging	-6.34	0.986	Lagging	-1.69	0.151	Lagging	-65.34
83	FLT100-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.33
84	FLT101-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.64	0.151	Lagging	-65.33
85	FLT102-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.33
86	FLT103-3PH	0.847	Lagging	-6.27	0.987	Lagging	-1.64	0.151	Lagging	-65.34
87	FLT104-3PH	0.846	Lagging	-6.29	0.987	Lagging	-1.65	0.151	Lagging	-65.34
88	FLT105-3PH	0.847	Lagging	-6.28	0.987	Lagging	-1.64	0.151	Lagging	-65.33
89	FLT106-3PH	0.848	Lagging	-6.26	0.987	Lagging	-1.61	0.151	Lagging	-65.31
90	FLT107-3PH	0.847	Lagging	-6.29	0.987	Lagging	-1.64	0.151	Lagging	-65.33

Table 5-13 (Continued)
Power Factor Analysis: ASGI-2014-012

Reference Number	Case	2015 Summer Peak				2015 Winter Peak				2025 Summer Peak		
		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)		Power Factor		Q (MVAR)
91	FLT108-3PH	0.847	Lagging	-6.29		0.987	Lagging	-1.64		0.151	Lagging	-65.33
92	FLT112-3PH	0.844	Lagging	-6.35		0.984	Lagging	-1.79		0.151	Lagging	-65.39
93	FLT117-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.148	Lagging	-66.78
94	FLT122-3PH	0.846	Lagging	-6.29		0.987	Lagging	-1.65		0.151	Lagging	-65.33
95	FLT126-3PH	0.847	Lagging	-6.27		0.987	Lagging	-1.62		0.151	Lagging	-65.35
96	FLT127-3PH	0.844	Lagging	-6.35		0.984	Lagging	-1.79		0.151	Lagging	-65.39
97	FLT128-3PH	0.841	Lagging	-6.44		0.982	Lagging	-1.94		0.151	Lagging	-65.46
98	FLT129-3PH	0.843	Lagging	-6.38		0.985	Lagging	-1.73		0.151	Lagging	-65.42
99	FLT130-3PH	0.843	Lagging	-6.39		0.985	Lagging	-1.74		0.151	Lagging	-65.42
100	FLT131-3PH	0.404	Lagging	-22.67		0.963	Lagging	-2.81		0.121	Lagging	-82.14
101	FLT132-3PH	0.848	Lagging	-6.26		0.987	Lagging	-1.61		0.151	Lagging	-65.37
102	FLT133-3PH	0.847	Lagging	-6.29		0.987	Lagging	-1.64		0.151	Lagging	-65.33
103	FLT134-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.128	Lagging	-77.43
104	FLT135-3PH	N/A	N/A	N/A		N/A	N/A	N/A		0.110	Lagging	-90.27
105	FLT136-3PH	0.847	Lagging	-6.29		0.987	Lagging	-1.64		0.113	Lagging	-87.69

Study Generator GEN-2013-027

The Power Factor Analysis shows that GEN-2013-027 has a power factor range of 0.966 leading (absorbing) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.959 leading (absorbing) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.969 leading (absorbing) to 1.0 (unity) for 2025 Summer Peak conditions.

Study Generators GEN-2014-033, GEN-2014-034, and GEN-2014-035 (Chaves County)

The Power Factor Analysis shows that the Chaves County generation has a power factor range of 0.967 to 0.992 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.980 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.986 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generator GEN-2014-047

The Power Factor Analysis shows that the GEN-2014-047 has a power factor range of 0.993 lagging (supplying) to 1.0 unity for 2015 Summer Peak conditions, a power factor range of 0.985 lagging (supplying) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.990 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generators GEN-2014-053 and GEN-2014-054 (Carlisle)

The Power Factor Analysis shows that the Carlisle generation has a power factor range of 0.945 leading (absorbing) to 1.0 unity for 2015 Summer Peak conditions, a power factor range of 0.941 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.699 to 0.941 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator GEN-2014-063

The Power Factor Analysis shows that the GEN-2014-063 has a power factor range of 0.972 to 0.999 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.986 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.695 to 0.996 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator GEN-2014-066

The Power Factor Analysis shows that the GEN-2014-066 has a power factor range of 0.929 lagging (supplying) to 0.992 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.950 to 0.990 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.878 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generator GEN-2014-070

The Power Factor Analysis shows that the GEN-2014-070 has a power factor range of 0.94 leading (absorbing) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.943 leading (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.894 to 0.898 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-002

The Power Factor Analysis shows that the ASGI-2014-002 has a power factor range of 0.946 to 0.992 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.964 lagging (supplying) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.905 to 0.978 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-005

The Power Factor Analysis shows that the ASGI-2014-005 has a power factor range of 0.473 lagging (supplying) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.563 to 0.989 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.345 lagging (supplying) to 0.872 leading (absorbing) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-008

The Power Factor Analysis shows that the ASGI-2014-008 has a power factor range of 0.904 lagging (supplying) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.859 lagging (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.783 lagging (supplying) to 1.0 (unity) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-009

The Power Factor Analysis shows that the ASGI-2014-009 has a power factor range of 0184 to 0.631 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.256 lagging (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.051 to 0.116 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-010

The Power Factor Analysis shows that the ASGI-2014-010 has a power factor range of 0.119 to 0.971 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.143 to 0.998 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.034 to 0.127 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-012

The Power Factor Analysis shows that the ASGI-2014-012 has a power factor range of 0.255 lagging (supplying) to 0.923 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.4461 to 0.999 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.084 to 0.765 leading (absorbing) for 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 and solar farms that interconnect to a 345 kV or 230 kV bus. The 2015 Summer Peak, 2015 Winter 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 and solar 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 345 kV or 230 kV wind and 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	15SP	15WP	25SP
			Mvar[(1)]		
GEN-2013-027	150	Tap Tolk to Yoakum 230kV (562480)	6.7	6.7	6.7
GEN-2014-047	40	Tap Tolk - Eddy County (Crossroads 560007) 345kV	12.2	12.2	12.2
GEN-2014-053	80	Carlisle 230kV (526161)	5.8	5.8	5.8
GEN-2014-054	120				
GEN-2014-063	120	Hobbs 230kV (527894)	11.7	11.7	11.7
GEN-2014-070	116	Tap Hobbs - Yoakum 230kV (560018)	0.3	0.3	0.3

(1) Mvar rating of shunt reactors modeled.

SECTION 7: CONCLUSIONS

SUMMARY OF STABILITY ANALYSIS

The Stability Analysis determined that there were multiple contingencies that resulted in system instability, generation tripping offline, or bus voltages below 0.7 p.u. or above 1.2 p.u. for the 2015 Summer Peak, 2015 Winter Peak, and 2025 Summer Peak conditions when all generation interconnection requests were at 100% output. The following contingencies required system upgrades in order to achieve system stability and recover within SPP criteria:

- FLT48-3PH
- FLT49-3PH
- FLT50-3PH
- FLT52-SB
- FLT62-3PH
- FLT63-SB
- FLT64-3PH
- FLT65-SB
- FLT66-3PH
- FLT67-3PH
- FLT68-SB
- FLT69-PO
- FLT70-SB
- FLT99-3PH
- FLT100-3PH
- FLT101-3PH
- FLT102-3PH
- FLT103-3PH
- FLT104-3PH
- FLT105-3PH
- FLT106-3PH
- FLT107-3PH

- FLT108-3PH
- FLT122-3PH
- FLT129-3PH (2015SP and 2015WP)
- FLT130-3PH (2015SP and 2015WP)

In order to mitigate all voltage violations and the contingencies that resulted in system instability, the following upgrades[7] were implemented as discussed with SPP:

- Conversion and rebuild of the existing Norton-Pleasant Hill 115 kV line to a 230 kV circuit
- Add a 230/115kV transformer at Norton
- Model corrections at Caprock wind farm[8]
- Add an additional 18 Mvar fast switched capacitor at the Caprock Wind 34.5kV bus
- Add additional switched capacitors on the GEN-2014-066 34.5kV bus and apply the extended ride-through option
- Apply extended ride-through option for GEN-2014-047
- Add additional switched capacitors and an 8 Mvar STATCOM on the ASGI-2014-002 34.5kV bus
- Add 150 Mvar of capacitor banks to the OKU 345kV bus
- Add a +150/-0 Mvar SVC to regulate the OKU 345kV bus
- Remove the 50 Mvar capacitor bank from the Border 345kV bus[9]
- Add a +125/-0 Mvar SVC to regulate the Border 345kV bus

After implementing the above upgrades, the contingency analysis was re-simulated for all contingencies. With the new 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.

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[7] SPP indicated additional upgrades were added to the models before they were provided to MEPPI.

[8] Model corrections included modeling the Caprock wind farm on a 600 V bus and modeling the plant's reactive compensation equipment including switch shunts, fast switched shunts, and dynamic reactive devices on the 34.5kV bus

[9] SPP initially added the 50 Mvar capacitor bank at Border in order to solve the powerflow model prior to the withdrawal of GEN-2014-062 from the SPP queue. After the withdrawal of GEN-2014-062 (200.1 MW on the TOLK to Eddy County 345 kV line) the 50 Mvar capacitor banks was no longer needed for the power flow solution.

SUMMARY OF THE SHORT CIRCUIT ANALYSIS

The short circuit analysis was performed on the 2025 Summer Peak power flow for all study projects. Refer to Table ES-1 for a list of maximum fault currents observed for each study project.

Table ES-1
List of Maximum Fault Currents Observed for Each Study Project

Ref. No.	Study Project	Maximum Fault Current (kA)	Fault Location	Bus Voltage (kV)
1	GEN-2013-027	32.35	HOBBS_INT	115
2	GEN-2014-033	10.80	EDDY_NTH	115
3	GEN-2014-034			
4	GEN-2014-035			
5	GEN-2014-047	29.15	CUNNINHAM	115
6	GEN-2014-053	35.10	LP-COOK	69
7	GEN-2014-054			
8	GEN-2014-063	32.35	HOBBS_INT	115
9	GEN-2014-066	28.93	TOLK_WEST	230
10	GEN-2014-070	32.35	HOBBS_INT	115
11	ASGI-2014-002	28.93	TOLK_WEST	230
12	ASGI-2014-005	15.27	POTASH_JCT	115
13	ASGI-2014-008	15.27	POTASH_JCT	115
14	ASGI-2014-009	15.27	POTASH_JCT	115
15	ASGI-2014-010	15.27	POTASH_JCT	115
16	ASGI-2014-012	32.35	HOBBS_INT	115

SUMMARY OF POWER FACTOR ANALYSIS

Study Generator GEN-2013-027

The Power Factor Analysis shows that GEN-2013-027 has a power factor range of 0.966 leading (absorbing) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.959 leading (absorbing) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.969 leading (absorbing) to 1.0 (unity) for 2025 Summer Peak conditions.

Study Generators GEN-2014-033, GEN-2014-034, and GEN-2014-035 (Chaves County)

The Power Factor Analysis shows that the Chaves County generation has a power factor range of 0.967 to 0.992 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.980 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.986 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generator GEN-2014-047

The Power Factor Analysis shows that the GEN-2014-047 has a power factor range of 0.993 lagging (supplying) to 1.0 unity for 2015 Summer Peak conditions, a power factor range of 0.985 lagging (supplying) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.990 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generators GEN-2014-053 and GEN-2014-054 (Carlisle)

The Power Factor Analysis shows that the Carlisle generation has a power factor range of 0.945 leading (absorbing) to 1.0 unity for 2015 Summer Peak conditions, a power factor range of 0.941 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.699 to 0.941 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator GEN-2014-063

The Power Factor Analysis shows that the GEN-2014-063 has a power factor range of 0.972 to 0.999 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.986 leading (absorbing) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.695 to 0.996 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator GEN-2014-066

The Power Factor Analysis shows that the GEN-2014-066 has a power factor range of 0.929 lagging (supplying) to 0.992 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.950 to 0.990 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.878 lagging (supplying) to 1.0 unity for 2025 Summer Peak conditions.

Study Generator GEN-2014-070

The Power Factor Analysis shows that the GEN-2014-070 has a power factor range of 0.94 leading (absorbing) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.943 leading (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.894 to 0.898 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-002

The Power Factor Analysis shows that the ASGI-2014-002 has a power factor range of 0.946 to 0.992 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.964 lagging (supplying) to 1.0 unity for 2015 Winter Peak conditions, and a power factor range of 0.905 to 0.978 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-005

The Power Factor Analysis shows that the ASGI-2014-005 has a power factor range of 0.473 lagging (supplying) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.563 to 0.989 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.345 lagging (supplying) to 0.872 leading (absorbing) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-008

The Power Factor Analysis shows that the ASGI-2014-008 has a power factor range of 0.904 lagging (supplying) to 1.0 (unity) for 2015 Summer Peak conditions, a power factor range of 0.859 lagging (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.783 lagging (supplying) to 1.0 (unity) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-009

The Power Factor Analysis shows that the ASGI-2014-009 has a power factor range of 0184 to 0.631 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.256 lagging (supplying) to 1.0 (unity) for 2015 Winter Peak conditions, and a power factor range of 0.051 to 0.116 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-010

The Power Factor Analysis shows that the ASGI-2014-010 has a power factor range of 0.119 to 0.971 lagging (supplying) for 2015 Summer Peak conditions, a power factor range of 0.143 to 0.998 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.034 to 0.127 lagging (supplying) for 2025 Summer Peak conditions.

Study Generator ASGI-2014-012

The Power Factor Analysis shows that the ASGI-2014-012 has a power factor range of 0.255 lagging (supplying) to 0.923 leading (absorbing) for 2015 Summer Peak conditions, a power factor range of 0.4461 to 0.999 lagging (supplying) for 2015 Winter Peak conditions, and a power factor range of 0.084 to 0.765 leading (absorbing) for 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 GEN-2013-027, GEN-2014-047, GEN-2014-053, GEN-2014-054, GEN-2014-063, and GEN-2014-070 for each season. The maximum reactance needed for zero Mvar flow was 12.2 Mvar for GEN-2014-047 (Tap Tolk – Eddy County 345 kV). The minimum reactance needed for zero Mvar flow was 0.3 Mvar for GEN-2014-070 (Tap Hobbs - Yoakum 230 kV).

Appendix A
STEADY STATE AND DYNAMIC MODEL DATA

Base Case Power Flows

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

- MDWG14-15SP_DIS1402-1_G06.sav
- MDWG14-15WP_DIS1402-1_G06.sav
- MDWG14-25SP_DIS1402-1_G06.sav

Three dynamic files were provided to MEPPI by SPP:

- MDWG14-15SP_DIS1402-1.dyr
- MDWG14-15WP_DIS1402-1.dyr
- MDWG14-25SP_DIS1402-1.dyr

GEN-2013-027

- Wind Farm Size: 149.96 MW
- Interconnection:
  - Voltage: 230 kV
  - POI: Tap Tolk to Yoakum 230 kV bus (562480)
  - Transformer 1: 230/34.5 kV step-up transformer
    - MVA: 99 MVA
    - Voltage: 230/34.5 kV
    - Z: 10.5%
- Collector System Equivalent Model:
  - Transmission Line 1:
    - R = 0.004900 p.u.
    - X = 0.006610 p.u.
    - B = 0.054830 p.u.
  - Transmission Line 2:
    - R = 0.068270 p.u.
    - X = 0.065190 p.u.
    - B = 0.004580 p.u.
- Wind Farm Parameters – Siemens 108m VS 2.3MW
  - Machine Terminal Voltage 1: 0.7 kV
  - Rated Power 1: 140.3 MW
  - Generator Step-Up Transformer 1:
    - MVA: 158.6 Winding MVA
    - High Voltage: 34.5 kV
    - Low Voltage: 0.7 kV
    - Z: 6.1%
  - Machine Terminal Voltage 2: 0.7 kV
  - Rated Power 2: 9.7 MW
  - Generator Step-Up Transformer 2:

- MVA: 10.4 Winding MVA
- High Voltage: 34.5 kV
- Low Voltage: 0.7 kV
- Z: 6.1%

The dynamic data for the Siemens 108m VS 2.3MW Generator is shown below:

```
/ ***** GEN-2013-027 Blue Cloud Wind Project *****
/ Siemens 108m VS 2.3MW 60Hz | Siemens 108m VS with powerboost 2.415MW 60Hz
(SWT_32_rev8.lib)
/
/ SWTGU1  108m VS 2.3 MW
 583843  'USRMDL' 1 'SWTGU1'   101   1   0   5   2   8
 0.010   0.010   2.000   1.200   0.110 /
 583843   'USRMDL' 1 'SWTEU1'   102   0    6   45   7   20
  0   0   1   1   1   0
  0.0000     0.0370    9.9800    0.0500     1.0000     1.0000   0.0000    0.0500    0.9500   0.0300
  1.0800     0.0300   15.0000   15.0000     0.2174    -0.2174   1.2500    1.1814    1.2000   1.0661
  0.9920     1.0420    1.0000    1.1027     0.1415     0.0200   0.8750    0.0500    1.1111   1.0003
 20.0000   -20.0000    0.0000    2.0000     0.9000   -38.0000   0.1900    0.9750    7.5000   0.0000
  0.0000   146.4100    1.0000    1.0410   146.4100 /
/ UV/OV & UF/OF Control Data
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0.875  5  3  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0.85  5  3  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0.7  5  2.6  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0.4  5  1.6  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0.15  5  0.85  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0  1.1  1  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0  1.2  0.15  0.05  /
  0  'USRMDL'  0  'FRQTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  57  100  0.2  0  /
  0  'USRMDL'  0  'FRQTPA'  0  2  6  4  0  1  583843  583843  '1'  0  0  0  0  62  0.2  0  /
/ SWTGU1 108m VS with powerboost 2.415 MW
 583846  'USRMDL' 1 'SWTGU1'   101   1   0   5   2   8
 0.010   0.010   2.000   1.200   0.110 /
 583846   'USRMDL' 1 'SWTEU1'   102   0    6   45   7   20
  1   0   1   1   1   0
  0.0000     0.0370    9.9800    0.0500     1.0000     1.0000   0.0000    0.0500    0.9500   0.0300
  1.0800     0.0300   15.0000   15.0000     0.2174    -0.2174   1.2500    1.1814    1.2000   1.0661
  0.9920     1.0420    1.0000    1.1027     0.1415     0.0200   0.8750    0.0500    1.1111   1.0003
 20.0000   -20.0000    0.0000    2.0000     0.9000   -38.0000   0.1900    0.9750    7.5000   0.0000
  0.0000   146.4100    1.0000    1.0410   146.4100 /
/ UV/OV & UF/OF Control Data
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0.875  5  3  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0.85  5  3  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0.7  5  2.6  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0.4  5  1.6  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0.15  5  0.85  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0  1.1  1  0.05  /
  0  'USRMDL'  0  'VTGTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0  1.2  0.15  0.05  /
  0  'USRMDL'  0  'FRQTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  57  100  0.2  0  /
  0  'USRMDL'  0  'FRQTPA'  0  2  6  4  0  1  583846  583846  '1'  0  0  0  0  62  0.2  0  /
```

GEN-2014-033

- Solar Inverter: 70 MW
- Interconnection:
  - Voltage: 115 kV
  - POI: Chaves County 115 kV bus (527482)
  - Transformer: 115/34.5 kV step-up transformer
    - MVA: 48 MVA
    - Voltage: 115/34.5 kV
    - Z: 8.0%
- Collector System Equivalent Model:
  - Transmission Line:
    - R = 0.004440 p.u.
    - X = 0.003000 p.u.
    - B = 0.008600 p.u.
- Solar Inverter Parameters – SC 500HE/CP 0.5 MVA
  - Machine Terminal Voltage: 0.3 kV
  - Rated Power: 70 MW
  - Generator Step-Up Transformer:
    - MVA: 70 Winding MVA
    - High Voltage: 34.5 kV
    - Low Voltage: 0.27 kV
    - Z: 6.0%

The dynamic data for the Sunny Central 500HE/CP 0.5 MVA PV inverter is shown below:

```
***** GEN-2014-033 Alien City Solar I *****
/ SMA Sunny Cenrtal SC 500HE/CP 0.5MVA Solar Inverter (SMASC_B19_32_IVF111.obj)
/
583953 'USRMDL' 1 'SMASC' 1 1 0 76 15 102 1 1 0 0.9 0.5 1 0.9 0.9 0 0.2 0.05 0.4
        2 3 1 0 5 0.5 0 1 0 1 2 0 5 0.9 0 0.05
        1.2 0.16 1.2 0.16 1.1 1 0.88 2 0.5 0.16 0.5 0.16 1.06 0.95
        65 0.1 65 0.1 60.5 0.16 59.3 0.16 57 0.16 50 0.1 60.5 59.3
        30 1 10 30 0 30 0 0.2 0.2 0.35 0.35 0.3491 2 4 0.1 -0.1 0 0.125 0.1 0 /
```

GEN-2014-034

- Solar Inverter: 70 MW
- Interconnection:
  - Voltage: 115 kV
  - POI: Chaves County 115 kV bus (527482)
  - Transformer: 115/34.5 kV step-up transformer
    - MVA: 48 MVA
    - Voltage: 115/34.5 kV

        - Z: 8.0%
- Collector System Equivalent Model:
    - Transmission Line:
        - R = 0.004440 p.u.
        - X = 0.003000 p.u.
        - B = 0.008600 p.u.
- Solar Inverter Parameters – SC 500HE/CP 0.5 MVA
    - Machine Terminal Voltage: 0.3 kV
    - Rated Power: 70 MW
    - Generator Step-Up Transformer:
        - MVA: 70 Winding MVA
        - High Voltage: 34.5 kV
        - Low Voltage: 0.27 kV
        - Z: 6.0%

The dynamic data for the Sunny Central 500HE/CP 0.5 MVA PV inverter is shown below:

```
/ ***** GEN-2014-034 Alien City Solar II *****
/ SMA Sunny Cenrtal SC 500HE/CP 0.5MVA Solar Inverter (SMASC_B19_32_IVF111.obj)
/
583963 'USRMDL' 1 'SMASC' 1 1 0 76 15 102 1 1 0 0.9 0.5 1 0.9 0.9 0 0.2 0.05 0.4
        2 3 1 0 5 0.5 0 1 0 1 2 0 5 0.9 0 0.05
        1.2 0.16 1.2 0.16 1.1 1 0.88 2 0.5 0.16 0.5 0.16 1.06 0.95
        65 0.1 65 0.1 60.5 0.16 59.3 0.16 57 0.16 50 0.1 60.5 59.3
        30 1 10 30 0 30 0 0.2 0.2 0.35 0.35 0.3491 2 4 0.1 -0.1 0 0.125 0.1 0 /
```

GEN-2014-035

- Solar Inverter: 30 MW
- Interconnection:
    - Voltage: 115 kV
    - POI: Chaves County 115 kV bus (527482)
    - Transformer: 115/34.5 kV step-up transformer
        - MVA: 18 MVA
        - Voltage: 115/34.5 kV
        - Z: 8.0%
- Collector System Equivalent Model:
    - Transmission Line:
        - R = 0.004880 p.u.
        - X = 0.003310 p.u.
        - B = 0.003500 p.u.
- Solar Inverter Parameters – SC 500HE/CP 0.5 MVA
    - Machine Terminal Voltage: 0.3 kV
    - Rated Power: 30 MW

- Generator Step-Up Transformer:
  - MVA: 30 Winding MVA
  - High Voltage: 34.5 kV
  - Low Voltage: 0.27 kV
  - Z: 6.0%

The dynamic data for the Sunny Central 500HE/CP 0.5 MVA PV inverter is shown below:

```
/ ***** GEN-2014-035 Alien City Solar III *****
/ SMA Sunny Cenrtal SC 500HE/CP 0.5MVA Solar Inverter (SMASC_B19_32_IVF111.obj)
/
583973 'USRMDL' 1 'SMASC' 1 1 0 76 15 102 1 1 0 0.9 0.5 1 0.9 0.9 0 0.2 0.05 0.4
            2 3 1 0 5 0.5 0 1 0 1 2 0 5 0.9 0 0.05
            1.2 0.16 1.2 0.16 1.1 1 0.88 2 0.5 0.16 0.5 0.16 1.06 0.95
            65 0.1 65 0.1 60.5 0.16 59.3 0.16 57 0.16 50 0.1 60.5 59.3
            30 1 10 30 0 30 0 0.2 0.2 0.35 0.35 0.3491 2 4 0.1 -0.1 0 0.125 0.1 0 /
```

GEN-2014-047

- Solar Inverter: 40 MW
- Interconnection:
  - Voltage: 345 kV
  - POI: Tap Tolk to Eddy County 345 kV bus (560007)
  - Transformer: 345/34.5 kV step-up transformer
    - MVA: 30 MVA
    - Voltage: 345/34.5 kV
    - Z: 10.0%
- Collector System Equivalent Model:
  - Transmission Line:
    - R = 0.010740 p.u.
    - X = 0.002790 p.u.
    - B = 0.053060 p.u.
- Solar Inverter Parameters – Advanced Energy 500NX 0.5 MVA
  - Machine Terminal Voltage: 0.5 kV
  - Rated Power: 40 MW
  - Generator Step-Up Transformer:
    - MVA: 40 Winding MVA
    - High Voltage: 34.5 kV
    - Low Voltage: 0.48 kV
    - Z: 6.0%

The dynamic data for the Advanced Energy 500NX 0.5MVA PV Solar inverter is shown below:

```
Advanced Energy 500NX 0.5MVA PV Solar Inverter (AEINX_A_V322_IVF140.obj)
/ Extended Ride-Through Option
584263 'USRMDL' 1 'AEINX' 1 1 1 27 4 14
                0
                1.20   1.10   0.005   2.26   142.30   0.4   25.00   1.00   1.2   1.0
                1.1    99.0   0.0     2.00   0.50     3.5   60.5    0.02   57.0  0.02
                59.3   0.10   0.50    0.164  0.505    30.0  0.0                  /
```

GEN-2014-053

- Wind Farm Size: 80 MW
- Interconnection:
  - Voltage: 230 kV
  - POI: Carlisle 230 kV bus (526161)
  - Transformer: 230/34.5 kV step-up transformer
    - MVA: 60 MVA
    - Voltage: 230/34.5 kV
    - Z: 8.5%
- Collector System Equivalent Model:
  - Transmission Line:
    - R = 0.007050 p.u.
    - X = 0.006480 p.u.
    - B = 0.011520 p.u.
- Wind Farm Parameters – GE 2.0MW
  - Machine Terminal Voltage: 0.7 kV
  - Rated Power: 80 MW
  - Wind Turbines:
    - Number: 40
    - Model: GE 2.0MW
  - Generator Step-Up Transformer:
    - MVA: 90 Winding MVA
    - High Voltage: 34.5 kV
    - Low Voltage: 0.69 kV
    - Z: 5.8%

The dynamic data for the GE 2.0MW generator is shown below:

```
/ GE 2.00MW (gewt_p32_v600.lib)
/
584033  'USRMDL' 1  'GEWTG2'  1 1 4 18 3 5
      0  40       0       0
       2.0000     0.80000     0.50000     0.90000      1.2200      1.2000
       2.0000     0.40000     0.80000      10.000     0.20000E-01   0.0000
       0.0000     0.50000     0.16700     0.90000     0.92500      0.0000   /
584033  'USRMDL' 1  'GEWTE2'  4 0 12 67 18 9
       584033        0            0            1            0            0
           0       0            0            1            0            0
      0.15000      2.000      1.0000      0.0000      0.0000      0.50000E-01   3.0000
      0.60000      1.1200      0.40000E-01  0.43600     -0.43600      1.1000      0.20000E-01
      0.45000         -0.45000          60.000          0.10000          0.90000
       1.1000          40.000          0.50000          1.4500          0.50000E-01
      0.50000E-01        1.0000          0.15000          0.96000          0.99600
       1.0040          1.0400          0.99999          0.99999          0.99999
      0.40000          1.0000          0.20000          1.0000          0.25000
      -1.0000          14.0000          25.000          3.0000          -0.90000
       8.0000          0.2000          10.000          1.0000          1.7000
       1.22           1.2500          5.0000          0.0000          0.0000
        0.000          0.25000E-02        1.0000          5.5000          0.10000
      -1.0000          0.10000          0.0000          0.10000          -0.10000
      0.70000          0.12000          -0.12000   /
584033  'USRMDL' 1  'GEWTT1'       5   0   1   5   4   3   0
        3.7000      0.0000      0.0000       1.8800      1.5000   /
 0 'USRMDL'  0 'GEWGC1' 8   0   3   6   0   4
       584033      '1 ' 0
        9999.0      5.0000      30.000       9999.0      9999.0
        30.000   /
 0 'USRMDL'  0 'GEWTA1'      8   0   3   9   1   4
       584033      '1 '  0
        20.000      0.0000      27.000      -4.0000      0.0000      1.2250
        58.0       104.000      1200.0   /
 0 'USRMDL'  0 'GEWTP1'      8   0   3   10   3   3
       584033      '1 '  0
       0.30000      150.00      25.000      3.0000      30.000
       -4.0000      27.000      -10.000      10.000      1.0000   /
 0 'USRMDL'  0 'GEWPLT' 8  0  2  0  0  17         584033      '1 '     /
/ ZVRT
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584033 584033 '1'  0 0 0  0.01 5.00  0.2000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584033 584033 '1'  0 0 0  0.75 5.00  10.000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584033 584033 '1'  0 0 0  0.85 5.00  600.00 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584033 584033 '1'  0 0 0  0.00 1.10  1.0000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584033 584033 '1'  0 0 0  0.00 1.15  0.1000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584033 584033 '1'  0 0 0  0.00 1.30  0.0100 0.08 /
```

GEN-2014-054

- Wind Farm Size: 120 MW
- Interconnection:
  - Voltage: 230 kV
  - POI: Carlisle 230 kV bus (526161)
  - Transformer: 230/34.5 kV step-up transformer
    - MVA: 84 MVA
    - Voltage: 230/34.5 kV
    - Z: 8.5%

- Collector System Equivalent Model:
    - Transmission Line:
        - R = 0.004670 p.u.
        - X = 0.004270 p.u.
        - B = 0.019220 p.u.
- Wind Farm Parameters – GE 2.0MW
    - Machine Terminal Voltage: 0.7 kV
    - Rated Power: 120 MW
    - Wind Turbines:
        - Number: 60
        - Model: GE 2.0MW
    - Generator Step-Up Transformer:
        - MVA: 135 Winding MVA
        - High Voltage: 34.5 kV
        - Low Voltage: 0.69 kV
        - Z: 5.8%

The dynamic data for the GE 2.0MW generator is shown below:

```
/ ***** GEN-2014-054 Red Raider Wind II *****
/ GE 2.00MW (gewt_p32_v600.lib)
/
584043  'USRMDL' 1  'GEWTG2'  1 1 4 18 3 5
      0  60       0       0
       2.0000     0.80000     0.50000     0.90000     1.2200      1.2000
       2.0000     0.40000     0.80000      10.000     0.20000E-01   0.0000
       0.0000     0.50000     0.16700     0.90000     0.92500      0.0000    /
584043  'USRMDL' 1  'GEWTE2'  4 0 12 67 18 9
       584043        0            0            1            0            0
           0        0            0            1            0            0
      0.15000     2.000      1.0000      0.0000      0.0000     0.50000E-01   3.0000
      0.60000     1.1200     0.40000E-01  0.43600     -0.43600     1.1000     0.20000E-01
      0.45000         -0.45000         60.000         0.10000         0.90000
       1.1000          40.000         0.50000         1.4500         0.50000E-01
      0.50000E-01        1.0000         0.15000         0.96000         0.99600
       1.0040          1.0400          0.99999         0.99999         0.99999
      0.40000          1.0000          0.20000          1.0000          0.25000
      -1.0000          14.0000          25.000          3.0000         -0.90000
       8.0000          0.2000          10.000          1.0000          1.7000
       1.22           1.2500          5.0000          0.0000          0.0000
        0.000          0.25000E-02        1.0000          5.5000          0.10000
      -1.0000          0.10000          0.0000          0.10000         -0.10000
      0.70000          0.12000         -0.12000    /
584043  'USRMDL' 1  'GEWTT1'       5    0    1    5    4    3   0
        3.7000      0.0000      0.0000      1.8800      1.5000    /
 0 'USRMDL'  0 'GEWGC1' 8    0    3    6    0    4
       584043      '1 ' 0
        9999.0      5.0000      30.000      9999.0      9999.0
        30.000    /
 0 'USRMDL'  0 'GEWTA1'      8    0    3    9    1    4
       584043      '1 '   0
        20.000      0.0000      27.000      -4.0000      0.0000      1.2250
        58.0       104.000      1200.0    /
 0 'USRMDL'  0 'GEWTP1'      8    0    3    10    3    3
       584043      '1 '   0
       0.30000      150.00      25.000      3.0000      30.000
       -4.0000      27.000      -10.000      10.000      1.0000    /
 0 'USRMDL'  0 'GEWPLT' 8  0  2  0  0  17         584043      '1 '     /
/ ZVRT
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584043 584043 '1'  0 0 0  0.01 5.00  0.2000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584043 584043 '1'  0 0 0  0.75 5.00  10.000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584043 584043 '1'  0 0 0  0.85 5.00  600.00 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584043 584043 '1'  0 0 0  0.00 1.10  1.0000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584043 584043 '1'  0 0 0  0.00 1.15  0.1000 0.08 /
0 'USRMDL' 0 'VTGTPA' 0 2 6 4 0 1  584043 584043 '1'  0 0 0  0.00 1.30  0.0100 0.08 /
```

GEN-2014-063

- Wind Farm Size: 120 MW
- Interconnection:
  - Voltage: 230 kV
  - POI: Hobbs 230 kV bus (527894)
  - Transformer: 230/34.5 kV step-up transformer
    - MVA: 80 MVA
    - Voltage: 230/34.5 kV

        - Z: 9.5%
- Collector System Equivalent Model:
    - Transmission Line:
        - R = 0.009440 p.u.
        - X = 0.010430 p.u.
        - B = 0.051380 p.u.
- Wind Farm Parameters – Vestas V110 VCSS 2.0 MW
    - Machine Terminal Voltage: 0.7 kV
    - Rated Power: 120 MW
    - Generator Step-Up Transformer:
        - MVA: 126 Winding MVA
        - High Voltage: 34.5 kV
        - Low Voltage: 0.69 kV
        - Z: 7.6%

The dynamic data for the Vestas 2.0 MW generator is shown below:

```
/ ***** GEN-2014-063 Lea County Wind *****
/ V110 VCSS 2.0 MW 60 Hz Mk10 (VestasWT_7_6_0_PSSE32.lib)
/
584243 'USRMDL' '1'  'VWCOR6' 1 1 2 45 23 104 1 0
 2000.0000 690.0000 903.3041 700.0000 2.6200 0.9676 0.0232
 1.9807 8.3333 1.9807 8.3333 30.0000 0.2000 1.2000
 0.1000 0.0012 0.9925 0.0474 1.6118 0.0000 351.8584
 161.5343 0.0300 0.0000 0.0300 0.3000 0.0000 1.0000
 0.3183 4.9736 2812227.1900 43.2960 90.0120 600000.0000 3.0000
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.0000/
0 'USRMDL' 0 'VWVAR6' 8 0 2 0 0 30 584243 '1'  /
0 'USRMDL' 0 'VWLVR6' 8 0 3 65 10 35 584243 '1' 1
 0.9000 0.0010 0.1500 18.6316 74.5430 74.5430 74.5430
 0.5000 1.0000 2.6200 0.9676 1.2000 0.5000 690.0000
 903.3041 0.3500 0.0500 0.2500 0.0200 3.0000 4.0000
 9999.0000 0.0232 0.9000 0.9000 0.0500 0.0000 0.0100
 0.0000 2.0000 0.0000 1.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 /
0 'USRMDL' 0 'VWPWR6' 8 0 3 30 7 10 584243 '1' 1
 1.0000 0.5000 -0.5000 0.6988 0.8844 0.9800 0.9600
 0.2000 0.2000 1.0000 1.0000 0.0000 0.0000 0.1000
 0.1000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 /
0 'USRMDL' 0 'VWMEC6' 8 0 2 10 8 0 584243 '1'
 2000.0000 422.2301 4736.7543 420.7500 83.5000 6188.8071 39.3992
 0.0000 0.0000 0.0000 /
0 'USRMDL' 0 'VWMEA6' 8 0 2 10 8 5 584243 '1'
 0.1000 0.1000 0.1000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.0000/
0 'USRMDL' 0 'VWVPR6' 0 2 7 30 0 18 584243 '1'  1 1 0 0 0
 0.8500 11.0000 0.8500 11.0000 0.9000 60.0000 1.1000
 60.0000 1.1500 2.0000 1.2000 0.0800 1.2500 0.0050
 1.2500 0.0050 0.0000 0.0000 0.0000 0.0000 0.0000
 0.0000 0.0000 0.1500 0.8000 2.7000 0.8500 3.5000
 0.9000 5.0000 /
0 'USRMDL' 0 'VWFPR6' 0 2 3 12 0 7 584243 '1'  0
 56.4000 0.2000 56.4000 0.2000 56.4000 0.2000 63.6000
 0.2000 63.6000 0.2000 63.6000 0.2000 /
```

GEN-2014-066

- Solar Inverter: 30 MW
- Interconnection:
  - Voltage: 115 kV
  - POI: Norton 115 kV bus (524502)
  - Transformer: 115/34.5 kV step-up transformer
    - MVA: 24 MVA
    - Voltage: 115/34.5 kV
    - Z: 9.0%
- Collector System Equivalent Model:

- Transmission Line:
  - R = 0.001290 p.u.
  - X = 0.002790 p.u.
  - B = 0.004480 p.u.
- Solar Inverter Parameters – AE 1000NX 1.0MW
  - Machine Terminal Voltage: 0.8 kV
  - Rated Power: 30 MW
  - Generator Step-Up Transformer:
    - MVA: 36 Winding MVA
    - High Voltage: 34.5 kV
    - Low Voltage: 0.8 kV
    - Z: 5.7%

The dynamic data for the Advanced Energy 1000NX 1.0MW PV inverter is shown below:

```
/ ***** GEN-2014-066 Caprock Solar II *****
/ Advanced Energy 1000NX 1.0MVA PV Solar Inverter (AEINX_A_V322_IVF140.obj)
/ Current model (AEINX_A_V322_IVF140.obj) with Default Option
584163 'USRMDL' 1  'AEINX' 1 1 1 27 4 14
          0
          1.20    1.10    0.003    1.80    22.50    0.4    30.00    1.12    1.2    0.02
          1.1    2.5    0.5    0.02    0.88    5.0    60.5    0.02    57.0    0.02
          59.3    0.1    1.00    0.485    1.00    30.0    0                    /
```

GEN-2014-070

- Solar Inverter: 116 MW
- Interconnection:
  - Voltage: 230 kV
  - POI: Tap Hobbs to Yoakum 230 kV bus (560018)
  - Transformer: 230/34.5 kV step-up transformer
    - MVA: 72 MVA
    - Voltage: 230/34.5 kV
    - Z: 7.5%
- Collector System Equivalent Model:
  - Transmission Line:
    - R = 0.017580 p.u.
    - X = 0.008600 p.u.
    - B = 0.002810 p.u.
- Solar Inverter Parameters – GE Prosolar 4.0MW
  - Machine Terminal Voltage: 0.6 kV
  - Rated Power: 116 MW
  - Generator Step-Up Transformer:
    - MVA: 116 Winding MVA

- High Voltage: 34.5 kV
- Low Voltage: 0.55 kV
- Z: 6.7%

The dynamic data for the GE Prosolar 4.0 MW PV inverter is shown below:

```
/ GE Prosolar 4.0MVA PV inverter (PSS\E included PV model)
584133 'USRMDL' 1 'PVGU1' 101 1 0  9  3 3
            0.02    0.02    0.05    0.1    1.1    2    1.1    1.2    0.02        /
584133 'USRMDL' 1 'PVEU1' 102 0 4 24 10 4
            584133 0 1 0
            0.15000  18.000   5.0000   0.00    0.00000  0.0000   0.08    0.312   -0.312   1.1000
            0.0000   0.5000   -0.5000   0.05    0.01    0.90000  1.1000  120.00   0.05000  0.05
            1.1000   1.11    1.1100   54.330 /
```

ASGI-2014-002

- Solar Inverter: 49.6 MW
- Interconnection:
  - Voltage: 115 kV
  - POI: Santa Rosa Tap to Tucumcari 115 kV bus (560018)
  - Transformer: 115/34.5 kV step-up transformer
    - MVA: 33 MVA
    - Voltage: 115/34.5 kV
    - Z: 10.5%
- Collector System Equivalent Model:
  - Transmission Line:
    - R = 0.005960 p.u.
    - X = 0.005000 p.u.
    - B = 0.006280 p.u.
- Solar Inverter Parameters – SMA 1.6MVA 630CP-US
  - Machine Terminal Voltage: 0.4 kV
  - Rated Power: 49.6 MW
  - Generator Step-Up Transformer:
    - MVA: 49.6 Winding MVA
    - High Voltage: 34.5 kV
    - Low Voltage: 0.36 kV
    - Z: 9.0%

The dynamic data for the SMA Sunny Central SC 800CP (XT) 0.800MVA PV Solar inverter is shown below:

```
/ ***** ASGI-2014-002 Brooklyn Ranch *****
/ SMA Sunny Cenrtal SC 800CP (XT) 0.800MVA PV Solar Inverter (SMASC_B19_32_IVF111.obj)
/
584314 'USRMDL' 1 'SMASC' 1 1 0 76 15 102 1 1 0 0.9 0.5 1 0.9 0.9 0 0.2 0.05 0.4
            2 1 1 0 5 0.5 0 1 0 1 2 0 5 0.9 0 0.05
            1.2 0.16 1.2 0.16 1.1 1 0.88 2 0.5 0.16 0.5 0.16 1.06 0.95
            65 0.1 65 0.1 60.5 0.16 59.3 0.16 57 0.16 50 0.1 60.5 59.3
            30 1 10 30 0  0 0 0.2 0.2 0.35 0.35 0.3491 2 2 0.1 -0.1 0 0.15  0.1 0 /
```

ASGI-2014-005

- Solar Inverter: 10 MW
- Interconnection:
  - Voltage: 69 kV
  - POI: Strata 69 kV bus (528046)
- Solar Inverter Parameters – Solar PV (PSS\E model)
  - Machine Terminal Voltage: 13 kV
  - Rated Power: 10 MW
  - Generator Step-Up Transformer:
    - MVA: 10 MVA
    - Voltage: 69/13 kV
    - Z: 10.0%

The dynamic data for the PV Solar inverter (PSS|E model) is shown below:

```
/ ***** ASGI-2014-005 Strata *****
/ PV Solar Inverter (PSS\E included PV model)
/
584333 'USRMDL' 1 'PVGU1' 101 1 0  9  3 3
           0.02     0.02     0.05     0.1      1.1      2       1.1      1.2      0.02          /
584333 'USRMDL' 1 'PVEU1' 102 0 4 24 10 4
           584333 0 1 0
           0.15000  18.000    5.0000   0.00     0.00000  0.0000   0.08     0.312   -0.312   1.1000
           0.0000   0.5000   -0.5000   0.05     0.01     0.90000  1.1000  120.00    0.05000  0.05
           1.1000   1.11     1.1100   10.0 /
```

ASGI-2014-008

- Solar Inverter: 10 MW
- Interconnection:
  - Voltage: 69 kV
  - POI: South Loving 69 kV bus (528218)
- Solar Inverter Parameters – Solar PV (PSS\E model)
  - Machine Terminal Voltage: 13 kV
  - Rated Power: 10 MW
  - Generator Step-Up Transformer:
    - MVA: 10 MVA
    - Voltage: 69/13 kV

- Z: 10.0%

The dynamic data for the PV Solar inverter (PSS|E model) is shown below:

```
/ ***** ASGI-2014-008 South Loving *****
/ PV Solar Inverter (PSS\E included PV model)
/
584343 'USRMDL' 1 'PVGU1' 101 1 0  9  3 3
              0.02    0.02    0.05    0.1    1.1    2    1.1    1.2    0.02        /
584343 'USRMDL' 1 'PVEU1' 102 0 4 24 10 4
              584343 0 1 0
              0.15000  18.000    5.0000   0.00    0.00000  0.0000   0.08    0.312   -0.312   1.1000
              0.0000   0.5000   -0.5000   0.05    0.01    0.90000  1.1000  120.00    0.05000  0.05
              1.1000   1.11     1.1100   10.0 /
```

ASGI-2014-009

- Solar Inverter: 10 MW
- Interconnection:
  - Voltage: 115 kV
  - POI: Wood Draw 115 kV bus (528228)
- Solar Inverter Parameters – Solar PV (PSS\E model)
  - Machine Terminal Voltage: 13 kV
  - Rated Power: 10 MW
  - Generator Step-Up Transformer:
    - MVA: 10 MVA
    - Voltage: 115/13 kV
    - Z: 10.0%

The dynamic data for the PV Solar inverter (PSS|E model) is shown below:

```
/ ***** ASGI-2014-009 Wood Draw *****
/ PV Solar Inverter (PSS\E included PV model)
/
584353 'USRMDL' 1 'PVGU1' 101 1 0  9  3 3
              0.02    0.02    0.05    0.1    1.1    2    1.1    1.2    0.02        /
584353 'USRMDL' 1 'PVEU1' 102 0 4 24 10 4
              584353 0 1 0
              0.15000  18.000    5.0000   0.00    0.00000  0.0000   0.08    0.312   -0.312   1.1000
              0.0000   0.5000   -0.5000   0.05    0.01    0.90000  1.1000  120.00    0.05000  0.05
              1.1000   1.11     1.1100   10.0 /
```

ASGI-2014-010

- Solar Inverter: 10 MW
- Interconnection:
  - Voltage: 115 kV
  - POI: Ochoa 115 kV bus (528232)
- Solar Inverter Parameters – Solar PV (PSS\E model)

  - Machine Terminal Voltage: 13 kV
  - Rated Power: 10 MW
  - Generator Step-Up Transformer:
    - MVA: 10 MVA
    - Voltage: 115/13 kV
    - Z: 10.0%

The dynamic data for the PV Solar inverter (PSS|E model) is shown below:

```
/ ***** ASGI-2014-010 Ochoa *****
/ PV Solar Inverter (PSS\E included PV model)
/
584363 'USRMDL' 1 'PVGU1' 101 1 0  9  3 3
        0.02   0.02   0.05   0.1   1.1   2   1.1   1.2   0.02   /
584363 'USRMDL' 1 'PVEU1' 102 0 4 24 10 4
        584363 0 1 0
        0.15000  18.000   5.0000   0.00   0.00000  0.0000   0.08   0.312   -0.312   1.1000
        0.0000   0.5000   -0.5000   0.05   0.01   0.90000   1.1000  120.00   0.05000  0.05
        1.1000   1.11   1.1100   10.0 /
```

ASGI-2014-012

- Solar Inverter: 10 MW
- Interconnection:
  - Voltage: 115 kV
  - POI: Cooper Ranch 115 kV bus (528554)
- Solar Inverter Parameters – Solar PV (PSS\E model)
  - Machine Terminal Voltage: 13 kV
  - Rated Power: 10 MW
  - Generator Step-Up Transformer:
    - MVA: 10 MVA
    - Voltage: 115/13 kV
    - Z: 10.0%

The dynamic data for the PV Solar inverter (PSS|E model) is shown below:

```
/ ***** ASGI-2014-012 Cooper Ranch *****
/ PV Solar Inverter (PSS\E included PV model)
/
584383 'USRMDL' 1 'PVGU1' 101 1 0  9  3 3
        0.02   0.02   0.05   0.1   1.1   2   1.1   1.2   0.02   /
584383 'USRMDL' 1 'PVEU1' 102 0 4 24 10 4
        584383 0 1 0
        0.15000  18.000   5.0000   0.00   0.00000  0.0000   0.08   0.312   -0.312   1.1000
        0.0000   0.5000   -0.5000   0.05   0.01   0.90000   1.1000  120.00   0.05000  0.05
        1.1000   1.11   1.1100   10.0 /
```

Appendix B
2015 Summer Peak Stability Analysis Plots

(Available Upon Request)

Group 6 Addendum

DISIS-2014-002-1

May 2015

Generator Interconnection

Revision History

Date	Author	Change Description
5/18/2015	SPP	DISIS-2014-002-1 Group 6 addendum issued

Southwest Power Pool

Addendum

DISIS-2014-002 Group 6 Cluster – Quay County (GEN-2011-046) Sensitivity Stability Analysis Results

A sensitivity analysis was performed for the DISIS-2014-002-1 Group 6 Cluster Study to evaluate the study results with the Prior Queued project, Quay County (GEN-2011-046), off-line. The original DISIS-2014-002 study indicated the need for additional reactive compensation equipment at Norton 115kV. This analysis was performed based on the changes due to withdrawals of DISIS-2014-002 projects and for interconnection configuration changes for the GEN-2013-022 Interconnection Request. The following upgrades were included:

- Conversion and rebuild of the existing Norton to Pleasant Hill 115kV circuit with a 230kV circuit
- Addition of a 230kV/115kV transformer at the existing Norton 115kV substation.
- Addition of an 18Mvar capacitor at the Caprock Wind (GEN-2001-036) 34.5kV substation controlled by the existing D-VAR equipment
- Addition of an 8Mvar STATCOM device at the ASGI-2014-002 34.5kV substation
- Inclusion of 10.8 Mvar of switched shunt capacitors at the ASGI-2014-002 34.5kV substation
- Inclusion of 8.4 Mvar of switched shunt capacitors at the GEN-2014-066 34.5kV substation
- Changes to GEN-2013-022 Interconnection configuration - GEN-2013-022 will be installed using its own 115/34.5kV transformer interconnected to the Caprock 115kV bus.

With these system upgrades, the results indicate that the DISIS-2014-002-1 Group 6 Cluster sensitivity analysis does not require any additional system upgrades to meet system angular & voltage recovery requirements. Low Voltage Ride Through (LVRT) analysis showed no generators/inverters tripping offline due to low voltage. The contingencies evaluated with these system upgrades for each season are summarized below in ***Table 0-1***.

Table 0-1: DISIS-2014-002 Group 6 Cluster Quay County (GEN-2011-046) Sensitivity Stability Analysis Results

Contingency Number and Name		2015SP	2015WP	2025SP
~~99~~	~~FLT_99_NORTON3_FETUCMCARI3_115kV_3PH~~	~~STABLE~~	~~STABLE~~	~~STABLE~~
100	FLT_100_PLSNTHILL3_ECLOVIS3_115kV_3PH	STABLE	STABLE	STABLE
101	FLT_101_PLSNTHILL3_NCLOVISTP3_115kV_3PH	STABLE	STABLE	STABLE
102	FLT_102_PLSNTHILL3_ECLOVIS3_115kV_3PH	STABLE	STABLE	STABLE
103	FLT_103_PLSNTHILL6_PLSNTHILL3_230_115kV_3PH	STABLE	STABLE	STABLE
104	FLT_104_PLSNTHILL6_OASIS6_230kV_3PH	STABLE	STABLE	STABLE
105	FLT_105_PLSNTHILL6_ROSEVELTN6_230kV_3PH	STABLE	STABLE	STABLE
106	FLT_106_OASIS6_OASIS3_230_115kV_3PH	STABLE	STABLE	STABLE
107	FLT_107_FECLVSINT3_NCLOVISTP3_115kV_3PH	STABLE	STABLE	STABLE
108	FLT_108_FECLVSINT3_WCLOVIS3_115kV_3PH	STABLE	STABLE	STABLE
122	FLT_122_FETUCMCARI3_LOPEZ3_115kV_3PH	STABLE	STABLE	STABLE

Appendix A: 2015 Summer Peak Stability Plots

(Available on request)

Appendix B: 2015 Winter Peak Stability Plots

(Available on request)

Appendix C: 2025 Summer Peak Stability Plots

(Available on request)