Preliminary Interconnection System Impact Study for Generator Interconnection Requests

(PISIS-2014-001)

August 2014

Generator Interconnection

SPP Southwest Power Pool

Revision History

Date	Author	Change Description
08/29/2014	SPP	Report Issued (PISIS-2014-001)

Executive Summary

Generator Interconnection customers have requested a Preliminary Interconnection System Impact Study (PISIS) under the Generator Interconnection Procedures (GIP) in the Southwest Power Pool Open Access Transmission Tariff (OATT). The Interconnection Customers' requests have been clustered together for the following System Impact Cluster Study window which closed March 31, 2014. The customers will be referred to in this study as the PISIS-2014-001 Interconnection Customers. This System Impact Study analyzes the interconnecting new generation totaling approximately 213.3 MW of new generation which would be located within the transmission system of Southwestern Public Service (SPS). The generator interconnection requests have a requested in service date of 12/31/2016[1]. The generator 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.

Power flow analysis has indicated that for the power flow cases studied, 213.3 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 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.

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) and Network Resource (NR) constraints, if requested by the Customer. 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 PISIS-2014-001 Interconnection Customers is estimated at $102,000,000. These costs are shown in Appendix E and F. Interconnection Service to PISIS-2014-001 Interconnection Customers is also contingent upon higher queued customers paying for certain required network upgrades. **<u>The in-service date for the</u>**

[1] The generation interconnection requests in-service dates will 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.

PISIS 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.

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. 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.

Table of Contents

Introduction **1**

Model Development **2**

Identification of Network Constraints **6**

Determination of Cost Allocated Network Upgrades **6**

Required Interconnection Facilities **7**

Power Flow Analysis **8**

Stability Analysis **11**

Conclusion **13**

Appendices **14**

A: Generator Interconnection Requests Considered for Impact Study A0
B: Prior Queued Generator Interconnection Requests B0
C: Study Groupings C0
D: Proposed Point of Interconnection One Line Diagrams D0
E: Cost Allocation per Interconnection Request (Including Prior Queued Upgrades) E0
F: Cost Allocation per Proposed Study Network Upgrade F0
G: Power Flow Analysis (Constraints Used For Mitigation) G0
H: Power Flow Analysis (Other Constraints Not Requiring Mitigation) H0
I: Power Flow Analysis (Constraints from Category C Contingencies) I0
J: Group 6 Dynamic Stability Analysis Report J0

Introduction

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Preliminary Interconnection System Impact Study (PISIS) for certain generator interconnection requests in the SPP Generator Interconnection Queue. These interconnection requests have been clustered together for the following System Impact Study window which closed March 31, 2014. The customers will be referred to in this study as the PISIS-2014-001 Interconnection Customers. This PISIS analyzes interconnecting a generator interconnection request associated with new generation totaling 213.3 MW which would be located within the transmission system of Southwestern Public Service (SPS). The interconnection requests have a requested in service date of 12/31/2016[2]. The generator 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.

The primary objective of this PISIS 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 will 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.

Model Development

Interconnection Requests Included in the Cluster

SPP included all interconnection requests that submitted a Preliminary Interconnection System Impact Study Agreement no later than March 31, 2014 and were subsequently accepted by Southwest Power Pool under the terms of the Generator Interconnection Procedures (GIP). The interconnection requests that are included in this study are listed in Appendix A.

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 2013 series Transmission Service Request (TSR) Models including the 2014 (spring, summer and winter peak seasons), the 2019 (summer and winter peak seasons), and the 2024 (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 generator requests using current dispatch orders.

Dynamic Stability

The 2013 series SPP Model Development Working Group (MDWG) Models 2014 winter, 2015 summer, 2019 summer, 2019 winter, and 2024 summer peak cases were used as starting points for this study.

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 PISIS-2014-001 Interconnection Customers have not been assigned acceleration costs for the below listed projects. <u>The PISIS-2014-001 Interconnection Customers' Generation Facilities in service dates may need to be delayed until the completion of the following upgrades.</u> 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.

- Balanced Portfolio Projects[3]:
  - Woodward – Border – TUCO Interchange 345kV Project, scheduled for 9/30/2014 in-service
    - Woodward – Border – TUCO Interchange 345kV circuit #1 and associated terminal equipment upgrades
  - Iatan – Nashua 345/161kV Project, scheduled for 6/1/2015 in-service
    - Iatan – Nashua 345kV circuit #1 and associated terminal equipment
    - Nashua 345/161/13kV autotransformer circuit #1
- Priority Projects[4]:
  - Woodward – Thistle double circuit 345kV, scheduled for 12/31/2014 in-service
  - Spearville – Clark County – Thistle double circuit 345kV, scheduled for 12/31/2014 in-service
- Northwest 345/138/13.8kV circuit #3 autotransformer, scheduled for 6/1/2017 in-service[5]
- Hoskins – Neligh East 345/115kV Project[6]
  - Neligh East 345/115kV substation and transformer
  - Neligh East Area 115kV upgrades to support new station
  - Hoskins – Neligh East 345kV circuit #1
- High Priority Incremental Loads (HPILs) Projects[7]:
  - TUCO Interchange – Yoakum – Hobbs Interchange 345/230kV Project
    - TUCO Interchange – Yoakum – Hobbs Interchange 345kV circuit #1 and associated terminal equipment upgrades
    - Hobbs 345/230/13kV transformer circuit #1
    - Yoakum 345/230/13kV transformer circuit #1
  - Battle Axe – Road Runner 115kV circuit #1
  - Chaves County – Price – CV Pines – Capitan 115kV circuit #1
  - China Draw – Yeso Hills 115kV circuit #1
  - Dollarhide – Toboso Flats 115kV circuit #1
  - Hobbs Interchange – Kiowa 345kV circuit #1
  - Kiowa – North Loving – China Draw 345/115kV Projects
    - Kiowa – North Loving – China Draw circuit #1 and associated terminal equipment upgrades
    - China Draw 345/115/13kV transformer circuit #1
    - North Loving 345/115/13kV transformer circuit #1
  - Kiowa – Road Runner 345/230/115kV Projects
    - Kiowa 345/230kV transformer circuit #1
    - Road Runner 345/115/13kV transformer circuit #1
  - Livingston Ridge – Sage Brush – Lagarto – Cardinal 115kV circuit #1

---

[3] Notification to Construct (NTC) issued June 2009
[4] Notification to Construct (NTC) issued June 2010
[5] SPP Transmission Service Project identified in SPP 2009-AG2-AFS6. Per SPP NTC 20137
[6] SPP Regional Reliability 2012 ITP 10 Project Per SPP-NTC-200220
[7] Per Network Upgrades assigned in High Priority Incremental Loads (HPILs) study, Including Direct Assigned Upgrades, Projects in SPP-NTC-200256 and SPP-NTC-200283.

- North Loving – South Loving 115kV circuit #1
- Ponderosa – Ponderosa Tap 115kV circuit #1

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 PISIS-2014-001 study and are assumed to be in service. This list may not be all inclusive. The PISIS-2014-001 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 Generator Interconnection Agreement or withdraw from the interconnection queue. The PISIS-2014-001 Interconnection Customer Generation Facilities in-service dates may need to be delayed until the completion of the following upgrades.

- Upgrades assigned to DISIS-2009-001 Interconnection Customers:
  - Lancer Project
    - Spearville – Lancer 345kV addition
    - Lancer 345/115kV transformer circuit #1 addition
    - Lancer – North Ft. Dodge 115kV addition
    - Ft Dodge – North Ft. Dodge circuit #2 addition
    - Move Fort Dodge terminal of Shooting Star 115kV at North Ft Dodge
  - Fort Randall – Meadow Grove – Kelly 230kV circuit #1 rerate (320MVA)
- Upgrades assigned to DISIS-2010-001 Interconnection Customers:
  - Switch 2749 – Wildorado 69kV circuit # 1 rebuild
- Upgrades assigned to DISIS-2010-002 Interconnection Customers:
  - Twin Church – Dixon County 230kV circuit #1 rerate (320MVA)
  - Buckner – Spearville 345kV terminal equipment
- Upgrades assigned to DISIS-2011-001 Interconnection Customers:
  - Hoskins – Dixon County – Twin Church 230kV circuit #1 conductor clearance increase
  - (NRIS only) New Deal – TUCO 345kV/115kV Project
  - (NRIS only) Wolfforth Interchange 230/115/13kV transformer circuit #1
  - (NRIS only) Woodward – FPL Switch – Mooreland – Glass Mountain 138kV circuit #1 rebuild
- Upgrades assigned to DISIS-2011-002 Interconnection Customers:
  - Power System Stabilizers - Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)
  - Jones – Lubbock South 230kV circuit #2 replace line traps
  - SUB 967 – SUB 968 – SUB 969 – SUB 974 69kV circuit #1 replace terminal equipment
  - (NRIS only) Hydro Carbon Tap - Sub974 69kV circuit #1 rewire CT
  - (NRIS only) Nebraska City U Syracuse – SUB 970 circuit #1 replace terminal equipment
- Upgrades assigned to DISIS-2012-001 Interconnection Customers:
  - GEN-2011-017 Tap 100MVAR Static VAR Compensator (SVC) and 100 MVAR Capacitor Bank(s)
- Upgrades assigned to DISIS-2012-002 Interconnection Customers:
  - Amoco Wasson – Oxy Tap 230kV circuit #1 replace line traps

    - Associated Electric Cooperatives Inc. (AECI) Fairfax 138/69kV transformer replacement
    - Lake Creek – Lone Wolf 69kV circuit #1 reset CT
    - Remington – Fairfax 138kV circuit #1 conductor clearance increase
    - Thistle +100MVAR Static VAR Compensator (SVC) and 100MVAR Capacitor Bank(s)
- Upgrades assigned to DISIS-2013-001 Interconnection Customers:
    - Deaf Smith – Plant X 230kV circuit #1 line trap replacements
    - 60 MVAR Capacitor Bank(s) at Oklaunion
    - Meadow Grove, North Petersburg, and South Norfolk 345/230/115kVProjects
        - Meadow Grove 115kV substation bay and 230/115kV transformer circuit #1
        - Meadow Grove – North Petersburg 115kV circuit #1
        - Meadow Grove – South Norfolk 230kV circuit #1
        - South Norfolk 345/230kV substation and 345/230kV transformer circuit #1
    - Tolk – Plant X 230kV circuit #3 build
    - Vinita – Vinita Junction 69kV rebuild
    - Vinita Junction 138/69/13.2kV transformer circuit #1 replacement
    - (NRIS only) Plant X 230/115/13kV transformer circuit #2 addition
- Upgrades assigned to DISIS-2013-002 Interconnection Customers:
    - Bushland – Tumbleweed (Bushland South) 230kV circuit #1 build
    - Bushland – Potter 230 kV terminal equipment upgrade
    - Gerald Gentlemen Station (GGS) Flowgate stability mitigation
    - Viola – Wichita 345kV circuit #1 terminal equipment upgrade
- Upgrades assigned to DISIS 2014-001 Interconnection Customers
    - Andrews – Road Runner 345kV circuit #1
    - Andrews Substation 230kV to 345kV Voltage Conversion
    - Hobbs – GEN-2014-012 – Andrews 230kV to 345kV Voltage Conversion
    - GEN 2014-007 tap – Border – Chisholm 345kV circuit #2
    - Harbine – Crete 115kV circuit #1
    - Meadow Grove – South Norfolk 230kV circuit #1 incremental upgrade
    - South Norfolk 345/230/13.8kV transformer circuit #1 incremental upgrade
    - (NRIS only) Elk City 230/115/13kV transformer terminal equipment

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 thirteen active regional groups based on geographical and electrical impacts. These groupings are shown in Appendix C.

To determine interconnection impacts, fifteen different generation dispatch scenarios of the spring base case models were developed to accommodate the regional groupings.

Power Flow

For Energy Resource Interconnection Service (ERIS), the wind generating plants were modeled at 100% nameplate of maximum generation. The other wind generating plants in the area were modeled at 80% nameplate while the wind 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 wind 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. 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. Other sensitivity analyses are also performed with all interconnection requests in each group being dispatched at 100% nameplate.

Peaking units were not dispatched in the 2014 spring model. To study peaking units' impacts, the 2014 summer and winter and 2019 summer and winter, and 2024 summer seasonal models were chosen and peaking units were modeled at 100% of the nameplate rating and wind generating facilities were modeled at 10% of the nameplate rating. Each interconnection request was also modeled separately at 100% nameplate for certain analyses. Planned High Priority Incremental Loads (HPILs) in group 6 were accounted for and modeled in the 2019 and 2024 seasonal peak cases.

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.

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. These constraints were then screened to determine which of the generator interconnection requests had at least a 20% Distribution Factor (DF) upon the constraint. Constraints that measured at least a 20% DF from at least one interconnection request were considered for transmission reinforcement. In addition, stability issues are also considered for transmission reinforcement. Interconnection Requests that have requested Network Resource Interconnection Service (NRIS) were also studied in the NRIS analysis to determine if any constraint had at least a 3% DF. If so, these constraints were also considered for mitigation.

Determination of Cost Allocated Network Upgrades

Cost Allocated Network Upgrades of wind generator interconnection requests were determined using the 2014 spring model. Cost Allocated Network Upgrades of peaking units was determined using the 2019 summer peak model. A PSS®MUST sensitivity analysis was performed to determine the Distribution Factors (DF), a distribution factor with no contingency that each generator interconnection request had on each new upgrade. The impact each generator 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 Generator 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 Generator 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 for Amounts Advanced for Network Upgrades

Interconnection Customer shall be entitled to credits 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.

Required Interconnection Facilities

The requirement to interconnect the 213.3 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 $102,000,000. Interconnection Facilities specific to each generator interconnection request are listed in Appendix E. A preliminary one-line drawing for each generator interconnection request are listed in Appendix D.

A list of constraints that were identified and used for mitigation are listed in Appendix G. Listed within Appendix G are the ERIS constraints with greater than or equal to a 20% DF, as well as, the NRIS constraints that have a DF of 3% or greater. Other Network Constraints which are not requiring mitigation are shown in Appendix H. 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. Additional constraints identified by multi-element contingencies are listed in Appendix I.

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 2014 spring peak, 2014 summer and winter peak, and the 2019 summer and winter peak, 2024 summer peak models. Planned High Priority Incremental Loads (HPILs) in group 6 were accounted for and modeled in the 2019 and 2024 seasonal peak cases. 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.

This analysis was conducted assuming that previous queued requests in the immediate area of these interconnect requests were in-service. The analysis of each Customer's project indicates that criteria violations will occur on the SPS transmission system under system intact and contingency conditions in the peak seasons.

Cluster Group 1 (Woodward Area)

In addition to the 5,318.7 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 2 (Hitchland Area)

In addition to the 3,261.2 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 3 (Spearville Area)

In addition to the 4,309.4 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 4 (NW Kansas Group)

In addition to the 2,045.7MW 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 5 (Amarillo Area)

In addition to the 1,314.1 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 6 (South Texas Panhandle/New Mexico)

In addition to the 4,035.5 MW of previously queued generation in the area, 213.2 MW of new interconnection service was studied. Constraints were seen along the Curry – Hereford 115kV line, requiring a rebuild. Additionally, the system topology is such that the 69 kV transmission line between Farwell and DS-#10 is normally open. Should the normally open line be switched into service and the transmission line between DS-#10 and Lariat be switched out of service then overloading will occur on the Deaf Smith REC #20 – Parmer County – Deaf Smith REC # 24 115 kV. For extended periods of operation under this configuration, additional curtailments will be required to account for the next possible contingency.

ERIS/NRIS Constraints			
MONITORED ELEMENT	RATE B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
COULTER INTERCHANGE - HILLSIDE 115KV CKT 1	191	112.4	BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1
DAWN SUB - Panda Energy Substation Hereford 115KV CKT 1	96	102.3	BUSHLAND INTERCHANGE - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1
DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1	96	109.2	BASE CASE
DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1	96	101.8	BASE CASE
CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1	96	131.9	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1
CARGILL SUB - FRIONA SUB 115KV CKT 1	96	125.0	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1
CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1	96	122.9	DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1
DAWN SUB - Panda Energy Substation Hereford 115KV CKT 1	96	102.3	BUSHLAND INTERCHANGE - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1
DEAF SMITH REC-#6 - FRIONA SUB 115KV CKT 1	96	118.9	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1
DEAF SMITH REC-#6 - HEREFORD INTERCHANGE 115KV CKT 1	96	115.9	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1

Cluster Group 7 (Southwestern Oklahoma)

In addition to the 1,900.0 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 8 (South Central Kansas/North Oklahoma)

In addition to the 3,864.1.6 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 9 (Nebraska)

In addition to the 2,514.0 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 375.8 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 14 (South Central Oklahoma)

In addition to the 362.5 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.

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 Analysis

A stability analysis was conducted for each Interconnection Customer using modified versions of the 2013 series SPP Model Development Working Group (MDWG) Models 2014 winter and 2015 summer peak dynamic cases. In addition to the 2014 winter and 2015 summer seasonal cases, Group 6 included a modified version of the 2019 summer, 2019 winter peak, and 2024 summer peak cases to analyze the planned High Priority Incremental Loads (HPILs) in the area. The stability analysis was conducted with all upgrades in service that were identified in the power flow analysis. For each group, the interconnection requests were studied at 100% nameplate output while the other groups were dispatched at 20% output for wind 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. The following synopsis is included for each group. The entire stability study for each group can be found in the Appendices section.

Cluster Group 1 (Woodward Area)

There were no customers requesting interconnection service in the Woodward area.

Cluster Group 2 (Hitchland Area)

There were no customers requesting interconnection service in the Hitchland area.

Cluster Group 3 (Spearville Area)

There were no customers requesting interconnection service in the Spearville area.

Cluster Group 4 (Northwest Kansas)

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

Cluster Group 5 (Amarillo Area)

There were no customers requesting interconnection service in the Amarillo Area.

Cluster Group 6 (South Texas Panhandle/New Mexico)

The Group 6 stability analysis for this area was performed by SPP Staff. Several stability related issues were observed in the analysis of GEN-2014-009. While some of these issues are expected to be caused by undesired interactions between PSS/E and the user model provided by the manufacturer, it should also be observed that the Short Circuit Ratio (SCR) for the GEN-2014-009 request has a worst case value of 1.69. This value could be considered too low for some manufacturer's machines to operate properly. It was found that these issues could otherwise be resolved by adding a 20Mvar static condenser device or for the size of the Interconnection Request to be reduced to approximately 43MW.

In addition, potential transmission stability issues were observed as noted in the Group 6 report. The most notable was for the outage of the 345kV line from TUCO to the GEN-2014-007 Interconnection Request. It was found the issues were mitigated with the addition of a second 345kV line from TUCO to GEN-2014-007. This 345kV line has been cost assigned to the PISIS-2014-001 Interconnection Customers.

With these qualifiers, stability analysis determined that with the reactive power equipment specified, all assigned Network Upgrades listed above and from the power flow analysis in service, 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.

Power Factor Requirements:

Request	Size (MW)	Generator Model	Point of Interconnection	Power Factor Requirement at POI*	
				Lagging (supplying)	Leading (absorbing)
GEN 2014-009	83.7 MW	Alstom ECO 122 2.7MW	Deaf Smith #10 69kV substation	0.95	0.95
GEN 2014-010	129.6 MW	Alstom ECO 122 2.7MW	Deaf Smith #20 115kV substation	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.

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)

There were no customers requesting interconnection service in the South Central Kansas/North Oklahoma area.

Cluster Group 9 (Nebraska)

There were no customers requesting interconnection service in the Nebraska 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)

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

Cluster Group 14 (South Central Oklahoma)

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

Conclusion

The minimum cost of interconnecting 213.3 MW of new interconnection requests included in this Preliminary Interconnection System Impact Study is estimated at $102,000,000 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 short circuit analysis. 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: Generator Interconnection Requests Considered for Impact Study

See next page.

A: Generation Interconnection Requests Considered for Impact 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*
GEN-2014-009	83.70	ER/NR	OKGE	Deaf Smith #10 69kV	Deaf Smith #10 69kV	12/31/2016	TBD
GEN-2014-010	129.60	ER/NR	SUNC	Deaf Smith #20 115kV	Deaf Smith #20 115kV	12/31/2016	TBD
Total:	**213.30**						

*Requests that are dependent upon Priority Projects or Balanced Portfolio may be delayed until 12/31/2014. Other requests in-service date to be determined after Facility Study.

B: Prior Queued Generator 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	28.80	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	29.60	SUNCMKEC	Morris 115kV	Under Study
ASGI-2013-005	1.80	SPS	FE Clovis 115kV	Under Study
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	Under Study (DISIS 2014-001)
GEN-2001-014	96.00	WFEC	Ft Supply 138kV	On-Line
GEN-2001-026	74.00	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	Tap Greensburg - Ft Dodge (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 34.5kV	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	Tap Latham - Neosho (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 Schedule for 2015
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	604.00	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 Schedule for 2014
GEN-2006-038N005	80.00	NPPD	Broken Bow 115kV	On-Line
GEN-2006-038N019	80.00	NPPD	Petersburg North 115kV	On-Line
GEN-2006-040	108.00	SUNCMKEC	Mingo 115kV	On Suspension
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-2007-011	135.00	SUNCMKEC	Syracuse 115kV	On Suspension
GEN-2007-011N08	81.00	NPPD	Bloomfield 115kV	On-Line
GEN-2007-021	201.00	OKGE	Tatonga 345kV	On Schedule for 2014
GEN-2007-025	300.00	WERE	Viola 345kV	On-Line
GEN-2007-032	150.00	WFEC	Tap Clinton Junction - Clinton 138kV	On Suspension
GEN-2007-038	200.00	SUNCMKEC	Spearville 345kV	On Schedule for 2015
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 Schedule for 2014
GEN-2007-046	199.50	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	Tap Wichita - Woodring (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 Eddy Co - Tolk (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	Tap Hitchland - Woodward Dbl Ckt (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	Tap Cudahy - Ft Dodge 115kV	On-Line
GEN-2008-086N02	200.00	NPPD	Tap Ft Randle - Columbus (Meadow Grove) 230kV	On Schedule for 2014
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	Tap Lacygne - Wolf Creek (Anderson County) 345kV	On Schedule for 2015
GEN-2008-119O	60.00	OPPD	S1399 161kV	On-Line
GEN-2008-123N	89.70	NPPD	Tap Guide Rock - Pauline (Rosemont) 115kV	On Schedule for 2014

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2008-124	200.10	SUNCMKEC	Ironwood 345kV	On Schedule for 2016
GEN-2008-129	80.00	MIPU	Pleasant Hill 161kV	On-Line
GEN-2009-008	199.50	MIDW	South Hays 230kV	On Suspension
GEN-2009-020	48.60	MIDW	Tap Nekoma - Bazine (Walnut Creek) 69kV	On Schedule for 2015
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	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV	On Schedule for 2014 (204 MW) and 2015 (96 MW)
GEN-2010-003	100.80	WERE	Tap Lacygne - Wolf Creek (Anderson County) 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 Schedule for 2016
GEN-2010-015	200.10	SUNCMKEC	Spearville 345kV	On Schedule for 2015
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	S 1399 161kV	IA Pending
GEN-2010-045	197.80	SUNCMKEC	Buckner 345kV	IA Pending
GEN-2010-046	56.00	SPS	TUCO Interchange 230kV	On Schedule for 2016
GEN-2010-048	70.00	MIDW	Tap Beach Station - Redline 115kV	IA Pending
GEN-2010-051	200.00	NPPD	Tap Twin Church - Hoskins 230kV	On Schedule for 2014
GEN-2010-055	4.50	AEPW	Wekiwa 138kV	On-Line
GEN-2010-056	151.20	MIPU	Tap Saint Joseph - Cooper 345kV	On Schedule for 2015
GEN-2010-057	201.00	MIDW	Rice County 230kV	On-Line
GEN-2011-007	250.10	OKGE	Tap Cimarron - Woodring (Mathewson) 345kV	On Schedule for 2015
GEN-2011-008	600.00	SUNCMKEC	Clark County 345kV	IA Pending
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 (Beaver County) 345kV	IA Pending
GEN-2011-016	200.10	SUNCMKEC	Spearville 345kV	IA Pending
GEN-2011-017	299.00	SUNCMKEC	Tap Spearville - PostRock (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 Schedule for 2017
GEN-2011-020	299.00	OKGE	Woodward 345kV	On Schedule for 2017
GEN-2011-022	299.00	SPS	Hitchland 345kV	On Schedule for 2017
GEN-2011-025	82.30	SPS	Tap Floyd County - Crosby County 115kV	On Suspension
GEN-2011-027	120.00	NPPD	Tap Twin Church - Hoskins 230kV (GEN-2010-51 Tap)	On Schedule for 2015
GEN-2011-037	7.00	WFEC	Blue Canyon 5 138kV	On-Line
GEN-2011-040	111.00	OKGE	Tap Ratliff - Pooleville 138kV	On Schedule for 2014
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 Suspension
GEN-2011-050	109.80	AEPW	Rush Springs Natural Gas Tap 138kV	On Suspension
GEN-2011-051	104.40	OKGE	Tap Woodward - Tatonga 345kV	IA Pending
GEN-2011-054	300.00	OKGE	Cimarron 345kV	On Schedule for 2013 (200 MW) and 2014 (99 MW)
GEN-2011-055	52.80	OPPD	South Sterling 69kV	IA Pending
GEN-2011-056	3.60	NPPD	Jeffrey 115kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
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	Tap Grassland - Borden County 230kV	On-Line
GEN-2012-004	41.40	OKGE	Tap Ratliff - Pooleville (Carter County) 138kV	On Schedule for 2014
GEN-2012-005	81.00	NPPD	Tap Fort Randall - Columbus (North of Meadow Grove) 230kV	Facility Study
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV	On Schedule for 2014
GEN-2012-009	15.00	SPS	Mustang 230kV	IA Pending
GEN-2012-010	15.00	SPS	Mustang 230kV	IA Pending
GEN-2012-011	200.00	SUNCMKEC	Tap Spearville - Post Rock 345kV (North of GEN-2011-017 Tap)	Facility Study
GEN-2012-020	478.00	SPS	TUCO 230kV	IA Pending
GEN-2012-021	4.80	LES	Terry Bundy Generating Station 115kV	On-Line
GEN-2012-023	115.00	WERE	Viola 345kV	IA Pending
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV	Facility Study
GEN-2012-026	100.00	MIDW	Colby 115kV	IA Pending
GEN-2012-027	136.00	AEPW	Shidler 138kV	On Schedule for 2015
GEN-2012-028	74.80	WFEC	Gotebo 69kV	On Schedule for 2015
GEN-2012-031	200.00	OKGE	Cimarron 345kV (GEN-2010-040 Sub)	IA Pending
GEN-2012-032	300.00	OKGE	Tap Rose Hill - Sooner (Ranch) 345kV	IA Pending
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	IA Pending
GEN-2012-035	7.00	SPS	Mustang 230kV	IA Pending
GEN-2012-036	7.00	SPS	Mustang 230kV	IA Pending
GEN-2012-037	203.00	SPS	TUCO 345kV	Facility Study
GEN-2012-040	76.50	WFEC	Chilocco 138kV	On Schedule for 2015
GEN-2012-041	121.50	OKGE	Tap Rose Hill - Sooner 345kV	On Schedule for 2015
GEN-2013-002	50.60	LES	Tap Sheldon - Folsom & Pleasant Hill 115kV CKT 2	Facility Study
GEN-2013-004	6.00	NPPD	Tap Fort Randall - Columbus (Meadow Grove) 230kV	Facility Study
GEN-2013-005	73.50	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV	Facility Study
GEN-2013-006	50.60	NPPD	Tap Fort Randall - Columbus (Meadow Grove) 230kV	Facility Study
GEN-2013-007	100.30	OKGE	Tap Prices Falls - Carter 138kV	Facility Study
GEN-2013-008	1.20	NPPD	Steele City 115kV	On-Line
GEN-2013-009	100.30	AEPW	Tap Alluwe Tap - Vinita Junction 138kV	Facility Study
GEN-2013-010	99.00	SUNCMKEC	Tap Spearville - Post Rock 345kV (GEN-2012-011 Tap)	Facility Study
GEN-2013-011	30.00	AEPW	Turk 138kV	Facility Study
GEN-2013-012	147.00	OKGE	Redbud 345kV	Facility Study
GEN-2013-013	248.40	SPS	Tap Eddy County - Tolk 345kV	Facility Study
GEN-2013-014	25.50	NPPD	Tap Guide Rock - Pauline (GEN-2008-123N Tap) 115kV	IA Pending
GEN-2013-015	125.80	NPPD	Tap Pauline - Hildreth 115kV	IA Pending
GEN-2013-016	203.00	SPS	TUCO 345kV	Facility Study
GEN-2013-019	73.60	LES	Tap Sheldon - Folsom & Pleasant Hill (GEN-2013-002 Tap) 115kV CKT 2	Facility Study
GEN-2013-022	25.00	SPS	Norton 115kV	Facility Study
GEN-2013-025	50.00	OKGE	Tap Cimarron - Woodring (Mathewson) 345kV	Facility Study
GEN-2013-026	150.00	GMO	Tap Saint Joseph - Cooper 345kV (GEN-2010-056 Tap)	Facility Study
GEN-2013-027	150.00	SPS	Tap Tolk - Yoakum 230kV	DISIS Stage
GEN-2013-027	326.40	SPS	Tap Tolk - Yoakum 230kV	DISIS Stage
GEN-2013-028	559.50	GRDA	Tap N Tulsa - GRDA 1 345kV	Facility Study

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2013-029	300.00	OKGE	Renfrow 345kV	Facility Study
GEN-2013-030	300.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV	Facility Study
GEN-2013-031	370.00	SPS	Bushland 230kV	Facility Study
GEN-2013-032	204.00	NPPD	Neligh 115kV	Facility Study
GEN-2013-033	28.00	MIDW	Goodman Energy Center 115kV	Facility Study
GEN-2013-034	73.60	OKGE	Tap Hitchland - Woodward Dbl Ckt (GEN-2013-034 Tap) 345kV	Facility Study
GEN-2013-035	100.00	OKGE	Tap Woodward - Tatonga 345kV (GEN-2011-051 Tap)	Facility Study
GEN-2014-001	200.60	WERE	Tap Wichita - Emporia Energy Center 345kV	Facility Study
GEN-2014-002	10.53	OKGE	Tatonga 345kV (GEN-2007-021 POI)	Facility Study
GEN-2014-003	15.84	OKGE	Tatonga 345kV (GEN-2007-044 POI)	Facility Study
GEN-2014-004	3.96	NPPD	Steele City 115kV (GEN-2011-018 POI)	Facility Study
GEN-2014-005	5.67	OKGE	Minco 345kV (GEN-2011-010 POI)	Facility Study
GEN-2014-006	74.90	NPPD	Harbine 115kV	DISIS Stage
GEN-2014-007	400.00	SPS	Tap TUCO Interchange - Border 345kV	DISIS Stage
GEN-2014-012	850.00	SPS	Tap Hobbs Interchange - Andrews 230kV	Facility Study
GEN-2014-013	73.50	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV	Facility Study
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 (Ord)	11.90	NPPD	Ord 115kV	On-Line
NPPD Distributed (Stuart)	2.10	NPPD	Ainsworth 115kV	On-Line
SPS Distributed (Dumas 19th St)	20.00	SPS	Dumas 19th Street 115kV	On-Line
SPS Distributed (Etter)	20.00	SPS	Etter 115kV	On-Line
SPS Distributed (Hopi)	10.00	SPS	Hopi 115kV	On-Line
SPS Distributed (Jal)	10.00	SPS	S Jal 115kV	On-Line
SPS Distributed (Lea Road)	10.00	SPS	Lea Road 115kV	On-Line
SPS Distributed (Monument)	10.00	SPS	Monument 115kV	On-Line
SPS Distributed (Moore E)	25.00	SPS	Moore East 115kV	On-Line
SPS Distributed (Ocotillo)	10.00	SPS	S_Jal 115kV	On-Line
SPS Distributed (Sherman)	20.00	SPS	Sherman 115kV	On-Line
SPS Distributed (Spearman)	10.00	SPS	Spearman 69kV	On-Line
SPS Distributed (TC-Texas County)	20.00	SPS	Texas County 115kV	On-Line
Total:	**29,524.9**			

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-2011-007	250.10	OKGE	Tap Cimarron - Woodring (Mathewson) 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-2011-054	300.00	OKGE	Cimarron 345kV
GEN-2012-031	200.00	OKGE	Cimarron 345kV (GEN-2010-040 Sub)
GEN-2013-025	50.00	OKGE	Tap Cimarron - Woodring (Mathewson) 345kV
GEN-2013-034	73.60	OKGE	Tap Hitchland - Woodward Dbl Ckt (GEN-2013-034 Tap) 345kV
GEN-2013-035	100.00	OKGE	Tap Woodward - Tatonga 345kV (GEN-2011-051 Tap)
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	4,540.24		
AREA TOTAL	4,540.24		

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	199.50	SPS	Hitchland 115kV
GEN-2008-047	300.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV
GEN-2010-001	300.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV
GEN-2010-014	358.80	SPS	Hitchland 345kV
GEN-2011-014	201.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV
GEN-2011-022	299.00	SPS	Hitchland 345kV
GEN-2013-030	300.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (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	**2,962.20**		
AREA TOTAL	**2,962.20**		

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	Tap Greensburg - Ft Dodge (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-2007-038	200.00	SUNCMKEC	Spearville 345kV
GEN-2007-040	200.00	SUNCMKEC	Buckner 345kV
GEN-2008-018	250.00	SPS	Finney 345kV
GEN-2008-079	99.20	SUNCMKEC	Tap Cudahy - Ft Dodge 115kV
GEN-2008-124	200.10	SUNCMKEC	Ironwood 345kV
GEN-2010-009	165.60	SUNCMKEC	Buckner 345kV
GEN-2010-015	200.10	SUNCMKEC	Spearville 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 - PostRock (GEN-2011-017T) 345kV
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV
GEN-2012-011	200.00	SUNCMKEC	Tap Spearville - Post Rock 345kV (North of GEN-2011-017 Tap)
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV
GEN-2013-010	99.00	SUNCMKEC	Tap Spearville - Post Rock 345kV (GEN-2012-011 Tap)
Gray County Wind (Montezuma)	110.00	SUNCMKEC	Gray County Tap 115kV
PRIOR QUEUED SUBTOTAL	**4,309.40**		
AREA TOTAL	**4,309.40**		

GROUP 4/11: NW KANSAS AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2013-004	29.60	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-2006-040	108.00	SUNCMKEC	Mingo 115kV
GEN-2007-011	135.00	SUNCMKEC	Syracuse 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-2010-048	70.00	MIDW	Tap Beach Station - Redline 115kV
GEN-2010-057	201.00	MIDW	Rice County 230kV
GEN-2012-026	100.00	MIDW	Colby 115kV
GEN-2013-033	28.00	MIDW	Goodman Energy Center 115kV
PRIOR QUEUED SUBTOTAL	**2,045.70**		
AREA TOTAL	**2,045.70**		

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
GEN-2013-031	370.00	SPS	Bushland 230kV
Llano Estacado (White Deer)	80.00	SPS	Llano Wind 115kV
PRIOR QUEUED SUBTOTAL	**1,074.10**		
AREA TOTAL	**1,074.10**		

GROUP 6: S-TX PANHANDLE/W-TX 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	28.80	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	1.80	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	604.00	SPS	Hobbs 230kV & Hobbs 115kV
GEN-2008-022	300.00	SPS	Tap Eddy Co - Tolk (Crossroads) 345kV
GEN-2010-006	205.00	SPS	Jones 230kV
GEN-2010-046	56.00	SPS	TUCO Interchange 230kV
GEN-2011-025	82.30	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	Tap Grassland - Borden County 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-2013-013	248.40	SPS	Tap Eddy County - Tolk 345kV
GEN-2013-016	203.00	SPS	TUCO 345kV
GEN-2013-022	25.00	SPS	Norton 115kV
GEN-2013-027	150.00	SPS	Tap Tolk - Yoakum 230kV
GEN-2013-027	326.40	SPS	Tap Tolk - Yoakum 230kV
GEN-2014-007	400.00	SPS	Tap TUCO Interchange - Border 345kV
GEN-2014-012	850.00	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	**5,337.55**		
GEN-2014-009	83.70	OKGE	Deaf Smith #10 69kV
GEN-2014-010	129.60	SUNC	Deaf Smith #20 115kV
CURRENT CLUSTER SUBTOTAL	**213.30**		
AREA TOTAL	**5,550.85**		

GROUP 7: SW-OKLAHOMA AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-026	74.00	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 34.5kV
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	1,900.00		
AREA TOTAL	1,900.00		

GROUP 8: N-OK/S-KS 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	Tap Latham - Neosho (Caney River) 345kV
GEN-2007-025	300.00	WERE	Viola 345kV
GEN-2008-013	300.00	OKGE	Tap Wichita - Woodring (Hunter) 345kV
GEN-2008-021	42.00	WERE	Wolf Creek 345kV
GEN-2008-098	100.80	WERE	Tap Lacygne - Wolf Creek (Anderson County) 345kV
GEN-2009-025	60.00	OKGE	Nardins 69kV
GEN-2010-003	100.80	WERE	Tap Lacygne - Wolf Creek (Anderson County) 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-2012-023	115.00	WERE	Viola 345kV
GEN-2012-027	136.00	AEPW	Shidler 138kV
GEN-2012-032	300.00	OKGE	Tap Rose Hill - Sooner (Ranch) 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	Tap Rose Hill - Sooner 345kV
GEN-2013-009	100.30	AEPW	Tap Alluwe Tap - Vinita Junction 138kV
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	4,064.70		
AREA TOTAL	4,064.70		

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	200.00	NPPD	Tap Ft Randle - Columbus (Meadow Grove) 230kV
GEN-2008-119O	60.00	OPPD	S1399 161kV
GEN-2008-123N	89.70	NPPD	Tap Guide Rock - Pauline (Rosemont) 115kV
GEN-2009-040	73.80	WERE	Marshall 115kV
GEN-2010-041	10.50	OPPD	S 1399 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	Tap Twin Church - Hoskins 230kV (GEN-2010-51 Tap)
GEN-2011-055	52.80	OPPD	South Sterling 69kV
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-2012-005	81.00	NPPD	Tap Fort Randall - Columbus (North of Meadow Grove) 230kV
GEN-2012-021	4.80	LES	Terry Bundy Generating Station 115kV
GEN-2013-002	50.60	LES	Tap Sheldon - Folsom & Pleasant Hill 115kV CKT 2
GEN-2013-004	6.00	NPPD	Tap Fort Randall - Columbus (Meadow Grove) 230kV
GEN-2013-005	73.50	NPPD	Meadow Grove (GEN-2008-086N2 Sub) 230kV
GEN-2013-006	50.60	NPPD	Tap Fort Randall - Columbus (Meadow Grove) 230kV
GEN-2013-008	1.20	NPPD	Steele City 115kV
GEN-2013-014	25.50	NPPD	Tap Guide Rock - Pauline (GEN-2008-123N Tap) 115kV
GEN-2013-015	125.80	NPPD	Tap Pauline - Hildreth 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-2014-006	74.90	NPPD	Harbine 115kV
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 (Ord)	11.90	NPPD	Ord 115kV
NPPD Distributed (Stuart)	2.10	NPPD	Ainsworth 115kV
PRIOR QUEUED SUBTOTAL	**2,372.66**		
AREA TOTAL	**2,372.66**		

GROUP 12: NW-AR 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**		

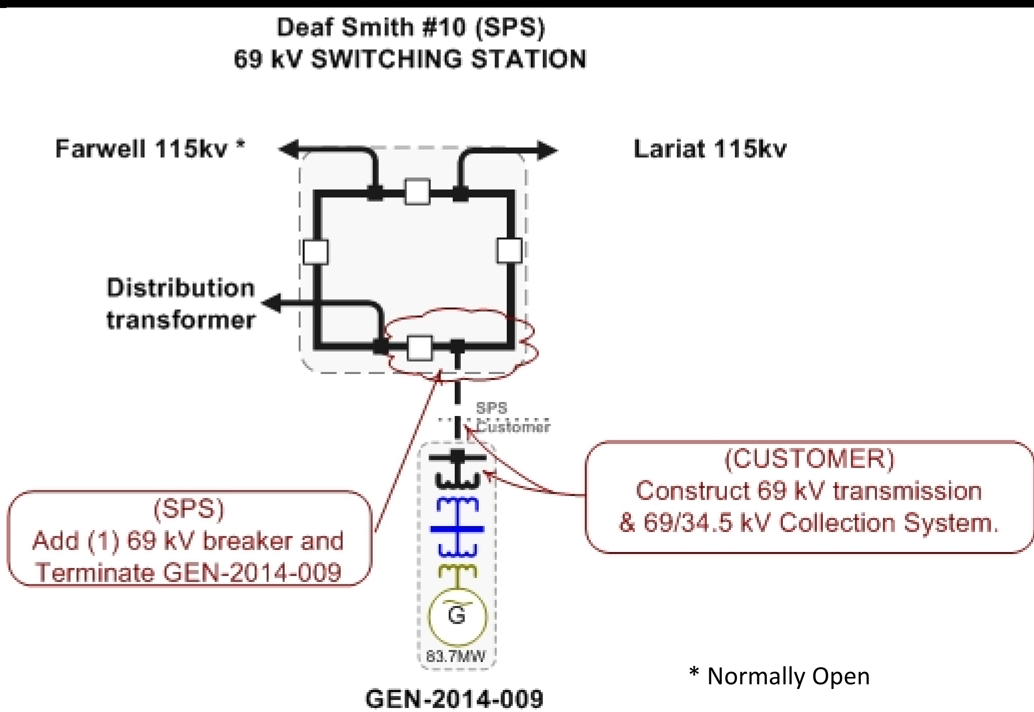
GROUP 13: NW MISSOURI AREA Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2013-007	90.00	AECI	Tap Hickory Creek - Locust Creek 161kV
GEN-2008-129	80.00	MIPU	Pleasant Hill 161kV
GEN-2010-036	4.60	WERE	6th Street 115kV
GEN-2010-056	151.20	MIPU	Tap Saint Joseph - Cooper 345kV
GEN-2011-011	50.00	KACP	Iatan 345kV
GEN-2013-026	150.00	GMO	Tap Saint Joseph - Cooper 345kV (GEN-2010-056 Tap)
PRIOR QUEUED SUBTOTAL	**525.80**		
AREA TOTAL	**525.80**		

GROUP 14: S-OKLAHOMA AREA Request	Capacity	Area	Proposed Point of Interconnection
GEN-2011-040	111.00	OKGE	Tap Ratliff - Pooleville 138kV
GEN-2011-050	109.80	AEPW	Rush Springs Natural Gas Tap 138kV
GEN-2012-004	41.40	OKGE	Tap Ratliff - Pooleville (Carter County) 138kV
GEN-2013-007	100.30	OKGE	Tap Prices Falls - Carter 138kV
PRIOR QUEUED SUBTOTAL	**362.50**		
AREA TOTAL	**362.50**		

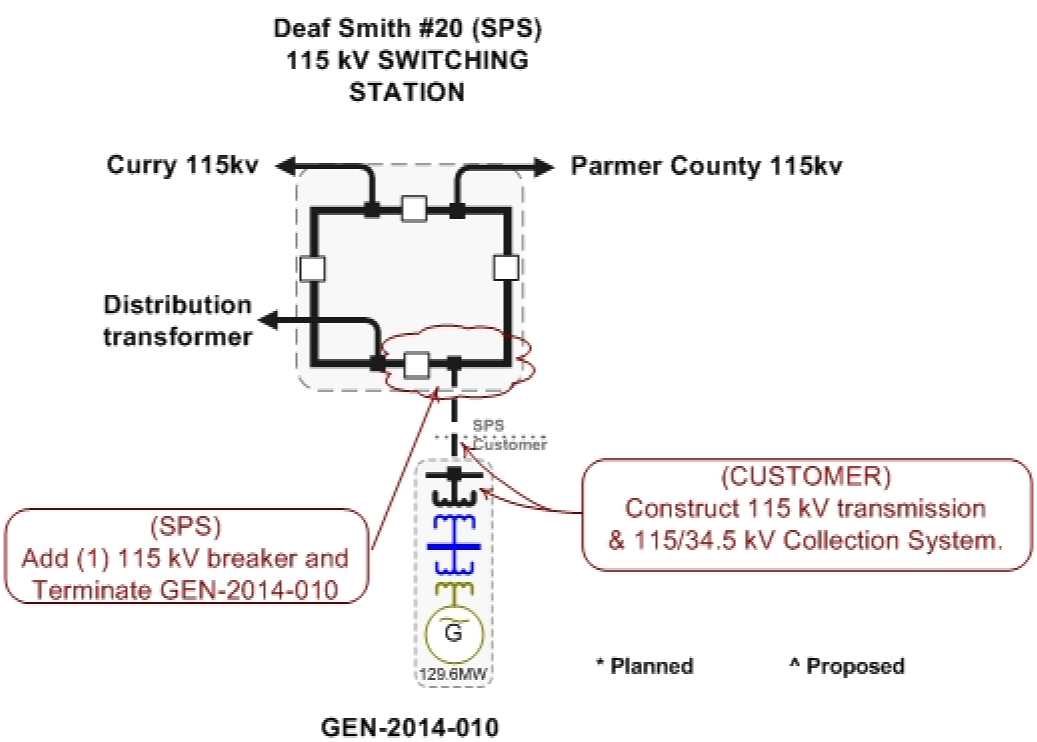
CLUSTER TOTAL (CURRENT STUDY)	**213.3**	**MW**
PQ TOTAL (PRIOR QUEUED)	**29,524.9**	**MW**
CLUSTER TOTAL (INCLUDING PRIOR QUEUED)	**29,738.2**	**MW**

D: Proposed Point of Interconnection One Line Diagrams

GEN-2014-009



GEN-2014-010



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 Generator 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 a 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 Generator 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
GEN-2014-009			
Cargil - Friona 115kV CKT 1 Rebuild approximately 1.2 miles of 115kV line	Current Study	$15,555.02	$1,200,000.00
Curry County Interchange - Deaf Smith #20 115kV CKT 1 Rebuild approximately 12.7 miles of 115kV line	Current Study	$87,775.83	$12,700,000.00
Deaf Smith #20 - Parmer County 115kV CKT 1 Rebuild approximately 7.6 miles of 115kV line	Current Study	$98,515.15	$7,600,000.00
Deaf Smith #24 - Cargill 115kV CKT 1 Rebuild approximately 7.7 miles of 115kV line	Current Study	$99,811.40	$7,700,000.00
Deaf Smith #6 - Hereford 115kV CKT 1 Rebuild approximately 7.1 miles of 115kV line	Current Study	$92,033.89	$7,100,000.00
Friona - Deaf Smith #6 115kV CKT 1 Rebuild approximately 18.9 miles of 115kV line	Current Study	$244,991.62	$18,900,000.00
GEN 2014-007 - Tuco 345kV CKT 2 Build approximately 35.6 miles of second circuit 345kV line	Current Study	$25,668,669.53	$35,600,000.00
GEN-2014-009 Interconnection Costs See one line Diagram	Current Study	$5,000,000.00	$5,000,000.00
Parmer County - Deaf Smith #24 115kV CKT 1 Rebuild approximately 1.2 miles of 115kV line	Current Study	$15,555.02	$1,200,000.00
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000.00
Bushland - Deaf Smith 230kV CKT 1 NRIS only required upgrade: Replace line traps	Previously Allocated		$193,279.00
Bushland - Potter County 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$400,000.00
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357.00
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Previously Allocated		$12,000,000.00

* 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
Clark - Thistle 345KV Dbl CKT Priority Project: Spearville - Clark - Thistle Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00
Deaf Smith - Plant X 230kV CKT 1 Replace line traps at both ends	Previously Allocated		$1,000,000.00
GEN-2014-007 Tap - Border - Chisholm 345kV CKT 2 Build approximately 167 miles of second circuit 345kV from GEN-2014-007 Tap - Border - Chisholm	Previously Allocated		$167,000,000.00
Oklaunion 345kV 60 Mvar Cap Bank Install 60MVar Cap Bank at Oklaunion.	Previously Allocated		$20,000,000.00
Power System Stabilizers (PSS) Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)	Previously Allocated		$210,000.00
Spearville - Clark 345KV Dbl CKT Priority Project: Spearville - Clark - Thistle Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00
Thistle - Flat Ridge 138kV CKT 1 Priority Project: Thistle - Flat Ridge 138kV CKT 1 (Total Project E&C Cost Shown.)	Previously Allocated		$5,776,280.00
Thistle - Wichita 345KV Dbl CKT Priority Project: Thistle - Wichita Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00
Thistle 345/138KV Transformer CKT 1 Priority Project: Thistle 345/138kV Transformer CKT 1 (Total Project E&C Cost Shown.)	Previously Allocated		$6,585,986.00
Wolfforth Interchange 230/115/13.2kV Transformer CKT 1 NRIS only required upgrade: Replace existing Wolfforth Interchange Transformer	Previously Allocated		$6,000,000.00
Woodward XFMR 345/138/13.8kV CKT 2 Balanced Portfolio: Woodward 345/138kV Transformer CKT 2 & 50 MVAR Reactor (Total Project E&C Cost Shown).	Previously Allocated		$249,247,072.00
	Current Study Total	$31,322,907.46	

GEN-2014-010

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
Cargil - Friona 115kV CKT 1 Rebuild approximately 1.2 miles of 115kV line	Current Study	$1,184,444.98	$1,200,000.00
Curry County Interchange - Deaf Smith #20 115kV CKT 1 Rebuild approximately 12.7 miles of 115kV line	Current Study	$12,612,224.17	$12,700,000.00
Deaf Smith #20 - Parmer County 115kV CKT 1 Rebuild approximately 7.6 miles of 115kV line	Current Study	$7,501,484.85	$7,600,000.00
Deaf Smith #24 - Cargill 115kV CKT 1 Rebuild approximately 7.7 miles of 115kV line	Current Study	$7,600,188.60	$7,700,000.00

* 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
Deaf Smith #6 - Hereford 115kV CKT 1 Rebuild approximately 7.1 miles of 115kV line	Current Study	$7,007,966.11	$7,100,000.00
Friona - Deaf Smith #6 115kV CKT 1 Rebuild approximately 18.9 miles of 115kV line	Current Study	$18,655,008.38	$18,900,000.00
GEN 2014-007 - Tuco 345kV CKT 2 Build approximately 35.6 miles of second circuit 345kV line	Current Study	$9,931,330.47	$35,600,000.00
GEN-2014-010 Interconnection Costs See one line Diagram	Current Study	$5,000,000.00	$5,000,000.00
Parmer County - Deaf Smith #24 115kV CKT 1 Rebuild approximately 1.2 miles of 115kV line	Current Study	$1,184,444.98	$1,200,000.00
Amoco Wasson - Oxy Tap 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$200,000.00
Bushland - Deaf Smith 230kV CKT 1 NRIS only required upgrade: Replace line traps	Previously Allocated		$193,279.00
Bushland - Potter County 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$400,000.00
Chisholm - Gracemont 345kV CKT 1 Per SPP-NTC-200255 and 200240 (Total Project E&C Cost Shown)	Previously Allocated		$162,952,357.00
Chisholm Substation Upgrade 345kV Expand planned Chisholm Substation to tap and terminate Woodward - Border 345kV into the Chisholm Substation	Previously Allocated		$12,000,000.00
Clark - Thistle 345KV Dbl CKT Priority Project: Spearville - Clark - Thistle Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00
Deaf Smith - Plant X 230kV CKT 1 Replace line traps at both ends	Previously Allocated		$1,000,000.00
GEN-2014-007 Tap - Border - Chisholm 345kV CKT 2 Build approximately 167 miles of second circuit 345kV from GEN-2014-007 Tap - Border - Chisholm	Previously Allocated		$167,000,000.00
Oklaunion 345kV 60 Mvar Cap Bank Install 60MVar Cap Bank at Oklaunion.	Previously Allocated		$20,000,000.00
Power System Stabilizers (PSS) Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)	Previously Allocated		$210,000.00
Spearville - Clark 345KV Dbl CKT Priority Project: Spearville - Clark - Thistle Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00

* 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
Thistle - Flat Ridge 138kV CKT 1 Priority Project: Thistle - Flat Ridge 138kV CKT 1 (Total Project E&C Cost Shown.)	Previously Allocated		$5,776,280.00
Thistle - Wichita 345KV Dbl CKT Priority Project: Thistle - Wichita Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00
Thistle 345/138KV Transformer CKT 1 Priority Project: Thistle 345/138kV Transformer CKT 1 (Total Project E&C Cost Shown.)	Previously Allocated		$6,585,986.00
Tolk - Plant X 230kV CKT 3 Build a 3rd circuit betweek Tolk - Plant X 230kV	Previously Allocated		$20,000,000.00
Wolfforth Interchange 230/115/13.2kV Transformer CKT 1 NRIS only required upgrade: Replace existing Wolfforth Interchange Transformer	Previously Allocated		$6,000,000.00
Woodward XFMR 345/138/13.8kV CKT 2 Balanced Portfolio: Woodward 345/138kV Transformer CKT 2 & 50 MVAR Reactor (Total Project E&C Cost Shown).	Previously Allocated		$249,247,072.00
	Current Study Total	$70,677,092.54	

TOTAL CURRENT STUDY COSTS: $102,000,000.00

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

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 Generator 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

Cargil - Friona 115kV CKT 1		**$1,200,000.00**
Rebuild approximately 1.2 miles of 115kV line		
GEN-2014-009	$15,555.02	
GEN-2014-010	$1,184,444.98	
Total Allocated Costs	**$1,200,000.00**	
Curry County Interchange - Deaf Smith #20 115kV CKT 1		**$12,700,000.00**
Rebuild approximately 12.7 miles of 115kV line		
GEN-2014-009	$87,775.83	
GEN-2014-010	$12,612,224.17	
Total Allocated Costs	**$12,700,000.00**	
Deaf Smith #20 - Parmer County 115kV CKT 1		**$7,600,000.00**
Rebuild approximately 7.6 miles of 115kV line		
GEN-2014-009	$98,515.15	
GEN-2014-010	$7,501,484.85	
Total Allocated Costs	**$7,600,000.00**	
Deaf Smith #24 - Cargill 115kV CKT 1		**$7,700,000.00**
Rebuild approximately 7.7 miles of 115kV line		
GEN-2014-009	$99,811.40	
GEN-2014-010	$7,600,188.60	
Total Allocated Costs	**$7,700,000.00**	
Deaf Smith #6 - Hereford 115kV CKT 1		**$7,100,000.00**
Rebuild approximately 7.1 miles of 115kV line		
GEN-2014-009	$92,033.89	
GEN-2014-010	$7,007,966.11	
Total Allocated Costs	**$7,100,000.00**	
Friona - Deaf Smith #6 115kV CKT 1		**$18,900,000.00**
Rebuild approximately 18.9 miles of 115kV line		
GEN-2014-009	$244,991.62	
GEN-2014-010	$18,655,008.38	
Total Allocated Costs	**$18,900,000.00**	

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

GEN 2014-007 - Tuco 345kV CKT 2 **$35,600,000.00**

Build approximately 35.6 miles of second circuit 345kV line

GEN-2014-009	$25,668,669.53
GEN-2014-010	$9,931,330.47
Total Allocated Costs	**$35,600,000.00**

GEN-2014-009 Interconnection Costs **$5,000,000.00**

See one line Diagram

GEN-2014-009	$5,000,000.00
Total Allocated Costs	**$5,000,000.00**

GEN-2014-010 Interconnection Costs **$5,000,000.00**

See one line Diagram

GEN-2014-010	$5,000,000.00
Total Allocated Costs	**$5,000,000.00**

Parmer County - Deaf Smith #24 115kV CKT 1 **$1,200,000.00**

Rebuild approximately 1.2 miles of 115kV line

GEN-2014-009	$15,555.02
GEN-2014-010	$1,184,444.98
Total Allocated Costs	**$1,200,000.00**

* 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	RATE B (MVA)	TDF	TC% LOADING (% MVA)	CONTINGENCY
FDNS	00NR	0	14WP	G14_009	'TO->FROM'	'COULTER INTERCHANGE - HILLSIDE 115KV CKT 1'	191	0.0592	112.4355	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_009	'TO->FROM'	'DAWN SUB - Panda Energy Substation Hereford 115KV CKT 1'	96	0.0515	102.3131	'BUSHLAND INTERCHANGE - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06NR	0_NO	14G	G14_009	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.08488	109.1866	'BASE CASE'
FDNS	06NR	0_NO	14G	G14_009	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.08488	101.7527	'BASE CASE'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.31468	131.9332	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.34119	125.2153	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	6	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.34122	115.7738	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	1	110.4587	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	1	110.4497	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.32638	105.548	'TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.3258	103.5829	'PLANT X STATION - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.32367	101.6483	'SPP-SWPS-01'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.31759	101.1004	'SPP-SWPS-26'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.32378	100.2591	'G14_007T 345.00 - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.32363	100.2463	'PLANT X STATION (WH ALM20171) 230/115/13.2KV TRANSFORMER CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.32365	100.2063	'OKLAUNION - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.32365	100.1283	'SPP-AEPW-32'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	106	1	113.0215	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	106	1	112.9264	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	106	1	110.4923	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	96	0.31468	125.039	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	96	0.34119	118.4422	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	6	0	14G	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	96	0.34122	109.0421	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	96	1	104.1539	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	96	1	104.1403	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	106	1	107.7169	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	106	1	107.5798	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'FROM->TO'	'CARGILL SUB - FRIONA SUB 115KV CKT 1'	106	1	104.1091	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'COULTER INTERCHANGE - HILLSIDE 115KV CKT 1'	191	0.09029	112.4355	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	122.9325	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	122.6641	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	119.5646	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	119.4125	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	112.6118	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	111.6953	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	103.834	'SPP-SWPS-T58'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	103.8319	'CARGILL SUB - FRIONA SUB 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	102.8962	'SPP-SWPS-T58'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	102.8951	'CARGILL SUB - FRIONA SUB 115KV CKT 1'
FDNS	00G14_010	0	14SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	117.9744	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	14SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	117.7576	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	14SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	113.6889	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	14SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	113.472	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	14SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	102.7113	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'
FDNS	00NR	0	14SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	102.4887	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	118.2225	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	117.1912	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	115.2088	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	114.1767	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	113.8581	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	112.825	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	105.5843	'SPP-SWPS-T58'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	105.5824	'CARGILL SUB - FRIONA SUB 115KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	104.5455	'SPP-SWPS-T58'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	104.5437	'CARGILL SUB - FRIONA SUB 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	0.67852	104.2379	'GEN525562 1-TOLK GEN #2 24 KV'

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATE B (MVA)	TDF	TC% LOADING (% MVA)	CONTINGENCY
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	0.67852	103.7288	'GEN525561 1-TOLK GEN #1 24 KV'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	0.6479	100.7102	'SPP-SWPS-K51'
FDNS	00NR	0	19SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	113.7925	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	19SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	113.6762	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	19SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	109.0925	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	19SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	108.9782	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	118.221	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	114.9366	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	113.3308	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	104.7489	'SPP-SWPS-T58'
FDNS	00NR	0	19WP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	106	1	104.741	'CARGILL SUB - FRIONA SUB 115KV CKT 1'
FDNS	00NR	0	24SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	112.9794	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	24SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	112.4885	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00NR	0	24SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	107.7455	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	00G14_010	0	24SP	G14_010	'TO->FROM'	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'	96	1	107.2521	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DAWN SUB - Panda Energy Substation Hereford 115KV CKT 1'	96	0.09774	102.3131	'BUSHLAND INTERCHANGE - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31468	144.3257	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34119	137.7529	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	6	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34122	128.4032	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	123.5192	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	123.5042	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32638	118.6026	'TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.3258	116.5674	'PLANT X STATION - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32367	114.6564	'SPP-SWPS-01'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31759	114.1292	'SPP-SWPS-26'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32363	113.2665	'PLANT X STATION (WH ALM20171) 230/115/13.2KV TRANSFORMER CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32378	113.2318	'G14_007T 345.00 - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32365	113.1797	'OKLAUNION - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32365	113.1049	'SPP-AEPW-32'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33194	112.9668	'CHAVES COUNTY INTERCHANGE - SAN JUAN MESA TAP 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34593	112.7293	'TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34462	110.8361	'PLANT X STATION - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34166	109.5212	'SPP-SWPS-01'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33838	109.3452	'SPP-SWPS-T45'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32293	109.3413	'TOLK STATION (ABBXNL844501) 345/230/13.2KV TRANSFORMER CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32293	109.3359	'CROSSROADS 345.00 - TOLK STATION 345KV CKT 1'
FDNS	06NR	0_NO	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31494	109.1866	'BASE CASE'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33428	108.9975	'SPP-SWPS-26'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32363	108.9287	'BORDER 7345.00 - G14_007T 345.00 345KV CKT 2'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32363	108.9286	'BORDER 7345.00 - G14_007T 345.00 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31395	108.8458	'DEAF SMITH COUNTY INTERCHANGE (ELCO 13458-1) 230/115/13.8KV TRANSFORMER CKT 2'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31484	108.6862	'DEAF SMITH COUNTY INTERCHANGE (GE M101353) 230/115/13.2KV TRANSFORMER CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34538	108.6696	'CHAVES COUNTY INTERCHANGE - SAN JUAN MESA TAP 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34012	108.6318	'PLANT X STATION (WH ALM20171) 230/115/13.2KV TRANSFORMER CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34102	108.1081	'OKLAUNION - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34102	108.0013	'SPP-AEPW-32'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.3433	107.8953	'G14_007T 345.00 - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	105.5576	'BASE CASE'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.35316	105.1033	'SPP-SWPS-T45'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32877	104.7516	'DEAF SMITH COUNTY INTERCHANGE (ELCO 13458-1) 230/115/13.8KV TRANSFORMER CKT 2'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32969	104.5556	'DEAF SMITH COUNTY INTERCHANGE (GE M101353) 230/115/13.2KV TRANSFORMER CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33889	104.4739	'TOLK STATION (ABBXNL844501) 345/230/13.2KV TRANSFORMER CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33889	104.4736	'CROSSROADS 345.00 - TOLK STATION 345KV CKT 1'
FDNS	06G14_010	0_NO	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32968	104.2925	'BASE CASE'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33972	104.2588	'BORDER 7345.00 - G14_007T 345.00 345KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33972	104.2588	'BORDER 7345.00 - G14_007T 345.00 345KV CKT 2'

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATE B (MVA)	TDF	TC% LOADING (% MVA)	CONTINGENCY
FDNS	6	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34595	103.2076	'TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.35552	102.4608	'SPP-SWPS-K51'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31733	102.4179	'CANYON EAST SUB - OSAGE SWITCHING STATION 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	102.2985	'GEN526332 1-JONES GEN #2 21 KV'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	102.2378	'GEN562414 1-G13-022 0.4800'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	101.9841	'GEN527162 1-MUSTANG GEN #2'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	101.984	'GEN527161 1-MUSTANG GEN #1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.323	101.558	'SPP-SWPS-T63'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	101.4206	'GEN527163 1-MUSTANG GEN #3 22 KV'
FDNS	6	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34464	101.4201	'PLANT X STATION - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31733	101.1323	'CANYON EAST SUB - CANYON WEST SUB 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33875	101.1245	'BASE CASE'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32293	100.8796	'EDDY COUNTY INTERCHANGE (ABB AEM30711) 345/230/13.2KV TRANSFORMER CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32293	100.8743	'CROSSROADS 345.00 - EDDY COUNTY INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31733	100.6247	'SPP-SWPS-V05'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	100.5847	'GEN527902 1-HOBBS PLANT #2 (CT)'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	100.5499	'GEN527901 1-HOBBS PLANT #1 (CT)'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32358	100.1649	'GEN527882 1-CUNNINGHAM GEN #2 20 KV'
FDNS	6	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34168	100.1517	'SPP-SWPS-01'
FDNS	00G14_010	0	14SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	116.7155	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	14SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	116.6192	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	14SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31451	112.9233	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	00G14_010	0	14SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.342	102.7252	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	106	1	117.0842	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	106	1	116.9968	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	19SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	111.4107	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	19SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	111.3604	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	106	1	115.1913	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	24SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	109.8467	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	24SP	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	1	109.8367	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31468	138.7524	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34119	131.9899	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	6	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34122	122.5267	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	117.0768	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	117.0687	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32638	112.1777	'TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.3258	110.2277	'PLANT X STATION - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32367	108.2859	'SPP-SWPS-01'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31759	107.7281	'SPP-SWPS-26'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32378	106.9091	'G14_007T 345.00 - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32363	106.881	'PLANT X STATION (WH ALM20171) 230/115/13.2KV TRANSFORMER CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32365	106.8554	'OKLAUNION - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32365	106.7765	'SPP-AEPW-32'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33194	106.4531	'CHAVES COUNTY INTERCHANGE - SAN JUAN MESA TAP 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34593	106.45	'TOLK STATION EAST - TUCO INTERCHANGE 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34462	104.5173	'PLANT X STATION - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34166	103.1969	'SPP-SWPS-01'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31395	102.8153	'DEAF SMITH COUNTY INTERCHANGE (ELCO 13458-1) 230/115/13.8KV TRANSFORMER CKT 2'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33838	102.7989	'SPP-SWPS-T45'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32293	102.7646	'TOLK STATION (ABBXNL844501) 345/230/13.2KV TRANSFORMER CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32293	102.7592	'CROSSROADS 345.00 - TOLK STATION 345KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.33428	102.6126	'SPP-SWPS-26'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31484	102.5506	'DEAF SMITH COUNTY INTERCHANGE (GE M101353) 230/115/13.2KV TRANSFORMER CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32363	102.5197	'BORDER 7345.00 - G14_007T 345.00 345KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32363	102.5197	'BORDER 7345.00 - G14_007T 345.00 345KV CKT 2'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34012	102.3604	'PLANT X STATION (WH ALM20171) 230/115/13.2KV TRANSFORMER CKT 1'

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATE B (MVA)	TDF	TC% LOADING (% MVA)	CONTINGENCY
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34538	102.1358	'CHAVES COUNTY INTERCHANGE - SAN JUAN MESA TAP 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34102	101.862	'OKLAUNION - TUCO INTERCHANGE 345KV CKT 1'
FDNS	06NR	0_NO	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31494	101.7527	'BASE CASE'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.34102	101.749	'SPP-AEPW-32'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.3433	101.6313	'G14_007T 345.00 - TUCO INTERCHANGE 345KV CKT 1'
FDNS	00G14_010	0	14SP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	109.4821	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	14SP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	109.4403	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	14SP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.31451	107.1619	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	106	1	114.2651	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	106	1	114.1728	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	19SP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	105.8756	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	19SP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	105.8428	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	19WP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	106	1	112.026	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	24SP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	102.1589	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00NR	0	24SP	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	1	102.1554	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#6 - FRIONA SUB 115KV CKT 1'	96	0.31468	118.9111	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#6 - FRIONA SUB 115KV CKT 1'	96	0.34119	112.376	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	6	0	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#6 - FRIONA SUB 115KV CKT 1'	96	0.34122	103.0104	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	00NR	0	14WP	G14_010	'TO->FROM'	'DEAF SMITH REC-#6 - FRIONA SUB 115KV CKT 1'	106	1	101.8495	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'DEAF SMITH REC-#6 - FRIONA SUB 115KV CKT 1'	106	1	101.6936	'CURRY COUNTY INTERCHANGE - DEAF SMITH REC-#20 115KV CKT 1'
FDNS	06NR	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#6 - HEREFORD INTERCHANGE 115KV CKT 1'	96	0.31468	115.9275	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	06G14_010	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#6 - HEREFORD INTERCHANGE 115KV CKT 1'	96	0.34119	109.4166	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'
FDNS	6	0	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#6 - HEREFORD INTERCHANGE 115KV CKT 1'	96	0.34122	100	'DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1'

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

See next page.

SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATE B (MVA)	TDF	TC% LOADING (% MVA)	CONTINGENCY
FDNS	00G14_009	0	24SP	G14_009	'FROM->TO'	'BUSHLAND INTERCHANGE (WH 7001795) 230/115/13.2KV TRANSFORMER CKT 1'	168	0.08127	100.6928	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06ALL	0_NO	14G	G14_009	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.09971	104.5635	'BASE CASE'
FDNS	06ALL	0_NO	14G	G14_009	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.09971	118.5268	'BASE CASE'
FDNS	06ALL	0_NO	14G	G14_009	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.09971	111.0815	'BASE CASE'
FDNS	00G14_009	0	19WP	G14_009	'TO->FROM'	'GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1'	361	0.10175	102.0589	'G14_007T 345.00 - TUCO INTERCHANGE 345KV CKT 1'
FDNS	00G14_010	0	24SP	G14_010	'FROM->TO'	'BUSHLAND INTERCHANGE - HILLSIDE 115KV CKT 1'	160	0.10869	102.8542	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	00G14_010	0	24SP	G14_010	'FROM->TO'	'BUSHLAND INTERCHANGE (WH 7001795) 230/115/13.2KV TRANSFORMER CKT 1'	168	0.10869	104.7013	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	00G14_010	0	24SP	G14_010	'FROM->TO'	'BUSHLAND INTERCHANGE (WH 7001795) 230/115/13.2KV TRANSFORMER CKT 1'	168	0.10869	100.1889	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06ALL	0_NO	14G	G14_010	'TO->FROM'	'CARGILL SUB - DEAF SMITH REC-#24 115KV CKT 1'	96	0.32977	104.5635	'BASE CASE'
FDNS	00G14_010	0	14WP	G14_010	'TO->FROM'	'COULTER INTERCHANGE - HILLSIDE 115KV CKT 1'	191	0.12541	100.8522	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	00G14_010	0	19SP	G14_010	'TO->FROM'	'COULTER INTERCHANGE - HILLSIDE 115KV CKT 1'	176	0.11395	103.0246	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	06ALL	0_NO	14G	G14_010	'FROM->TO'	'DEAF SMITH REC-#20 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32977	118.5268	'BASE CASE'
FDNS	06ALL	0_NO	14G	G14_010	'TO->FROM'	'DEAF SMITH REC-#24 - PARMER COUNTY SUB 115KV CKT 1'	96	0.32977	111.0815	'BASE CASE'

I: Power Flow Analysis (Constraints from Category C Contingencies)

To be performed; results will be available upon request. Contact SPP Generator Interconnection Studies for details.

J: Group 6 Dynamic Stability Analysis Report

See report on next page.

Group 6 Impact Study

PISIS-2014-001

August 2014
Generator Interconnection

Revision History

Date	Author	Change Description
8/29/2014	SPP	PISIS-2014-001 Group 6 Stability Report Issued

Southwest Power Pool

Executive Summary

PISIS-2014-001 Interconnection Customers have requested a Definitive Interconnection System Impact Study detailing the impacts of interconnecting the generation projects shown below.

- GEN-2014-009 – 83.7MW wind generation project using Alstom ECO 122 2.7MW generators connected to Deaf Smith #10 69kV substation on the Southwestern Public Service (SPS) Transmission System.
- GEN-2014-009 – 129.6MW wind generation project using Alstom ECO 122 2.7MW generators connected to Deaf Smith #20 115kV substation on the Southwestern Public Service (SPS) Transmission System.

There are thirty-six (36) previously queued generation projects in the Group 6 area.

A stability analysis and power factor analysis were performed for the addition of the generation projects in Group 6. The analyses were performed on five seasonal models, the modified versions of the 2014 winter peak, 2015 summer peak, 2019 summer peak, 2019 winter peak, and 2024 summer peak cases. A total of one-hundred-forty-nine (149) contingencies were evaluated.

Numerical instability was observed with the Alstom ECO 122 Wind Turbine Generators for several contingencies as noted in ***Table* 3-3**. To achieve dynamic simulations that exhibit a moderate amount of non-converged solution iterations, network upgrades and project enhancements were explored as follows:

- Install 20Mvar CSTATT static condenser dynamic reactive device on GEN-2014-009 34.5kV substation

- Reduce the project size of GEN-2014-009 to 43.2MW (16 wind turbines)

Although a reduction in the GEN-2014-009 project size would result in a moderate amount of non-converged solution iterations, this option was not further pursued in this study as the GEN-2014-009 request was for 83.7MW.

Transmission System Stability issues were observed with several studied contingencies as noted in ***Table* 3-3**. Most notable of the issues was low voltage associated with transmission line faults causing the outage of the TUCO Interchange to GEN-2014-007 Tap 345kV transmission line. The outage of this line segment caused voltage depression at the Oklaunion 345kV bus. 345kV transmission reactive power reinforcement is required to alleviate this potential voltage instability. The transmission reactive power reinforcement required is the following:

- TUCO Interchange to GEN-2014-007 345kV Interconnect Substation 345kV transmission line second circuit.

With all Base Case Network Upgrades in service, previously assigned Network Upgrades in service, and the above listed newly assigned Network Upgrades and reactive power equipment in service, the Group 6 projects were found to remain on line, and the transmission system was found to remain stable for all conditions studied. The wind turbine generators in GEN-2014-009 and GEN-2014-010 have the capability of pre-contingency voltage recovery, and the post fault voltage recovery was found to be within the criterion of 0.7 pu to 1.2 pu.

A power factor analysis was performed for each interconnection project. All five study cases, 2014 winter peak, 2015 summer peak, 2019 summer peak, 2019 winter peak, and 2024 summer peak cases were used in the analyses. The power factor analyses showed that GEN-2014-009 and GEN-2014-010 will be required to provide the pro-forma standard 0.95 leading (absorbing) to 0.95 lagging (supplying) at their respective Points of Interconnection (POI).

The Low Voltage Ride Through (LVRT) analysis showed that none of the interconnection requests in this study tripped offline when their respective POI's were faulted to draw the POI voltage down to 0.0 pu. Therefore, each interconnection request in this study meets the FECR Order #661 requirement.

All generators in the monitored areas remained stable for all of the modeled disturbances.

Nothing in this study should be construed as a guarantee of delivery or transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service must be requested on Southwest Power Pool's OASIS by the Customer.

Table of Contents

Revision History 1

Executive Summary i

Table of Contents iii

1. Introduction 1

2. Facilities 4

Generating Facility 4

Interconnection Facilities 4

3. Stability Analysis 6

Model Preparation 6

Disturbances 6

Results 19

FERC LVRT Compliance 27

4. Power Factor Analysis 28

Model Preparation 28

Disturbances 28

Results 28

5. Reduced Generation Analysis 29

Model Preparation 29

Results 29

6. Conclusion 30

Appendix A – 2014 Winter Peak Stability Plots 32

Appendix B – 2015 Summer Peak Stability Plots 33

Appendix C – 2019 Summer Peak Stability Plots 34

Appendix D – 2019 Winter Peak Stability Plots 35

Appendix E – 2024 Summer Peak Stability Plots 36

Appendix F – Power Factor Analysis for GEN-2014-009 37

Appendix G – Power Factor Analysis for GEN-2014-010 41

1. Introduction

PISIS-2014-001 Interconnection Customers have requested a Preliminary Interconnection System Impact Study detailing the impacts of interconnecting the two (2) generation projects shown below in ***Table 1-1***.

Table 1-1: PISIS-2014-001 Group 6 Interconnection Requests

Request	Capacity (MW)	Generator Model	Point of Interconnection
GEN-2014-009	83.7	Alstom ECO 122 2.7MW	Deaf Smith #10 69kV (524853)
GEN-2014-010	129.6	Alstom ECO 122 2.7MW	Deaf Smith #20 115kV (524669)

There are thirty-six (36) previously queued generation projects in the Group 6 area. These interconnection requests are listed below in ***Table* 1-2**.

Table 1-2: PISIS-2014-001 Group 6 Prior Queued Interconnection Requests

Request	Capacity (MW)	Generator Model	Point of Interconnection
GEN-2001-033	180	Mitsubishi 1000 (WT1G1)	San Juan Mesa 230kV (524885)
GEN-2001-036	80	Mitsubishi 1000 (WT1G1)	Norton 115kV (524502)
GEN-2006-018	170	GENSAL	TUCO Interchange 230kV (525830)
GEN-2008-022	300	Vestas V100 VCSS 2.0MW	Tap on Eddy County – Tolk 345kV line (GEN-2008-022-POI, 560007)
GEN-2010-006	180 Summer 205 Winter	GENROU	Jones 230kV(526337)
ASGI-2010-010	42.2	GENSAL	Lovington 115kV (528334)
ASGI-2010-020	30	Nordex N100 2.5MW	Tap LE-Tatum – LE-Crosssroads 69kV (ASGI-2010-020-POI, 560360)
ASGI-2010-021	15	Mitsubishi MPS-1000A 1.0MW	Tap LE-Saunder Tap – LE-Anderson 69kV (ASGI-2010-021 POI, 560364)
GEN-2010-046	56	GENSAL	TUCO Interchange 230kV (525830)
ASGI-2011-001	27.3	Suzlon S97 2.1MW	Lovington 115kV (528334)
ASGI-2011-003	10	Sany 2.0MW (WT3G1)	Hendricks 69kV (525943)
ASGI-2011-004	19.2	Sany 1.8MW (WT3G2)	SP Crosby 69kV (525915)
GEN-2011-025	79.5	Alstom ECO 122 2.7MW Alstom ECO 110 3.0MW	Tap on Floyd County – Crosby County 115kV line (GEN-2011-025 POI, 562004)
GEN-2011-045	180 Summer 205 Winter	GENROU	Jones 230kV (526337)
GEN-2011-046	23 Summer 27 Winter	GENROU	Lopez 115kV (524472)
GEN-2011-048	165 Summer 175 Winter	GENROU	Mustang 230kV (527151)
ASGI-2012-002	18.15	Vestas 1.65MW V82	Clovis 115kV (524808)
GEN-2012-001	61.2	CCWE 3.6MW (W4G2U)	Tap Grassland – Borden 230kV (GEN-2012-001 POI, 526679)
GEN-2012-009	15 MW increase	GENROU	Mustang 230kV (527151)

Table 1-2: PISIS-2014-001 Group 6 Prior Queued Interconnection Requests

Request	Capacity (MW)	Generator Model	Point of Interconnection
GEN-2012-010	15 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-020	477.12	G.E. 1.68MW	TUCO Interchange 230kV (525830)
GEN-2012-034	7 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-035	7 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-036	7 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-037	196 Summer 203 Winter	GENROU	TUCO Interchange 345kV (525832)
GEN-2013-013	248.4	Siemens 2.3MW (W4GUR2)	Tap Eddy County – Tolk 345kV (GEN-2013-013 POI, 560726)
GEN-2013-016	191 Summer 203 Winter	GENROU	TUCO Interchange 345kV (525832)
ASGI-2013-002	18.4	Siemens 2.3MW (W4GUR2)	Tucumcari 115kV (524509)
ASGI-2013-003	18.4	Siemens 2.3MW (W4GUR2)	Clovis 115kV (524808)
ASGI-2013-005	1.65	Vestas V82 1.65MW	Clovis 115kV (524808)
ASGI-2013-006	2	Gamesa G114 2.0MW	SP Erskine 115kV (562109)
GEN-2013-022	25	Solaron 0.5MW Inverter	Norton 115kV (524502)
GEN-2013-027	327	Alstom ECO 122 3.0MW	Tap Tolk West – Yoakum 230kV (GEN-2013-027 POI, 562480)
ASGI-2014-001	2.5	G.E. 2.5MW	SP Erskine 115kV (562109)
GEN-2014-007	399.6	G.E. 1.85MW	Tap Border – TUCO Interchange 345kV (GEN-2014-007 POI, 562487)
GEN-2014-012	779 Summer 850 Winter	GENROU	Tap Hobbs – Andrews 345kV (GEN-2014-012 POI, 527020)

A stability analysis and a power factor analysis were performed for the addition of the generation projects in Group 6. The analyses were performed on five seasonal models, the modified versions of the 2014 winter peak, 2015 summer peak, 2019 summer peak, 2019 winter peak, and 2024 summer peak cases.

The stability analysis determines 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 is investigated. The three-phase faults and the single line-to-ground faults listed in ***Table* 3-1** were used in the stability analysis.

The power factor analysis determines the power factor at the point of interconnection (POI) for the wind interconnection projects for pre-contingency and post-contingency conditions. The contingencies used in the power factor analysis (**Table F-1** and **Table G-1**) are a subset of the stability analysis contingencies shown in ***Table* 3-1**.

Nothing in this System Impact Study constitutes a request for transmission service or grants the Interconnection Customer any rights to transmission service.

2. Facilities

Generating Facility

GEN-2014-009 Interconnection Customer's request to interconnect a total of 83.7MW is comprised of thirty-one (31) Alstom ECO122 2.7MW wind turbine generators and associated interconnection facilities.

GEN-2014-010 Interconnection Customer's request to interconnect a total of 129.6MW (bus 524669) is comprised of forty-eight (48) Alstom ECO122 2.7MW wind turbine generators and associated interconnection facilities.

Interconnection Facilities

The POI for GEN-2014-009 Interconnection Customer is Deaf Smith #10 69kV substation (bus 524853). **Figure 2-1** depicts the one-line diagram of the local transmission system including the POI as well as the power flow model representing the request.

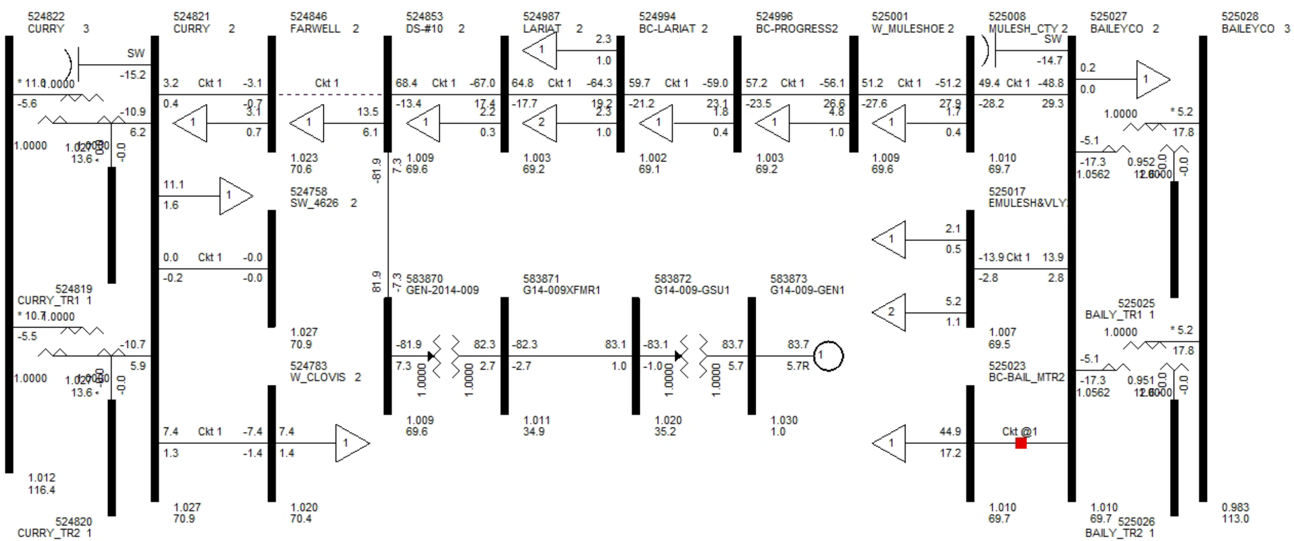


Figure 2-1: Proposed POI Configuration and Request Power Flow Model for GEN-2014-009

The POI for GEN-2014-010 Interconnection Customer is Deaf Smith #20 115kV substation (bus 524669). **Figure 2-2** depicts the one-line diagram of the local transmission system including the POI as well as the power flow model representing the request.

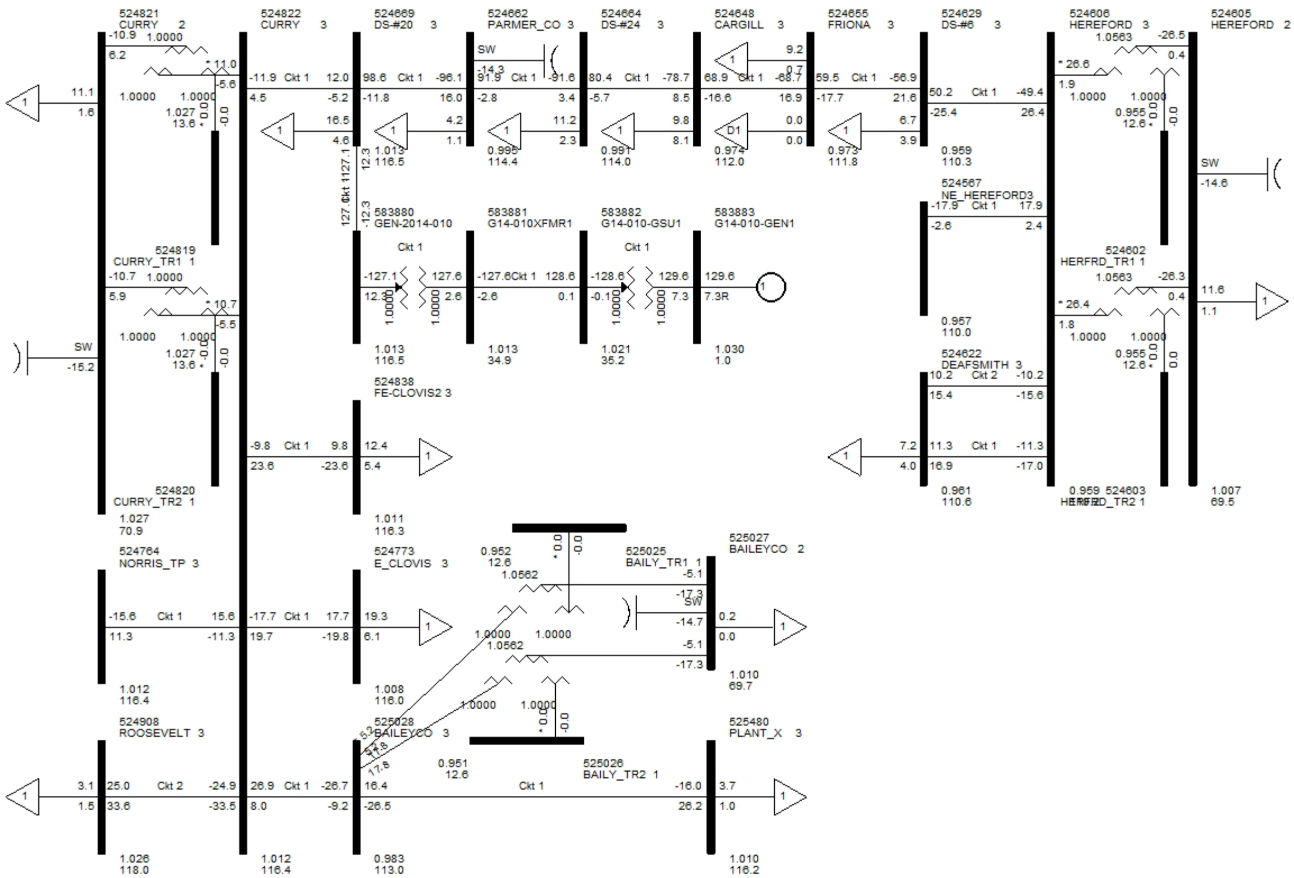


Figure 2-2: Proposed POI Configuration and Request Power Flow Model for GEN-2014-010

3. Stability Analysis

Transient stability analysis is used to determine if the transmission system can maintain angular stability and ensure bus voltages stay within planning criteria bandwidth during and after a disturbance while considering the addition of a generator interconnection request.

Model Preparation

Transient stability analysis was performed using modified versions of the 2013 series of Model Development Working Group (MDWG) dynamic study models including the 2014 winter peak, 2015 summer peak, 2019 summer peak, 2019 winter peak, and the 2024 summer peak seasonal models. The cases are then loaded with prior queued interconnection requests and network upgrades assigned to those interconnection requests. Finally the prior queued and study generation are dispatched into the SPP footprint. Initial simulations are then carried out for a no-disturbance run of twenty (20) seconds to verify the numerical stability of the model.

Disturbances

One-hundred forty-nine (149) contingencies were identified for use in this study and are listed in ***Table* 3-1**. These contingencies included three-phase faults and single-phase line faults at locations defined by SPP. Single-phase line faults were simulated by applying fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice.

Except for transformer faults, the typical sequence of events for a three-phase and a single-phase fault is as follows:

1. apply fault at particular location
2. continue fault for five (5) cycles, clear the fault by tripping the faulted facility
3. after an additional twenty (20) cycles, re-close the previous facility back into the fault
4. continue fault for five (5) additional cycles
5. trip the faulted facility and remove the fault

Transformer faults are typically modeled as three-phase faults, unless otherwise noted. The sequence of events for a transformer fault is as follows:

1. apply fault for five (5) cycles
2. clear the fault by tripping the affected transformer facility (unless otherwise noted there will be no re-closing into a transformer fault)

The control areas monitored include 520, 524, 525, 526, 531, 534, and 536.

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
1	FLT_001_DS102_FARWELL2_69kV_3PH	Alternate system configuration: 3 phase fault on the Deaf Smith #10 (524853) to Farwell (524846) 69kV line, near Deaf Smith #10. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Farwell (524846) to Curry (524821) 69kV line. b. Apply fault at the Deaf Smith #10 69kV bus. c. Clear fault after 5 cycles by tripping the faulted line and Farwell 69kV bus.
2	FLT_002_DS102_FARWELL2_69kV_1PH	*Single phase fault and sequence like previous*
3	FLT_003_CURRY3_BAILEYCO3_115kV_3PH	Alternate system configuration: 3 phase fault on the Curry (524822) to Bailey County (525028) 115kV line, near Curry. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open the Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Curry 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT_004_CURRY3_BAILEYCO3_115kV_1PH	*Single phase fault and sequence like previous*
5	FLT_005_P4CURRWCLOCURR_CURRY3_69_115kV_1PH	Alternate system configuration with stuck breaker condition: Single phase fault on the Curry (524821) to West Clovis (524783) 69kV line, near Curry. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open the Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Curry 69kV bus. c. Clear fault after 16 cycles by tripping the faulted line and a single Curry (524822) 115kV to (524821) 69kV transformer.
6	FLT_006_CURRY2_CURRY3_69_115kV_3PH	Alternate system configuration: 3 phase fault on the Curry (524821) 69kV to (524822) 115kV transformer, near Curry 69kV. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Curry 69kV bus. c. Clear fault after 5 cycles by tripping the faulted transformer.
7	FLT_007_MULESHCTY2_WMULESH_69kV_3PH	Alternate system configuration: 3 phase fault on the Muleshoe City (525008) to West Muleshoe (525001) 69kV line, near West Muleshoe. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open the Muleshoe City (525008) to Bailey County (525027) 69kV line. b. Apply fault at the Muleshoe City 69kV bus. c. Clear fault after 5 cycles by tripping the faulted line and West Muleshoe 69kV bus.
8	FLT_008_MULESHCTY2_WMULESH_69kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
9	FLT_009_DS102_LARIAT2_69kV_3PH	Alternate system configuration: 3 phase fault on the Deaf Smith #10 (524853) to Lariat (524987) 69kV line, near Deaf Smith #10. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open the Lariat (524987) to BC-Lariat (524994) 69kV line. b. Apply fault at the Deaf Smith #10 69kV bus. c. Clear fault after 5 cycles by tripping the faulted line and Lariat 69kV bus.
10	FLT_010_DS102_LARIAT2_69kV_1PH	*Single phase fault and sequence like previous*
11	FLT_011_BAILEYCO3_PLANTX3_115kV_3PH	Alternate system configuration: 3 phase fault on the Bailey County (525028) to Plant X (525480) 115kV line, near Bailey County. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Bailey County 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT_012_BAILEYCO3_PLANTX3_115kV_1PH	*Single phase fault and sequence like previous*
13	FLT_013_P4BAILEMVTBAIL_BAILEYCO3_69_115kV_1PH	Stuck breaker condition: Single phase fault on the Bailey County (525027) to East Muleshoe & Valley Tap (525017) 69kV line, near Bailey County. a. Apply fault at the Bailey County 69kV bus. b. Clear fault after 16 cycles by tripping the faulted line and a single Bailey County (525028) 115kV to (525027) 69kV transformer.
14	FLT_014_BAILEYCO2_BAILEYCO3_69_115kV_3PH	3 phase fault on the Bailey County (525027) 69kV to (525028) 115kV transformer, near Bailey County 69kV. a. Apply fault at the Bailey County 69kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
15	FLT_015_DS203_CURRY3_115kV_3PH	Alternate system configuration: 3 phase fault on the Deaf Smith #20 (524669) to Curry (524822) 115kV line, near Deaf Smith #20. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Deaf Smith #20 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
16	FLT_016_DS203_CURRY3_115kV_1PH	*Single phase fault and sequence like previous*
17	FLT_017_DS203_CURRY3_115kV_3PH	3 phase fault on the Deaf Smith #20 (524669) to Curry (524822) 115kV line, near Deaf Smith #20. a. Apply fault at the Deaf Smith #20 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.
18	FLT_018_DS203_CURRY3_115kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
19	FLT_019_P4CURRDS20CURR_CURRY2_115_69kV_1PH	Stuck Breaker Condition: Single phase fault on the Curry (524822) to Deaf Smith #20 (524669) 115kV line, near Curry. a. Apply fault at the Curry 115kV bus. b. Clear fault after 16 cycles by tripping the faulted line and a single Curry (524822) 115kV to (524821) 69kV transformer.
20	FLT_020_CURRY3_FECLOVIS23_115kV_3PH	3 phase fault on the Curry (524822) to Farmer's Electric Cooperative – Clovis (524838) 115kV line, near Curry. a. Apply fault at the Curry 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.
21	FLT_021_CURRY3_FECLOVIS23_115kV_1PH	*Single phase fault and sequence like previous*
22	FLT_022_CURRY3_ECLOVIS3_115kV_3PH	3 phase fault on the Curry (524822) to East Clovis (524773) 115kV line, near Curry. a. Apply fault at the Curry 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.
23	FLT_023_CURRY3_ECLOVIS3_115kV_1PH	*Single phase fault and sequence like previous*
24	FLT_024_CURRY3_NORRISTP3_115kV_3PH	3 phase fault on the Curry (524822) to Norris Tap (524764) 115kV line, near Curry. a. Apply fault at the Curry 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.
25	FLT_025_CURRY3_NORRISTP3_115kV_1PH	*Single phase fault and sequence like previous*
26	FLT_026_CURRY3_ROOSEVELT3_115kV_3PH	3 phase fault on the Curry (524822) to Roosevelt County (524908) 115kV line, near Curry. a. Apply fault at the Curry 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.
27	FLT_027_CURRY3_ROOSEVELT3_115kV_1PH	*Single phase fault and sequence like previous*
28	FLT_028_ROOSEVELT3_PORTALES3_115kV_3PH	3 phase fault on the Roosevelt County (524908) to Portales (524924) 115kV line, near Roosevelt County. a. Apply fault at the Roosevelt County 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.
29	FLT_029_ROOSEVELT3_PORTALES3_115kV_1PH	*Single phase fault and sequence like previous*
30	FLT_030_ROOSEVELT3_ROSEVELTN6_115_230kV_3PH	3 phase fault on the Roosevelt County (524908) 115kV to (524909) 230kV transformer, near Roosevelt County 115kV. a. Apply fault at the Roosevelt County 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
31	FLT_031_ROSEVELTN6_TOLKWEST6_230kV_3PH	3 phase fault on the Roosevelt County (524909) to Tolk West (525531) 230kV line, near Roosevelt County. a. Apply fault at the Roosevelt County 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
32	FLT_032_ROSEVELTN6_TOLKWEST6_230kV_1PH	*Single phase fault and sequence like previous*
33	FLT_033_TOLKTAP6_TOLK7_230_345kV_3PH	3 phase fault on the Tolk Tap (525543) 230kV to Tolk (525549) 345kV transformer, near Tolk Tap 230kV. a. Apply fault at the Tolk Tap 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
34	FLT_034_G08022TAP_EDDYCNTY7_345kV_3PH	3 phase fault on the GEN-2008-022 Tap (560007) to Eddy County (527802) 345kV line, near GEN-2008-022 Tap. a. Apply fault at the GEN-2008-022 Tap 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
35	FLT_035_G08022TAP_EDDYCNTY7_345kV_1PH	*Single phase fault and sequence like previous*
36	FLT_036_TUCOINT6_TOLKEAST6_230kV_3PH	3 phase fault on the TUCO Interchange (525830) to Tolk East (525524) 230kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
37	FLT_037_TUCOINT6_TOLKEAST6_230kV_1PH	*Single phase fault and sequence like previous*
38	FLT_038_TUCOINT7_OKU7_345kV_3PH	3 phase fault on the TUCO Interchange (525832) to Oklaunion (515456) 345kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 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.
39	FLT_039_TUCOINT7_OKU7_345kV_1PH	*Single phase fault and sequence like previous*
40	FLT_040_TUCOINT7_G14007TAP_345kV_3PH	3 phase fault on the TUCO Interchange (525832) to GEN-2014-007-Tap (562487) 345kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
41	FLT_041_TUCOINT7_G14007TAP_345kV_1PH	*Single phase fault and sequence like previous*
42	FLT_042_TUCOINT7_TUCOINT6_345_230kV_3PH	3 phase fault on a single TUCO Interchange 345kV (525832) to 230kV (525830) transformer, near TUCO Interchange 345kV. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
43	FLT_043_CHISHOLM7_WWRDEHV7_345kV_3PH	3 phase fault on the Chisholm (511553) to Woodward (515375) 345kV line, near Chisholm. a. Apply fault at the Chisholm 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
44	FLT_044_CHISHOLM7_WWRDEHV7_345kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
45	FLT_045_CHISHOLM7_GRACMNT7_345kV_3PH	3 phase fault on the Chisholm (511553) to Gracemont (515800) 345kV line, near Chisholm. a. Apply fault at the Chisholm 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
46	FLT_046_CHISHOLM7_GRACMNT7_345kV_1PH	*Single phase fault and sequence like previous*
47	FLT_047_CHISHOLM7_CHISHOLM6_345_230kV_3PH	3 phase fault on the Chisholm (511553) 345kV to (511557) 230kV transformer, near Chisholm 345kV. a. Apply fault at the Chisholm 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
48	FLT_048_ROSEVELTN6_PLSNTHILL6_230kV_3PH	3 phase fault on the Roosevelt County (524909) to Pleasant Hill (524770) 230kV line, near Roosevelt County. a. Apply fault at the Roosevelt County 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.
49	FLT_049_ROSEVELTN6_PLSNTHILL6_230kV_1PH	*Single phase fault and sequence like previous*
50	FLT_050_PLSNTHILL6_OASIS6_230kV_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.
51	FLT_051_PLSNTHILL6_OASIS6_230kV_1PH	*Single phase fault and sequence like previous*
52	FLT_052_OASIS6_SANJANHVB1_230kV_3PH	3 phase fault on the Oasis (524875) to San Juan Mesa Tap (524885) 230kV line, near Oasis. a. Apply fault at the Oasis 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.
53	FLT_053_OASIS6_SANJANHVB1_230kV_1PH	*Single phase fault and sequence like previous*
54	FLT_054_SANJANHVB1_CHAVESCNTY6_230kV_3PH	3 phase fault on the San Juan Mesa Tap (524885) to Chaves County (527483) 230kV line, near San Juan Mesa Tap. a. Apply fault at the San Juan Mesa 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.
55	FLT_055_SANJANHVB1_CHAVESCNTY6_230kV_1PH	*Single phase fault and sequence like previous*
56	FLT_056_OASIS6_SW4K336_230kV_3PH	3 phase fault on the Oasis (524875) to Roosevelt County (524915) 230kV line, near Oasis. a. Apply fault at the Oasis 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.
57	FLT_057_OASIS6_SW4K336_230kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
58	FLT_058_OASIS6_OASIS3_230_115kV_3PH	3 phase fault on the Oasis (524875) 230kV to (524874) 115kV transformer, near Oasis 230kV. a. Apply fault at the Oasis 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
59	FLT_059_PLSNTHILL6_PLSNTHILL3_230_115kV_3PH	3 phase fault on the Pleasant Hill (524770) 230kV to (524768) 115kV 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.
60	FLT_060_ROSEVELTN6_SW4K336_230kV_3PH	3 phase fault on the Roosevelt County (524909) to Roosevelt County (524915) 230kV line, near Roosevelt County. a. Apply fault at the Roosevelt County 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.
61	FLT_061_ROSEVELTN6_SW4K336_230kV_1PH	*Single phase fault and sequence like previous*
62	FLT_062_SW4K336_ROSEVELTS6_230kV_3PH	3 phase fault on the Roosevelt County (524915) to Roosevelt County (524911) 230kV line, near Roosevelt County. a. Apply fault at the Roosevelt County 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.
63	FLT_063_SW4K336_ROSEVELTS6_230kV_1PH	*Single phase fault and sequence like previous*
64	FLT_064_ROSEVELTS6_TOLKEAST6_230kV_3PH	3 phase fault on the Roosevelt County (524911) to Tolk East (525524) 230kV line, near Roosevelt County. a. Apply fault at the Roosevelt County 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
65	FLT_065_ROSEVELTS6_TOLKEAST6_230kV_1PH	*Single phase fault and sequence like previous*
66	FLT_066_CURRY3_BAILEYCO3_115kV_3PH	3 phase fault on the Curry (524822) to Bailey County (525028) 115kV line, near Curry. a. Apply fault at the Curry 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.
67	FLT_067_CURRY3_BAILEYCO3_115kV_1PH	*Single phase fault and sequence like previous*
68	FLT_068_BAILEYCO3_PLANTX3_115kV_3PH	3 phase fault on the Bailey County (525028) to Plant X (525480) 115kV line, near Bailey County. a. Apply fault at the Bailey County 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.
69	FLT_069_BAILEYCO3_PLANTX3_115kV_1PH	*Single phase fault and sequence like previous*
70	FLT_070_BAILEYCO3_EMUVLYTP3_115kV_3PH	3 phase fault on the Bailey County (525028) to East Muleshoe & Valley Tap (525019) 115kV line, near Bailey County. a. Apply fault at the Bailey County 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 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
71	FLT_071_BAILEYCO3_EMUVLYTP3_115kV_1PH	*Single phase fault and sequence like previous*
72	FLT_072_EMUVLYTP3_PLANTX3_115kV_1PH	3 phase fault on the East Muleshoe & Valley Tap (525019) to Plant X (525480) 115kV line, near East Muleshoe & Valley Tap. a. Apply fault at the East Muleshoe & Valley 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.
73	FLT_073_EMUVLYTP3_PLANTX3_115kV_1PH	*Single phase fault and sequence like previous*
74	FLT_074_PLANTX3_LCSOLTON3_115kV_3PH	3 phase fault on the Plant X (525480) to South Olton Sub #13 (525440) 115kV line, near Plant X. a. Apply fault at the Plant X 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
75	FLT_075_PLANTX3_LCSOLTON3_115kV_1PH	*Single phase fault and sequence like previous*
76	FLT_076_PLANTX3_BCEARTH3_115kV_3PH	3 phase fault on the Plant X (525480) to Earth (525056) 115kV line, near Plant X. a. Apply fault at the Plant X 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
77	FLT_077_PLANTX3_BCEARTH3_115kV_1PH	*Single phase fault and sequence like previous*
78	FLT_078_P4PLANBCEAPLAN_PLANTX6_115_230kV_1PH	Stuck Breaker Condition: Single phase fault on the Plant X (525480) to Earth (525056) 115kV line, near Plant X. a. Apply fault at the Plant X 115kV bus. b. Clear fault after 16 cycles by tripping the faulted line and a single Plant X (525480) 115kV to (525481) 230kV transformer.
79	FLT_079_PLANTX3_LAMBCNTY3_115kV_3PH	3 phase fault on the Plant X (525480) to Lamb County (525636) 115kV line, near Plant X. a. Apply fault at the Plant X 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
80	FLT_080_PLANTX3_LAMBCNTY3_115kV_1PH	*Single phase fault and sequence like previous*
81	FLT_081_PLANTX3_HALECNTY3_115kV_3PH	3 phase fault on the Plant X (525480) to Hale County (525454) 115kV line, near Plant X. a. Apply fault at the Plant X 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
82	FLT_082_PLANTX3_HALECNTY3_115kV_1PH	*Single phase fault and sequence like previous*
83	FLT_083_PLANTX3_PLANTX6_115_230kV_3PH	3 phase fault on the Plant X (525480) 115kV to (525481) 230kV transformer, near Plant X 115kV. a. Apply fault at the Plant X 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
84	FLT_084_PLANTX6_DEAFSMITH6_230kV_3PH	3 phase fault on the Plant X (525481) to Deaf Smith (524623) 230kV line, near Plant X. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
85	FLT_085_PLANTX6_DEAFSMITH6_230kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
86	FLT_086_PLANTX6_TOLKEAST6_230kV_3PH	3 phase fault on the Plant X (525481) to Tolk East (525524) 230kV line, near Plant X. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
87	FLT_087_PLANTX6_TOLKEAST6_230kV_1PH	*Single phase fault and sequence like previous*
88	FLT_088_PLANTX6_TOLKWEST6_230kV_3PH	3 phase fault on the Plant X (525481) to Tolk West (525531) 230kV line, near Plant X. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
89	FLT_089_PLANTX6_TOLKWEST6_230kV_1PH	*Single phase fault and sequence like previous*
90	FLT_090_P6PLANTX6_TOLKWEST6_230kV_3PH	Prior outage of a single Plant X (525481) to Tolk West (525531) 230kV line: 3 phase fault on the remaining Plant X (525481) to Tolk West (525531) 230kV line, near Plant X 230kV. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
91	FLT_091_P7PLANTX6_TOLKWEST6_230kV_1PH	Loss of double circuit: Single phase fault on both Plant X (525481) to Tolk West (525531) 230kV lines, near Plant X 230kV. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted lines.
92	FLT_092_BUSHLAND6_BUSHLAND3_230_115kV_3PH	3 phase fault on the Bushland (524267) 230kV to (524266) 115kV transformer, near Bushland 230kV. a. Apply fault at the Bushland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
93	FLT_093_HEREFORD3_HEREFORD2_115_69kV_3PH	3 phase fault on a single Hereford (524606) 115kV to (524605) 69kV transformer, near Hereford 115kV. a. Apply fault at the Hereford 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
94	FLT_094_PLANTX6_SUNDOWN6_230kV_3PH	3 phase fault on the Plant X (525481) to Sundown (526435) 230kV line, near Plant X. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
95	FLT_095_PLANTX6_SUNDOWN6_230kV_1PH	*Single phase fault and sequence like previous*
96	FLT_096_PLANTX6_BUSHLANDS_230kV_3PH	3 phase fault on the Plant X (525481) to Bushland South (560016) 230kV line, near Plant X. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
97	FLT_097_PLANTX6_BUSHLANDS_230kV_1PH	*Single phase fault and sequence like previous*
98	FLT_098_PLANTX6_NEWHART6_230kV_3PH	3 phase fault on the Plant X (525481) to Newhart (525461) 230kV line, near Plant X. a. Apply fault at the Plant X 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
99	FLT_099_PLANTX6_NEWHART6_230kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
100	FLT_100_DS203_PARMERCO3_115kV_3PH	3 phase fault on the Deaf Smith #20 (524669) to Parmer County (524662) 115kV line, near Deaf Smith #20. a. Apply fault at the Deaf Smith #20 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	FLT_101_DS203_PARMERCO3_115kV_1PH	*Single phase fault and sequence like previous*
102	FLT_102_DS63_HEREFORD3_115kV_3PH	3 phase fault on the Deaf Smith #6 (524629) to Hereford (524606) 115kV line, near Deaf Smith #6. a. Apply fault at the Deaf Smith #6 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	FLT_103_DS63_HEREFORD3_115kV_1PH	*Single phase fault and sequence like previous*
104	FLT_104_P4HEREDS6HERE_HEREFORD2_115_69kV_1PH	Stuck Breaker Condition: Single phase fault on the Hereford (524606) to Deaf Smith #6 (524629) 115kV line, near Hereford. a. Apply fault at the Hereford 115kV bus. b. Clear fault after 16 cycles by tripping the faulted line and a single Hereford (524606) 115kV to (524605) 69kV transformer.
105	FLT_105_HEREFORD3_NEHEREFORD3_115kV_3PH	3 phase fault on the Hereford (524606) to Hereford Northeast (524567) 115kV line, near Hereford. a. Apply fault at the Hereford 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.
106	FLT_106_HEREFORD3_NEHEREFORD3_115kV_1PH	*Single phase fault and sequence like previous*
107	FLT_107_HEREFORD3_DEAFSMITH3_115kV_3PH	3 phase fault on a single Hereford (524606) to Deaf Smith (524622) 115kV line, near Hereford. a. Apply fault at the Hereford 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	FLT_108_HEREFORD3_DEAFSMITH3_115kV_1PH	*Single phase fault and sequence like previous*
109	FLT_109_P6HEREFORD3_DEAFSMITH3_115kV_3PH	Prior outage of a single Hereford (524606) to Deaf Smith (524622) 115kV line: 3 phase fault on the remaining Hereford (524606) to Deaf Smith (524622) 115kV line, near Hereford 115kV. a. Apply fault at the Hereford 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.
110	FLT_110_P7HEREFORD3_DEAFSMITH3_115kV_1PH	Loss of double circuit: Single phase fault on both Hereford (524606) to Deaf Smith (524622) 115kV lines, near Hereford 115kV. a. Apply fault at the Hereford 115kV bus. b. Clear fault after 5 cycles by tripping the faulted lines. c. Wait 20 cycles, and then re-close the lines in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the lines in (b) and remove fault.

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
111	FLT_111_DEAFSMITH3_NEHEREFORD3_115kV_3PH	3 phase fault on the Deaf Smith (524622) to Hereford Northeast (524567) 115kV line, near Deaf Smith. a. Apply fault at the Deaf Smith 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.
112	FLT_112_DEAFSMITH3_NEHEREFORD3_115kV_1PH	*Single phase fault and sequence like previous*
113	FLT_113_DEAFSMITH3_PANDAHFD3_115kV_3PH	3 phase fault on the Deaf Smith (524622) to Panda Energy Station (524597) 115kV line, near Deaf Smith. a. Apply fault at the Deaf Smith 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.
114	FLT_114_DEAFSMITH3_PANDAHFD3_115kV_1PH	*Single phase fault and sequence like previous*
115	FLT_115_DEAFSMITH3_DS213_115kV_3PH	3 phase fault on the Deaf Smith (524622) to Deaf Smith #21 (524734) 115kV line, near Deaf Smith. a. Apply fault at the Deaf Smith 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.
116	FLT_116_DEAFSMITH3_DS213_115kV_1PH	*Single phase fault and sequence like previous*
117	FLT_117_DEAFSMITH3_DEAFSMITH6_115_230kV_3PH	3 phase fault on the Deaf Smith (524622) 115kV to (524623) 230kV transformer, near Deaf Smith 115kV. a. Apply fault at the Deaf Smith 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
118	FLT_118_DEAFSMITH6_BUSHLAND6_230kV_3PH	3 phase fault on the Deaf Smith (524623) to Bushland (524267) 230kV line, near Deaf Smith. a. Apply fault at the Deaf Smith 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.
119	FLT_119_DEAFSMITH6_BUSHLAND6_230kV_1PH	*Single phase fault and sequence like previous*
120	FLT_120_BUSHLAND6_POTTERCO6_230kV_3PH	3 phase fault on the Bushland (524267) to Potter County (523959) 230kV line, near Bushland. a. Apply fault at the Bushland 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.
121	FLT_121_BUSHLAND6_POTTERCO6_230kV_1PH	*Single phase fault and sequence like previous*
122	FLT_122_POTTERCO6_POTTERCO7_230_345kV_3PH	3 phase fault on the Potter County (523959) 230kV to (523961) 345kV transformer, near Potter County 230kV. a. Apply fault at the Potter County 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
123	FLT_123_POTTERCO7_HITCHLAND7_345kV_3PH	3 phase fault on the Potter County (523961) to Hitchland (523097) 345kV 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.
124	FLT_124_POTTERCO7_HITCHLAND7_345kV_1PH	*Single phase fault and sequence like previous*
125	FLT_125_HITCHLAND7_BEAVERCO_345kV_3PH	3 phase fault on a single Hitchland (523097) to Beaver County (580500) 345kV line, near Hitchland. a. Apply fault at the Hitchland 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.
126	FLT_126_HITCHLAND7_BEAVERCO_345kV_1PH	*Single phase fault and sequence like previous*
127	FLT_127_HITCHLAND7_FINNEY7_345kV_3PH	3 phase fault on the Hitchland (523097) to Finney (523853) 345kV line, near Hitchland. a. Apply fault at the Hitchland 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.
128	FLT_128_HITCHLAND7_FINNEY7_345kV_1PH	*Single phase fault and sequence like previous*
129	FLT_129_FINNEY7_HOLCOMB7_345kV_3PH	3 phase fault on the Finney (523853) to Holcomb (531449) 345kV line, near Finney. a. Apply fault at the Finney 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	FLT_130_FINNEY7_HOLCOMB7_345kV_1PH	*Single phase fault and sequence like previous*
131	FLT_131_HITCHLAND7_HITCHLAND6_345_230kV_3PH	3 phase fault on the Hitchland (523097) 345kV to (523095) 230kV transformer, near Hitchland 345kV. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
132	FLT_132_BUSHLAND6_BUSHLANDS_230kV_3PH	3 phase fault on the Bushland (524267) to Bushland South (560016) 230kV line, near Bushland. a. Apply fault at the Bushland 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.
133	FLT_133_BUSHLAND6_BUSHLANDS_230kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
134	FLT_134_DS203_PARMERCO3_115kV_3PH	Alternate system configuration: 3 phase fault on the Deaf Smith #20 (524669) to Parmer County (524662) 115kV line, near Deaf Smith #20. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Deaf Smith #20 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
135	FLT_135_DS203_PARMERCO3_115kV_1PH	*Single phase fault and sequence like previous*
136	FLT_136_CURRY3_FECLOVIS23_115kV_3PH	Alternate system configuration: 3 phase fault on the Curry (524822) to Farmer's Electric Cooperative – Clovis (524838) 115kV line, near Curry. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Curry 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
137	FLT_137_CURRY3_FECLOVIS23_115kV_1PH	*Single phase fault and sequence like previous*
138	FLT_138_CURRY3_ECLOVIS3_115kV_3PH	Alternate system configuration: 3 phase fault on the Curry (524822) to East Clovis (524773) 115kV line, near Curry. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Curry 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
139	FLT_139_CURRY3_ECLOVIS3_115kV_1PH	*Single phase fault and sequence like previous*
140	FLT_140_CURRY3_NORRISTP3_115kV_3PH	Alternate system configuration: 3 phase fault on the Curry (524822) to Norris Tap (524764) 115kV line, near Curry. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Curry 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
141	FLT_141_CURRY3_NORRISTP3_115kV_1PH	*Single phase fault and sequence like previous*

Table 3-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
142	FLT_142_CURRY3_ROOSEVELT3_115kV_3PH	Alternate system configuration: 3 phase fault on the Curry (524822) to Roosevelt County (524908) 115kV line, near Curry. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Curry 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
143	FLT_143_CURRY3_ROOSEVELT3_115kV_1PH	*Single phase fault and sequence like previous*
144	FLT_144_BAILEYCO3_EMUVLYTP3_115kV_3PH	Alternate system configuration: 3 phase fault on the Bailey County (525028) to East Muleshoe & Valley Tap (525019) 115kV line, near Bailey County. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the Bailey County 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
145	FLT_145_BAILEYCO3_EMUVLYTP3_115kV_1PH	*Single phase fault and sequence like previous*
146	FLT_146_EMUVLYTP3_PLANTX3_115kV_3PH	Alternate system configuration: 3 phase fault on the East Muleshoe & Valley Tap (525019)to Plant X (525480) 115kV line, near East Muleshoe & Valley Tap. a. Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. b. Apply fault at the East Muleshoe & Valley Tap 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (b) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
147	FLT_147_EMUVLYTP3_PLANTX3_115kV_1PH	*Single phase fault and sequence like previous*
148	FLT_148_HEREFORD3_NEHEREFORD3_115kV_3PH	Prior outage of the Curry (524822) to Deaf Smith #20 (524669) 115kV line: 3 phase fault on the Hereford (524606) to Hereford Northeast (524567) 115kV line, near Hereford. a. Apply fault at the Hereford 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.
149	FLT_149_HEREFORD3_NEHEREFORD3_115kV_1PH	*Single phase fault and sequence like previous*

NOTE: For alternate system configurations and prior outage contingencies assume that the network is at steady state after the topology change.

Results

Numerical instability was observed with the Alstom ECO 122 Wind Turbine Generators for several contingencies as noted in ***Table* 3-3**. A limited short circuit analysis was conducted at each project's POI for system intact (no line outages) and for line outages near the POI. The results of the short circuit analysis are shown in ***Table* 3-2**. From the table it can be seen that the lowest short circuit ratio (SCR) for GEN-2014-009 is 1.69 MVA/MW and the SCR for GEN-2014-010 is 1.97MVA/MW.

***Table* 3-2: Short Circuit Ratio**

POI and Immediate Topology		Outage	Value	2014WP	2015SP	2019SP	2019WP	2024SP
GEN-2014-009 (83.7MW) POI at Deaf Smith #10	Farwell 69kV circuit (open) Lariat 69kV circuit (closed)	System Intact	MVA	203.59	201.44	201.70	202.07	201.60
			SCR	2.43	2.41	2.41	2.41	2.41
		Bailey Co. 115/69kV transformer	MVA	177.29	173.86	173.29	175.99	172.57
			SCR	2.12	2.08	2.07	2.10	2.06
		Bailey Co. to Curry 115kV	MVA	182.22	178.88	179.23	179.37	178.52
			SCR	2.18	2.14	2.14	2.14	2.13
		Bailey Co. to Plant X or East Muleshoe & Valley Tap 115kV	MVA	147.02	144.82	143.67	147.09	141.67
			SCR	1.76	1.73	1.72	1.76	1.69
	Farwell 69kV circuit (closed) Lariat 69kV circuit (open)	System Intact	MVA	232.86	233.54	233.63	232.06	233.68
			SCR	2.78	2.79	2.79	2.77	2.79
		Bailey Co. to Curry 115kV	MVA	229.88	231.47	231.06	229.26	231.40
			SCR	2.75	2.77	2.76	2.74	2.76
		Curry Co. 115/69kV transformer	MVA	175.20	175.00	173.95	174.71	173.52
			SCR	2.09	2.09	2.08	2.09	2.07
		Curry to Deaf Smith #20 115kV	MVA	229.78	231.71	231.84	229.71	230.99
			SCR	2.75	2.77	2.77	2.74	2.76
		Curry to Roosevelt 115kV	MVA	225.11	224.06	223.17	223.08	223.33
			SCR	2.69	2.68	2.67	2.67	2.67
GEN-2014-010 (129.6MW) POI at Deaf Smith #20	Curry 115kV circuit (closed) Parmer Co. 115kV circuit (closed)	System Intact	MVA	945.36	935.53	936.19	934.98	943.06
			SCR	7.29	7.22	7.22	7.21	7.28
		Bailey Co. to Plant X or East Muleshoe & Valley Tap 115kV	MVA	913.38	901.61	899.36	904.78	905.68
			SCR	7.05	6.96	6.94	6.98	6.99
		Curry to Deaf Smith #20 115kV	MVA	270.30	258.98	255.54	268.38	266.94
			SCR	2.09	2.00	1.97	2.07	2.06
		Deaf Smith #20 to Parmer Co. 115kV	MVA	690.38	691.04	694.94	683.02	690.31
			SCR	5.33	5.33	5.36	5.27	5.33

To achieve dynamic simulations that exhibit a moderate amount of non-converged solution iterations, network upgrades and project enhancements were explored as follows:

- Install 20Mvar CSTATT (STATCON/STATCOM) static condenser dynamic reactive device on the GEN-2014-009 34.5kV bus of its 34.5/69kV substation
- Reduce the project size of GEN-2014-009 to 43.2MW (16 wind turbines)

Although a reduction in the GEN-2014-009 project size would result in a moderate amount of non-converged solution iterations, this option was not further pursued in this study as the GEN-2014-009 request was for 83.7MW. Additional reactive equipment was not found to be necessary for GEN-2014-010 to achieve simulation convergence following fault removal.

Transmission System Stability issues were observed with several studied contingencies as noted in ***Table* 3-3**. Most notable of the issues was low voltage associated with transmission line faults causing the outage of the TUCO Interchange to GEN-2014-007 Tap 345kV transmission line. The outage of this line segment caused voltage depression at the Oklaunion 345kV bus. 345kV transmission reactive power reinforcement is required to alleviate this potential voltage instability. The transmission reactive power reinforcement required is the following:

- TUCO Interchange to GEN-2014-007 345kV Substation 345kV transmission line second circuit.

With all Base Case Network Upgrades in service, previously assigned Network Upgrades in service, and the above listed newly assigned Network Upgrades in service, the Group 6 projects were found to remain on line, and the transmission system was found to remain stable for all conditions studied. The wind turbine generators in GEN-2014-009 and GEN-2014-010 have the capability of pre-contingency voltage recovery, and the post fault voltage recovery was found to be within the criterion of 0.7 pu to 1.2 pu.

The transmission reinforcement listed above were added into the models and all simulations were performed again. These results are listed in ***Table* 3-4**. The results indicate that the transmission system remained stable for all fault contingencies studied.

***Table* 3-3*:* Stability Analysis Results without Additional System Upgrades**

	Contingency Number and Name	2014WP	2015SP	2019SP	2019WP	2024SP
1	FLT_001_DS102_FARWELL2_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
2	FLT_002_DS102_FARWELL2_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
3	FLT_003_CURRY3_BAILEYCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
4	FLT_004_CURRY3_BAILEYCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
5	FLT_005_P4CURRWCLOCURR_CURRY3_69_115kV_1PH	UNSTABLE	UNSTABLE	UNSTABLE	UNSTABLE	STABLE
6	FLT_006_CURRY2_CURRY3_69_115kV_3PH	UNSTABLE	UNSTABLE	UNSTABLE	UNSTABLE	STABLE
7	FLT_007_MULESHCTY2_WMULESH_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
8	FLT_008_MULESHCTY2_WMULESH_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
9	FLT_009_DS102_LARIAT2_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
10	FLT_010_DS102_LARIAT2_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
11	FLT_011_BAILEYCO3_PLANTX3_115kV_3PH	STABLE	STABLE	N/A	N/A	N/A
12	FLT_012_BAILEYCO3_PLANTX3_115kV_1PH	STABLE	STABLE	N/A	N/A	N/A
13	FLT_013_P4BAILEMVTBAIL_BAILEYCO3_69_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
14	FLT_014_BAILEYCO2_BAILEYCO3_69_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
15	FLT_015_DS203_CURRY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
16	FLT_016_DS203_CURRY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
17	FLT_017_DS203_CURRY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
18	FLT_018_DS203_CURRY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
19	FLT_019_P4CURRDS20CURR_CURRY2_115_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
20	FLT_020_CURRY3_FECLOVIS23_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
21	FLT_021_CURRY3_FECLOVIS23_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
22	FLT_022_CURRY3_ECLOVIS3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
23	FLT_023_CURRY3_ECLOVIS3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
24	FLT_024_CURRY3_NORRISTP3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
25	FLT_025_CURRY3_NORRISTP3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
26	FLT_026_CURRY3_ROOSEVELT3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
27	FLT_027_CURRY3_ROOSEVELT3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
28	FLT_028_ROOSEVELT3_PORTALES3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
29	FLT_029_ROOSEVELT3_PORTALES3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
30	FLT_030_ROOSEVELT3_ROSEVELTN6_115_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
31	FLT_031_ROSEVELTN6_TOLKWEST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
32	FLT_032_ROSEVELTN6_TOLKWEST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
33	FLT_033_TOLKTAP6_TOLK7_230_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
34	FLT_034_G08022TAP_EDDYCNTY7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
35	FLT_035_G08022TAP_EDDYCNTY7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE

***Table* 3-3: Stability Analysis Results without Additional System Upgrades**

	Contingency Number and Name	2014WP	2015SP	2019SP	2019WP	2024SP
36	FLT_036_TUCOINT6_TOLKEAST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
37	FLT_037_TUCOINT6_TOLKEAST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
38	FLT_038_TUCOINT7_OKU7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
39	FLT_039_TUCOINT7_OKU7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
40	FLT_040_TUCOINT7_G14007TAP_345kV_3PH	STABLE	STABLE	UNSTABLE	UNSTABLE	STABLE
41	FLT_041_TUCOINT7_G14007TAP_345kV_1PH	STABLE	STABLE	UNSTABLE	UNSTABLE	STABLE
42	FLT_042_TUCOINT7_TUCOINT6_345_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
43	FLT_043_CHISHOLM7_WWRDEHV7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
44	FLT_044_CHISHOLM7_WWRDEHV7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
45	FLT_045_CHISHOLM7_GRACMNT7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
46	FLT_046_CHISHOLM7_GRACMNT7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
47	FLT_047_CHISHOLM7_CHISHOLM6_345_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
48	FLT_048_ROSEVELTN6_PLSNTHILL6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
49	FLT_049_ROSEVELTN6_PLSNTHILL6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
50	FLT_050_PLSNTHILL6_OASIS6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
51	FLT_051_PLSNTHILL6_OASIS6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
52	FLT_052_OASIS6_SANJANHVB1_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
53	FLT_053_OASIS6_SANJANHVB1_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
54	FLT_054_SANJANHVB1_CHAVESCNTY6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
55	FLT_055_SANJANHVB1_CHAVESCNTY6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
56	FLT_056_OASIS6_SW4K336_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
57	FLT_057_OASIS6_SW4K336_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
58	FLT_058_OASIS6_OASIS3_230_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
59	FLT_059_PLSNTHILL6_PLSNTHILL3_230_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
60	FLT_060_ROSEVELTN6_SW4K336_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
61	FLT_061_ROSEVELTN6_SW4K336_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
62	FLT_062_SW4K336_ROSEVELTS6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
63	FLT_063_SW4K336_ROSEVELTS6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
64	FLT_064_ROSEVELTS6_TOLKEAST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
65	FLT_065_ROSEVELTS6_TOLKEAST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
66	FLT_066_CURRY3_BAILEYCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
67	FLT_067_CURRY3_BAILEYCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
68	FLT_068_BAILEYCO3_PLANTX3_115kV_3PH	UNSTABLE	UNSTABLE	N/A	N/A	N/A
69	FLT_069_BAILEYCO3_PLANTX3_115kV_1PH	UNSTABLE	UNSTABLE	N/A	N/A	N/A
70	FLT_070_BAILEYCO3_EMUVLYTP3_115kV_3PH	N/A	N/A	UNSTABLE	UNSTABLE	UNSTABLE
71	FLT_071_BAILEYCO3_EMUVLYTP3_115kV_1PH	N/A	N/A	UNSTABLE	UNSTABLE	UNSTABLE
72	FLT_072_EMUVLYTP3_PLANTX3_115kV_1PH	N/A	N/A	UNSTABLE	UNSTABLE	UNSTABLE
73	FLT_073_EMUVLYTP3_PLANTX3_115kV_1PH	N/A	N/A	UNSTABLE	UNSTABLE	UNSTABLE
74	FLT_074_PLANTX3_LCSOLTON3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
75	FLT_075_PLANTX3_LCSOLTON3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
76	FLT_076_PLANTX3_BCEARTH3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
77	FLT_077_PLANTX3_BCEARTH3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
78	FLT_078_P4PLANBCEAPLAN_PLANTX6_115_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
79	FLT_079_PLANTX3_LAMBCNTY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
80	FLT_080_PLANTX3_LAMBCNTY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
81	FLT_081_PLANTX3_HALECNTY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
82	FLT_082_PLANTX3_HALECNTY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
83	FLT_083_PLANTX3_PLANTX6_115_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
84	FLT_084_PLANTX6_DEAFSMITH6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
85	FLT_085_PLANTX6_DEAFSMITH6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
86	FLT_086_PLANTX6_TOLKEAST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
87	FLT_087_PLANTX6_TOLKEAST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
88	FLT_088_PLANTX6_TOLKWEST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
89	FLT_089_PLANTX6_TOLKWEST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
90	FLT_090_P6PLANTX6_TOLKWEST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
91	FLT_091_P7PLANTX6_TOLKWEST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE

***Table* 3-3: Stability Analysis Results without Additional System Upgrades**

	Contingency Number and Name	2014WP	2015SP	2019SP	2019WP	2024SP
92	FLT_092_BUSHLAND6_BUSHLAND3_230_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
93	FLT_093_HEREFORD3_HEREFORD2_115_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
94	FLT_094_PLANTX6_SUNDOWN6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
95	FLT_095_PLANTX6_SUNDOWN6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
96	FLT_096_PLANTX6_BUSHLANDS_230kV_3PH	STABLE	N/A	N/A	N/A	N/A
97	FLT_097_PLANTX6_BUSHLANDS_230kV_1PH	STABLE	N/A	N/A	N/A	N/A
98	FLT_098_PLANTX6_NEWHART6_230kV_3PH	N/A	STABLE	STABLE	STABLE	STABLE
99	FLT_099_PLANTX6_NEWHART6_230kV_1PH	N/A	STABLE	STABLE	STABLE	STABLE
100	FLT_100_DS203_PARMERCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
101	FLT_101_DS203_PARMERCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
102	FLT_102_DS63_HEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
103	FLT_103_DS63_HEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
104	FLT_104_P4HEREDS6HERE_HEREFORD2_115_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
105	FLT_105_HEREFORD3_NEHEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
106	FLT_106_HEREFORD3_NEHEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
107	FLT_107_HEREFORD3_DEAFSMITH3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
108	FLT_108_HEREFORD3_DEAFSMITH3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
109	FLT_109_P6HEREFORD3_DEAFSMITH3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
110	FLT_110_P7HEREFORD3_DEAFSMITH3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
111	FLT_111_DEAFSMITH3_NEHEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
112	FLT_112_DEAFSMITH3_NEHEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
113	FLT_113_DEAFSMITH3_PANDAHFD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
114	FLT_114_DEAFSMITH3_PANDAHFD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
115	FLT_115_DEAFSMITH3_DS213_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
116	FLT_116_DEAFSMITH3_DS213_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
117	FLT_117_DEAFSMITH3_DEAFSMITH6_115_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
118	FLT_118_DEAFSMITH6_BUSHLAND6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
119	FLT_119_DEAFSMITH6_BUSHLAND6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
120	FLT_120_BUSHLAND6_POTTERCO6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
121	FLT_121_BUSHLAND6_POTTERCO6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
122	FLT_122_POTTERCO6_POTTERCO7_230_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
123	FLT_123_POTTERCO7_HITCHLAND7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
124	FLT_124_POTTERCO7_HITCHLAND7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
125	FLT_125_HITCHLAND7_BEAVERCO_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
126	FLT_126_HITCHLAND7_BEAVERCO_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
127	FLT_127_HITCHLAND7_FINNEY7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
128	FLT_128_HITCHLAND7_FINNEY7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
129	FLT_129_FINNEY7_HOLCOMB7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
130	FLT_130_FINNEY7_HOLCOMB7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
131	FLT_131_HITCHLAND7_HITCHLAND6_345_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
132	FLT_132_BUSHLAND6_BUSHLANDS_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
133	FLT_133_BUSHLAND6_BUSHLANDS_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
134	FLT_134_DS203_PARMERCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
135	FLT_135_DS203_PARMERCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
136	FLT_136_CURRY3_FECLOVIS23_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
137	FLT_137_CURRY3_FECLOVIS23_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
138	FLT_138_CURRY3_ECLOVIS3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
139	FLT_139_CURRY3_ECLOVIS3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
140	FLT_140_CURRY3_NORRISTP3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
141	FLT_141_CURRY3_NORRISTP3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
142	FLT_142_CURRY3_ROOSEVELT3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
143	FLT_143_CURRY3_ROOSEVELT3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
144	FLT_144_BAILEYCO3_EMUVLYTP3_115kV_3PH	N/A	N/A	STABLE	STABLE	STABLE
145	FLT_145_BAILEYCO3_EMUVLYTP3_115kV_1PH	N/A	N/A	STABLE	STABLE	STABLE
146	FLT_146_EMUVLYTP3_PLANTX3_115kV_3PH	N/A	N/A	STABLE	STABLE	STABLE
147	FLT_147_EMUVLYTP3_PLANTX3_115kV_1PH	N/A	N/A	STABLE	STABLE	STABLE

Table 3-3: Stability Analysis Results without Additional System Upgrades

	Contingency Number and Name	2014WP	2015SP	2019SP	2019WP	2024SP
148	FLT_148_HEREFORD3_NEHEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
149	FLT_149_HEREFORD3_NEHEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE

Table 3-4: Stability Analysis Results with Required Reactive Power Devices and Additional System Upgrades

	Contingency Number and Name	2014WP	2015SP	2019SP	2019WP	2024SP
1	FLT_001_DS102_FARWELL2_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
2	FLT_002_DS102_FARWELL2_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
3	FLT_003_CURRY3_BAILEYCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
4	FLT_004_CURRY3_BAILEYCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
5	FLT_005_P4CURRWCLOCURR_CURRY3_69_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
6	FLT_006_CURRY2_CURRY3_69_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
7	FLT_007_MULESHCTY2_WMULESH_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
8	FLT_008_MULESHCTY2_WMULESH_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
9	FLT_009_DS102_LARIAT2_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
10	FLT_010_DS102_LARIAT2_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
11	FLT_011_BAILEYCO3_PLANTX3_115kV_3PH	STABLE	STABLE	N/A	N/A	N/A
12	FLT_012_BAILEYCO3_PLANTX3_115kV_1PH	STABLE	STABLE	N/A	N/A	N/A
13	FLT_013_P4BAILEMVTBAIL_BAILEYCO3_69_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
14	FLT_014_BAILEYCO2_BAILEYCO3_69_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
15	FLT_015_DS203_CURRY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
16	FLT_016_DS203_CURRY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
17	FLT_017_DS203_CURRY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
18	FLT_018_DS203_CURRY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
19	FLT_019_P4CURRDS20CURR_CURRY2_115_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
20	FLT_020_CURRY3_FECLOVIS23_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
21	FLT_021_CURRY3_FECLOVIS23_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
22	FLT_022_CURRY3_ECLOVIS3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
23	FLT_023_CURRY3_ECLOVIS3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
24	FLT_024_CURRY3_NORRISTP3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
25	FLT_025_CURRY3_NORRISTP3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
26	FLT_026_CURRY3_ROOSEVELT3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
27	FLT_027_CURRY3_ROOSEVELT3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
28	FLT_028_ROOSEVELT3_PORTALES3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
29	FLT_029_ROOSEVELT3_PORTALES3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
30	FLT_030_ROOSEVELT3_ROSEVELTN6_115_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
31	FLT_031_ROSEVELTN6_TOLKWEST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
32	FLT_032_ROSEVELTN6_TOLKWEST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
33	FLT_033_TOLKTAP6_TOLK7_230_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
34	FLT_034_G08022TAP_EDDYCNTY7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
35	FLT_035_G08022TAP_EDDYCNTY7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
36	FLT_036_TUCOINT6_TOLKEAST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
37	FLT_037_TUCOINT6_TOLKEAST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
38	FLT_038_TUCOINT7_OKU7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
39	FLT_039_TUCOINT7_OKU7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
40	FLT_040_TUCOINT7_G14007TAP_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
41	FLT_041_TUCOINT7_G14007TAP_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
42	FLT_042_TUCOINT7_TUCOINT6_345_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
43	FLT_043_CHISHOLM7_WWRDEHV7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
44	FLT_044_CHISHOLM7_WWRDEHV7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
45	FLT_045_CHISHOLM7_GRACMNT7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
46	FLT_046_CHISHOLM7_GRACMNT7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE

Table 3-4: Stability Analysis Results with Required Reactive Power Devices and Additional System Upgrades

	Contingency Number and Name	2014WP	2015SP	2019SP	2019WP	2024SP
47	FLT_047_CHISHOLM7_CHISHOLM6_345_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
48	FLT_048_ROSEVELTN6_PLSNTHILL6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
49	FLT_049_ROSEVELTN6_PLSNTHILL6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
50	FLT_050_PLSNTHILL6_OASIS6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
51	FLT_051_PLSNTHILL6_OASIS6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
52	FLT_052_OASIS6_SANJANHVB1_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
53	FLT_053_OASIS6_SANJANHVB1_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
54	FLT_054_SANJANHVB1_CHAVESCNTY6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
55	FLT_055_SANJANHVB1_CHAVESCNTY6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
56	FLT_056_OASIS6_SW4K336_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
57	FLT_057_OASIS6_SW4K336_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
58	FLT_058_OASIS6_OASIS3_230_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
59	FLT_059_PLSNTHILL6_PLSNTHILL3_230_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
60	FLT_060_ROSEVELTN6_SW4K336_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
61	FLT_061_ROSEVELTN6_SW4K336_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
62	FLT_062_SW4K336_ROSEVELTS6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
63	FLT_063_SW4K336_ROSEVELTS6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
64	FLT_064_ROSEVELTS6_TOLKEAST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
65	FLT_065_ROSEVELTS6_TOLKEAST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
66	FLT_066_CURRY3_BAILEYCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
67	FLT_067_CURRY3_BAILEYCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
68	FLT_068_BAILEYCO3_PLANTX3_115kV_3PH	STABLE	STABLE	N/A	N/A	N/A
69	FLT_069_BAILEYCO3_PLANTX3_115kV_1PH	STABLE	STABLE	N/A	N/A	N/A
70	FLT_070_BAILEYCO3_EMUVLYTP3_115kV_3PH	N/A	N/A	STABLE	STABLE	STABLE
71	FLT_071_BAILEYCO3_EMUVLYTP3_115kV_1PH	N/A	N/A	STABLE	STABLE	STABLE
72	FLT_072_EMUVLYTP3_PLANTX3_115kV_1PH	N/A	N/A	STABLE	STABLE	STABLE
73	FLT_073_EMUVLYTP3_PLANTX3_115kV_1PH	N/A	N/A	STABLE	STABLE	STABLE
74	FLT_074_PLANTX3_LCSOLTON3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
75	FLT_075_PLANTX3_LCSOLTON3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
76	FLT_076_PLANTX3_BCEARTH3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
77	FLT_077_PLANTX3_BCEARTH3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
78	FLT_078_P4PLANBCEAPLAN_PLANTX6_115_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
79	FLT_079_PLANTX3_LAMBCNTY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
80	FLT_080_PLANTX3_LAMBCNTY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
81	FLT_081_PLANTX3_HALECNTY3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
82	FLT_082_PLANTX3_HALECNTY3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
83	FLT_083_PLANTX3_PLANTX6_115_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
84	FLT_084_PLANTX6_DEAFSMITH6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
85	FLT_085_PLANTX6_DEAFSMITH6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
86	FLT_086_PLANTX6_TOLKEAST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
87	FLT_087_PLANTX6_TOLKEAST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
88	FLT_088_PLANTX6_TOLKWEST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
89	FLT_089_PLANTX6_TOLKWEST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
90	FLT_090_P6PLANTX6_TOLKWEST6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
91	FLT_091_P7PLANTX6_TOLKWEST6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
92	FLT_092_BUSHLAND6_BUSHLAND3_230_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
93	FLT_093_HEREFORD3_HEREFORD2_115_69kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
94	FLT_094_PLANTX6_SUNDOWN6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
95	FLT_095_PLANTX6_SUNDOWN6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
96	FLT_096_PLANTX6_BUSHLANDS_230kV_3PH	STABLE	N/A	N/A	N/A	N/A
97	FLT_097_PLANTX6_BUSHLANDS_230kV_1PH	STABLE	N/A	N/A	N/A	N/A
98	FLT_098_PLANTX6_NEWHART6_230kV_3PH	N/A	STABLE	STABLE	STABLE	STABLE
99	FLT_099_PLANTX6_NEWHART6_230kV_1PH	N/A	STABLE	STABLE	STABLE	STABLE
100	FLT_100_DS203_PARMERCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE

Table 3-4: Stability Analysis Results with Required Reactive Power Devices and Additional System Upgrades

Contingency Number and Name		2014WP	2015SP	2019SP	2019WP	2024SP
101	FLT_101_DS203_PARMERCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
102	FLT_102_DS63_HEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
103	FLT_103_DS63_HEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
104	FLT_104_P4HEREDS6HERE_HEREFORD2_115_69kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
105	FLT_105_HEREFORD3_NEHEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
106	FLT_106_HEREFORD3_NEHEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
107	FLT_107_HEREFORD3_DEAFSMITH3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
108	FLT_108_HEREFORD3_DEAFSMITH3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
109	FLT_109_P6HEREFORD3_DEAFSMITH3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
110	FLT_110_P7HEREFORD3_DEAFSMITH3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
111	FLT_111_DEAFSMITH3_NEHEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
112	FLT_112_DEAFSMITH3_NEHEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
113	FLT_113_DEAFSMITH3_PANDAHFD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
114	FLT_114_DEAFSMITH3_PANDAHFD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
115	FLT_115_DEAFSMITH3_DS213_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
116	FLT_116_DEAFSMITH3_DS213_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
117	FLT_117_DEAFSMITH3_DEAFSMITH6_115_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
118	FLT_118_DEAFSMITH6_BUSHLAND6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
119	FLT_119_DEAFSMITH6_BUSHLAND6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
120	FLT_120_BUSHLAND6_POTTERCO6_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
121	FLT_121_BUSHLAND6_POTTERCO6_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
122	FLT_122_POTTERCO6_POTTERCO7_230_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
123	FLT_123_POTTERCO7_HITCHLAND7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
124	FLT_124_POTTERCO7_HITCHLAND7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
125	FLT_125_HITCHLAND7_BEAVERCO_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
126	FLT_126_HITCHLAND7_BEAVERCO_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
127	FLT_127_HITCHLAND7_FINNEY7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
128	FLT_128_HITCHLAND7_FINNEY7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
129	FLT_129_FINNEY7_HOLCOMB7_345kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
130	FLT_130_FINNEY7_HOLCOMB7_345kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
131	FLT_131_HITCHLAND7_HITCHLAND6_345_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
132	FLT_132_BUSHLAND6_BUSHLANDS_230kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
133	FLT_133_BUSHLAND6_BUSHLANDS_230kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
134	FLT_134_DS203_PARMERCO3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
135	FLT_135_DS203_PARMERCO3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
136	FLT_136_CURRY3_FECLOVIS23_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
137	FLT_137_CURRY3_FECLOVIS23_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
138	FLT_138_CURRY3_ECLOVIS3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
139	FLT_139_CURRY3_ECLOVIS3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
140	FLT_140_CURRY3_NORRISTP3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
141	FLT_141_CURRY3_NORRISTP3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
142	FLT_142_CURRY3_ROOSEVELT3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
143	FLT_143_CURRY3_ROOSEVELT3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE
144	FLT_144_BAILEYCO3_EMUVLYTP3_115kV_3PH	N/A	N/A	STABLE	STABLE	STABLE
145	FLT_145_BAILEYCO3_EMUVLYTP3_115kV_1PH	N/A	N/A	STABLE	STABLE	STABLE
146	FLT_146_EMUVLYTP3_PLANTX3_115kV_3PH	N/A	N/A	STABLE	STABLE	STABLE
147	FLT_147_EMUVLYTP3_PLANTX3_115kV_1PH	N/A	N/A	STABLE	STABLE	STABLE
148	FLT_148_HEREFORD3_NEHEREFORD3_115kV_3PH	STABLE	STABLE	STABLE	STABLE	STABLE
149	FLT_149_HEREFORD3_NEHEREFORD3_115kV_1PH	STABLE	STABLE	STABLE	STABLE	STABLE

FERC LVRT Compliance

FERC Order #661A places specific requirements on wind farms through its Low Voltage Ride Through (LVRT) provisions. For Interconnection Agreements signed after December 31, 2006, wind farms shall stay on line for faults at the POI that draw the voltage down at the POI to 0.0 pu.

Fault contingencies were developed to verify that wind farms remain on line when the POI voltage is drawn down to 0.0 pu. These contingencies are shown in ***Table* 3-5**.

***Table* 3-5*:* Summary of LVRT Analysis**

Contingency Number and Name		Description
1	FLT_001_DS102_FARWELL2_69kV_3PH	Alternate system configuration: Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Farwell (524846) to Curry (524821) 69kV line. 3 phase fault on the Deaf Smith #10 (524853) to Farwell (524846) 69kV line, near Deaf Smith #10.
9	FLT_009_DS102_LARIAT2_69kV_3PH	Alternate system configuration: Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open the Lariat (524987) to BC-Lariat (524994) 69kV line. 3 phase fault on the Deaf Smith #10 (524853) to Lariat (524987) 69kV line, near Deaf Smith #10.
15	FLT_015_DS203_CURRY3_115kV_3PH	Alternate system configuration: Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. 3 phase fault on the Deaf Smith #20 (524669) to Curry (524822) 115kV line, near Deaf Smith #20.
17	FLT_017_DS203_CURRY3_115kV_3PH	3 phase fault on the Deaf Smith #20 (524669) to Curry (524822) 115kV line, near Deaf Smith #20.
100	FLT_100_DS203_PARMERCO3_115kV_3PH	3 phase fault on the Deaf Smith #20 (524669) to Parmer County (524662) 115kV line, near Deaf Smith #20.
134	FLT_134_DS203_PARMERCO3_115kV_3PH	Alternate system configuration: Close-in the Deaf Smith #10 (524853) to Farwell (524846) 69kV line and open Deaf Smith #10 (524853) to Lariat (524987) 69kV line. 3 phase fault on the Deaf Smith #20 (524669) to Parmer County (524662) 115kV line, near Deaf Smith #20.

The required prior queued project wind farms remained online for the fault contingencies described in this section as well as the fault contingencies described in the Disturbances section of this report. GEN-2014-009 and GEN-2014-010 were found to be in compliance with FERC Order #661A.

4. Power Factor Analysis

The power factor analysis was performed for each wind project included in this study and is designed to demonstrate the reactive power requirements at the point of interconnection (POI). For all wind projects that require reactive power, the final requirement in the GIA will be the pro-forma 95% lagging to 95% leading at the POI.

Model Preparation

For each wind project included in this study, as well as previous queued projects modeled at the same POI, the wind projects were turned off for the power factor analysis. The wind farms were replaced by an equivalent generator located at the POI producing the total MW of the wind farms at that POI and 0.0 var capability.

A var generator without limits was modeled at the wind farm's POI to hold a voltage schedule at the POI consistent with the greater of the voltage schedule in the base case or unity (1.0 pu) voltage.

Disturbances

Each N-1 contingency evaluated in the Stability Analysis found in **Table 3-1** was also included in the determination of the power factor requirements.

Results

The power factor ranges are summarized in ***Table* 4-1** and the resultant ranges are shown in Appendix F and Appendix G for each contingency. Since the analysis showed that reactive power is required for each of the study projects, the final requirement in the Generation Interconnection Agreement (GIA) for each project will be the pro-forma 95% lagging to 95% leading at the POI.

***Table* 4-1*:* Summary of Power Factor Analysis at the POI**

Request	Capacity	POI	Fuel	Generator	Leading (absorbing vars)	Lagging (providing vars)
GEN-2014-009	83.7	Deaf Smith #10 69kV substation (bus 524853)	Wind	Alstom ECO122 2.7MW	0.9217	0.99996
GEN-2014-010	129.6	Deaf Smith #20 115kV substation (bus 524669)	Wind	Alstom ECO122 2.7MW	0.9235	0.9992

NOTE: 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.

5. Reduced Generation Analysis

Interconnection requests for wind generation projects that interconnect to a 345kV or 230kV bus on the SPP system are analyzed for the capacitive charging effects during reduced generation conditions (unsuitable wind speeds, curtailment, etc.) at the generation site.

Model Preparation

The project generators and capacitors (if any), and all other wind projects that share the same POI, were turned off in the base case. The resulting reactive power injection into the transmission network comes from the capacitance of the project's transmission lines and collector cables. This reactive power injection is measured at the POI. Shunt reactors were added at the study project substation low voltage bus to bring the Mvar flow into the POI down to approximately zero.

Results

A final shunt reactor requirement for each of the studied interconnection requests is shown in ***Table* 5-1**. There were no projects interconnection into a 345kV or 230kV substation thus this analysis did not analyze the capacitive charging effects during reduced generation conditions.

***Table* 5-1*:* Summary of Shunt Reactor Requirements**

Request	Capacity	POI	Approximate Shunt Reactor Required
GEN-2014-009	83.7	Deaf Smith #10 69kV substation (bus 524853)	N/A
GEN-2014-010	129.6	Deaf Smith #20 115kV substation (bus 524669)	N/A

6. Conclusion

PISIS-2014-001 Interconnection Customers have requested a Preliminary Interconnection System Impact Study detailing the impacts of interconnecting generation to the SPP Transmission System.

Numerical instability was observed with the Alstom ECO 122 Wind Turbine Generators for several contingencies as noted in ***Table*** **3-3**. To achieve dynamic simulations that exhibit a moderate amount of non-converged solution iterations, network upgrades and project enhancements were explored as follows:

- Install 20Mvar CSTATT static condenser dynamic reactive device on GEN-2014-009 34.5kV substation
- Reduce the project size of GEN-2014-009 to 43.2MW (16 wind turbines)

Although a reduction in the GEN-2014-009 project size would result in a moderate amount of non-converged solution iterations, this option was not further pursued in this study as the GEN-2014-009 request was for 83.7MW.

Transmission System Stability issues were observed with several studied contingencies as noted in ***Table*** **3-3**. Most notable of the issues was low voltage associated with transmission line faults causing the outage of the TUCO Interchange to GEN-2014-007 Tap 345kV transmission line. The outage of this line segment caused voltage depression at the Oklaunion 345kV bus. 345kV transmission reactive power reinforcement is required to alleviate this potential voltage instability. The transmission reactive power reinforcement required is the following:

- TUCO Interchange to GEN-2014-007 Tap 345kV transmission line second circuit.

With all Base Case Network Upgrades in service, previously assigned Network Upgrades in service, and the newly assigned Network Upgrades and reactive power equipment in service, the Group 6 projects were found to be stable for all contingencies studied. The wind turbine generators in GEN-2014-009 and GEN-2014-010 have the capability of pre-contingency voltage recovery, and the post fault voltage recovery was found to be within the criterion of 0.7 pu to 1.2 pu.

A power factor analysis was performed for each interconnection project. All five study cases, 2014 winter, 2015 summer, 2019 summer, 2019 winter, and 2024 summer peak conditions were used in the analyses. The power factor analyses showed that GEN-2014-009 and GEN-2014-010 will be required to provide the pro-forma standard 0.95 leading (absorbing) to 0.95 lagging (supplying) at their respective Point of Interconnection (POI).

A reduced generation analysis was not performed for the interconnection requests as there were no projects interconnecting into a 345kV or 230kV substation. It is the responsibility of the Interconnection Customer to determine if additional reactive equipment is necessary to achieve the requirements at the POI.

The Low Voltage Ride Through (LVRT) analysis showed that none of the interconnection requests in this study tripped offline when their respective POI's were faulted to draw the POI voltage down to 0.0 pu. Therefore, each interconnection request in this study meets the FECR Order #661 requirement.

All generators in the monitored areas remained stable for all of the modeled disturbances.

Any changes to the assumptions made in this study, for example, one or more of the previously queued requests withdraw, may require a re-study at the expense of the Customer.

Nothing in this study should be construed as a guarantee of delivery or transmission service. If the customer wishes to sell power from the facility, a separate request for transmission service must be requested on Southwest Power Pool's OASIS by the Customer.

Appendix A – 2014 Winter Peak Stability Plots

(Available on request)

Appendix B – 2015 Summer Peak Stability Plots

(Available on request)

Appendix C – 2019 Summer Peak Stability Plots

(Available on request)

Appendix D – 2019 Winter Peak Stability Plots

(Available on request)

Appendix E – 2024 Summer Peak Stability Plots

(Available on request)

Appendix F – Power Factor Analysis for GEN-2014-009

Table F-1: GEN-2014-009 Power Factor Analysis Results

PISIS-2014-001 Group 06 - GEN-2014-009 POI - DS-#10 2 - 69.0kV (524853)			2014 Winter Voltage = 1.005 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.005pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
0	FLT_00_NoFault	83.7	-12.92	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.11	0.990	LEAD	-8.62	0.995	LEAD
1	FLT_01_DS102_FARWELL2_69kV	83.7	-13.83	0.987	LEAD	-9.06	0.994	LEAD	-8.58	0.995	LEAD	-12.16	0.990	LEAD	-8.67	0.995	LEAD
3	FLT_03_CURRY3_BAILEYCO3_115kV	83.7	-30.53	0.939	LEAD	-26.44	0.954	LEAD	-27.55	0.950	LEAD	-28.55	0.946	LEAD	-23.87	0.962	LEAD
5	FLT_05_P4CURRWCLOCURR_CURRY3_69_115kV	83.7	-22.34	0.966	LEAD	-19.74	0.973	LEAD	-19.02	0.975	LEAD	-20.94	0.970	LEAD	-18.69	0.976	LEAD
6	FLT_06_CURRY2_CURRY3_69_115kV	83.7	-22.41	0.966	LEAD	-19.50	0.974	LEAD	-18.71	0.976	LEAD	-20.87	0.970	LEAD	-18.21	0.977	LEAD
7	FLT_07_MULESHCTY2_WMULESH_69kV	83.7	-30.45	0.940	LEAD	-18.32	0.977	LEAD	-15.28	0.984	LEAD	-29.12	0.944	LEAD	-12.47	0.989	LEAD
9	FLT_09_DS102_LARIAT2_69kV	83.7	-32.30	0.933	LEAD	-26.49	0.953	LEAD	-24.07	0.961	LEAD	-31.48	0.936	LEAD	-22.05	0.967	LEAD
11	FLT_11_BAILEYCO3_PLANTX3_115kV	83.7	-31.93	0.934	LEAD	-27.06	0.952	LEAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	FLT_13_P4BAILEMVTBAIL_BAILEYCO3_69_115kV	83.7	-12.86	0.988	LEAD	-6.64	0.997	LEAD	-5.67	0.998	LEAD	-11.58	0.991	LEAD	-4.08	0.999	LEAD
14	FLT_14_BAILEYCO2_BAILEYCO3_69_115kV	83.7	-12.46	0.989	LEAD	-6.58	0.997	LEAD	-5.59	0.998	LEAD	-11.56	0.991	LEAD	-2.96	0.999	LEAD
15	FLT_15_DS203_CURRY3_115kV	83.7	-32.29	0.933	LEAD	-29.66	0.943	LEAD	-25.80	0.956	LEAD	-28.00	0.948	LEAD	-21.00	0.970	LEAD
17	FLT_17_DS203_CURRY3_115kV	83.7	-12.65	0.989	LEAD	-9.08	0.994	LEAD	-9.11	0.994	LEAD	-11.98	0.990	LEAD	-8.52	0.995	LEAD
19	FLT_19_P4CURRDS20CURR_CURRY2_115_69kV	83.7	-21.91	0.967	LEAD	-9.05	0.994	LEAD	-9.22	0.994	LEAD	-11.96	0.990	LEAD	-8.49	0.995	LEAD
20	FLT_20_CURRY3_FECLOVIS23_115kV	83.7	-13.10	0.988	LEAD	-9.19	0.994	LEAD	-9.33	0.994	LEAD	-12.45	0.989	LEAD	-8.85	0.994	LEAD
22	FLT_22_CURRY3_ECLOVIS3_115kV	83.7	-13.09	0.988	LEAD	-9.13	0.994	LEAD	-9.26	0.994	LEAD	-12.43	0.989	LEAD	-8.77	0.995	LEAD
24	FLT_24_CURRY3_NORRISTP3_115kV	83.7	-12.90	0.988	LEAD	-8.92	0.994	LEAD	-8.88	0.994	LEAD	-11.91	0.990	LEAD	-8.50	0.995	LEAD
26	FLT_26_CURRY3_ROOSEVELT3_115kV	83.7	-12.28	0.989	LEAD	-8.08	0.995	LEAD	-7.90	0.996	LEAD	-11.76	0.990	LEAD	-7.32	0.996	LEAD
28	FLT_28_ROOSEVELT3_PORTALES3_115kV	83.7	-13.00	0.988	LEAD	-8.97	0.994	LEAD	-9.07	0.994	LEAD	-12.04	0.990	LEAD	-8.55	0.995	LEAD
30	FLT_30_ROOSEVELT3_ROSEVELTN6_115_230kV	83.7	-13.47	0.987	LEAD	-7.92	0.996	LEAD	-7.82	0.996	LEAD	-11.68	0.990	LEAD	-7.06	0.996	LEAD
31	FLT_31_ROSEVELTN6_TOLKWEST6_230kV	83.7	-13.47	0.987	LEAD	-9.61	0.993	LEAD	-9.33	0.994	LEAD	-12.37	0.989	LEAD	-8.49	0.995	LEAD
33	FLT_33_TOLKTAP6_TOLK7_230_345kV	83.7	-12.82	0.988	LEAD	-8.74	0.995	LEAD	-8.75	0.995	LEAD	-11.94	0.990	LEAD	-8.52	0.995	LEAD
34	FLT_34_G08022TAP_EDDYCNTY7_345kV	83.7	-12.78	0.989	LEAD	-8.66	0.995	LEAD	-8.55	0.995	LEAD	-11.58	0.991	LEAD	-7.38	0.996	LEAD
36	FLT_36_TUCOINT6_TOLKEAST6_230kV	83.7	-13.00	0.988	LEAD	-9.03	0.994	LEAD	-9.16	0.994	LEAD	-11.73	0.990	LEAD	-8.66	0.995	LEAD
38	FLT_38_TUCOINT7_OKU7_345kV	83.7	-12.95	0.988	LEAD	-9.01	0.994	LEAD	-9.10	0.994	LEAD	-12.74	0.989	LEAD	-8.63	0.995	LEAD

Table F-1: GEN-2014-009 Power Factor Analysis Results

	PISIS-2014-001 Group 06 - GEN-2014-009 POI - DS-#10 2 - 69.0kV (524853)		2014 Winter Voltage = 1.005 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.005pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
40	FLT_40_TUCOINT7_G14007TAP_345kV	83.7	-12.96	0.988	LEAD	-9.01	0.994	LEAD			-9.13	0.994	LEAD	- 12.64	0.989	LEAD	-8.64
42	FLT_42_TUCOINT7_TUCOINT6_345_230kV	83.7	-12.92	0.988	LEAD	-9.02	0.994	LEAD	-9.12	0.994	LEAD	-12.08	0.990	LEAD	-8.62	0.995	LEAD
43	FLT_43_CHISHOLM7_WWRDEHV7_345kV	83.7	-12.92	0.988	LEAD	-9.02	0.994	LEAD	-9.12	0.994	LEAD	-11.94	0.990	LEAD	-8.62	0.995	LEAD
45	FLT_45_CHISHOLM7_GRACMNT7_345kV	83.7	-12.92	0.988	LEAD	-9.02	0.994	LEAD	-9.12	0.994	LEAD	-11.96	0.990	LEAD	-8.62	0.995	LEAD
47	FLT_47_CHISHOLM7_CHISHOLM6_345_230kV	83.7	-12.92	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.08	0.990	LEAD	-8.62	0.995	LEAD
48	FLT_48_ROSEVELTN6_PLSNTHILL6_230kV	83.7	-12.68	0.989	LEAD	-8.78	0.995	LEAD	-8.91	0.994	LEAD	-11.99	0.990	LEAD	-8.36	0.995	LEAD
50	FLT_50_PLSNTHILL6_OASIS6_230kV	83.7	-12.82	0.988	LEAD	-8.89	0.994	LEAD	-9.00	0.994	LEAD	-12.03	0.990	LEAD	-8.51	0.995	LEAD
52	FLT_52_OASIS6_SANJANHVB1_230kV	83.7	-13.07	0.988	LEAD	-9.11	0.994	LEAD	-8.93	0.994	LEAD	-11.66	0.990	LEAD	-8.80	0.995	LEAD
54	FLT_54_SANJANHVB1_CHAVESCNTY6_230kV	83.7	-13.19	0.988	LEAD	-9.15	0.994	LEAD	-9.08	0.994	LEAD	-12.61	0.989	LEAD	-8.76	0.995	LEAD
56	FLT_56_OASIS6_SW4K336_230kV	83.7	-12.70	0.989	LEAD	-8.67	0.995	LEAD	-8.83	0.994	LEAD	-11.75	0.990	LEAD	-8.09	0.995	LEAD
58	FLT_58_OASIS6_OASIS3_230_115kV	83.7	-12.64	0.989	LEAD	-8.46	0.995	LEAD	-8.29	0.995	LEAD	-11.96	0.990	LEAD	-7.78	0.996	LEAD
59	FLT_59_PLSNTHILL6_PLSNTHILL3_230_115kV	83.7	-12.62	0.989	LEAD	-8.60	0.995	LEAD	-8.68	0.995	LEAD	-12.33	0.989	LEAD	-8.27	0.995	LEAD
60	FLT_60_ROSEVELTN6_SW4K336_230kV	83.7	-13.09	0.988	LEAD	-8.73	0.995	LEAD	-8.71	0.995	LEAD	-12.06	0.990	LEAD	-8.35	0.995	LEAD
62	FLT_62_SW4K336_ROSEVELTS6_230kV	83.7	-13.49	0.987	LEAD	-8.86	0.994	LEAD	-7.75	0.996	LEAD	-12.35	0.989	LEAD	-6.58	0.997	LEAD
64	FLT_64_ROSEVELTS6_TOLKEAST6_230kV	83.7	-13.48	0.987	LEAD	-9.43	0.994	LEAD	-9.34	0.994	LEAD	-12.35	0.989	LEAD	-8.50	0.995	LEAD
66	FLT_66_CURRY3_BAILEYCO3_115kV	83.7	-12.06	0.990	LEAD	-6.72	0.997	LEAD	-4.92	0.998	LEAD	-11.59	0.991	LEAD	-2.85	0.999	LEAD
68	FLT_68_BAILEYCO3_PLANTX3_115kV	83.7	-8.55	0.995	LEAD	-3.71	0.999	LEAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
70	FLT_70_BAILEYCO3_EMUVLYTP3_115kV	83.7	N/A	N/A	N/A	N/A	N/A	N/A	-2.91	0.999	LEAD	-7.17	0.996	LEAD	-0.52	1.000	LEAD
72	FLT_72_EMUVLYTP3_PLANTX3_115kV	83.7	N/A	N/A	N/A	N/A	N/A	N/A	-1.87	1.000	LEAD	-6.92	0.997	LEAD	0.71	1.000	LAG
74	FLT_74_PLANTX3_LCSOLTON3_115kV	83.7	-12.86	0.988	LEAD	-8.97	0.994	LEAD	-9.01	0.994	LEAD	-11.94	0.990	LEAD	-8.47	0.995	LEAD
76	FLT_76_PLANTX3_BCEARTH3_115kV	83.7	-12.89	0.988	LEAD	-8.89	0.994	LEAD	-8.86	0.994	LEAD	-12.14	0.990	LEAD	-8.29	0.995	LEAD
78	FLT_78_P4PLANBCEAPLAN_PLANTX6_115_230kV	83.7	-13.04	0.988	LEAD	-8.95	0.994	LEAD	-9.12	0.994	LEAD	-12.44	0.989	LEAD	-8.62	0.995	LEAD
79	FLT_79_PLANTX3_LAMBCNTY3_115kV	83.7	-12.90	0.988	LEAD	-9.02	0.994	LEAD	-9.12	0.994	LEAD	-12.09	0.990	LEAD	-8.59	0.995	LEAD
81	FLT_81_PLANTX3_HALECNTY3_115kV	83.7	-12.87	0.988	LEAD	-8.99	0.994	LEAD	-9.06	0.994	LEAD	-11.92	0.990	LEAD	-8.53	0.995	LEAD
83	FLT_83_PLANTX3_PLANTX6_115_230kV	83.7	-13.03	0.988	LEAD	-7.17	0.996	LEAD	-9.21	0.994	LEAD	-11.47	0.991	LEAD	-8.87	0.994	LEAD
84	FLT_84_PLANTX6_DEAFSMITH6_230kV	83.7	-12.98	0.988	LEAD	-9.00	0.994	LEAD	-9.05	0.994	LEAD	-11.87	0.990	LEAD	-8.55	0.995	LEAD
86	FLT_86_PLANTX6_TOLKEAST6_230kV	83.7	-12.95	0.988	LEAD	-9.04	0.994	LEAD	-9.16	0.994	LEAD	-11.82	0.990	LEAD	-8.67	0.995	LEAD
88	FLT_88_PLANTX6_TOLKWEST6_230kV	83.7	-12.95	0.988	LEAD	-9.04	0.994	LEAD	-9.16	0.994	LEAD	-11.80	0.990	LEAD	-8.67	0.995	LEAD
90	FLT_90_P6PLANTX6_TOLKWEST6_230kV	83.7	-13.04	0.988	LEAD	-9.05	0.994	LEAD	-9.22	0.994	LEAD	-12.05	0.990	LEAD	-8.77	0.995	LEAD
91	FLT_91_P7PLANTX6_TOLKWEST6_230kV	83.7	-13.04	0.988	LEAD	-9.05	0.994	LEAD	-9.22	0.994	LEAD	-12.05	0.990	LEAD	-8.77	0.995	LEAD

Table F-1: GEN-2014-009 Power Factor Analysis Results

	PISIS-2014-001 Group 06 - GEN-2014-009 POI - DS-#10 2 - 69.0kV (524853)		2014 Winter Voltage = 1.005 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.005pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
92	FLT_92_BUSHLAND6_BUSHLAND3_230_115 kV	83.7	-12.93	0.988	LEAD	-9.03	0.994	LEAD	-9.14	0.994	LEAD	-12.13	0.990	LEAD	-8.63	0.995	LEAD
93	FLT_93_HEREFORD3_HEREFORD2_115_69kV	83.7	-12.92	0.988	LEAD	-9.01	0.994	LEAD	-9.11	0.994	LEAD	-12.11	0.990	LEAD	-8.60	0.995	LEAD
94	FLT_94_PLANTX6_SUNDOWN6_230kV	83.7	-12.87	0.988	LEAD	-9.00	0.994	LEAD	-9.11	0.994	LEAD	-12.18	0.990	LEAD	-8.56	0.995	LEAD
96	FLT_96_PLANTX6_BUSHLANDS_230kV	83.7	-12.96	0.988	LEAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
98	FLT_98_PLANTX6_NEWHART6_230kV	83.7	N/A	N/A	N/A	-9.03	0.994	LEAD	-9.15	0.994	LEAD	-11.88	0.990	LEAD	-8.69	0.995	LEAD
100	FLT_100_DS203_PARMERCO3_115kV	83.7	-13.03	0.988	LEAD	-8.51	0.995	LEAD	-8.81	0.995	LEAD	-12.49	0.989	LEAD	-8.21	0.995	LEAD
102	FLT_102_DS63_HEREFORD3_115kV	83.7	-12.96	0.988	LEAD	-8.69	0.995	LEAD	-8.90	0.994	LEAD	-11.50	0.991	LEAD	-8.20	0.995	LEAD
104	FLT_104_P4HEREDS6HERE_HEREFORD2_115 _69kV	83.7	-12.96	0.988	LEAD	-8.69	0.995	LEAD	-8.90	0.994	LEAD	-11.49	0.991	LEAD	-8.29	0.995	LEAD
105	FLT_105_HEREFORD3_NEHEREFORD3_115k V	83.7	-12.92	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.11	0.990	LEAD	-8.62	0.995	LEAD
107	FLT_107_HEREFORD3_DEAFSMITH3_115kV	83.7	-12.91	0.988	LEAD	-9.01	0.994	LEAD	-9.11	0.994	LEAD	-12.10	0.990	LEAD	-8.60	0.995	LEAD
109	FLT_109_P6HEREFORD3_DEAFSMITH3_115k V	83.7	-13.59	0.987	LEAD	-8.95	0.994	LEAD	-9.04	0.994	LEAD	-12.07	0.990	LEAD	-8.50	0.995	LEAD
110	FLT_110_P7HEREFORD3_DEAFSMITH3_115k V	83.7	-13.59	0.987	LEAD	-8.95	0.994	LEAD	-9.04	0.994	LEAD	-12.07	0.990	LEAD	-8.50	0.995	LEAD
111	FLT_111_DEAFSMITH3_NEHEREFORD3_115k V	83.7	-12.91	0.988	LEAD	-9.01	0.994	LEAD	-9.11	0.994	LEAD	-12.10	0.990	LEAD	-8.60	0.995	LEAD
113	FLT_113_DEAFSMITH3_PANDAHFD3_115kV	83.7	-12.88	0.988	LEAD	-8.99	0.994	LEAD	-9.10	0.994	LEAD	-11.98	0.990	LEAD	-8.61	0.995	LEAD
115	FLT_115_DEAFSMITH3_DS213_115kV	83.7	-12.94	0.988	LEAD	-9.02	0.994	LEAD	-9.14	0.994	LEAD	-12.16	0.990	LEAD	-8.73	0.995	LEAD
117	FLT_117_DEAFSMITH3_DEAFSMITH6_115_2 30kV	83.7	-12.88	0.988	LEAD	-8.99	0.994	LEAD	-9.08	0.994	LEAD	-12.05	0.990	LEAD	-8.52	0.995	LEAD
118	FLT_118_DEAFSMITH6_BUSHLAND6_230kV	83.7	-12.82	0.988	LEAD	-8.92	0.994	LEAD	-9.03	0.994	LEAD	-11.79	0.990	LEAD	-8.44	0.995	LEAD
120	FLT_120_BUSHLAND6_POTTERCO6_230kV	83.7	-12.91	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.07	0.990	LEAD	-8.62	0.995	LEAD
122	FLT_122_POTTERCO6_POTTERCO7_230_345 kV	83.7	-12.90	0.988	LEAD	-9.01	0.994	LEAD	-9.12	0.994	LEAD	-12.12	0.990	LEAD	-8.61	0.995	LEAD
123	FLT_123_POTTERCO7_HITCHLAND7_345kV	83.7	-12.90	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.17	0.990	LEAD	-8.61	0.995	LEAD
125	FLT_125_HITCHLAND7_BEAVERCO_345kV	83.7	-12.91	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.12	0.990	LEAD	-8.62	0.995	LEAD
127	FLT_127_HITCHLAND7_FINNEY7_345kV	83.7	-12.91	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.12	0.990	LEAD	-8.62	0.995	LEAD
129	FLT_129_FINNEY7_HOLCOMB7_345kV	83.7	-12.91	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.13	0.990	LEAD	-8.62	0.995	LEAD
131	FLT_131_HITCHLAND7_HITCHLAND6_345_2 30kV	83.7	-12.92	0.988	LEAD	-9.02	0.994	LEAD	-9.13	0.994	LEAD	-12.11	0.990	LEAD	-8.62	0.995	LEAD
132	FLT_132_BUSHLAND6_BUSHLANDS_230kV	83.7	-12.91	0.988	LEAD	-9.03	0.994	LEAD	-9.14	0.994	LEAD	-12.06	0.990	LEAD	-8.63	0.995	LEAD
134	FLT_134_DS203_PARMERCO3_115kV	83.7	-32.85	0.931	LEAD	-27.75	0.949	LEAD	-25.52	0.957	LEAD	-28.54	0.947	LEAD	-20.73	0.971	LEAD

Table F-1: GEN-2014-009 Power Factor Analysis Results

PISIS-2014-001 Group 06 - GEN-2014-009 POI - DS-#10 2 - 69.0kV (524853)			2014 Winter Voltage = 1.005 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.005pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
136	FLT_136_CURRY3_FECLOVIS23_115kV	83.7	-35.22	0.922	LEAD	-25.65	0.956	LEAD	-23.32	0.963	LEAD	-29.54	0.943	LEAD	-22.62	0.965	LEAD
138	FLT_138_CURRY3_ECLOVIS3_115kV	83.7	-35.18	0.922	LEAD	-25.44	0.957	LEAD	-23.10	0.964	LEAD	-29.49	0.943	LEAD	-22.39	0.966	LEAD
140	FLT_140_CURRY3_NORRISTP3_115kV	83.7	-33.35	0.929	LEAD	-24.63	0.959	LEAD	-26.91	0.952	LEAD	-27.92	0.949	LEAD	-21.33	0.969	LEAD
142	FLT_142_CURRY3_ROOSEVELT3_115kV	83.7	-28.96	0.945	LEAD	-24.32	0.960	LEAD	-23.60	0.962	LEAD	-28.38	0.947	LEAD	-21.43	0.969	LEAD
144	FLT_144_BAILEYCO3_EMUVLYTP3_115kV	83.7	N/A	N/A	N/A	N/A	N/A	N/A	-23.27	0.963	LEAD	-29.62	0.943	LEAD	-21.79	0.968	LEAD
146	FLT_146_EMUVLYTP3_PLANTX3_115kV	83.7	N/A	N/A	N/A	N/A	N/A	N/A	-22.71	0.965	LEAD	-29.41	0.943	LEAD	-21.12	0.970	LEAD
148	FLT_148_HEREFORD3_NEHEREFORD3_115kV	83.7	-12.65	0.989	LEAD	-9.08	0.994	LEAD	-9.11	0.994	LEAD	-11.98	0.990	LEAD	-8.52	0.995	LEAD

Appendix G – Power Factor Analysis for GEN-2014-010

Table G-1: GEN-2014-010 Power Factor Analysis Results

	PISIS-2014-001 Group 06 - GEN-2014-010 POI - DS-#20 3 - 115.0kV (524669)		2014 Winter Voltage = 1.002 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.0 pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
0	FLT_00_NoFault	129.6	-48.62	0.936	LEAD	-26.39	0.980	LEAD	-18.01	0.990	LEAD	-37.96	0.960	LEAD	-33.76	0.968	LEAD
1	FLT_01_DS102_FARWELL2_69kV	129.6	-49.00	0.935	LEAD	-26.72	0.979	LEAD	-18.36	0.990	LEAD	-38.36	0.959	LEAD	-34.17	0.967	LEAD
3	FLT_03_CURRY3_BAILEYCO3_115kV	129.6	-41.55	0.952	LEAD	-18.96	0.989	LEAD	-13.19	0.995	LEAD	-28.17	0.977	LEAD	-30.68	0.973	LEAD
5	FLT_05_P4CURRWCLOCURR_CURRY3_69_115kV	129.6	-41.69	0.952	LEAD	-14.93	0.993	LEAD	-7.68	0.998	LEAD	-27.60	0.978	LEAD	-24.24	0.983	LEAD
6	FLT_06_CURRY2_CURRY3_69_115kV	129.6	-42.05	0.951	LEAD	-15.13	0.993	LEAD	-7.84	0.998	LEAD	-28.00	0.977	LEAD	-24.24	0.983	LEAD
7	FLT_07_MULESHCTY2_WMULESH_69kV	129.6	-44.75	0.945	LEAD	-19.61	0.989	LEAD	-11.89	0.996	LEAD	-31.45	0.972	LEAD	-28.33	0.977	LEAD
9	FLT_09_DS102_LARIAT2_69kV	129.6	-43.70	0.948	LEAD	-16.45	0.992	LEAD	-9.09	0.998	LEAD	-29.90	0.974	LEAD	-25.37	0.981	LEAD
11	FLT_11_BAILEYCO3_PLANTX3_115kV	129.6	-38.87	0.958	LEAD	-8.61	0.998	LEAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13	FLT_13_P4BAILEMVTBAIL_BAILEYCO3_69_115kV	129.6	-48.32	0.937	LEAD	-27.10	0.979	LEAD	-18.81	0.990	LEAD	-37.34	0.961	LEAD	-34.71	0.966	LEAD
14	FLT_14_BAILEYCO2_BAILEYCO3_69_115kV	129.6	-48.26	0.937	LEAD	-26.52	0.980	LEAD	-18.41	0.990	LEAD	-37.36	0.961	LEAD	-34.21	0.967	LEAD
15	FLT_15_DS203_CURRY3_115kV	129.6	-27.79	0.978	LEAD	-12.56	0.995	LEAD	-6.79	0.999	LEAD	-19.23	0.989	LEAD	-20.21	0.988	LEAD
17	FLT_17_DS203_CURRY3_115kV	129.6	-27.71	0.978	LEAD	-12.54	0.995	LEAD	-6.76	0.999	LEAD	-19.03	0.989	LEAD	-20.23	0.988	LEAD
19	FLT_19_P4CURRDS20CURR_CURRY2_115_69kV	129.6	-27.78	0.978	LEAD	-12.54	0.995	LEAD	-6.76	0.999	LEAD	-19.03	0.989	LEAD	-20.22	0.988	LEAD
20	FLT_20_CURRY3_FECLOVIS23_115kV	129.6	-50.87	0.931	LEAD	-28.45	0.977	LEAD	-20.55	0.988	LEAD	-41.28	0.953	LEAD	-36.45	0.963	LEAD
22	FLT_22_CURRY3_ECLOVIS3_115kV	129.6	-50.67	0.931	LEAD	-27.69	0.978	LEAD	-19.73	0.989	LEAD	-41.08	0.953	LEAD	-35.59	0.964	LEAD
24	FLT_24_CURRY3_NORRISTP3_115kV	129.6	-46.88	0.940	LEAD	-24.62	0.982	LEAD	-15.78	0.993	LEAD	-35.15	0.965	LEAD	-31.46	0.972	LEAD
26	FLT_26_CURRY3_ROOSEVELT3_115kV	129.6	-37.61	0.960	LEAD	-15.13	0.993	LEAD	-3.80	1.000	LEAD	-22.95	0.985	LEAD	-18.44	0.990	LEAD
28	FLT_28_ROOSEVELT3_PORTALES3_115kV	129.6	-49.46	0.934	LEAD	-25.61	0.981	LEAD	-17.13	0.991	LEAD	-37.11	0.961	LEAD	-32.67	0.970	LEAD
30	FLT_30_ROOSEVELT3_ROSEVELTN6_115_230kV	129.6	-36.94	0.962	LEAD	-14.46	0.994	LEAD	-4.46	0.999	LEAD	-22.14	0.986	LEAD	-17.45	0.991	LEAD
31	FLT_31_ROSEVELTN6_TOLKWEST6_230kV	129.6	-53.27	0.925	LEAD	-35.58	0.964	LEAD	-26.05	0.980	LEAD	-33.91	0.967	LEAD	-38.33	0.959	LEAD
33	FLT_33_TOLKTAP6_TOLK7_230_345kV	129.6	-46.18	0.942	LEAD	-25.27	0.982	LEAD	-11.89	0.996	LEAD	-35.32	0.965	LEAD	0.00	1.000	LAG
34	FLT_34_G08022TAP_EDDYCNTY7_345kV	129.6	-48.81	0.936	LEAD	-23.72	0.984	LEAD	-12.92	0.995	LEAD	-33.64	0.968	LEAD	-20.93	0.987	LEAD
36	FLT_36_TUCOINT6_TOLKEAST6_230kV	129.6	-46.09	0.942	LEAD	-22.96	0.985	LEAD	-14.24	0.994	LEAD	-34.99	0.965	LEAD	-31.55	0.972	LEAD
38	FLT_38_TUCOINT7_OKU7_345kV	129.6	-45.29	0.944	LEAD	-21.69	0.986	LEAD	-11.38	0.996	LEAD	-33.25	0.969	LEAD	-31.31	0.972	LEAD

Table G-1: GEN-2014-010 Power Factor Analysis Results

PISIS-2014-001 Group 06 - GEN-2014-010 POI - DS-#20 3 - 115.0kV (524669)			2014 Winter Voltage = 1.002 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.0 pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
40	FLT_40_TUCOINT7_G14007TAP_345kV	129.6	-45.39	0.944	LEAD	-20.22	0.988	LEAD			-18.01	0.990	LEAD	- 31.83	0.971	LEAD	- 30.93
42	FLT_42_TUCOINT7_TUCOINT6_345_230kV	129.6	-48.23	0.937	LEAD	-25.80	0.981	LEAD	-17.21	0.991	LEAD	-37.38	0.961	LEAD	-33.48	0.968	LEAD
43	FLT_43_CHISHOLM7_WWRDEHV7_345kV	129.6	-48.16	0.937	LEAD	-25.58	0.981	LEAD	-16.78	0.992	LEAD	-36.76	0.962	LEAD	-33.22	0.969	LEAD
45	FLT_45_CHISHOLM7_GRACMNT7_345kV	129.6	-48.26	0.937	LEAD	-25.96	0.981	LEAD	-17.43	0.991	LEAD	-37.20	0.961	LEAD	-33.55	0.968	LEAD
47	FLT_47_CHISHOLM7_CHISHOLM6_345_230kV	129.6	-48.51	0.937	LEAD	-26.02	0.980	LEAD	-17.54	0.991	LEAD	-37.77	0.960	LEAD	-33.39	0.968	LEAD
48	FLT_48_ROSEVELTN6_PLSNTHILL6_230kV	129.6	-45.73	0.943	LEAD	-23.43	0.984	LEAD	-15.50	0.993	LEAD	-36.52	0.963	LEAD	-30.80	0.973	LEAD
50	FLT_50_PLSNTHILL6_OASIS6_230kV	129.6	-47.48	0.939	LEAD	-24.76	0.982	LEAD	-16.45	0.992	LEAD	-37.10	0.961	LEAD	-32.30	0.970	LEAD
52	FLT_52_OASIS6_SANJANHVB1_230kV	129.6	-52.30	0.927	LEAD	-30.50	0.973	LEAD	-19.25	0.989	LEAD	-33.29	0.969	LEAD	-37.55	0.960	LEAD
54	FLT_54_SANJANHVB1_CHAVESCNTY6_230kV	129.6	-47.27	0.939	LEAD	-24.72	0.982	LEAD	-13.59	0.995	LEAD	-28.79	0.976	LEAD	-30.42	0.974	LEAD
56	FLT_56_OASIS6_SW4K336_230kV	129.6	-46.16	0.942	LEAD	-22.08	0.986	LEAD	-14.66	0.994	LEAD	-33.86	0.968	LEAD	-27.82	0.978	LEAD
58	FLT_58_OASIS6_OASIS3_230_115kV	129.6	-44.17	0.947	LEAD	-20.59	0.988	LEAD	-9.51	0.997	LEAD	-28.52	0.977	LEAD	-25.21	0.982	LEAD
59	FLT_59_PLSNTHILL6_PLSNTHILL3_230_115kV	129.6	-45.63	0.943	LEAD	-21.37	0.987	LEAD	-14.40	0.994	LEAD	-39.53	0.957	LEAD	-29.92	0.974	LEAD
60	FLT_60_ROSEVELTN6_SW4K336_230kV	129.6	-50.40	0.932	LEAD	-22.99	0.985	LEAD	-13.04	0.995	LEAD	-37.37	0.961	LEAD	-30.61	0.973	LEAD
62	FLT_62_SW4K336_ROSEVELTS6_230kV	129.6	-38.17	0.959	LEAD	-14.07	0.994	LEAD	-5.24	0.999	LEAD	-33.70	0.968	LEAD	-11.94	0.996	LEAD
64	FLT_64_ROSEVELTS6_TOLKEAST6_230kV	129.6	-53.39	0.925	LEAD	-35.78	0.964	LEAD	-26.26	0.980	LEAD	-33.70	0.968	LEAD	-38.44	0.959	LEAD
66	FLT_66_CURRY3_BAILEYCO3_115kV	129.6	-49.24	0.935	LEAD	-30.49	0.973	LEAD	-22.38	0.985	LEAD	-39.63	0.956	LEAD	-40.79	0.954	LEAD
68	FLT_68_BAILEYCO3_PLANTX3_115kV	129.6	-39.27	0.957	LEAD	-17.30	0.991	LEAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
70	FLT_70_BAILEYCO3_EMUVLYTP3_115kV	129.6	N/A	N/A	N/A	N/A	N/A	N/A	-10.84	0.997	LEAD	-25.67	0.981	LEAD	-26.38	0.980	LEAD
72	FLT_72_EMUVLYTP3_PLANTX3_115kV	129.6	N/A	N/A	N/A	N/A	N/A	N/A	-10.13	0.997	LEAD	-25.75	0.981	LEAD	-25.39	0.981	LEAD
74	FLT_74_PLANTX3_LCSOLTON3_115kV	129.6	-48.23	0.937	LEAD	-25.70	0.981	LEAD	-17.03	0.991	LEAD	-37.53	0.961	LEAD	-32.93	0.969	LEAD
76	FLT_76_PLANTX3_BCEARTH3_115kV	129.6	-47.27	0.939	LEAD	-20.34	0.988	LEAD	-10.14	0.997	LEAD	-37.26	0.961	LEAD	-25.93	0.981	LEAD
78	FLT_78_P4PLANBCEAPLAN_PLANTX6_115_230kV	129.6	-47.31	0.939	LEAD	-19.26	0.989	LEAD	-9.94	0.997	LEAD	-34.80	0.966	LEAD	-25.74	0.981	LEAD
79	FLT_79_PLANTX3_LAMBCNTY3_115kV	129.6	-48.59	0.936	LEAD	-26.35	0.980	LEAD	-18.03	0.990	LEAD	-37.94	0.960	LEAD	-33.83	0.968	LEAD
81	FLT_81_PLANTX3_HALECNTY3_115kV	129.6	-48.26	0.937	LEAD	-26.07	0.980	LEAD	-17.53	0.991	LEAD	-37.56	0.960	LEAD	-33.39	0.968	LEAD
83	FLT_83_PLANTX3_PLANTX6_115_230kV	129.6	-48.67	0.936	LEAD	-21.82	0.986	LEAD	-16.73	0.992	LEAD	-34.90	0.966	LEAD	-32.76	0.970	LEAD
84	FLT_84_PLANTX6_DEAFSMITH6_230kV	129.6	-40.35	0.955	LEAD	-10.38	0.997	LEAD	2.86	1.000	LAG	-28.10	0.977	LEAD	-16.32	0.992	LEAD
86	FLT_86_PLANTX6_TOLKEAST6_230kV	129.6	-48.42	0.937	LEAD	-25.67	0.981	LEAD	-17.15	0.991	LEAD	-36.87	0.962	LEAD	-33.28	0.969	LEAD
88	FLT_88_PLANTX6_TOLKWEST6_230kV	129.6	-48.40	0.937	LEAD	-25.62	0.981	LEAD	-17.09	0.991	LEAD	-36.81	0.962	LEAD	-33.25	0.969	LEAD
90	FLT_90_P6PLANTX6_TOLKWEST6_230kV	129.6	-47.67	0.939	LEAD	-23.05	0.985	LEAD	-14.23	0.994	LEAD	-34.03	0.967	LEAD	-31.60	0.972	LEAD
91	FLT_91_P7PLANTX6_TOLKWEST6_230kV	129.6	-47.67	0.939	LEAD	-23.05	0.985	LEAD	-14.23	0.994	LEAD	-34.03	0.967	LEAD	-31.60	0.972	LEAD

Table G-1: GEN-2014-010 Power Factor Analysis Results

	PISIS-2014-001 Group 06 - GEN-2014-010 POI - DS-#20 3 - 115.0kV (524669)		2014 Winter Voltage = 1.002 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.0 pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
92	FLT_92_BUSHLAND6_BUSHLAND3_230_115 kV	129.6	-49.21	0.935	LEAD	-27.34	0.978	LEAD	-19.02	0.989	LEAD	-38.57	0.958	LEAD	-34.84	0.966	LEAD
93	FLT_93_HEREFORD3_HEREFORD2_115_69kV	129.6	-48.55	0.936	LEAD	-25.77	0.981	LEAD	-17.14	0.991	LEAD	-37.86	0.960	LEAD	-32.60	0.970	LEAD
94	FLT_94_PLANTX6_SUNDOWN6_230kV	129.6	-47.64	0.939	LEAD	-25.89	0.981	LEAD	-17.37	0.991	LEAD	-37.60	0.960	LEAD	-32.63	0.970	LEAD
96	FLT_96_PLANTX6_BUSHLANDS_230kV	129.6	-45.92	0.943	LEAD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
98	FLT_98_PLANTX6_NEWHART6_230kV	129.6	N/A	N/A	N/A	-20.26	0.988	LEAD	-10.23	0.997	LEAD	-34.33	0.967	LEAD	-29.07	0.976	LEAD
100	FLT_100_DS203_PARMERCO3_115kV	129.6	-53.83	0.924	LEAD	-42.23	0.951	LEAD	-38.18	0.959	LEAD	-45.10	0.944	LEAD	-36.90	0.962	LEAD
102	FLT_102_DS63_HEREFORD3_115kV	129.6	-32.85	0.969	LEAD	-28.16	0.977	LEAD	-23.39	0.984	LEAD	-26.08	0.980	LEAD	-18.69	0.990	LEAD
104	FLT_104_P4HEREDS6HERE_HEREFORD2_115 _69kV	129.6	-32.85	0.969	LEAD	-28.16	0.977	LEAD	-23.39	0.984	LEAD	-26.08	0.980	LEAD	-18.69	0.990	LEAD
105	FLT_105_HEREFORD3_NEHEREFORD3_115k V	129.6	-48.59	0.936	LEAD	-26.53	0.980	LEAD	-18.19	0.990	LEAD	-37.98	0.960	LEAD	-33.88	0.967	LEAD
107	FLT_107_HEREFORD3_DEAFSMITH3_115kV	129.6	-48.17	0.937	LEAD	-25.68	0.981	LEAD	-17.16	0.991	LEAD	-37.57	0.960	LEAD	-32.63	0.970	LEAD
109	FLT_109_P6HEREFORD3_DEAFSMITH3_115k V	129.6	-45.67	0.943	LEAD	-21.43	0.987	LEAD	-12.09	0.996	LEAD	-35.34	0.965	LEAD	-25.70	0.981	LEAD
110	FLT_110_P7HEREFORD3_DEAFSMITH3_115k V	129.6	-45.67	0.943	LEAD	-21.43	0.987	LEAD	-12.09	0.996	LEAD	-35.34	0.965	LEAD	-25.70	0.981	LEAD
111	FLT_111_DEAFSMITH3_NEHEREFORD3_115k V	129.6	-48.31	0.937	LEAD	-25.59	0.981	LEAD	-16.98	0.992	LEAD	-37.60	0.960	LEAD	-32.74	0.970	LEAD
113	FLT_113_DEAFSMITH3_PANDAHFD3_115kV	129.6	-49.92	0.933	LEAD	-26.39	0.980	LEAD	-18.00	0.990	LEAD	-37.75	0.960	LEAD	-34.32	0.967	LEAD
115	FLT_115_DEAFSMITH3_DS213_115kV	129.6	-49.79	0.933	LEAD	-26.66	0.979	LEAD	-18.81	0.990	LEAD	-37.23	0.961	LEAD	-39.91	0.956	LEAD
117	FLT_117_DEAFSMITH3_DEAFSMITH6_115_2 30kV	129.6	-44.73	0.945	LEAD	-22.36	0.985	LEAD	-13.04	0.995	LEAD	-36.02	0.963	LEAD	-25.50	0.981	LEAD
118	FLT_118_DEAFSMITH6_BUSHLAND6_230kV	129.6	-46.86	0.940	LEAD	-23.83	0.984	LEAD	-15.65	0.993	LEAD	-37.94	0.960	LEAD	-23.61	0.984	LEAD
120	FLT_120_BUSHLAND6_POTTERCO6_230kV	129.6	-49.66	0.934	LEAD	-27.57	0.978	LEAD	-19.26	0.989	LEAD	-39.06	0.957	LEAD	-34.29	0.967	LEAD
122	FLT_122_POTTERCO6_POTTERCO7_230_345 kV	129.6	-49.42	0.934	LEAD	-27.43	0.978	LEAD	-19.32	0.989	LEAD	-38.97	0.958	LEAD	-34.21	0.967	LEAD
123	FLT_123_POTTERCO7_HITCHLAND7_345kV	129.6	-49.72	0.934	LEAD	-27.84	0.978	LEAD	-19.74	0.989	LEAD	-39.31	0.957	LEAD	-34.64	0.966	LEAD
125	FLT_125_HITCHLAND7_BEAVERCO_345kV	129.6	-48.75	0.936	LEAD	-26.53	0.980	LEAD	-18.18	0.990	LEAD	-38.11	0.959	LEAD	-33.84	0.968	LEAD
127	FLT_127_HITCHLAND7_FINNEY7_345kV	129.6	-48.97	0.935	LEAD	-26.80	0.979	LEAD	-18.54	0.990	LEAD	-38.39	0.959	LEAD	-33.92	0.967	LEAD
129	FLT_129_FINNEY7_HOLCOMB7_345kV	129.6	-49.05	0.935	LEAD	-27.08	0.979	LEAD	-18.84	0.990	LEAD	-38.50	0.959	LEAD	-34.20	0.967	LEAD
131	FLT_131_HITCHLAND7_HITCHLAND6_345_2 30kV	129.6	-48.63	0.936	LEAD	-26.39	0.980	LEAD	-18.02	0.990	LEAD	-37.98	0.960	LEAD	-33.74	0.968	LEAD
132	FLT_132_BUSHLAND6_BUSHLANDS_230kV	129.6	-49.21	0.935	LEAD	-27.43	0.978	LEAD	-19.13	0.989	LEAD	-38.65	0.958	LEAD	-34.48	0.966	LEAD
134	FLT_134_DS203_PARMERCO3_115kV	129.6	-47.15	0.940	LEAD	-45.42	0.944	LEAD	-35.60	0.964	LEAD	-48.36	0.937	LEAD	-30.49	0.973	LEAD

Table G-1: GEN-2014-010 Power Factor Analysis Results

PISIS-2014-001 Group 06 - GEN-2014-010 POI - DS-#20 3 - 115.0kV (524669)			2014 Winter Voltage = 1.002 pu			2015 Summer Voltage = 1.0 pu			2019 Summer Voltage = 1.0 pu			2019 Winter Voltage = 1.0 pu			2024 Summer Voltage = 1.0 pu		
	Contingency Name	Power at POI	VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor		VARS at POI	Power Factor	
136	FLT_136_CURRY3_FECLOVIS23_115kV	129.6	-45.89	0.943	LEAD	-18.05	0.990	LEAD	-11.17	0.996	LEAD	-32.83	0.969	LEAD	-27.57	0.978	LEAD
138	FLT_138_CURRY3_ECLOVIS3_115kV	129.6	-45.70	0.943	LEAD	-17.36	0.991	LEAD	-10.42	0.997	LEAD	-32.63	0.970	LEAD	-26.79	0.979	LEAD
140	FLT_140_CURRY3_NORRISTP3_115kV	129.6	-40.91	0.954	LEAD	-14.03	0.994	LEAD	-6.27	0.999	LEAD	-26.57	0.980	LEAD	-22.50	0.985	LEAD
142	FLT_142_CURRY3_ROOSEVELT3_115kV	129.6	-29.09	0.976	LEAD	-4.67	0.999	LEAD	5.31	0.999	LAG	-13.67	0.994	LEAD	-8.81	0.998	LEAD
144	FLT_144_BAILEYCO3_EMUVLYTP3_115kV	129.6	N/A	N/A	N/A	N/A	N/A	N/A	0.23	1.000	LAG	-25.93	0.981	LEAD	-13.67	0.994	LEAD
146	FLT_146_EMUVLYTP3_PLANTX3_115kV	129.6	N/A	N/A	N/A	N/A	N/A	N/A	2.10	1.000	LAG	-25.31	0.981	LEAD	-13.64	0.995	LEAD
148	FLT_148_HEREFORD3_NEHEREFORD3_115kV	129.6	-27.62	0.978	LEAD	-12.61	0.995	LEAD	-6.86	0.999	LEAD	-18.99	0.989	LEAD	-20.29	0.988	LEAD