

Definitive Interconnection  
System Impact Study for  
Generation Interconnection  
Requests

(DISIS-2011-002-4)

May 2014  
Revised June 2014

**Generation Interconnection**

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## Revision History

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Date	Author	Change Description
01/31/2012	SPP	Report Issued (DISIS-2011-002)
06/14/2012	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2011-002-1)
02/01/2013	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2011-002-2)
12/31/2013	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2011-002-3)
01/08/2014	SPP	Report Re-Posted (DISIS-2011-002-3) revised for appendix error
5/23/2014	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2011-002-4)
06/09/2014	SPP	Report Re-Posted (DISIS-2011-002-4) revised for Group 9 error

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## Executive Summary

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Generation Interconnection customers have requested a Definitive Interconnection System Impact Study (DISIS) under the Generation 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 September 30, 2011. The customers will be referred to in this study as the DISIS-2011-002 Interconnection Customers. This System Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling approximately 1,524.1 MW of new generation which would be located within the transmission systems of American Electric Power-West (AEPW), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Omaha Public Power District (OPPD), Southwestern Public Service (SPS), Westar Energy (WERE) and Western Farmers Electric Cooperative (WFEC). The various generation interconnection requests have differing proposed in-service dates<sup>1</sup>. The generation interconnection requests included in this System Impact Cluster Study are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date. This restudy was performed to account for withdrawals within the DISIS-2011-002 study and/or higher queued projects withdrawing.

Power flow analysis has indicated that for the power flow cases studied, 1,524.1 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 Order No. 661-A 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.

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

The total estimated minimum cost for interconnecting the DISIS-2011-002 interconnection customers is \$49,174,873. These costs are shown in Appendix E and F. Interconnection Service to DISIS-2011-002 interconnection customers is also contingent upon higher queued customers

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<sup>1</sup> 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 Customer's 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.

paying for certain required network upgrades. **The in service date for the DISIS customers will be deferred until the construction of these network upgrades can be completed.**

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

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 the Energy Resource (ERIS) Interconnection Request. 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.

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## Introduction

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Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Definitive Interconnection System Impact Study (DISIS) for certain generation interconnection requests in the SPP Generation Interconnection Queue. These interconnection requests have been clustered together for the following System Impact Study window which closed September 30, 2011. The customers will be referred to in this study as the DISIS-2011-002 Interconnection Customers. This System Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling 1,524.1 MW of new generation which would be located within the transmission systems of American Electric Power-West (AEPW), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Omaha Public Power District (OPPD), Southwestern Public Service (SPS), Westar Energy (WERE) and Western Farmers Electric Cooperative (WFEC). The various generation interconnection requests have differing proposed in-service dates<sup>2</sup>. The generation interconnection requests included in this System Impact Study are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date. This restudy was performed to account for withdrawals within the DISIS-2011-002 study and/or higher queued projects withdrawing.

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

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<sup>2</sup> 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 Customer's that proceed to the Facility Study will be provided a new in-service date based on the competition of the Facility Study.

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# Model Development

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## Interconnection Requests Included in the Cluster

SPP has included all interconnection requests that submitted a Definitive Interconnection System Impact Study Agreement no later than September 30, 2011 and were subsequently accepted by Southwest Power Pool under the terms of the Generator Interconnection Procedures (GIP) that became effective March 30, 2010. The interconnection requests that are included in this study are listed in Appendix A.

## Affected System Interconnection Requests

Also included in this Definitive Impact Study is a single Affected System Study, located on the Golden Spread Electric Cooperative, Inc. (GSEC) system, which shares connections to the SPS system. The Affected System Study Requests has been given the designations: ASGI-2011-004 (20 MW, POI is Pleasant Hill 69kV).

## 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 2014 spring, 2014 summer and winter peak, 2019 summer and winter peak, and the 2024 summer peak scenario 0 cases were used for this study. After the cases were developed, each of the control areas' resources were then re-dispatched to account for the new generation requests using current dispatch orders.

### Dynamic Stability

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

## Base Case Upgrades

The following facilities are part of the SPP Transmission Expansion Plan or the Balanced Portfolio or recently approved Priority Projects. These facilities, have an approved Notice to Construct (NTC), or are in construction stages and were assumed to be in-service at the time of dispatch and added to the base case models. The DISIS-2011-002 Customers have not been assigned acceleration costs for the below listed projects. The DISIS-2011-002 Customers Generation Facilities in service dates may need to be delayed until the completion of the following upgrades. 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.

- Hitchland 230/115kV area projects<sup>3</sup>:
  - Hitchland – Ochiltree 230kV Project, (placed in-service 2013)
- Balanced Portfolio Projects<sup>4</sup>:
  - Woodward – Border – TUCO 345kV project, scheduled for 5/19/2014 in-service
    - Woodward 345/138kV circuit #2 autotransformer
    - TUCO 345/138kV circuit #2 autotransformer
    - Reactors at Woodward and Border
  - Iatan – Nashua 345kV, scheduled for 6/1/2015 in-service
    - Nashua 345/161kV autotransformer
  - Muskogee– Seminole 345kV, scheduled for 12/31/2013 in-service
  - Cleveland – Sooner 345kV, (placed in-service 2012)
  - Tap Stillwell – Swissvale 345kV line at West Gardner, (placed in-service 2013)
- Priority Projects<sup>5</sup>:
  - Hitchland – Woodward double circuit 345kV, scheduled for 6/30/2014 in-service
    - Hitchland 345/230kV circuit #2 autotransformer
  - Woodward – Thistle double circuit 345kV, scheduled for 12/31/2014 in-service
  - Spearville – Clark double circuit 345kV, scheduled for 12/31/2014 in-service
  - Clark – Thistle double circuit 345kV, scheduled for 12/31/2014 in-service
  - Thistle – Wichita double circuit 345kV, scheduled for 12/31/2014 in-service
  - Thistle 345/138kV autotransformer, scheduled for 12/31/2014 in-service
  - Thistle – Flat Ridge 138kV, scheduled for 12/31/2014 in-service
- Various MKEC Transmission System Upgrades<sup>6</sup>
  - Harper – Flat Ridge 138kV rebuild (placed in-service in 2013)
  - Flat Ridge – Medicine Lodge 138kV rebuild, scheduled for 12/31/2013 in-service
  - Pratt – Medicine Lodge 115kV rebuild, scheduled for 6/15/2014 in-service
  - Medicine Lodge 138/115kV autotransformer replacement (placed in-service in 2013)
- Northwest 345/138/13.8kV circuit #3 autotransformer, scheduled for 6/1/2017 in-service<sup>7</sup>
- Woodward (OKGE) – Woodward (WFEC) 69kV rebuild, scheduled for 6/1/2015 in-service<sup>8</sup>
- Sheldon – SW7<sup>th</sup> and Pleasant Hill 115kV circuit #2 rebuild (placed in-service in 2013)<sup>9</sup>
- Moundridge 138/115/13.8kV autotransformer circuit #2, scheduled for 12/1/2014 in-service<sup>10</sup>

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<sup>3</sup> SPP Regional Reliability Projects identified in 2007 STEP. As of the writing of this report, SPP Project Tracking TAGIT shows some of these project's in-service dates have been delayed from the original 2010/2011 in-service dates.

<sup>4</sup> Notice to Construct (NTC) issued June 2009.

<sup>5</sup> Notice to Construct (NTC) issued June 2010.

<sup>6</sup> SPP Transmission Service Projects identified in SPP-2007-AG3-AFS-9.

<sup>7</sup> SPP Transmission Service Project identified in SPP-2009-AG2-AFS6. Per SPP-NTC-20137.

<sup>8</sup> SPP Regional Reliability Project. Per SPP-NTC-20003.

<sup>9</sup> SPP Regional Reliability 2012 ITPNT Project. Per SPP-NTC-200171.

<sup>10</sup> SPP Regional Reliability 2012 ITP10 Project. Per SPP-NTC-200181.



## Contingent Upgrades

The following facilities do not yet have approval. These facilities have been assigned to higher queued interconnection customers. These facilities have been included in the models for the DISIS-2011-002 study and are assumed to be in service. This list may not be all inclusive. The DISIS-2011-002 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 GIA or withdraw from the interconnection queue. The DISIS-2011-002 Customer Generation Facilities in service dates may need to be delayed until the completion of the following upgrades.

- Upgrades assigned to ICS-2008-001 Interconnection Customers
  - Line Traps at Amarillo South – Swisher 230kV
- 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 Ft. Dodge terminal of Shooting Star 115kV
  - Fort Randall – Meadow Grove – Kelly 230kV circuit #1, rerate (320MVA)
- Upgrades assigned to DISIS-2010-001 Interconnection Customers:
  - Beaver County 345kV Expansion (Tap & Tie Hitchland – Woodward circuit #2 into Beaver County 345kV)
  - Switch 2749 – Wildorado 69kV circuit #1, rebuild
- Upgrades assigned to DISIS-2010-002 Interconnection Customers:
  - Buckner –Spearville 345kV circuit #1, replace terminal equipment
  - Twin Church – Dixon County 230kV circuit #1, rerate (320MVA)
- Upgrades assigned to DISIS-2011-001 Interconnection Customers:
  - Beaver County – Buckner 345kV circuit #1, build
  - Rice County – Circle 230kV conversion, (placed In-Service in 2012)
  - Rice County – Lyons 115kV, rebuild (placed In-Service in 2013)
  - Rice County 230/115kV autotransformer, (placed In-Service in 2012)
  - Wheatland – Lyons 115kV, rerate (199 MVA) (placed In-Service in 2012)
  - Hoskins – Dixon County – Twin Church 230kV circuit #1, rerate
  - (NRIS only) Mooreland – FPL Switch – Woodward 138kV circuit #1 rebuild
  - (NRIS only) Glass Mountain – Mooreland 138kV circuit #1, rebuild
  - (NRIS only) TUCO – New Deal – Stanton 345/115kV Project, build
  - (NRIS only) Wolfforth 230/115kV transformer circuit #1, rebuild

## Potential Upgrades Not in the Base Case

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

## **Regional Groupings**

The interconnection requests listed in Appendix A were grouped together in fifteen different 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 each group, the various wind generating plants were modeled at 100% nameplate of maximum generation. The other wind generating plants in each area were modeled at 80% nameplate while the wind generating plants in the other areas were modeled at 20% nameplate of maximum generation. These projects were dispatched as Energy Resources with equal distribution across the SPP footprint. Certain projects that requested Network Resource Interconnection Service were dispatched in an additional analysis into the balancing authority of the interconnecting transmission owner. 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 each interconnection request modeled at 100% nameplate.

Peaking units were not dispatched in the 2014 spring model. To study peaking units' impacts, the 2014 summer and winter, 2019 summer and winter, and 2024 summer peak 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.

### **Dynamic Stability**

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

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## Identification of Network Constraints

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The initial set of network constraints were found by using PTI 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 if any of the generation 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 mitigation. 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 considered for mitigation.

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## Determination of Cost Allocated Network Upgrades

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Cost Allocated Network Upgrades of wind generation 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 MUST sensitivity analysis was performed to determine the Distribution Factors (DF), a distribution factor with no contingency that each generation interconnection request had on each new upgrade. The impact each generation interconnection request had on each upgrade project was weighted by the size of each request. Finally the costs due by each request for a particular project were then determined by allocating the portion of each request's impact over the impact of all affecting requests.

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

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

$$\text{Request X Impact Factor on Upgrade Project 1} = \text{PTDF}(X) * \text{MW}(X) = X1$$

$$\text{Request Y Impact Factor on Upgrade Project 1} = \text{PTDF}(Y) * \text{MW}(Y) = Y1$$

$$\text{Request Z Impact Factor on Upgrade Project 1} = \text{PTDF}(Z) * \text{MW}(Z) = Z1$$

- 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.

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## **Required Interconnection Facilities**

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The requirement to interconnect the 1,524.1 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 \$49,174,873. Interconnection Facilities specific to each generation interconnection request are listed in Appendix E. A preliminary one-line drawing for each generation interconnection request are listed in Appendix D.

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.

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## **Power Flow Analysis**

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### **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. NERC Category “B” and “C” 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, and 2024 summer peak models. The output of the Interconnection Customer’s facility was offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource (ER) Interconnection Request. Certain requests that requested 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 NPPD and SPS transmission systems under system intact and contingency conditions in the peak seasons.

**Cluster Group 1 (Woodward Area)**

In addition to the 3,680.2 MW of previously queued generation in the area, 404.4 MW of new interconnection service was studied. With the withdrawal of higher queued Interconnection Requests, it was determined that the second circuit from Woodward – Tatonga – Mathewson-Cimarron is no longer required as a Previous Network Upgrade in this area. With the other previously assigned Network Upgrades in service (for NRIS), no new constraints were found in this area. The following constraints for NRIS were observed.

Group 1: NRIS Constraints				
MONITORED ELEMENT	RATE B (MVA)	TC%LOADING (% MVA)	CONTINGENCY	
FPL SWITCH - WOODWARD 138KV CKT 1	153	152.1678	NORTHWEST - TATONGA7	345.00 345KV CKT 1
GLASS MOUNTAIN - MOORELAND 138KV CKT 1	124	102.4095	NORTHWEST - TATONGA7	345.00 345KV CKT 1
FPL SWITCH - MOORELAND 138KV CKT 1	287	103.0622	NORTHWEST - TATONGA7	345.00 345KV CKT 1

**Cluster Group 2 (Hitchland Area)**

In addition to the 2,662.2 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 3,687.9 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 1,888.1 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 5 (Amarillo Area)**

In addition to the 932.6 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 6 (South Texas Panhandle/New Mexico)**

In addition to the 1,853.3 MW of previously queued generation in the area, 427.0 MW of new interconnection service was studied. With previously allocated network upgrades to higher queued customers included in the analysis, no new ERIS constraints were found in this area. The replacement of the line traps on Jones – Lubbock South 230kV circuit 2 (in-service) relieved previously seen overloads on the circuit. NRIS analysis was performed and showed an overload on Allen – Lubbock South 115kV for the outage of Lubbock South – Wolfforth 230kV. The Lubbock

South transformer was observed as being overloaded. This transformer is approved to be replaced. The Wolfforth transformer was observed as being overloaded. The Wolfforth transformer is currently assigned to DISIS-2011-001 Interconnection Customers. The Yoakum transformer, which was observed as overloaded, is slated for replacement.

Group 6: NRIS Constraints			
MONITORED ELEMENT	RATE B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
ALLEN SUB - LUBBOCK SOUTH INTERCHANGE 115KV CKT 1	160	100.4	LUBBOCK SOUTH INTERCHANGE - WOLFFORTH INTERCHANGE 230KV CKT 1
LUBBOCK SOUTH INTERCHANGE (ABB LLM60043) 230/115/13.2KV TRANSFORMER CKT 1	252	109.1038	JONES STATION - LUBBOCK EAST INTERCHANGE 230KV CKT 1
WOLFFORTH INTERCHANGE (WH 7001668) 230/115/13.2KV TRANSFORMER CKT 1	168	100.1511	CARLISLE INTERCHANGE (WH XHS70711) 230/115/13.2KV TRANSFORMER CKT 1
YOAKUM COUNTY INTERCHANGE (PENN C010585) 230/115/13.2KV TRANSFORMER CKT 2	150	100.5986	YOAKUM COUNTY INTERCHANGE (GE M100899) 230/115/13.2KV TRANSFORMER CKT 1

### Cluster Group 7 (Southwestern Oklahoma)

In addition to the 1,568.2 MW of previously queued generation in the area, 257.0 MW of new interconnection service was studied. With the other previously assigned Network Upgrades in service (for NRIS), no new constraints were found in this area.

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

In addition to the 1,759.1 MW of previously queued generation in the area, 150.4 MW of new interconnection service was studied. No new constraints were found in this area.

### Cluster Group 9/10 (Nebraska)

In addition to the 1,459.2 MW of previously queued generation in the area, 64.5 MW of new interconnection service was studied. Outlet issues require mitigation for GEN-2011-055 request in this group. The requirements to interconnect GEN-2011-055 include rebuilding and reconfiguration of the POI substation, as well as, replacement of some additional terminal equipment at other substations. Additionally, for interconnection customers that requested NRIS, a couple of additional upgrades were identified.

Group 9: ERIE Constraints			
MONITORED ELEMENT	RATE B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
SUB 969 - SUB 974 69KV CKT 1	47	111.9275	SUB 968 - SUB 969 69KV CKT 1
SUB 968 - SUB 969 69KV CKT 1	47	110.8632	SUB 969 - SUB 974 69KV CKT 1
SUB 967 - SUB 968 69KV CKT 1	47	102.0333	SUB 969 - SUB 974 69KV CKT 1

Group 9: NRIS Constraints			
MONITORED ELEMENT	RATE B (MVA)	TC%LOADING (% MVA)	CONTINGENCY
NEB CITY U SYR SUB - SUB 970 69KV CKT 1	47	104.5341	SUB 963 - SUB 977 69KV CKT 1
HYDROCARBON TAP - SUB 974 69KV CKT 1	57	101.4337	SUB 963 - SUB 977 69KV CKT 1

### Cluster Group 12 (Northwest Arkansas)

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

**Cluster Group 13 (Northwest Missouri)**

In addition to the 285.8 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 0.0 MW of previously queued generation in the area, 220.8 MW of new interconnection service was studied. No new constraints were found in this area.

**Curtailement 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 under certain system conditions to allow system operators to maintain the reliability of the transmission network.

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## Stability Analysis

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A stability analysis was conducted for each Interconnection Customer's facility using modified versions of the 2013 series SPP Model Development Working Group (MDWG) Models 2014 winter, 2015 summer, and 2024 summer peak dynamic models. 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 fossil 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.

### **Cluster Group 1 (Woodward Area)**

The Group 1 stability analysis for this restudy was performed by SPP Staff. This analysis was performed to evaluate the impacts of the removal of the previously assigned Tatonga-Mathewson-Cimarron 345kV line. Stability analysis has determined that when all previously assigned and currently assigned network upgrades are placed in-service the transmission system will remain stable and low voltage ride through requirements are satisfied for the contingencies studied.

Power Factor analysis was not performed again for this restudy. With the power factor requirements and all network upgrades in service, all interconnection requests in Group 1 will meet FERC Order #661A low voltage ride through (LVRT) requirements.

### **Cluster Group 2 (Hitchland Area)**

There was no stability analysis conducted in the Hitchland area due to no requests in the area.

### **Cluster Group 3 (Spearville Area)**

There was no stability analysis conducted in the Spearville area due to no requests in the area.

### **Cluster Group 4 (Mingo Area)**

There was no stability analysis conducted in the Mingo area due to no requests in the area.

### **Cluster Group 5 (Amarillo Area)**

There was no stability analysis conducted in the Amarillo area due to no requests in the area.

### **Cluster Group 6 (South Texas Panhandle/New Mexico)**

The Group 6 stability analysis was not performed again for this restudy.

### **Cluster Group 7 (Southwest Oklahoma Area)**

The Group 7 stability analysis was not performed again for this restudy.

### **Cluster Group 8 (South Central Kansas/North Oklahoma)**

The Group 8 stability analysis was not performed again for this restudy.



**Cluster Group 9/10 (Nebraska)**

The Group 9/10 stability analysis was not performed again for this restudy.

**Cluster Group 11 (North Central Kansas Area)**

There was no stability analysis conducted in the North Central Kansas area due to no requests in the area.

**Cluster Group 12 (Northwest Arkansas Area)**

There was no stability analysis conducted in the Northwest Arkansas area due to no requests in the area.

**Cluster Group 13 (Northwest Missouri Area)**

There was no stability analysis conducted in the Northwest Missouri area due to no requests in the area.

**Cluster Group 14 (South Central Oklahoma)**

The Group 14 stability analysis was not performed again for this restudy.

**Cluster Group 15 (reserved)**

This group has been retired and all prior Group 15 requests have been re-designated as Group 9/10 requests.

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## Conclusion

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The minimum cost of interconnecting 1,524.1 MW of new interconnection requests included in this Definitive Interconnection System Impact Study is estimated at \$49,174,873 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).

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# Appendix

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**A: Generation 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*
ASGI-2011-004	20.00	ER	SPS	Pleasant Hill 69kV	Pleasant Hill 69kV		TBD
GEN-2011-037	7.00	ER	WFEC	Blue Canyon 5 138kV	Blue Canyon 5 138kV	1/1/2012	
GEN-2011-040	111.00	ER/NR	OKGE	Pooleville 138kV	Tap Ratliff - Pooleville (Carter County) 138kV	12/31/2012	
GEN-2011-045	205.00	ER/NR	SPS	Jones 230kV	Jones 230kV	6/1/2013	TBD
GEN-2011-046	27.00	ER/NR	SPS	Tucumcari 115kV	Lopez 115kV	6/1/2013	TBD
GEN-2011-048	175.00	ER/NR	SPS	Mustang 230kV	Mustang 230kV	3/1/2013	TBD
GEN-2011-049	250.00	ER/NR	OKGE	Border 345kV	Border 345kV	12/31/2013	TBD
GEN-2011-050	109.80	ER/NR	AEPW	Tap Rush Springs - Marlow 138kV	Santa Fe Station 138kV	12/31/2013	
GEN-2011-051	104.40	ER/NR	OKGE	Tap Woodward - Tatonga 345kV	Tap Woodward - Tatonga 345kV	12/31/2013	12/31/2014
GEN-2011-054	300.00	ER	OKGE	Cimarron 345kV	Cimarron 345kV	11/30/2013	12/31/2014
GEN-2011-055	52.80	ER/NR	OPPD	South Sterling 69kV	South Sterling 69kV	12/31/2012	TBD
GEN-2011-056	3.60	ER	NPPD	Jeffrey 115kV	Jeffrey 115kV	6/30/2012	
GEN-2011-056A	3.60	ER	NPPD	John Lake 1 115kV	John 1 115kV	6/30/2012	
GEN-2011-056B	4.50	ER	NPPD	John Lake 2 115kV	John 2 115kV	6/30/2012	
GEN-2011-057	150.40	ER	WERE	Creswell 138kV	Creswell 138kV	12/31/2013	
<b>Total: 1,524.10</b>							

\*Requests that 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 Interconnection Requests**

See next page.

## **B: Prior Queued Interconnection Requests**

<b>Request</b>	<b>Amount</b>	<b>Area</b>	<b>Requested/Proposed Point of Interconnection</b>	<b>Status or In-Service Date</b>
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
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
GEN-2006-002	101.00	AEPW	Sweetwater 230kV	On-Line
GEN-2006-006	205.50	SUNCMKEC	Spearville 345kV	On Suspension
GEN-2006-018	170.00	SPS	TUCO Interchange 230kV	On-Line
GEN-2006-020N	42.00	NPPD	Bloomfield 115kV	On-Line
GEN-2006-020S	18.90	SPS	DWS Frisco 115kV	On-Line
GEN-2006-021	101.00	SUNCMKEC	Flat Ridge Tap 138kV	On-Line
GEN-2006-024S	19.80	WFEC	Buffalo Bear Tap 69kV	On-Line
GEN-2006-026	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

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
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-2006-047	240.00	SPS	Tap Bushland - Deaf Smith (Buffalo) 230kV	On Suspension
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 (Madison County) 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
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 2015



Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
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	On Schedule for 2017
GEN-2010-046	56.00	SPS	TUCO Interchange 230kV	On Schedule for 2016
GEN-2010-048	70.00	MIDW	Tap Beach Station - Redline 115kV	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	On Schedule for 2019
GEN-2011-010	100.80	OKGE	Minco 345kV	On-Line
GEN-2011-011	50.00	KACP	Iatan 345kV	On-Line
GEN-2011-014	201.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (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 for 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
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

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
SPS Distributed (TC-Texas County)	20.00	SPS	Texas County 115kV	On-Line
<b>Total:</b>		<b>19,776.6</b>		

## **C: Study Groupings**

See next page

## C. Study Groups

<b>GROUP 1: WOODWARD AREA</b>			
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
<b>PRIOR QUEUED SUBTOTAL</b>	<b>3,680.20</b>		
GEN-2011-051	104.40	OKGE	Tap Woodward - Tatonga 345kV
GEN-2011-054	300.00	OKGE	Cimarron 345kV
<b>CURRENT CLUSTER SUBTOTAL</b>	<b>404.40</b>		
<b>AREA TOTAL</b>	<b>4,084.60</b>		

<b>GROUP 2: HITCHLAND AREA</b>			
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
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
<b>PRIOR QUEUED SUBTOTAL</b>	<b>2,662.20</b>		
<b>AREA TOTAL</b>	<b>2,662.20</b>		

**GROUP 3: SPEARVILLE AREA**

Request	Capacity	Area	Proposed Point of Interconnection
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
Gray County Wind (Montezuma)	110.00	SUNCMKEC	Gray County Tap 115kV
<b>PRIOR QUEUED SUBTOTAL</b>	<b>3,687.90</b>		
<b>AREA TOTAL</b>	<b>3,687.90</b>		

**GROUP 4/11: NW KANSAS AREA**

Request	Capacity	Area	Proposed Point of Interconnection
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
<b>PRIOR QUEUED SUBTOTAL</b>	<b>1,888.10</b>		
<b>AREA TOTAL</b>	<b>1,888.10</b>		

**GROUP 5: AMARILLO AREA**

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2002-022	240.00	SPS	Bushland 230kV
GEN-2006-047	240.00	SPS	Tap Bushland - Deaf Smith (Buffalo) 230kV
GEN-2008-051	322.00	SPS	Potter County 345kV
GEN-2008-088	50.60	SPS	Vega 69kV
Llano Estacado (White Deer)	80.00	SPS	Llano Wind 115kV
<b>PRIOR QUEUED SUBTOTAL</b>	<b>932.60</b>		
<b>AREA TOTAL</b>	<b>932.60</b>		

<b>GROUP 6: S-TX PANHANDLE/W-TX AREA</b>			
<b>Request</b>	<b>Capacity</b>	<b>Area</b>	<b>Proposed Point of Interconnection</b>
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
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
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
<b>PRIOR QUEUED SUBTOTAL</b>	<b>1,853.30</b>		
ASGI-2011-004	20.00	SPS	Pleasant Hill 69kV
GEN-2011-045	205.00	SPS	Jones 230kV
GEN-2011-046	27.00	SPS	Lopez 115kV
GEN-2011-048	175.00	SPS	Mustang 230kV
<b>CURRENT CLUSTER SUBTOTAL</b>	<b>427.00</b>		
<b>AREA TOTAL</b>	<b>2,280.30</b>		

**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
<b>PRIOR QUEUED SUBTOTAL</b>	<b>1,568.20</b>		
GEN-2011-037	7.00	WFEC	Blue Canyon 5 138kV
GEN-2011-049	250.00	OKGE	Border 345kV
<b>CURRENT CLUSTER SUBTOTAL</b>	<b>257.00</b>		
<b>AREA TOTAL</b>	<b>1,825.20</b>		

**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
<b>PRIOR QUEUED SUBTOTAL</b>	<b>1,759.10</b>		
GEN-2011-057	150.40	WERE	Creswell 138kV
<b>CURRENT CLUSTER SUBTOTAL</b>	<b>150.40</b>		
<b>AREA TOTAL</b>	<b>1,909.50</b>		

<b>GROUP 9/10: NEBRASKA AREA</b>			
<b>Request</b>	<b>Capacity</b>	<b>Area</b>	<b>Proposed Point of Interconnection</b>
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 (Madison County) 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)
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
<b>PRIOR QUEUED SUBTOTAL</b>	<b>1,459.20</b>		
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
<b>CURRENT CLUSTER SUBTOTAL</b>	<b>64.50</b>		
<b>AREA TOTAL</b>	<b>1,523.70</b>		



**GROUP 12: NW-AR AREA**

Request	Capacity	Area	Proposed Point of Interconnection
<b>AREA TOTAL</b>		<b>0.00</b>	

**GROUP 13: NW MISSOURI AREA**

Request	Capacity	Area	Proposed Point of Interconnection
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
<b>PRIOR QUEUED SUBTOTAL</b>		<b>285.80</b>	
<b>AREA TOTAL</b>		<b>285.80</b>	

**GROUP 14: S-OKLAHOMA AREA**

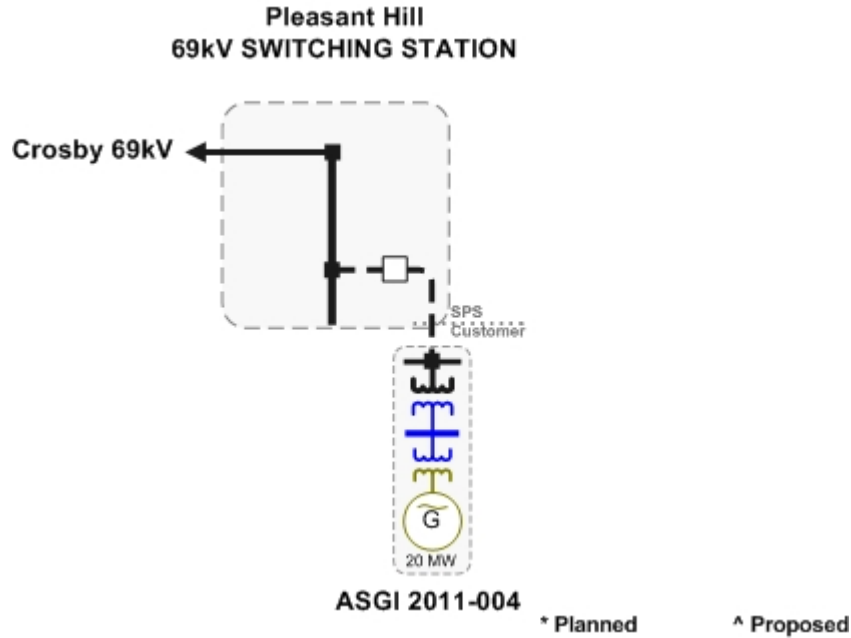
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2011-040	111.00	OKGE	Tap Ratliff - Pooleville (Carter County) 138kV
GEN-2011-050	109.80	AEPW	Santa Fe Station 138kV
<b>CURRENT CLUSTER SUBTOTAL</b>		<b>220.80</b>	
<b>AREA TOTAL</b>		<b>220.80</b>	

<b>CLUSTER TOTAL (CURRENT STUDY)</b>	<b>1,524.1</b>	<b>MW</b>
<b>PQ TOTAL (PRIOR QUEUED)</b>	<b>19,776.6</b>	<b>MW</b>
<b>CLUSTER TOTAL (INCLUDING PRIOR QUEUED)</b>	<b>21,300.7</b>	<b>MW</b>

### **D: Proposed Point of Interconnection One line Diagrams**

**\*\*Refer to most recent Facility study for each request for an updated one-line.\*\***

#### **ASGI-2011-004**



#### **GEN-2011-037**

**\*\*Refer to Facility Study for an updated one-line\*\***

#### **GEN-2011-040**

**\*\*Refer to Facility Study for an updated one-line\*\***

#### **GEN-2011-045**

**\*\*Refer to Facility Study for an updated one-line\*\***

#### **GEN-2011-046**

**\*\*Refer to Facility Study for an updated one-line\*\***

#### **GEN-2011-048**

**\*\*Refer to Facility Study for an updated one-line\*\***

**GEN-2011-049**

**\*\*Refer to Facility Study for an updated one-line\*\***

**GEN-2011-050**

**\*\*Refer to Facility Study for an updated one-line\*\***

**GEN-2011-051**

**\*\*Refer to Facility Study for an updated one-line\*\***

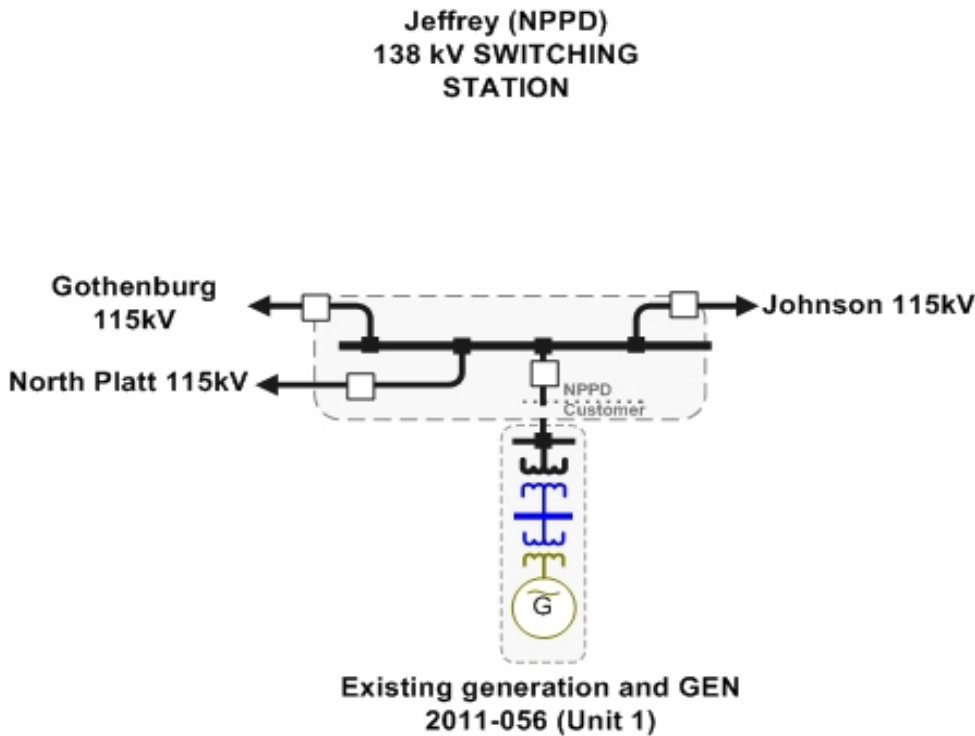
**GEN-2011-054**

**\*\*Refer to Facility Study for an updated one-line\*\***

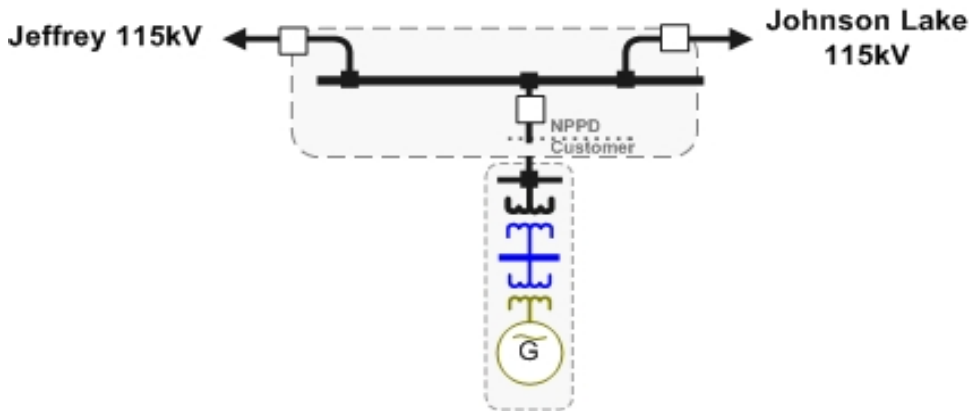
**GEN-2011-055**

**\*\*Refer to Facility Study for an updated one-line\*\***

**GEN-2011-056**

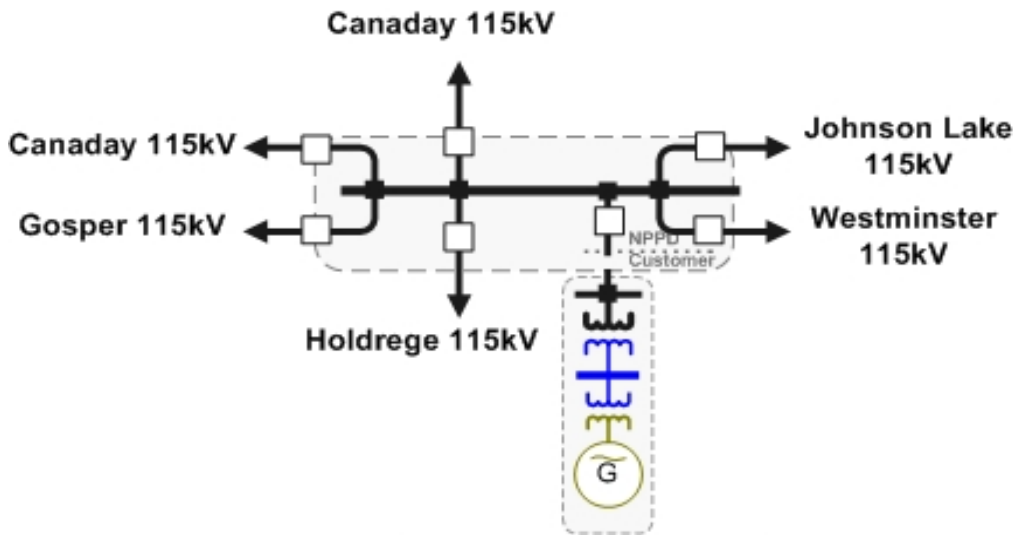


**Johnson No. 1 (NPPD)  
115 kV SWITCHING  
STATION**



**Existing generation and GEN  
2011-056 (Unit 2)**

**Johnson No. 2 (NPPD)  
115 kV SWITCHING  
STATION**



**Existing generation and GEN  
2011-056 (Unit 3)**

**GEN-2011-057**

**\*\*Refer to Facility Study for an updated one-line\*\***

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

Important Note:

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

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

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

In addition should a higher queued request, defined as one this study includes as a prior queued request, withdraw, the Network Upgrades assigned to the withdrawn request may be reallocated to the remaining requests that have an impact on the Network Upgrade under a restudy. Also, should 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 Generation Interconnection Request Customer will be determined at the time of a restudy.

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

# Appendix E. Cost Allocation Per Request

(Including Previously Allocated Network Upgrades\*)

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
<b>ASGI-2011-004</b>			
ASGI-2011-004 Interconnection Costs Per SPP Service Agreement Number 2872, Affected Facilities Construction Agreement.	Current Study	\$219,400.00	\$219,400.00
Power System Stabilizers (PSS) Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)	Current Study	\$9,836.07	\$210,000.00
Beaver County - Woodward 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00
Beaver County 345kV Expansion Beaver County Expansion: Tap & Tie in Hitchland - Woodward 345kV CKT 2	Previously Allocated		\$3,500,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Hitchland - Beaver County 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00
Hitchland 345/230kV Autotransformer CKT 2 Priority Project: Hitchland 345/230kV Autotransformer CKT 2 (Total Project E&C Cost Shown).	Previously Allocated		\$8,883,760.00
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 - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$207,782,000.00
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
TUCO Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: TUCO 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		\$14,900,907.00
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
	<b>Current Study Total</b>	<b>\$229,236.07</b>	

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

<b>Interconnection Request and Upgrades</b>	<b>Upgrade Type</b>	<b>Allocated Cost</b>	<b>Upgrade Cost</b>
<b>GEN-2011-037</b>			
GEN-2011-037 Interconnection Costs See Online Diagram.	Current Study	\$0.00	\$0.00
Clinton Jct - GEN-2007-032 Tap - Clinton 138kV Terminal Equipment Upgrade at Clinton Jct: Per GEN-2007-032 Interconnection	Previously Allocated		\$0.00
	<b>Current Study Total</b>	\$0.00	
<b>GEN-2011-040</b>			
GEN-2011-040 Interconnection Costs See Online Diagram.	Current Study	\$4,203,401.00	\$4,203,401.00
	<b>Current Study Total</b>	\$4,203,401.00	
<b>GEN-2011-045</b>			
Allen - Lubbock South 115kV CKT 1 NRIS only required upgrade: Rebuild approximately 6 miles of 115kV from Allen - Lubbock South	Current Study	\$10,946,449.00	\$10,946,449.00
GEN-2011-045 Interconnection Costs See Online Diagram.	Current Study	\$2,187,010.00	\$2,187,010.00
Power System Stabilizers (PSS) Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)	Current Study	\$100,819.67	\$210,000.00
Jones - Lubbock South 230kV CKT 2 Per SPP-2010-AGP1-AFS-8, Replace Line Traps.	In-Service		\$200,000.00
Beaver County - Woodward 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00
Beaver County 345kV Expansion Beaver County Expansion: Tap & Tie in Hitchland - Woodward 345kV CKT 2	Previously Allocated		\$3,500,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Hitchland - Beaver County 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00
Lubbock South 230/115kV Autotransformer CKT 2 NRIS only required upgrade Per 2013-SPP-ITP-NT and SPP-NTC-200214: Install 2nd 230/115/13.2kV Autotransformer	Previously Allocated		\$5,179,953.00

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

<b>Interconnection Request and Upgrades</b>	<b>Upgrade Type</b>	<b>Allocated Cost</b>	<b>Upgrade Cost</b>
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 - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$207,782,000.00
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
TUCO Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: TUCO 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		\$14,900,907.00
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
	<b>Current Study Total</b>		<b>\$13,234,278.67</b>

### **GEN-2011-046**

GEN-2011-046 Interconnection Costs See Online Diagram.	Current Study	\$3,433,559.00	\$3,433,559.00
Power System Stabilizers (PSS) Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)	Current Study	\$13,278.69	\$210,000.00
Beaver County - Woodward 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00
Beaver County 345kV Expansion Beaver County Expansion: Tap & Tie in Hitchland - Woodward 345kV CKT 2	Previously Allocated		\$3,500,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Hitchland - Beaver County 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00
Hitchland 345/230kV Autotransformer CKT 2 Priority Project: Hitchland 345/230kV Autotransformer CKT 2 (Total Project E&C Cost Shown).	Previously Allocated		\$8,883,760.00

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



<b>Interconnection Request and Upgrades</b>	<b>Upgrade Type</b>	<b>Allocated Cost</b>	<b>Upgrade Cost</b>
Lubbock South 230/115kV Autotransformer CKT 2 NRIS only required upgrade Per 2013-SPP-ITP-NT and SPP-NTC-200214: Install 2nd 230/115/13.2kV Autotransformer	Previously Allocated		\$5,179,953.00
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 - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$207,782,000.00
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
TUCO Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: TUCO 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		\$14,900,907.00
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
Yoakum 230/115/13kV Transformer CKT 1 and 2 NRIS only required upgrade Per SPP-2011-AG3-AFS-11: Replace existing two Yoakum 230/115/13kV transformers.	Previously Allocated		\$7,514,514.00
	<b>Current Study Total</b>		<b>\$3,446,837.69</b>

### **GEN-2011-048**

GEN-2011-048 Interconnection Costs See Online Diagram.	Current Study	\$1,008,667.00	\$1,008,667.00
Power System Stabilizers (PSS) Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)	Current Study	\$86,065.57	\$210,000.00
Beaver County - Woodward 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00
Beaver County 345kV Expansion Beaver County Expansion: Tap & Tie in Hitchland - Woodward 345kV CKT 2	Previously Allocated		\$3,500,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Hitchland - Beaver County 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00

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

<b>Interconnection Request and Upgrades</b>	<b>Upgrade Type</b>	<b>Allocated Cost</b>	<b>Upgrade Cost</b>
Hitchland 345/230kV Autotransformer CKT 2 Priority Project: Hitchland 345/230kV Autotransformer CKT 2 (Total Project E&C Cost Shown).	Previously Allocated		\$8,883,760.00
Lubbock South 230/115kV Autotransformer CKT 2 NRIS only required upgrade Per 2013-SPP-ITP-NT and SPP-NTC-200214: Install 2nd 230/115/13.2kV Autotransformer	Previously Allocated		\$5,179,953.00
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 - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$207,782,000.00
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
TUCO Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: TUCO 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		\$14,900,907.00
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
Yoakum 230/115/13kV Transformer CKT 1 and 2 NRIS only required upgrade Per SPP-2011-AG3-AFS-11: Replace existing two Yoakum 230/115/13kV transformers.	Previously Allocated		\$7,514,514.00
	<b>Current Study Total</b>		<b>\$1,094,732.57</b>

### GEN-2011-049

GEN-2011-049 Interconnection Costs See Oneline Diagram.	Current Study	\$3,654,353.00	\$3,654,353.00
Cleveland - Sooner 345KV CKT 1 Balanced Portfolio: Cleveland - Sooner 345kV CKT 1 (Total Project E&C Cost Shown).	In-Service		\$58,692,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
FPL Switch - Woodward 138kV CKT 1 NRIS only required upgrade: Rebuild approximately 12 miles of 138kV line	Previously Allocated		\$6,509,948.00
Hitchland - Beaver County 345kV Dbl CKT Priority Project: Hitchland - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$226,040,727.00

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

<b>Interconnection Request and Upgrades</b>	<b>Upgrade Type</b>	<b>Allocated Cost</b>	<b>Upgrade Cost</b>
Northwest 345/138k/13.8kV Autotransformer CKT 3 NRIS only required upgrade: Per 2009-AG2-AFS6	Previously Allocated		\$15,000,000.00
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 - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$207,782,000.00
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
TUCO Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: TUCO 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		\$14,900,907.00
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
	<b>Current Study Total</b>	<b>\$3,654,353.00</b>	

### **GEN-2011-050**

GEN-2011-050 Interconnection Costs See Online Diagram.	Current Study	\$7,310,940.00	\$7,310,940.00
	<b>Current Study Total</b>	<b>\$7,310,940.00</b>	

### **GEN-2011-051**

GEN-2011-051 Interconnection Costs See Online Diagram.	Current Study	\$9,276,873.00	\$9,276,873.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
FPL Switch - Mooreland 138kV CKT 1 NRIS only required upgrade: Rebuild approximately 0.2 miles of 138kV line	Previously Allocated		\$820,000.00
FPL Switch - Woodward 138kV CKT 1 NRIS only required upgrade: Rebuild approximately 12 miles of 138kV line	Previously Allocated		\$6,509,948.00
Glass Mountain - Mooreland 138kV NRIS only required upgrade: Rebuild approximately 24 miles of 138kV line	Previously Allocated		\$15,072,467.00

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

<b>Interconnection Request and Upgrades</b>	<b>Upgrade Type</b>	<b>Allocated Cost</b>	<b>Upgrade Cost</b>
Northwest 345/138k/13.8kV Autotransformer CKT 3 NRIS only required upgrade: Per 2009-AG2-AFS6	Previously Allocated		\$15,000,000.00
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 - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$207,782,000.00
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
TUCO Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: TUCO 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		\$14,900,907.00
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
	<b>Current Study Total</b>	<b>\$9,276,873.00</b>	

#### **GEN-2011-054**

GEN-2011-054 Interconnection Costs See Online Diagram.	Current Study	\$10,000.00	\$10,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: Tuco - Woodward 345kV CKT 1 (Total Project E&C Cost Shown)	Previously Allocated		\$249,247,072.00
Hitchland 345/230kV Autotransformer CKT 2 Priority Project: Hitchland 345/230kV Autotransformer CKT 2 (Total Project E&C Cost Shown).	Previously Allocated		\$8,883,760.00
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 - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$207,782,000.00
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

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

<b>Interconnection Request and Upgrades</b>	<b>Upgrade Type</b>	<b>Allocated Cost</b>	<b>Upgrade Cost</b>
TUCO Interchange 345/230/13.2KV Autotransformer CKT 2 Balanced Portfolio: TUCO 345/230 kV Transformer CKT 2 (Total Project E&C Cost Shown)	Previously Allocated		\$14,900,907.00
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
	<b>Current Study Total</b>	<b>\$10,000.00</b>	
<b>GEN-2011-055</b>			
GEN-2011-055 Interconnection Costs See Online Diagram.	Current Study	\$4,632,395.00	\$4,632,395.00
Hydro Carbon Tap - Sub974 69kV CKT 1 NRIS only required upgrade: Rewire CT on Sub 974	Current Study	\$9,793.00	\$9,793.00
Nebraska City U Syracuse - SUB 970 CKT 1 NRIS only required upgrade: Replace Terminal Equipment	Current Study	\$15,667.00	\$15,667.00
SUB 967 - SUB 968 69kV CKT 1 Replace terminal equipment	Current Study	\$15,667.00	\$15,667.00
SUB 968 - SUB 969 69kV CKT 1 Mitigated by replacing terminal equipment at Sub 969	Current Study	\$0.00	\$0.00
SUB 969 - SUB 974 69kV CKT 1 Mitigated by replacing terminal equipment at Sub 969	Current Study	\$0.00	\$0.00
	<b>Current Study Total</b>	<b>\$4,673,522.00</b>	
<b>GEN-2011-056</b>			
GEN-2011-056 Interconnection Costs See Online Diagram.	Current Study	\$1.00	\$1.00
	<b>Current Study Total</b>	<b>\$1.00</b>	
<b>GEN-2011-057</b>			
GEN-2011-057 Interconnection Costs See Online Diagram.	Current Study	\$2,040,698.00	\$2,040,698.00
Cleveland - Sooner 345KV CKT 1 Balanced Portfolio: Cleveland - Sooner 345kV CKT 1 (Total Project E&C Cost Shown).	In-Service		\$58,692,000.00
	<b>Current Study Total</b>	<b>\$2,040,698.00</b>	
<b>TOTAL CURRENT STUDY COSTS:</b>		<b>\$49,174,873.00</b>	

\* 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 Generation Interconnection Request Customer(s) which have an impact in this study assuming all higher queued projects remain in the queue and achieve commercial operation.

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

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

# Appendix F. Cost Allocation by Upgrade

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**Allen - Lubbock South 115kV CKT 1** **\$10,946,449.00**

NRIS only required upgrade: Rebuild approximately 6 miles of 115kV from Allen - Lubbock South

GEN-2011-045 \$10,946,449.00

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**Total Allocated Costs** **\$10,946,449.00**

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**ASGI-2011-004 Interconnection Costs** **\$219,400.00**

Per SPP Service Agreement Number 2872, Affected Facilities Construction Agreement.

ASGI-2011-004 \$219,400.00

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**Total Allocated Costs** **\$219,400.00**

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**GEN-2011-037 Interconnection Costs** **\$0.00**

See Online Diagram.

GEN-2011-037 \$0.00

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**Total Allocated Costs** **\$0.00**

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**GEN-2011-040 Interconnection Costs** **\$4,203,401.00**

See Online Diagram.

GEN-2011-040 \$4,203,401.00

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**Total Allocated Costs** **\$4,203,401.00**

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**GEN-2011-045 Interconnection Costs** **\$2,187,010.00**

See Online Diagram.

GEN-2011-045 \$2,187,010.00

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**Total Allocated Costs** **\$2,187,010.00**

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**GEN-2011-046 Interconnection Costs** **\$3,433,559.00**

See Online Diagram.

GEN-2011-046 \$3,433,559.00

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**Total Allocated Costs** **\$3,433,559.00**

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**GEN-2011-048 Interconnection Costs** **\$1,008,667.00**

See Online Diagram.

GEN-2011-048 \$1,008,667.00

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**Total Allocated Costs** **\$1,008,667.00**

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

<b>GEN-2011-049 Interconnection Costs</b>		<b>\$3,654,353.00</b>
See Online Diagram.		
	GEN-2011-049	\$3,654,353.00
	<b>Total Allocated Costs</b>	<b>\$3,654,353.00</b>
<b>GEN-2011-050 Interconnection Costs</b>		<b>\$7,310,940.00</b>
See Online Diagram.		
	GEN-2011-050	\$7,310,940.00
	<b>Total Allocated Costs</b>	<b>\$7,310,940.00</b>
<b>GEN-2011-051 Interconnection Costs</b>		<b>\$9,276,873.00</b>
See Online Diagram.		
	GEN-2011-051	\$9,276,873.00
	<b>Total Allocated Costs</b>	<b>\$9,276,873.00</b>
<b>GEN-2011-054 Interconnection Costs</b>		<b>\$10,000.00</b>
See Online Diagram.		
	GEN-2011-054	\$10,000.00
	<b>Total Allocated Costs</b>	<b>\$10,000.00</b>
<b>GEN-2011-055 Interconnection Costs</b>		<b>\$4,632,395.00</b>
See Online Diagram.		
	GEN-2011-055	\$4,632,395.00
	<b>Total Allocated Costs</b>	<b>\$4,632,395.00</b>
<b>GEN-2011-056 Interconnection Costs</b>		<b>\$1.00</b>
See Online Diagram.		
	GEN-2011-056	\$1.00
	<b>Total Allocated Costs</b>	<b>\$1.00</b>
<b>GEN-2011-057 Interconnection Costs</b>		<b>\$2,040,698.00</b>
See Online Diagram.		
	GEN-2011-057	\$2,040,698.00
	<b>Total Allocated Costs</b>	<b>\$2,040,698.00</b>
<b>Hydro Carbon Tap - Sub974 69kV CKT 1</b>		<b>\$9,793.00</b>
NRIS only required upgrade: Rewire CT on Sub 974		
	GEN-2011-055	\$9,793.00
	<b>Total Allocated Costs</b>	<b>\$9,793.00</b>

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



<b>Nebraska City U Syracuse - SUB 970 CKT 1</b>		<b>\$15,667.00</b>
NRIS only required upgrade: Replace Terminal Equipment		
	GEN-2011-055	\$15,667.00
	<b>Total Allocated Costs</b>	<b>\$15,667.00</b>
<b>Power System Stabilizers (PSS)</b>		<b>\$210,000.00</b>
Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)		
	ASGI-2011-004	\$9,836.07
	GEN-2011-045	\$100,819.67
	GEN-2011-046	\$13,278.69
	GEN-2011-048	\$86,065.57
	<b>Total Allocated Costs</b>	<b>\$210,000.00</b>
<b>SUB 967 - SUB 968 69kV CKT 1</b>		<b>\$15,667.00</b>
Replace terminal equipment		
	GEN-2011-055	\$15,667.00
	<b>Total Allocated Costs</b>	<b>\$15,667.00</b>
<b>SUB 968 - SUB 969 69kV CKT 1</b>		<b>\$0.00</b>
Mitigated by replacing terminal equipment at Sub 969		
	GEN-2011-055	\$0.00
	<b>Total Allocated Costs</b>	<b>\$0.00</b>
<b>SUB 969 - SUB 974 69kV CKT 1</b>		<b>\$0.00</b>
Mitigated by replacing terminal equipment at Sub 969		
	GEN-2011-055	\$0.00
	<b>Total Allocated Costs</b>	<b>\$0.00</b>

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

## **G: Power Flow Analysis (Constraints For Mitigation)**

See next page.



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

See Next Page



SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATEB (MVA)	TDF	TC%LOADING (% MVA)	CONTINGENCY
FDNS		0	0 14SP	G11_045	FROM->TO	LUBBOCK SOUTH INTERCHANGE (ABB LLM60043) 230/115/13.2KV TRANSFORMER CKT 1	252	0.13578	102.7524	LUBBOCK EAST INTERCHANGE (ENRCO 136162) 230/115/13.2KV TRANSFORMER CKT 1
FDNS	00G11_045		0 14SP	G11_045	FROM->TO	LUBBOCK SOUTH INTERCHANGE (ABB LLM60043) 230/115/13.2KV TRANSFORMER CKT 1	252	0.13578	102.7524	LUBBOCK EAST INTERCHANGE (ENRCO 136162) 230/115/13.2KV TRANSFORMER CKT 1
FDNS		0	0 14SP	G11_048	TO->FROM	BAILEY COUNTY REC-EARTH INTERCHANGE - PLANT X STATION 115KV CKT 1	160	0.05618	101.2671	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1
FDNS	00G11_048		0 14SP	G11_048	TO->FROM	BAILEY COUNTY REC-EARTH INTERCHANGE - PLANT X STATION 115KV CKT 1	160	0.05618	101.2671	DEAF SMITH COUNTY INTERCHANGE - PLANT X STATION 230KV CKT 1
FDNS		0	0 14SP	G11_048	FROM->TO	LUBBOCK SOUTH INTERCHANGE (ABB LLM60043) 230/115/13.2KV TRANSFORMER CKT 1	252	0.03046	102.7524	LUBBOCK EAST INTERCHANGE (ENRCO 136162) 230/115/13.2KV TRANSFORMER CKT 1
FDNS	00G11_048		0 14SP	G11_048	FROM->TO	LUBBOCK SOUTH INTERCHANGE (ABB LLM60043) 230/115/13.2KV TRANSFORMER CKT 1	252	0.03046	102.7524	LUBBOCK EAST INTERCHANGE (ENRCO 136162) 230/115/13.2KV TRANSFORMER CKT 1
FNSL		0	0 24SP	G11_048	TO->FROM	PCA INTERCHANGE - REDDY 3115.00 115KV CKT 1	160	0.03868	104.0293	CUNNINGHAM STATION - POTASH JUNCTION INTERCHANGE 230KV CKT 1
FNSL	00G11_048		0 24SP	G11_048	TO->FROM	PCA INTERCHANGE - REDDY 3115.00 115KV CKT 1	160	0.03868	104.0293	CUNNINGHAM STATION - POTASH JUNCTION INTERCHANGE 230KV CKT 1
FDNS		0	0 24SP	G11_048	FROM->TO	YOAKUM COUNTY INTERCHANGE (PENN C010585) 230/115/13.2KV TRANSFORMER CKT 2	150	0.05935	101.1758	YOAKUM COUNTY INTERCHANGE (GE M100899) 230/115/13.2KV TRANSFORMER CKT 1
FDNS	00G11_048		0 24SP	G11_048	FROM->TO	YOAKUM COUNTY INTERCHANGE (PENN C010585) 230/115/13.2KV TRANSFORMER CKT 2	150	0.05935	101.1758	YOAKUM COUNTY INTERCHANGE (GE M100899) 230/115/13.2KV TRANSFORMER CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04163	184.5152	DBL-WICH-THI
FDNS		1	0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04169	162.2636	DBL-WICH-THI
FDNS	06ALL		0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04135	131.1551	DBL-WICH-THI
FDNS	07ALL		0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04174	119.1608	DBL-WICH-THI
FDNS		6	0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04151	118.5823	DBL-WICH-THI
FDNS	07NR		0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04734	116.0672	DBL-WICH-THI
FDNS	07G11_049		0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04176	115.8966	DBL-WICH-THI
FDNS		7	0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04176	113.9162	DBL-WICH-THI
FDNS	00NR		0 14WP	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04668	107.0564	DBL-WICH-THI
FDNS	00NR		0 19WP	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.0482	106.7753	DBL-WICH-THI
FDNS	09ALL		0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04167	102.6887	DBL-WICH-THI
FDNS		9	0 14G	G11_049	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	0.04174	100.8451	DBL-WICH-THI
FDNS	01ALL		0 14G	G11_049	TO->FROM	EL RENO - ROMAN NOSE 138KV CKT 1	153	0.031	100.3437	NORTHWEST - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FLATRDG3 - THISTLE4 138.00 138KV CKT 1	286	0.05874	103.1131	DBL-WICH-THI
FDNS	01ALL		0 14G	G11_049	FROM->TO	FPL SWITCH - MOORELAND 138KV CKT 1	287	0.08803	117.9721	NORTHWEST - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	FROM->TO	FPL SWITCH - MOORELAND 138KV CKT 1	287	0.08993	107.073	DBL-THIS-WWR
FDNS	01ALL		0 14G	G11_049	FROM->TO	FPL SWITCH - MOORELAND 138KV CKT 1	287	0.08033	103.7095	DBL-WICH-THI
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08803	168.8569	NORTHWEST - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08993	147.6688	DBL-THIS-WWR
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08033	141.0742	DBL-WICH-THI
FDNS		1	0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08774	141.045	NF
FDNS		1	0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08985	121.364	DBL-THIS-WWR
FDNS		1	0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08019	120.0783	DBL-WICH-THI
FDNS	06ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08533	115.1682	NORTHWEST - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06966	114.1981	WOODWARD (WOODWRD2) 138/69/13.2KV TRANSFORMER CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06192	112.6256	GEN520997 1-MORLND2
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06192	112.2287	GEN515787 1-OKLA WIND ENERGY CENTER
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.07213	109.7223	DBL-BVR-WWRD
FDNS	06ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.07809	109.6167	DBL-WICH-THI
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06192	108.4665	GEN520922 1-SLEEPING BEAR
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06192	106.6517	GEN520998 1-MORLND3
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06972	106.0665	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 2
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.0697	106.0402	THISTLE7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.0727	105.3496	IODINE - WOODWARD EHV 138KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06438	104.384	DEWEY - TALOGA 138KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08498	104.0211	BORDER 7345.00 - TUCO INTERCHANGE 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.0727	103.7072	DEWEY - IODINE 138KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06192	103.319	BASE CASE
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08803	102.7596	G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	06ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08533	102.7495	G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06248	102.7096	FT SUPPLY - IODINE 138KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06474	102.4708	DBL-HTCH-BVR
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06627	101.7809	THISTLE7 345.00 - WICHITA 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06627	101.7809	THISTLE7 345.00 - WICHITA 345KV CKT 2
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06966	101.64	WOODWARD - WOODWARD 69KV CKT 1
FDNS	06ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.05969	101.5693	GEN520997 1-MORLND2
FDNS		1	0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06175	101.4567	GEN520997 1-MORLND2
FDNS	06ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06719	101.2072	WOODWARD (WOODWRD2) 138/69/13.2KV TRANSFORMER CKT 1
FDNS	06ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.08533	101.1396	G11_051T 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1
FDNS	01ALL		0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06248	101.1373	IODINE - MOORELAND 138KV CKT 1
FDNS		1	0 14G	G11_049	TO->FROM	FPL SWITCH - WOODWARD 138KV CKT 1	153	0.06947	99.8	WOODWARD (WOODWRD2) 138/69/13.2KV TRANSFORMER CKT 1









## **I: Power Flow Analysis (Category "C" Contingencies)**

Available on Request

# **J: Dynamic Stability Analysis Report**

None