Definitive Interconnection System Impact Study for Generation Interconnection Requests

(DISIS-2013-001-4)

October 2014

Generator Interconnection

SPP Southwest Power Pool

Revision History

Date	Author	Change Description
07/31/2013	SPP	Report Issued (DISIS-2013-001) – Group 6 Interconnection Requests not included in this issue.
08/30/2013	SPP	Group 6 Interconnection Requests results appended and NRIS withdrawals accounted, Report Re-Posted (DISIS-2013-001-1)
01/31/2014	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2013-001-2)
07/30/2014	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2013-001-3, Group 3 and 8 Restudy)
10/23/2014	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2013-001-4)

Executive Summary

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 March 31, 2013. The customers will be referred to in this study as the DISIS-2013-001 Interconnection Customers. This System Impact Study analyzes the interconnection of a generation interconnection request associated with generation totaling approximately 605.9 MW of new generation which would be located within the transmission systems of American Electric Cooperative Corporation (AEPW), Oklahoma Gas and Electric (OKGE), Sunflower Electric Power Corporation/Mid-Kansas Electric Power LLC (SUNC)/(MKEC). The generation interconnection requests have various proposed in-service date[1]. The generation interconnection request included in this System Impact Cluster Study is listed in Appendix A by its queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date.

Power flow analysis has indicated that for the power flow cases studied, 605.9 MW of nameplate generation may be interconnected with transmission system reinforcements within the SPP transmission system. Dynamic stability and power factor analysis has determined the need for reactive compensation in accordance with FERC Order #661A for wind farm interconnection requests and those requirements are listed for each interconnection request within the contents of this report. Dynamic stability analysis has determined that the transmission system will remain stable with the assigned Network Upgrades and necessary reactive compensation requirements.

In no way does this study guarantee operation for all periods of time. This interconnection study identifies and assigns transmission reinforcements for Energy Resource (ER) interconnection injection constraints (defined as a 20% distribution factor impact) and Network Resource (NR) constraints if requested by the Customer. This interconnection study does not assign transmission reinforcements for all potential transmission constraints. It should be noted that although this study analyzed many of the most probable contingencies, it is not an all-inclusive list and cannot account for every operational situation. Because of this, it is likely that the Customer(s) may be required to reduce their generation output to 0 MW, also known as curtailment, under certain system conditions to allow system operators to maintain the reliability of the transmission network.

The total estimated minimum cost for interconnecting the DISIS-2013-001 Interconnection Customers is estimated at $8,233,175. These costs are shown in Appendix E and F. Interconnection

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

Service to DISIS-2013-001 Interconnection Customers is also contingent upon higher queued customers paying for certain required network upgrades. **The in-service date for the DISIS customers will be deferred until the construction of these network upgrades can be completed.**

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

Network constraints listed in Appendix H are in the local area of the new generation when this generation is injected throughout the SPP footprint for Energy Resource Interconnection Service (ERIS) requests. Certain Interconnection Requests were also studied for Network Resource Interconnection Service (NRIS). Those constraints are also listed in Appendix H. Additional network constraints will have to be verified with a Transmission Service Request (TSR) and associated studies. With a defined source and sink in a TSR, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements.

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

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Introduction

Pursuant to the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT), SPP has conducted this Definitive Interconnection System Impact Study (DISIS) for certain generation interconnection requests in the SPP Generation Interconnection Queue. These interconnection requests have been clustered together for the following System Impact Study window which closed March 31, 2013. The customers will be referred to in this study as the DISIS-2013-001 Interconnection Customers. Only study results for those requests within DISIS-2013-001 Group 3 and Group 8 are included within this restudy. The study results for the previous restudy are still valid for the remaining groups included within this DISIS-2013-001. This System Impact Study analyzes the interconnection of a generation interconnection request associated with new generation totaling approximately 605.9 MW of new generation which would be located within the transmission systems of American Electric Cooperative Corporation (AEPW), Lincoln Electric System (LES), Oklahoma Gas and Electric (OKGE), Southwestern Public Service (SPS), and Sunflower Electric Power Corporation/Mid-Kansas Electric Power LLC (SUNC)/(MKEC). The generation interconnection request has a differing proposed in-service date[2]. The generation interconnection requests included in this System Impact Study are listed in Appendix A by their queue number, amount, requested interconnection service, area, requested interconnection point, proposed interconnection point, and the requested in-service date.

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

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

Model Development

Interconnection Requests Included in the Cluster

SPP has included all interconnection requests that submitted a Definitive Interconnection System Impact Study Agreement no later than March 31, 2013 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 Request

Also included in this Definitive Interconnection System Impact Study are three Affected System Studies. The Affected System Study Requests have been given the designations: ASGI-2013-001 (11.5MW, Point of Interconnection is PanTex South 115kV), ASGI-2013-002 (18.4 MW, Point of Interconnection is Farmers Electric Tucumcari 115kV), and ASGI-2013-003 (18.4 MW, Point of Interconnection is Farmers Electric Clovis 115kV). ASGI-2013-001 is located on a Customer distribution voltage bus served by the Southwestern Public Service Transmission System. ASGI-2013-001 was studied in Group 5 (Amarillo Area), ASGI-2013-002 and ASGI-2013-003 was studied in Group 6 (southern Texas Panhandle).

Previously Queued Interconnection Requests

The previous queued requests included in this study are listed in Appendix C. 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, and the 2019 summer and winter peak, and 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 peak cases were used as starting points for this study.

Base Case Upgrades

The following facilities are part of the SPP Transmission Expansion Plan, the Balanced Portfolio or recently approved Priority Projects. These facilities have an approved Notification to Construct (NTC) or are in construction stages and were assumed to be in-service at the time of dispatch and added to the base case models. The DISIS-2013-001 Interconnection Customers have not been assigned acceleration costs for the below listed projects. The DISIS-2013-001 Interconnection 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.

- Balanced Portfolio Projects[3]:
  - Woodward – Border – TUCO 345kV project, scheduled for 9/30/2014 in-service
    - Woodward 345/138kV circuit #2 autotransformer , placed in-service in 2014
    - TUCO 345/230kV circuit #2 autotransformer, placed in-service in 2014
    - Reactors at Woodward and Border, placed in-service in 2014
  - Iatan – Nashua 345kV, scheduled for 6/1/2015 in-service
    - Nashua 345/161kV autotransformer
  - Muskogee – Seminole 345kV, placed in-service in 2013
- Priority Projects[4]:
  - Hitchland – Woodward double circuit 345kV, placed in-service in 2014
    - Hitchland 345/230kV circuit #2 autotransformer, placed in-service in 2014
  - Woodward – Thistle double circuit 345kV, scheduled for 12/31/2014 in-service
  - Spearville – Clark County double circuit 345kV, scheduled for 12/31/2014 in-service
  - Clark County – Thistle double circuit 345kV, scheduled for 12/31/2014 in-service
  - Thistle – Wichita double circuit 345kV, placed in-service in 2014
  - Thistle 345/138kV autotransformer, placed in-service in 2014
  - Thistle – Flat Ridge 138kV, placed in-service in 2014
- Sheldon – SW 7th and Pleasant Hill 115kV circuit #2 rebuild, placed in-service in 2013[5]
- Arcadia – Redbud 345kV circuit #1 and #2 terminal equipment replacement, placed in-service in 2013[6]

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-2013-001 study and are assumed to be in service. This list may not be all inclusive. The DISIS-2013-001 Interconnection Customers, at this time, do not have responsibility for these facilities but may later be assigned the cost of these facilities if higher queued customers terminate their Generation Interconnection Agreement or withdraw from the interconnection queue. The DISIS-2013-001 Interconnection Customer Generation Facilities in-service dates may need to be delayed until the completion of the following upgrades.

[3] Notification to Construct (NTC) issued June 2009
[4] Notification to Construct (NTC) issued June 2010
[5] SPP Regional Reliability 2012 ITPNT Project Per SPP-NTC-200171
[6] SPP Regional Reliability 2013 ITPNT Project Per SPP-NTC-200204

- 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:
  - 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
- Upgrades assigned to DISIS-2011-002 Interconnection Customers:
  - Power System Stabilizers - Install Power System Stabilizers @ Tolk(Units: 1,2) and Jones (Units: 1,2,3,4)
- Upgrades assigned to DISIS-2012-001 Interconnection Customers:
  - None at this time
- Upgrades assigned to DISIS-2012-002 interconnection Customers:
  - Amoco Wasson – Oxy Tap 230kV circuit #1 replace line traps
  - Associated Electric Cooperatives Inc. (AECI) Fairfax 138/69kV circuit #1 replace transformer
  - Lake Creek – Lone Wolf 69kV circuit #1 reset CT
  - Remington – Fairfax 138kV circuit #1 conductor clearance increase

Potential Upgrades Not in the Base Case

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

Regional Groupings

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

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

Power Flow

For 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 a load factor by area 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 all interconnection requests in each group being dispatched at 100% nameplate.

Peaking units were not dispatched in the 2014 spring model. To study peaking units' impacts, the 2014 summer and winter and 2019 summer and winter, and 2024 summer seasonal models were chosen and peaking units were modeled at 100% of the nameplate rating and wind generating facilities were modeled at 10% of the nameplate rating. Each interconnection request was also modeled separately at 100% nameplate for certain analyses.

Dynamic Stability

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

Identification of Network Constraints

The initial set of network constraints were found by using PSS®MUST First Contingency Incremental Transfer Capability (FCITC) analysis on the entire cluster grouping dispatched at the various levels mentioned above. These constraints were then screened to determine 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 also considered for mitigation.

Determination of Cost Allocated Network Upgrades

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

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

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

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

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

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

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

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

- Repeat previous for each responsible GI request for each Project

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

Credits for Amounts Advanced for Network Upgrades

Interconnection Customer shall be entitled to credits in accordance with Attachment Z2 of the SPP Tariff for any Network Upgrades including any tax gross-up or any other tax-related payments associated with the Network Upgrades, and not refunded to the Interconnection Customer.

Required Interconnection Facilities

The requirement to interconnect the 605.9 MW of generation into the existing and proposed transmission systems in the affected areas of the SPP transmission footprint consist of the necessary cost allocated shared facilities listed in Appendix F by upgrade. The interconnection requirements total an estimated $8,233,175. Interconnection Facilities specific to each generation interconnection request are listed in Appendix E. A preliminary one-line drawing for the generation interconnection request is listed in Appendix D.

A list of constraints that were identified and used for mitigation are listed in Appendix G. Listed within Appendix G are the ERIS constraints with greater than or equal to a 20% DF, as well as, the NRIS constraints that have a DF of 3% or greater. Other Network Constraints which are not requiring mitigation are shown in Appendix H. With a defined source and sink in a TSR, this list of Network Constraints will be refined and expanded to account for all Network Upgrade requirements. Additional constraints identified by NERC category "C" contingencies are listed in Appendix I.

Power Flow Analysis

Power Flow Analysis Methodology

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

Power Flow Analysis

A power flow analysis was conducted for each Interconnection Customer's facility using modified versions of the 2014 spring peak, 2014 summer and winter peak, and the 2019 summer and winter peak, 2024 summer peak models. The output of the Interconnection Customer's facility was offset in each model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource Interconnection Service request (ERIS). Certain requests that are pursuing Network Resource Interconnection Service (NRIS) had an additional analysis conducted for displacing resources in the interconnecting Transmission Owner's balancing authority.

This analysis was conducted assuming that previous queued requests in the immediate area of these interconnect requests were in-service. The analysis of Group 3 and Group Interconnection Customer's project indicates that criteria violations will occur on the SUNC/MKEC transmission systems under system intact and contingency conditions in the peak seasons.

Cluster Group 1 (Woodward Area)

In addition to the 4,084.6 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 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 3,810.4 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied.

Cluster Group 4/11 (NW Kansas Group)

In addition to the 1,818.1 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 692.6 MW of previously queued generation in the area, 11.5 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 3,091.65 MW of previously queued generation in the area, 239.8 MW of new interconnection service was studied. No new constraints were found in this area.

Cluster Group 7 (Southwestern Oklahoma)

In addition to the 1,900.0 MW of previously queued generation in the area, 0.0 MW of new interconnection service was studied. No new constraints were found in this area.

Cluster Group 8 (South Central Kansas/North Oklahoma)

In addition to the 2,642.3 MW of previously queued generation in the area, 147 MW of new interconnection service was studied. An additional 1,200 MW of existing generation was studied for Interconnection Requests that share a Point of Interconnection (POI) with the studied generation. No new constraints were found in this area.

Cluster Group 9/10 (Nebraska)

In addition to the 1,562.7 MW of previously queued generation in the area, 77.2 MW of new interconnection service was studied. No new constraints were found in this area.

Cluster Group 12 (Northwest Arkansas)

In addition to the 0.0 MW of previously queued generation in the area, 30.0 MW of new interconnection service was studied. An additional 620.0 MW of existing generation was studied for Interconnection Requests that share a Point of Interconnection (POI) with the studied generation. No new constraints were found in this area.

Cluster Group 13 (Northwest Missouri)

In addition to the 134.6 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 14 (South Central Oklahoma)

In addition to the 262.2 MW of previously queued generation in the area, 100.3 MW of new interconnection service was studied. No new constraints were found in this area.

Curtailment and System Reliability

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

Stability Analysis

A stability analysis was conducted for each Interconnection Customer using modified versions of the 2013 series SPP Model Development Working Group (MDWG) Models 2014 winter, 2015 summer, and 2024 summer peak dynamic cases. 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. The entire stability study for each group can be found in the Appendices section.

Cluster Group 1 (Woodward Area)

The Group 1 stability analysis was not performed again for this restudy. No requests remain in this Group.

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)

The Group 3 stability analysis was not performed again for this restudy. No requests remain in this Group.

Cluster Group 4/11 (Northwest Kansas Area)

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

Cluster Group 5 (Amarillo Area)

The Group 5 stability analysis was not performed again for this restudy. The original analysis in DISIS-2013-001 is still valid.

Cluster Group 6 (South Texas Panhandle/New Mexico)

The Group 6 stability analysis for this restudy was performed by SPP Staff. The analysis was performed to evaluate the impacts of the withdrawal of GEN-2013-013. Stability analysis has determined that when all previously 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.

Cluster Group 7 (Southwest Oklahoma Area)

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

Cluster Group 8 (South Central Kansas/North Oklahoma)

The Group 8 stability analysis was not performed again for this restudy. The original analysis in DISIS-2013-001 is still valid.

Cluster Group 9/10 (Nebraska)

The Group 9/10 stability analysis was not performed again for this restudy. The original analysis in DISIS-2013-001 is still valid.

Cluster Group 12 (Northwest Arkansas Area)

The Group 12 stability analysis was not performed again for this restudy. The original analysis in DISIS-2013-001 is still valid.

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. The original analysis in DISIS-2013-001 is still valid.

Conclusion

The minimum cost of interconnecting 605.9 MW of new interconnection requests included in this Definitive Interconnection System Impact Study is estimated at $8,233,175 for the Allocated Network Upgrades and Transmission Owner Interconnection Facilities are listed in Appendix E and F. These costs do not include the cost of upgrades of other transmission facilities listed in Appendix H which are Network Constraints.

These interconnection costs do not include any cost of Network Upgrades determined to be required by short circuit analysis. These studies will be performed if the Interconnection Customer executes the appropriate Interconnection Facilities Study Agreement and provides the required data along with demonstration of Site Control and the appropriate deposit. At the time of the Interconnection Facilities Study, a better determination of the interconnection facilities may be available.

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

Appendices

A: 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-2013-001	11.50	ER	SPS	PanTex South 115kV	PanTex South 115kV		
ASGI-2013-002	18.40	ER	SPS	FE Tucumcari 115kV	FE Tucumcari 115kV		
ASGI-2013-003	18.40	ER	SPS	FE Clovis 115kV	FE Clovis 115kV		
GEN-2013-002	50.60	ER/NR	LES	Tap Sheldon - Folsom & Pleasant Hill 115kV CKT 2	Tap Sheldon - Folsom & Pleasant Hill 115kV CKT 2	12/31/2013	TBD
GEN-2013-007	100.30	ER/NR	OKGE	Tap Prices Falls - Carter 138kV	Tap Prices Falls - Carter 138kV	12/31/2014	TBD
GEN-2013-008	1.20	ER	NPPD	Steele City 115kV	Steele City 115kV	12/31/2013	
GEN-2013-011	30.00	ER	AEPW	Turk 138kV	Turk 138kV		TBD
GEN-2013-012	147.00	ER	OKGE	Redbud 345kV	Redbud 345kV	11/30/2014	TBD
GEN-2013-014	25.50	ER/NR	NPPD	Tap Guide Rock - Pauline (GEN-2008-123N Tap) 115kV	Tap Guide Rock - Pauline (GEN-2008-123N Tap) 115kV	12/31/2014	TBD
GEN-2013-016	203.00	ER	SPS	TUCO 345kV	TUCO 345kV	12/1/2016	TBD
Total:	**605.90**						

*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: Generation Interconnection Requests in Impact Study

See next page.

B: Prior Queued Interconnection Requests

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
ASGI-2010-006	150.00	AECI	Tap Fairfax (AECI) - Shilder (AEPW) 138kV	AECI queue Affected Study
ASGI-2010-010	42.20	SPS	Lovington 115kV	Lea County Affected Study
ASGI-2010-020	30.00	SPS	Tap LE-Tatum - LE-Crossroads 69kV	Lea County Affected Study
ASGI-2010-021	15.00	SPS	Tap LE-Saunders Tap - LE-Anderson 69kV	Lea County Affected Study
ASGI-2011-001	28.80	SPS	Lovington 115kV	On-Line
ASGI-2011-002	20.00	SPS	Herring 115kV	On-Line
ASGI-2011-003	10.00	SPS	Hendricks 115kV	On-Line
ASGI-2011-004	20.00	SPS	Pleasant Hill 69kV	Under Study (DISIS-2011-002)
ASGI-2012-002	18.15	SPS	FE-Clovis Interchange 115kV	Under Study (DISIS-2012-002)
ASGI-2012-006	22.50	SUNCMKEC	Tap Hugoton - Rolla 69kV	Under Study (DISIS-2012-001)
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

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2006-031	75.00	MIDW	Knoll 115kV	On-Line
GEN-2006-035	225.00	AEPW	Sweetwater 230kV	On-Line at 132MW
GEN-2006-037N1	75.00	NPPD	Broken Bow 115kV	On Schedule for 2014
GEN-2006-038N005	80.00	NPPD	Broken Bow 115kV	On-Line
GEN-2006-038N019	80.00	NPPD	Petersburg North 115kV	On-Line
GEN-2006-040	108.00	SUNCMKEC	Mingo 115kV	On Suspension
GEN-2006-043	99.00	AEPW	Sweetwater 230kV	On-Line
GEN-2006-044	370.00	SPS	Hitchland 345kV	On-Line at 120MW
GEN-2006-044N	40.50	NPPD	North Petersburg 115kV	On-Line
GEN-2006-046	131.00	OKGE	Dewey 138kV	On-Line
GEN-2007-011	135.00	SUNCMKEC	Syracuse 115kV	On Suspension
GEN-2007-011N08	81.00	NPPD	Bloomfield 115kV	On-Line
GEN-2007-021	201.00	OKGE	Tatonga 345kV	On Schedule for 2014
GEN-2007-025	300.00	WERE	Viola 345kV	On-Line
GEN-2007-032	150.00	WFEC	Tap Clinton Junction - Clinton 138kV	On Suspension
GEN-2007-040	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 County - Tolk (Crossroads) 345kV	On Schedule for 2015
GEN-2008-023	150.00	AEPW	Hobart Junction 138kV	On-Line
GEN-2008-037	101.00	WFEC	Tap Washita - Blue Canyon Wind 138kV	On-Line
GEN-2008-044	197.80	OKGE	Tatonga 345kV	On-Line
GEN-2008-047	300.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV	On Schedule for 2014
GEN-2008-051	322.00	SPS	Potter County 345kV	On-Line at 161MW
GEN-2008-079	99.20	SUNCMKEC	Tap Cudahy - Ft Dodge 115kV	On-Line
GEN-2008-086N02	200.00	NPPD	Tap Ft Randle - Columbus (Meadow Grove) 230kV	On Schedule for 2014
GEN-2008-088	50.60	SPS	Vega 69kV	On Suspension
GEN-2008-092	201.00	MIDW	Post Rock 230kV	On Schedule for 2014
GEN-2008-098	100.80	WERE	Tap Lacygne - Wolf Creek (Anderson County) 345kV	On Schedule for 2015
GEN-2008-119O	60.00	OPPD	S1399 161kV	On-Line
GEN-2008-123N	89.70	NPPD	Tap Guide Rock - Pauline (Rosemont) 115kV	On Schedule for 2014
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	108.00	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
GEN-2010-003	100.80	WERE	Tap Lacygne - Wolf Creek (Anderson County) 345kV	On Schedule for 2015

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
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	On Schedule for 2015
GEN-2010-045	197.80	SUNCMKEC	Buckner 345kV	On Schedule for 2017
GEN-2010-046	56.00	SPS	TUCO Interchange 230kV	On Schedule for 2016
GEN-2010-051	200.00	NPPD	Tap Twin Church - Hoskins 230kV	On Schedule for 2014
GEN-2010-055	4.50	AEPW	Wekiwa 138kV	On-Line
GEN-2010-057	201.00	MIDW	Rice County 230kV	On-Line
GEN-2011-007	250.10	OKGE	Tap Cimarron - Woodring (Mathewson) 345kV	On Suspension
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 Schedule for 2015
GEN-2011-027	120.00	NPPD	Tap Twin Church - Hoskins 230kV (GEN-2010-51 Tap)	On Schedule for 2015
GEN-2011-037	7.00	WFEC	Blue Canyon 5 138kV	On-Line
GEN-2011-040	111.00	OKGE	Tap Ratliff - Pooleville (Carter County) 138kV	On Schedule for 2014
GEN-2011-045	205.00	SPS	Jones 230kV	On-Line
GEN-2011-046	27.00	SPS	Lopez 115kV	On-Line
GEN-2011-048	175.00	SPS	Mustang 230kV	On-Line
GEN-2011-049	250.00	OKGE	Border 345kV	On Suspension
GEN-2011-050	109.80	AEPW	Santa Fe Station 138kV	On Suspension
GEN-2011-051	104.40	OKGE	Tap Woodward - Tatonga 345kV	On Suspension
GEN-2011-054	300.00	OKGE	Cimarron 345kV	On Schedule for 2014
GEN-2011-055	52.80	OPPD	South Sterling 69kV	IA Pending
GEN-2011-056	3.60	NPPD	Jeffrey 115kV	On-Line
GEN-2011-056A	3.60	NPPD	John 1 115kV	On-Line
GEN-2011-056B	4.50	NPPD	John 2 115kV	On-Line
GEN-2011-057	150.40	WERE	Creswell 138kV	On Schedule for 2014
GEN-2012-001	61.20	SPS	Tap Grassland - Borden County 230kV	On-Line
GEN-2012-004	41.40	OKGE	Tap Ratliff - Pooleville (Carter County) 138kV	On Schedule for 2014
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV	On Schedule for 2014
GEN-2012-009	15.00	SPS	Mustang 230kV	IA Pending
GEN-2012-010	15.00	SPS	Mustang 230kV	IA Pending
GEN-2012-020	478.00	SPS	TUCO 230kV	IA Pending
GEN-2012-021	4.80	LES	Terry Bundy Generating Station 115kV	On-Line
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV	Facility Study

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2012-027	136.00	AEPW	Shidler 138kV	On Schedule for 2015
GEN-2012-028	74.80	WFEC	Gotebo 69kV	On Schedule for 2015
GEN-2012-032	300.00	OKGE	Tap Rose Hill - Sooner (Ranch) 345kV	On Schedule for 2015
GEN-2012-033	98.80	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV	On Schedule for 2015
GEN-2012-034	7.00	SPS	Mustang 230kV	IA Pending
GEN-2012-035	7.00	SPS	Mustang 230kV	IA Pending
GEN-2012-036	7.00	SPS	Mustang 230kV	IA Pending
GEN-2012-037	203.00	SPS	TUCO 345kV	On Schedule for 2015
GEN-2012-040	76.50	WFEC	Chilocco 138kV	On Suspension
GEN-2012-041	121.50	OKGE	Tap Rose Hill - Sooner 345kV	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
SPS Distributed (TC-Texas County)	20.00	SPS	Texas County 115kV	On-Line
Total:	**22,661.4**			

C: Study Groupings

See next page

C. Study Groups

GROUP 1: WOODWARD AREA			
Request	**Capacity**	**Area**	**Proposed Point of Interconnection**
GEN-2001-014	96.00	WFEC	Ft Supply 138kV
GEN-2001-037	100.00	OKGE	FPL Moreland Tap 138kV
GEN-2005-008	120.00	OKGE	Woodward 138kV
GEN-2006-024S	19.80	WFEC	Buffalo Bear Tap 69kV
GEN-2006-046	131.00	OKGE	Dewey 138kV
GEN-2007-021	201.00	OKGE	Tatonga 345kV
GEN-2007-043	200.00	OKGE	Minco 345kV
GEN-2007-044	300.00	OKGE	Tatonga 345kV
GEN-2007-050	170.00	OKGE	Woodward EHV 138kV
GEN-2007-062	765.00	OKGE	Woodward EHV 345kV
GEN-2008-003	101.00	OKGE	Woodward EHV 138kV
GEN-2008-044	197.80	OKGE	Tatonga 345kV
GEN-2010-011	29.70	OKGE	Tatonga 345kV
GEN-2010-040	300.00	OKGE	Cimarron 345kV
GEN-2011-007	250.10	OKGE	Tap Cimarron - Woodring (Mathewson) 345kV
GEN-2011-010	100.80	OKGE	Minco 345kV
GEN-2011-019	299.00	OKGE	Woodward 345kV
GEN-2011-020	299.00	OKGE	Woodward 345kV
GEN-2011-051	104.40	OKGE	Tap Woodward - Tatonga 345kV
GEN-2011-054	300.00	OKGE	Cimarron 345kV
PRIOR QUEUED SUBTOTAL	**4,084.60**		
AREA TOTAL	**4,084.60**		

GROUP 2: HITCHLAND AREA			
Request	**Capacity**	**Area**	**Proposed Point of Interconnection**
ASGI-2011-002	20.00	SPS	Herring 115kV
GEN-2002-008	240.00	SPS	Hitchland 345kV
GEN-2002-009	80.00	SPS	Hansford 115kV
GEN-2003-020	160.00	SPS	Martin 115kV
GEN-2006-020S	18.90	SPS	DWS Frisco 115kV
GEN-2006-044	370.00	SPS	Hitchland 345kV
GEN-2007-046	199.50	SPS	Hitchland 115kV
GEN-2008-047	300.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV
GEN-2010-001	300.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV
GEN-2010-014	358.80	SPS	Hitchland 345kV
GEN-2011-014	201.00	OKGE	Tap Hitchland - Woodward Dbl Ckt (Beaver County) 345kV
GEN-2011-022	299.00	SPS	Hitchland 345kV
SPS Distributed (Dumas 19th St)	20.00	SPS	Dumas 19th Street 115kV
SPS Distributed (Etter)	20.00	SPS	Etter 115kV
SPS Distributed (Moore E)	25.00	SPS	Moore East 115kV
SPS Distributed (Sherman)	20.00	SPS	Sherman 115kV
SPS Distributed (Spearman)	10.00	SPS	Spearman 69kV
SPS Distributed (TC-Texas County)	20.00	SPS	Texas County 115kV
PRIOR QUEUED SUBTOTAL	**2,662.20**		
AREA TOTAL	**2,662.20**		

GROUP 3: SPEARVILLE AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2012-006	22.50	SUNCMKEC	Tap Hugoton - Rolla 69kV
GEN-2001-039A	105.00	SUNCMKEC	Tap Greensburg - Ft Dodge (Shooting Star Tap) 115kV
GEN-2002-025A	150.00	SUNCMKEC	Spearville 230kV
GEN-2004-014	154.50	SUNCMKEC	Spearville 230kV
GEN-2005-012	250.00	SUNCMKEC	Ironwood 345kV
GEN-2006-006	205.50	SUNCMKEC	Spearville 345kV
GEN-2006-021	101.00	SUNCMKEC	Flat Ridge Tap 138kV
GEN-2007-040	200.00	SUNCMKEC	Buckner 345kV
GEN-2008-018	250.00	SPS	Finney 345kV
GEN-2008-079	99.20	SUNCMKEC	Tap Cudahy - Ft Dodge 115kV
GEN-2008-124	200.10	SUNCMKEC	Ironwood 345kV
GEN-2010-009	165.60	SUNCMKEC	Buckner 345kV
GEN-2010-015	200.10	SUNCMKEC	Spearville 345kV
GEN-2010-045	197.80	SUNCMKEC	Buckner 345kV
GEN-2011-008	600.00	SUNCMKEC	Clark County 345kV
GEN-2011-016	200.10	SUNCMKEC	Spearville 345kV
GEN-2011-017	299.00	SUNCMKEC	Tap Spearville - PostRock (GEN-2011-017T) 345kV
GEN-2012-007	120.00	SUNCMKEC	Rubart 115kV
GEN-2012-024	180.00	SUNCMKEC	Clark County 345kV
Gray County Wind (Montezuma)	110.00	SUNCMKEC	Gray County Tap 115kV
PRIOR QUEUED SUBTOTAL	**3,810.40**		
AREA TOTAL	**3,810.40**		

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-2010-057	201.00	MIDW	Rice County 230kV
PRIOR QUEUED SUBTOTAL	**1,818.10**		
AREA TOTAL	**1,818.10**		

GROUP 5: AMARILLO AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2002-022	240.00	SPS	Bushland 230kV
GEN-2008-051	322.00	SPS	Potter County 345kV
GEN-2008-088	50.60	SPS	Vega 69kV
Llano Estacado (White Deer)	80.00	SPS	Llano Wind 115kV
PRIOR QUEUED SUBTOTAL	**692.60**		
ASGI-2013-001	11.50	SPS	PanTex South 115kV
CURRENT CLUSTER SUBTOTAL	**11.50**		
AREA TOTAL	**704.10**		

GROUP 6: S-TX PANHANDLE/W-TX AREA			
Request	**Capacity**	**Area**	**Proposed Point of Interconnection**
ASGI-2010-010	42.20	SPS	Lovington 115kV
ASGI-2010-020	30.00	SPS	Tap LE-Tatum - LE-Crossroads 69kV
ASGI-2010-021	15.00	SPS	Tap LE-Saunders Tap - LE-Anderson 69kV
ASGI-2011-001	28.80	SPS	Lovington 115kV
ASGI-2011-003	10.00	SPS	Hendricks 115kV
ASGI-2011-004	20.00	SPS	Pleasant Hill 69kV
ASGI-2012-002	18.15	SPS	FE-Clovis Interchange 115kV
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 County - Tolk (Crossroads) 345kV
GEN-2010-006	205.00	SPS	Jones 230kV
GEN-2010-046	56.00	SPS	TUCO Interchange 230kV
GEN-2011-025	82.30	SPS	Tap Floyd County - Crosby County 115kV
GEN-2011-045	205.00	SPS	Jones 230kV
GEN-2011-046	27.00	SPS	Lopez 115kV
GEN-2011-048	175.00	SPS	Mustang 230kV
GEN-2012-001	61.20	SPS	Tap Grassland - Borden County 230kV
GEN-2012-009	15.00	SPS	Mustang 230kV
GEN-2012-010	15.00	SPS	Mustang 230kV
GEN-2012-020	478.00	SPS	TUCO 230kV
GEN-2012-034	7.00	SPS	Mustang 230kV
GEN-2012-035	7.00	SPS	Mustang 230kV
GEN-2012-036	7.00	SPS	Mustang 230kV
GEN-2012-037	203.00	SPS	TUCO 345kV
SPS Distributed (Hopi)	10.00	SPS	Hopi 115kV
SPS Distributed (Jal)	10.00	SPS	S Jal 115kV
SPS Distributed (Lea Road)	10.00	SPS	Lea Road 115kV
SPS Distributed (Monument)	10.00	SPS	Monument 115kV
SPS Distributed (Ocotillo)	10.00	SPS	S_Jal 115kV
PRIOR QUEUED SUBTOTAL	**3,091.65**		
ASGI-2013-002	18.40	SPS	FE Tucumcari 115kV
ASGI-2013-003	18.40	SPS	FE Clovis 115kV
GEN-2013-016	203.00	SPS	TUCO 345kV
CURRENT CLUSTER SUBTOTAL	**239.80**		
AREA TOTAL	**3,331.45**		

GROUP 7: SW-OKLAHOMA AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-026	74.00	WFEC	Washita 138kV
GEN-2002-005	120.00	WFEC	Red Hills Tap 138kV
GEN-2003-004	100.00	WFEC	Washita 138kV
GEN-2003-005	100.00	WFEC	Anadarko - Paradise (Blue Canyon) 138kV
GEN-2003-022	120.00	AEPW	Washita 138kV
GEN-2004-020	27.00	AEPW	Washita 34.5kV
GEN-2004-023	20.60	WFEC	Washita 138kV
GEN-2005-003	30.60	WFEC	Washita 138kV
GEN-2006-002	101.00	AEPW	Sweetwater 230kV
GEN-2006-035	225.00	AEPW	Sweetwater 230kV
GEN-2006-043	99.00	AEPW	Sweetwater 230kV
GEN-2007-032	150.00	WFEC	Tap Clinton Junction - Clinton 138kV
GEN-2007-052	150.00	WFEC	Anadarko 138kV
GEN-2008-023	150.00	AEPW	Hobart Junction 138kV
GEN-2008-037	101.00	WFEC	Tap Washita - Blue Canyon Wind 138kV
GEN-2011-037	7.00	WFEC	Blue Canyon 5 138kV
GEN-2011-049	250.00	OKGE	Border 345kV
GEN-2012-028	74.80	WFEC	Gotebo 69kV
PRIOR QUEUED SUBTOTAL	**1,900.00**		
AREA TOTAL	**1,900.00**		

GROUP 8: N-OK/S-KS AREA

Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2010-006	150.00	AECI	Tap Fairfax (AECI) - Shilder (AEPW) 138kV
GEN-2002-004	200.00	WERE	Latham 345kV
GEN-2005-013	201.00	WERE	Tap Latham - Neosho (Caney River) 345kV
GEN-2007-025	300.00	WERE	Viola 345kV
GEN-2008-013	300.00	OKGE	Tap Wichita - Woodring (Hunter) 345kV
GEN-2008-021	42.00	WERE	Wolf Creek 345kV
GEN-2008-098	100.80	WERE	Tap Lacygne - Wolf Creek (Anderson County) 345kV
GEN-2009-025	60.00	OKGE	Nardins 69kV
GEN-2010-003	100.80	WERE	Tap Lacygne - Wolf Creek (Anderson County) 345kV
GEN-2010-005	300.00	WERE	Viola 345kV
GEN-2010-055	4.50	AEPW	Wekiwa 138kV
GEN-2011-057	150.40	WERE	Creswell 138kV
GEN-2012-027	136.00	AEPW	Shidler 138kV
GEN-2012-032	300.00	OKGE	Tap Rose Hill - Sooner (Ranch) 345kV
GEN-2012-033	98.80	OKGE	Tap and Tie South 4th - Bunch Creek & Enid Tap - Fairmont (GEN-2012-033T) 138kV
GEN-2012-040	76.50	WFEC	Chilocco 138kV
GEN-2012-041	121.50	OKGE	Tap Rose Hill - Sooner 345kV
PRIOR QUEUED SUBTOTAL	**2,642.30**		
GEN-2013-012	147.00	OKGE	Redbud 345kV
CURRENT CLUSTER SUBTOTAL	**147.00**		
AREA TOTAL	**2,789.30**		

GROUP 9/10: NEBRASKA AREA			
Request	**Capacity**	**Area**	**Proposed Point of Interconnection**
GEN-2002-023N	0.80	NPPD	Harmony 115kV
GEN-2003-021N	75.00	NPPD	Ainsworth Wind Tap 115kV
GEN-2004-023N	75.00	NPPD	Columbus Co 115kV
GEN-2006-020N	42.00	NPPD	Bloomfield 115kV
GEN-2006-037N1	75.00	NPPD	Broken Bow 115kV
GEN-2006-038N005	80.00	NPPD	Broken Bow 115kV
GEN-2006-038N019	80.00	NPPD	Petersburg North 115kV
GEN-2006-044N	40.50	NPPD	North Petersburg 115kV
GEN-2007-011N08	81.00	NPPD	Bloomfield 115kV
GEN-2008-086N02	200.00	NPPD	Tap Ft Randle - Columbus (Meadow Grove) 230kV
GEN-2008-119O	60.00	OPPD	S1399 161kV
GEN-2008-123N	89.70	NPPD	Tap Guide Rock - Pauline (Rosemont) 115kV
GEN-2009-040	108.00	WERE	Marshall 115kV
GEN-2010-041	10.50	OPPD	S 1399 161kV
GEN-2010-051	200.00	NPPD	Tap Twin Church - Hoskins 230kV
GEN-2011-018	73.60	NPPD	Steele City 115kV
GEN-2011-027	120.00	NPPD	Tap Twin Church - Hoskins 230kV (GEN-2010-51 Tap)
GEN-2011-055	52.80	OPPD	South Sterling 69kV
GEN-2011-056	3.60	NPPD	Jeffrey 115kV
GEN-2011-056A	3.60	NPPD	John 1 115kV
GEN-2011-056B	4.50	NPPD	John 2 115kV
GEN-2012-021	4.80	LES	Terry Bundy Generating Station 115kV
NPPD Distributed (Broken Bow)	8.30	NPPD	Broken Bow 115kV
NPPD Distributed (Burt County Wind)	12.00	NPPD	Tekamah & Oakland 115kV
NPPD Distributed (Burwell)	3.00	NPPD	Ord 115kV
NPPD Distributed (Columbus Hydro)	45.00	NPPD	Columbus 115kV
NPPD Distributed (Ord)	11.90	NPPD	Ord 115kV
NPPD Distributed (Stuart)	2.10	NPPD	Ainsworth 115kV
PRIOR QUEUED SUBTOTAL	**1,562.70**		
GEN-2013-002	50.60	LES	Tap Sheldon - Folsom & Pleasant Hill 115kV CKT 2
GEN-2013-008	1.20	NPPD	Steele City 115kV
GEN-2013-014	25.50	NPPD	Tap Guide Rock - Pauline (GEN-2008-123N Tap) 115kV
CURRENT CLUSTER SUBTOTAL	**77.30**		
AREA TOTAL	**1,640.00**		

GROUP 12: NW-AR AREA			
Request	**Capacity**	**Area**	**Proposed Point of Interconnection**
GEN-2013-011	30.00	AEPW	Turk 138kV
CURRENT CLUSTER SUBTOTAL	**30.00**		
AREA TOTAL	**30.00**		

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-2011-011	50.00	KACP	Iatan 345kV
PRIOR QUEUED SUBTOTAL	**134.60**		
AREA TOTAL	**134.60**		

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
GEN-2012-004	41.40	OKGE	Tap Ratliff - Pooleville (Carter County) 138kV
PRIOR QUEUED SUBTOTAL	**262.20**		
GEN-2013-007	100.30	OKGE	Tap Prices Falls - Carter 138kV
CURRENT CLUSTER SUBTOTAL	**100.30**		
AREA TOTAL	**362.50**		

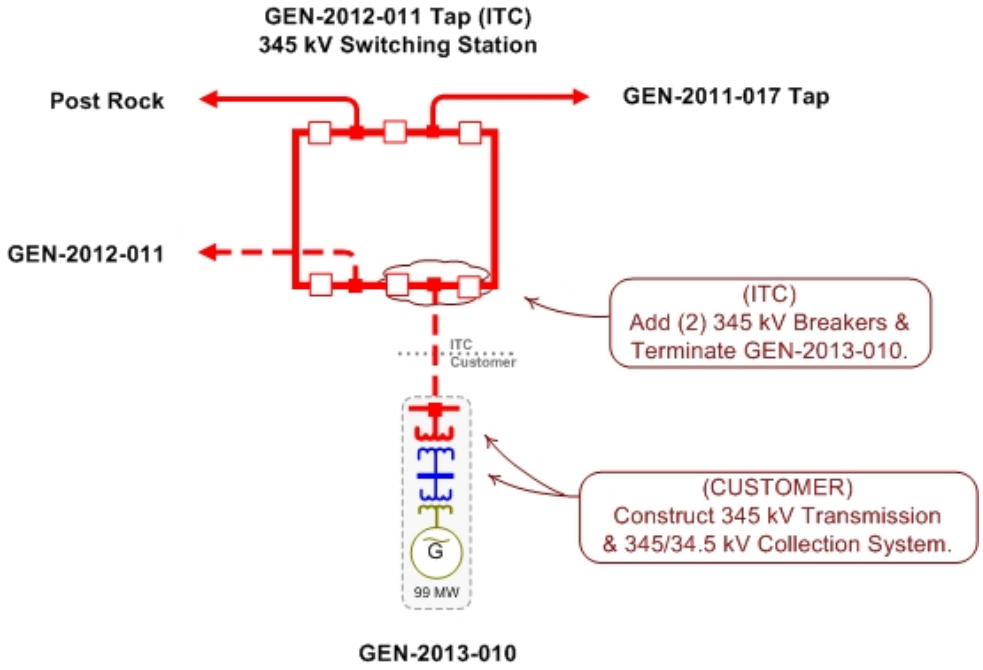
CLUSTER TOTAL (CURRENT STUDY)	**605.9**	**MW**
PQ TOTAL (PRIOR QUEUED)	**22,661.4**	**MW**
CLUSTER TOTAL (INCLUDING PRIOR QUEUED)	**23,267.3**	**MW**

D: Proposed Point of Interconnection One Line Diagrams

GEN-2013-009

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

GEN-2013-010



GEN-2013-012

****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 the Group 3 and Group 8 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 Customer shown in this report.

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

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

There may be additional costs allocated to the Group 3 and Group 8 Customer. See Appendix F for more details.

Appendix E. Cost Allocation Per Request

(Including Previously Allocated Network Upgrades*)

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
ASGI-2013-001			
ASGI-2013-001 Interconnection Costs See One-Line Diagram.	Current Study	$0.00	$0.00
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
Thistle - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$207,782,000.00
	Current Study Total	$0.00	
ASGI-2013-002			
ASGI-2013-002 Interconnection Costs See One-Line Diagram.	Current Study	$0.00	$0.00
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
Bushland - Potter County 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$400,000.00
Thistle - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$207,782,000.00
	Current Study Total	$0.00	
ASGI-2013-003			
ASGI-2013-003 Interconnection Costs See One-Line Diagram.	Current Study	$0.00	$0.00
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
Bushland - Potter County 230kV CKT 1 Replace line traps at both terminals	Previously Allocated		$400,000.00
Thistle - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$207,782,000.00
	Current Study Total	$0.00	
GEN-2013-002			

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

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
GEN-2013-002 Interconnection Costs See One-Line Diagram.	Current Study	$3,399,285.00	$3,399,285.00
	Current Study Total	$3,399,285.00	
GEN-2013-007			
GEN-2013-007 Interconnection Costs See One-Line Diagram.	Current Study	$3,033,890.00	$3,033,890.00
	Current Study Total	$3,033,890.00	
GEN-2013-008			
GEN-2013-008 Interconnection Costs See One-Line Diagram.	Current Study	$0.00	$0.00
	Current Study Total	$0.00	
GEN-2013-011			
GEN-2013-011 Interconnection Costs See One-Line Diagram.	Current Study	$0.00	$0.00
	Current Study Total	$0.00	
GEN-2013-012			
GEN-2013-012 Interconnection Costs See One-Line Diagram.	Current Study	$0.00	$0.00
	Current Study Total	$0.00	
GEN-2013-014			
GEN-2013-014 Interconnection Costs See One-Line Diagram.	Current Study	$900,000.00	$1,800,000.00
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
Clark - Thistle 345KV Dbl CKT Priority Project: Spearville - Clark - Thistle Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00
Spearville - Clark 345KV Dbl CKT Priority Project: Spearville - Clark - Thistle Dbl 345kV CKT (Total Project E&C Cost Shown.)	Previously Allocated		$426,504,292.00
	Current Study Total	$1,800,000.00	
GEN-2013-016			
GEN-2013-016 Interconnection Costs See One-Line Diagram.	Current Study	$0.00	$0.00

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

Interconnection Request and Upgrades	Upgrade Type	Allocated Cost	Upgrade Cost
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
Bucker - Spearville 345V CKT 1 Replace Terminal equipment	Previously Allocated		$771,000.00
Thistle - Woodward 345KV Dbl CKT Priority Project: Thistle - Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		$207,782,000.00
	Current Study Total	$0.00	
	TOTAL CURRENT STUDY COSTS:	**$8,233,175.00**	

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

F: Cost Allocation per Proposed Study Network Upgrade

Important Note:

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

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

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

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

Appendix F. Cost Allocation by Upgrade

ASGI-2013-001 Interconnection Costs			**$0.00**
See One-Line Diagram.			
	ASGI-2013-001	$0.00	
	Total Allocated Costs	**$0.00**	
ASGI-2013-002 Interconnection Costs			**$0.00**
See One-Line Diagram.			
	ASGI-2013-002	$0.00	
	Total Allocated Costs	**$0.00**	
ASGI-2013-003 Interconnection Costs			**$0.00**
See One-Line Diagram.			
	ASGI-2013-003	$0.00	
	Total Allocated Costs	**$0.00**	
GEN-2013-002 Interconnection Costs			**$3,399,285.00**
See One-Line Diagram.			
	GEN-2013-002	$3,399,285.00	
	Total Allocated Costs	**$3,399,285.00**	
GEN-2013-007 Interconnection Costs			**$3,033,890.00**
See One-Line Diagram.			
	GEN-2013-007	$3,033,890.00	
	Total Allocated Costs	**$3,033,890.00**	
GEN-2013-008 Interconnection Costs			**$0.00**
See One-Line Diagram.			
	GEN-2013-008	$0.00	
	Total Allocated Costs	**$0.00**	
GEN-2013-011 Interconnection Costs			**$0.00**
See One-Line Diagram.			
	GEN-2013-011	$0.00	
	Total Allocated Costs	**$0.00**	

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

GEN-2013-012 Interconnection Costs			**$0.00**
See One-Line Diagram.			
	GEN-2013-012	$0.00	
	Total Allocated Costs	**$0.00**	
GEN-2013-014 Interconnection Costs			**$1,800,000.00**
See One-Line Diagram.			
	GEN-2013-014	$900,000.00	
	Total Allocated Costs	**$3,600,000.00**	
GEN-2013-016 Interconnection Costs			**$0.00**
See One-Line Diagram.			
	GEN-2013-016	$0.00	
	Total Allocated Costs	**$0.00**	

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

G: Power Flow Analysis (Constraints Used For Mitigation)

See next page.

GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEB	TDF	TC%LOADING	CONTNAME
None									

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

See next page.

GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEB	TDF	TC%LOADING	CONTNAME
00ASGI_13_001	0	24SP	ASGI13_001	'TO->FROM'	'NORTHWEST INTERCHANGE - ROLLHILLS 3115.00 115KV CKT 1'	154	0.03296	104.3212	'BASE CASE'
00ASGI_13_001	0	24SP	ASGI13_001	'TO->FROM'	'NORTHWEST INTERCHANGE - ROLLHILLS 3115.00 115KV CKT 1'	154	0.03129	102.8835	'RANDALL COUNTY INTERCHANGE - SOUTH GEORGIA INTERCHANGE 115KV CKT 1'
00ASGI_13_002	0	14SP	ASGI13_002	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.03159	101.5438	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
00ASGI_13_002	0	14WP	ASGI13_002	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.03084	100.5007	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
00ASGI_13_003	0	14SP	ASGI13_003	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.03147	102.0482	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
00ASGI_13_003	0	14WP	ASGI13_003	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.0308	101.3452	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
00G13_007	0	14WP	G13_007	'FROM->TO'	'LAWEASOKLUNI'	425	0.07547	105.1	'BASE CASE'
00G13_011	0	14WP	G13_011	'FROM->TO'	'LAWEASOKLUNI'	425	0.05889	106.5	'BASE CASE'
00G13_011	0	19WP	G13_011	'FROM->TO'	'LAWEASOKLUNI'	425	0.05451	99.9	'BASE CASE'
00G13_012	0	14WP	G13_012	'FROM->TO'	'LAWEASOKLUNI'	425	0.04907	106.5	'BASE CASE'
00G13_012	0	19WP	G13_012	'FROM->TO'	'LAWEASOKLUNI'	425	0.045	99.9	'BASE CASE'
00G13_016	0	14SP	G13_016	'TO->FROM'	'HALE CO INTERCHANGE - TUCO INTERCHANGE 115KV CKT 1'	96	0.0399	101.8752	'KRESS INTERCHANGE - SWISHER COUNTY INTERCHANGE 115KV CKT 1'
00G13_016	0	14SP	G13_016	'TO->FROM'	'HALE CO INTERCHANGE - TUCO INTERCHANGE 115KV CKT 1'	96	0.0399	101.8495	'SWISHER COUNTY INTERCHANGE (GE M101686) 230/115/13.2KV TRANSFORMER CKT 1'
00G13_016	0	24SP	G13_016	'FROM->TO'	'TUCO INTERCHANGE (GE M102345) 230/115/13.2KV TRANSFORMER CKT 1'	252	0.05278	106.9254	'TUCO INTERCHANGE (ENRCO 136401) 230/115/13.2KV TRANSFORMER CKT 2'
00G13_016	0	24SP	G13_016	'FROM->TO'	'TUCO INTERCHANGE (GE M102345) 230/115/13.2KV TRANSFORMER CKT 1'	252	0.05278	109.8396	'TUCO INTERCHANGE (ENRCO 136401) 230/115/13.2KV TRANSFORMER CKT 2'
00NR	0	14WP	G13_007	'FROM->TO'	'LAWEASOKLUNI'	425	0.03004	113.5	'BASE CASE'
0	0	14SP	ASGI13_003	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.03145	101.7975	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
0	0	14SP	ASGI13_002	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.03157	101.7975	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
0	0	14SP	G13_016	'TO->FROM'	'HALE CO INTERCHANGE - TUCO INTERCHANGE 115KV CKT 1'	96	0.03997	100	'KRESS INTERCHANGE - SWISHER COUNTY INTERCHANGE 115KV CKT 1'
0	0	14SP	G13_016	'TO->FROM'	'HALE CO INTERCHANGE - TUCO INTERCHANGE 115KV CKT 1'	96	0.03997	99.9	'SWISHER COUNTY INTERCHANGE (GE M101686) 230/115/13.2KV TRANSFORMER CKT 1'
0	0	24SP	ASGI13_001	'TO->FROM'	'NORTHWEST INTERCHANGE - ROLLHILLS 3115.00 115KV CKT 1'	154	0.03294	104.5583	'BASE CASE'
0	0	24SP	ASGI13_001	'TO->FROM'	'NORTHWEST INTERCHANGE - ROLLHILLS 3115.00 115KV CKT 1'	154	0.03128	102.9636	'RANDALL COUNTY INTERCHANGE - SOUTH GEORGIA INTERCHANGE 115KV CKT 1'
0	0	24SP	G13_016	'FROM->TO'	'TUCO INTERCHANGE (GE M102345) 230/115/13.2KV TRANSFORMER CKT 1'	252	0.05254	110.1359	'TUCO INTERCHANGE (ENRCO 136401) 230/115/13.2KV TRANSFORMER CKT 2'
0	0	24SP	G13_016	'FROM->TO'	'TUCO INTERCHANGE (GE M102345) 230/115/13.2KV TRANSFORMER CKT 1'	252	0.05254	113.1063	'TUCO INTERCHANGE (ENRCO 136401) 230/115/13.2KV TRANSFORMER CKT 2'
0	0	14WP	G13_007	'FROM->TO'	'LAWEASOKLUNI'	425	0.07535	106.2	'BASE CASE'
0	0	14WP	G13_012	'FROM->TO'	'LAWEASOKLUNI'	425	0.04898	106.2	'BASE CASE'
0	0	14WP	G13_011	'FROM->TO'	'LAWEASOKLUNI'	425	0.05881	106.2	'BASE CASE'
0	0	14WP	ASGI13_003	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.03082	99.7	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
0	0	14WP	ASGI13_002	'FROM->TO'	'GRAPEVINE INTERCHANGE (PENN 0257751) 230/115/13.2KV TRANSFORMER CKT 1'	112	0.03086	99.7	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
0	0	19WP	G13_007	'FROM->TO'	'LAWEASOKLUNI'	425	0.07055	99.8	'BASE CASE'
0	0	19WP	G13_012	'FROM->TO'	'LAWEASOKLUNI'	425	0.04499	99.8	'BASE CASE'
0	0	19WP	G13_011	'FROM->TO'	'LAWEASOKLUNI'	425	0.0545	99.8	'BASE CASE'
05ALL	0	14G	ASGI13_001	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	0.03054	103.9596	'DBL-WICH-THI'
05ALL	0	14G	ASGI13_001	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	110	0.03054	114.7393	'DBL-WICH-THI'
05ASGI_13_001	0	14G	ASGI13_001	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	110	0.0306	110.0595	'DBL-WICH-THI'
5	0	14G	ASGI13_001	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	110	0.0306	109.9974	'DBL-WICH-THI'
06ALL	0	14G	G13_007	'FROM->TO'	'LAWEASOKLUNI'	425	0.08115	123	'BASE CASE'
06ALL	0	14G	ASGI13_003	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04567	105.1044	'G11_051T 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1'
06ALL	0	14G	ASGI13_002	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04569	105.1044	'G11_051T 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1'
06ALL	0	14G	ASGI13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04547	105.1044	'G11_051T 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1'
06ALL	0	14G	ASGI13_003	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04567	106.8032	'G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1'
06ALL	0	14G	ASGI13_002	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04569	106.8032	'G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1'
06ALL	0	14G	ASGI13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04547	106.8032	'G11_051T 345.00 - TATONGA7 345.00 345KV CKT 1'
06ALL	0	14G	ASGI13_003	'TO->FROM'	'PLANT X STATION - TOLK STATION WEST 230KV CKT 1'	502	0.34829	109.044	'PLANT X STATION - TOLK STATION EAST 230KV CKT 2'
06ALL	0	14G	ASGI13_002	'TO->FROM'	'PLANT X STATION - TOLK STATION WEST 230KV CKT 1'	502	0.33772	109.044	'PLANT X STATION - TOLK STATION EAST 230KV CKT 2'
06ALL	0	14G	ASGI13_003	'TO->FROM'	'PLANT X STATION - TOLK STATION EAST 230KV CKT 2'	502	0.34546	108.2546	'PLANT X STATION - TOLK STATION WEST 230KV CKT 1'
06ALL	0	14G	ASGI13_002	'TO->FROM'	'PLANT X STATION - TOLK STATION EAST 230KV CKT 2'	502	0.33498	108.2546	'PLANT X STATION - TOLK STATION WEST 230KV CKT 1'
06ALL	0	14G	ASGI13_001	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	0.03028	123.1364	'DBL-WICH-THI'
06ALL	0	14G	ASGI13_001	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	110	0.03028	133.9148	'DBL-WICH-THI'
06ALL	0	14G	ASGI13_003	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04567	119.7853	'DBL-TGA-MATT'
06ALL	0	14G	ASGI13_002	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04569	119.7853	'DBL-TGA-MATT'
06ALL	0	14G	ASGI13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04547	119.7853	'DBL-TGA-MATT'
06ASGI_13_002	0	14G	ASGI13_002	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04586	110.3135	'DBL-TGA-MATT'
06ASGI_13_003	0	14G	ASGI13_003	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04584	110.4223	'DBL-TGA-MATT'
6	0	14G	G13_007	'FROM->TO'	'LAWEASOKLUNI'	425	0.08073	105.4	'BASE CASE'
6	0	14G	ASGI13_001	'TO->FROM'	'CLEARWATER - MILAN TAP 138KV CKT 1'	110	0.03038	113.7627	'DBL-WICH-THI'
6	0	14G	ASGI13_001	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	110	0.03038	124.5656	'DBL-WICH-THI'
6	0	14G	ASGI13_003	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.0458	110.7063	'DBL-TGA-MATT'
6	0	14G	ASGI13_002	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04582	110.7063	'DBL-TGA-MATT'
6	0	14G	ASGI13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04561	110.7063	'DBL-TGA-MATT'
09ALL	0	14G	ASGI13_001	'FROM->TO'	'HARPER - MILAN TAP 138KV CKT 1'	110	0.03053	102.4505	'DBL-WICH-THI'

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

Available on Request

J: Group 6 Dynamic Stability Analysis Report

See report on next page

Group 6 Impact Study

DISIS-2013-001-4

October 2014
Generator Interconnection

SPP Southwest Power Pool

Revision History

Date	Author	Change Description
8/30/2013	SPP	DISIS-2013-001-1 Group 6 Stability Report Issued
1/31/2014	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2013-001-2)
10/23/2014	SPP	Account for Withdrawn Projects, Report Re-Posted (DISIS-2013-001-4)

Executive Summary

DISIS-2013-001-4 Interconnection Customers have requested a Definitive Interconnection System Impact Study detailing the impacts of interconnecting the generation projects shown below.

- GEN-2013-016 – 191MW/203MW (summer/winter) combustion turbine generation facility connected at TUCO 345kV Interchange on the Southwestern Public Service (SPS) Transmission System.
- ASGI-2013-002 – 18.4MW wind farm using Siemens 2.3MW generators connected to a 69kV substation on the Farmers Electric Cooperative transmission system. This request was studied as an Affected System request.
- ASGI-2013-003 – 18.4MW wind farm using Siemens 2.3MW generators connected to a 69kV substation on the Farmers Electric Cooperative transmission system. This request was studied as an Affected System request.

There are twenty-six (26) previously queued generation projects in the Group 6 area.

A stability analysis was performed for the addition of the generation projects in Group 6 to re-evaluate the need for the Oklaunion Capacitor Network Upgrades assigned in DISIS-2013-001-2. The analyses were performed on three seasonal models, the modified versions of the 2014 winter peak, the 2015 summer peak, and the 2024 summer peak cases. A total of nineteen (19) contingencies were evaluated for each season.

With all Base Case Network Upgrades in service, and previously assigned Network Upgrades in service, the Group 6 projects were found to remain on line, and the transmission system was found to remain stable for all conditions studied. The reactive compensation at Oklaunion (capacitor bank) is no longer required.

The analysis identified simulations unstable in the Category 'C' analysis for prior outage situation for DISIS-2013-001 Interconnection Requests in the 2014WP, 2015SP, and 2024SP models. The mitigation for this prior outage situation is to back down the dispatch output of the Interconnection Requests.

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

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

Table of Contents

I. Introduction

DISIS-2013-001 Interconnection Customers have requested a Definitive Interconnection System Impact Study detailing the impacts of interconnecting the generation projects shown Table I-1 below.

Table I-1: Group 6 Interconnection Requests

Request	Capacity (MW)	Generator Model	Point of Interconnection
GEN-2013-016	191 Summer 203 Winter	GENROU	TUCO 345kV (525832)
ASGI-2013-002	18.4	Siemens 2.3MW VS	Tucumcari 115kV (524509)
ASGI-2013-003	18.4	Siemens 2.3MW VS	Clovis 115kV (524808)

The previously queued generation projects in the Group 6 area are listed in Table I-2 below.

Table I-2: Group 6 Prior Queued Interconnection Requests

Request	Capacity (MW)	Generator Model	Point of Interconnection
GEN-2001-033	180	Mitsubishi 1000	San Juan Mesa 230kV (524885)
GEN-2001-036	80	CIMTR	Norton 115kV (524502)
GEN-2006-018	170	GENSAL	TUCO 230kV (525830)
GEN-2008-022	300	G.E. 2.5MW	Tap on Eddy County – Tolk 345kV line (GEN-2008-022-POI, 560007)
GEN-2010-006	180 Summer 205 Winter	GENROU	Jones 230kV(526337)
ASGI-2010-010	42	GENSAL	Lovington 115kV (528334)
ASGI-2010-020	30	Nordex 2.5MW	Tap LE-Tatum – LE-Crosssroads 69kV (ASGI-2010-020-POI, 560360)
GEN-2010-020	20	Emerson 0.5MW	Roswell 69kV (527563)
ASGI-2010-021	15	Mitsubishi MPS-1000A 1.0MW	Tap LE-Saunder Tap – LE-Anderson 69kV (ASGI-2010-021 POI, 560364)
GEN-2010-046	56	GENSAL	TUCO 230kV (525830)
ASGI-2011-003	10	Sany 2.0MW	Hendricks 69kV (525943)
ASGI-2011-001	27.3	Suzlon 2.1MW	Lovington 115kV (528334)
GEN-2011-025	80	G.E. 1.6MW	Tap on Floyd County – Crosby County 115kV line (GEN-2011-025 POI, 562004)
GEN-2011-045	180 Summer 205 Winter	GENROU	Jones 230kV (526337)
GEN-2011-046	23 Summer 27 Winter	GENROU	Quay County 115kV (524472)
GEN-2011-048	165 Summer 175 Winter	GENROU	Mustang 230kV (527151)
ASGI-2011-004	19.2	G.E. 1.6MW	Crosby 69kV (525915)
GEN-2012-001	61.2	CCWE 3.6MW (WT4)	Tap Grassland – Borden 230kV (GEN-2012-001 POI, 526679)
GEN-2012-009	15 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-010	15 MW increase	GENROU	Mustang 230kV (527151)

Table I-2: Group 6 Prior Queued Interconnection Requests

Request	Capacity (MW)	Generator Model	Point of Interconnection
GEN-2012-020	478	G.E. 1.68MW	TUCO 230kV (525830)
GEN-2012-034	7 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-035	7 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-036	7 MW increase	GENROU	Mustang 230kV (527151)
GEN-2012-037	196 Summer 203 Winter	GENROU	TUCO 345kV (525832)
ASGI-2012-002	18	Vestas 1.65MW V82	Clovis 115kV (524808)

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

The stability analysis determines the impacts of the new interconnecting project on the stability and voltage recovery of the nearby systems and the ability of the interconnecting project to meet FERC Order 661A. If problems with stability or voltage recovery are identified, the need for reactive compensation or system upgrades is investigated. The three-phase faults and the single line-to-ground faults listed in Table III-1 were used in the stability analysis.

The power factor analysis determines the power factor at the point of interconnection for the wind interconnection project for pre-contingency and post-contingency conditions. The contingencies used in the power factor analysis (Table IV-2) are a subset of the stability analysis contingencies shown in Table III-1.

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

II. Facilities

A one-line drawing for each of the generation interconnection requests in this study is shown in Figure II-1 through Figure II-5.

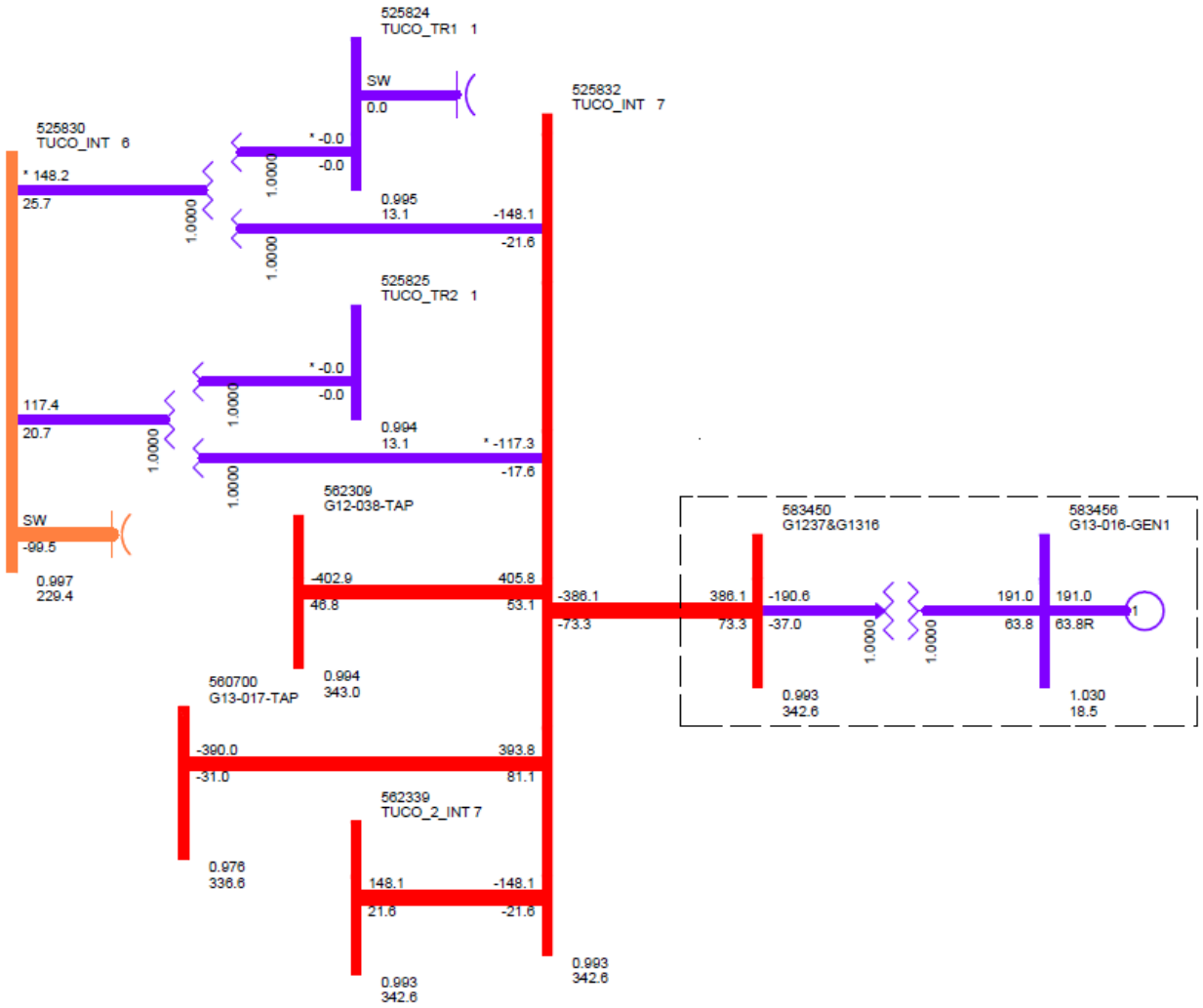


Figure II-2[1]: GEN-2013-016 One-line Diagram

[1] Taken from Burns & McDonnell work product from B&M Project #74393 performed under contract to SPP.

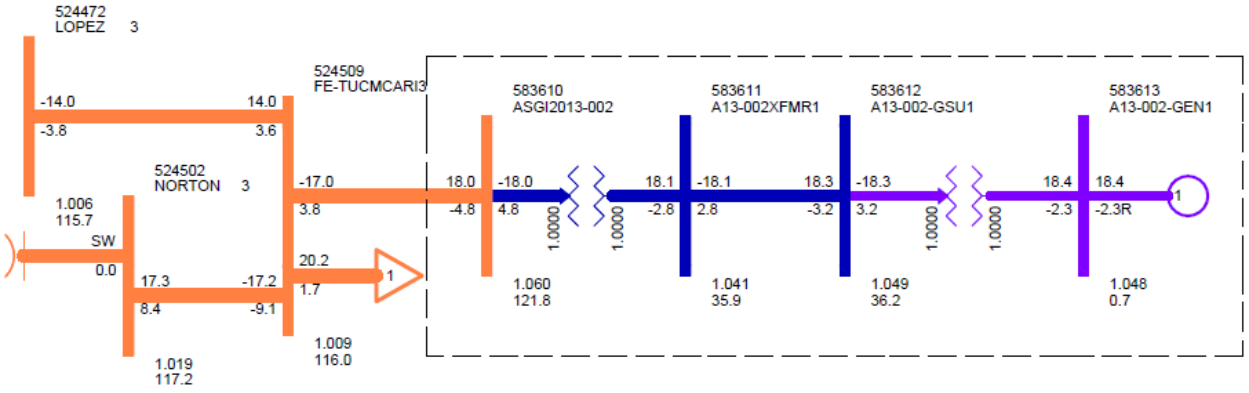


Figure II-4[2]: ASGI-2013-002 One-line Diagram

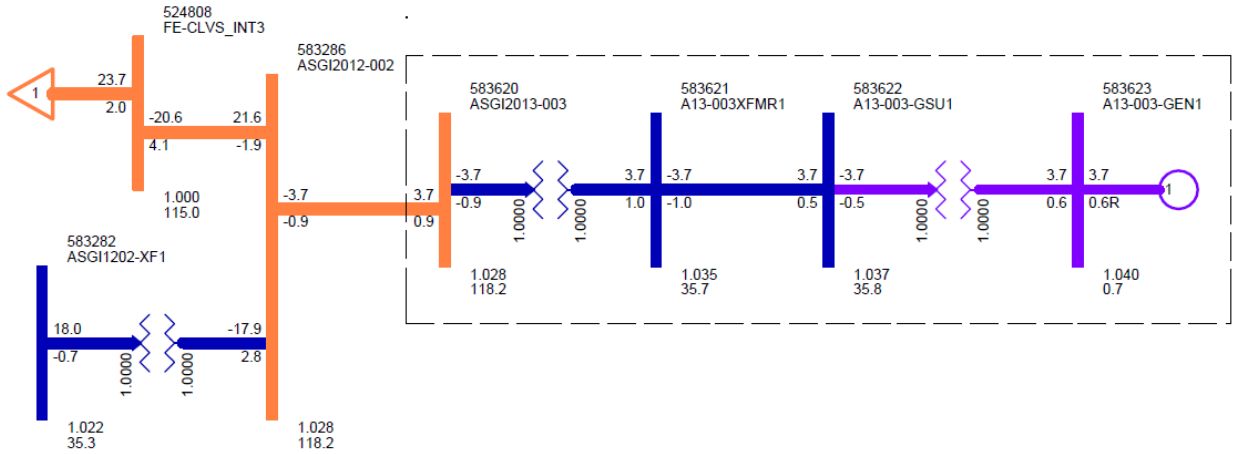


Figure II-5[3]: ASGI-2013-003 One-line Diagram

[2] Taken from Burns & McDonnell work product from B&M Project #74393 performed under contract to SPP.
[3] Taken from Burns & McDonnell work product from B&M Project #74393 performed under contract to SPP.

III. Stability Analysis

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

Model Preparation

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

Disturbances

Nineteen (19) contingencies were identified for use in this study and are listed in Table III-1. These contingencies included three-phase faults and single-phase line faults at locations defined by SPP. Single-phase line faults were simulated by applying fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice.

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

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

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

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

The control area monitored is 526.

Table III-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
1	FLT_01_TUCOINT7_BORDER_345 kV_3PH	3 phase fault on the TUCO Interchange (525832) to Border (515458) 345kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
2	FLT_02_TUCOINT7_BORDER_345 kV_1PH	*Single phase fault and sequence like previous*
3	FLT_03_TUCOINT7_OKU_345kV_ 3PH	3 phase fault on the TUCO Interchange (525832) to Oklaunion (515456) 345kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT_04_TUCOINT7_OKU_345kV_ 1PH	*Single phase fault and sequence like previous*
5	FLT_05_BORDER_WWRDEHV7_3 45kV_3PH	3 phase fault on the Border (515458) to Woodward (515375) 345kV line, near Border. a. Apply fault at the Border 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
6	FLT_06_BORDER_WWRDEHV7_3 45kV_1PH	*Single phase fault and sequence like previous*
7	FLT_07_TUCOINT7_TUCOINT6_34 5_230kV_3PH	3 phase fault on the TUCO Interchange 345kV (525832) / 230kV (525830) / 13.2kV (525825) transformer circuit #1, near TUCO Interchange 3455kV. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
8	FLT_08_TUCOINT7_TUCOINT6_34 5_230kV_3PH	3 phase fault on the TUCO Interchange 345kV (525832) / 230kV (525830) / 13.2kV (525823) transformer circuit #2, near TUCO Interchange 3455kV. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
9	FLT_09_TUCOINT6_SWISHER_23 0kV_3PH	3 phase fault on the TUCO Interchange (525830) to Swisher (525213) 230kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
10	FLT_10_TUCOINT6_SWISHER_23 0kV_1PH	*Single phase fault and sequence like previous*
11	FLT_11_TUCOINT6_TOLKEAST_23 0kV_3PH	3 phase fault on the TUCO Interchange (525830) to Tolk East (525524) 230kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT_12_TUCOINT6_TOLKEAST_23 0kV_1PH	*Single phase fault and sequence like previous*

Table III-1: Contingencies Evaluated

Cont. No.	Contingency Name	Description
13	FLT_13_TUCOINT6_CARLISLE_230 kV_3PH	3 phase fault on the TUCO Interchange (525830) to Carlisle (526161) 230kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT_14_TUCOINT6_CARLISLE_230 kV_1PH	*Single phase fault and sequence like previous*
15	FLT_15_TUCOINT6_JONES_230kV _3PH	3 phase fault on the TUCO Interchange (525830) to Jones (526337) 230kV line, near TUCO Interchange. a. Apply fault at the TUCO Interchange 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
16	FLT_16_TUCOINT6_JONES_230kV _1PH	*Single phase fault and sequence like previous*
17	FLT_17_TUCOINT6_TUCOINT3_23 0_115kV_3PH	3 phase fault on the TUCO Interchange 230kV (525830) / 115kV (525828) / 13.2kV (525821) transformer circuit #1, near TUCO Interchange 3455kV. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
18	FLT_18_TUCOINT6_TUCOINT3_23 0_115kV_3PH	3 phase fault on the TUCO Interchange 230kV (525830) / 115kV (525828) / 13.2kV (525819) transformer circuit #2, near TUCO Interchange 3455kV. a. Apply fault at the TUCO Interchange 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
19	FLT_19_TUCOINT7_OKU_ 345kV_3PH_PO_TUCOINT7_Bord er	Prior outage on the Border (515458) to TUCO (525832) 345kV circuit #1: 3 phase fault on the Oklaunion (515456) to TUCO (525832) 345kV line, near TUCO. a. Prior outage of Border to Tuco 345kV Ckt 1. b. Apply fault at the TUCO 345kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (c) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (c) and remove fault.

NOTE: For prior outage contingencies assume that the network is at steady state after the prior outage.

Results

The stability analysis was performed and the results are summarized in Table III-2. No Transmission system stability issues were observed.

Some prior outage conditions that were studied indicated potential instability in the power system. For these Category "C" contingencies studied, it will be required to back down (curtail) studied and prior queued generation for the prior outage.

The stability plots will be available upon request.

Table III-2: Stability Analysis Results

	Contingency Number and Name	2014WP	2015SP	2024SP
1	FLT_01_TUCOINT7_BORDER_345kV_3PH	STABLE	STABLE	STABLE
2	FLT_02_TUCOINT7_BORDER_345kV_1PH	STABLE	STABLE	STABLE
3	FLT_03_TUCOINT7_OKU_345kV_3PH	STABLE	STABLE	STABLE
4	FLT_04_TUCOINT7_OKU_345kV_1PH	STABLE	STABLE	STABLE
5	FLT_05_BORDER_WWRDEHV7_345kV_3PH	STABLE	STABLE	STABLE
6	FLT_06_BORDER_WWRDEHV7_345kV_1PH	STABLE	STABLE	STABLE
7	FLT_07_TUCOINT7_TUCOINT6_345_230kV_3PH	STABLE	STABLE	STABLE
8	FLT_08_TUCOINT7_TUCOINT6_345_230kV_3PH	STABLE	STABLE	STABLE
9	FLT_09_TUCOINT6_SWISHER_230kV_3PH	STABLE	STABLE	STABLE
10	FLT_10_TUCOINT6_SWISHER_230kV_1PH	STABLE	STABLE	STABLE
11	FLT_11_TUCOINT6_TOLKEAST_230kV_3PH	STABLE	STABLE	STABLE
12	FLT_12_TUCOINT6_TOLKEAST_230kV_1PH	STABLE	STABLE	STABLE
13	FLT_13_TUCOINT6_CARLISLE_230kV_3PH	STABLE	STABLE	STABLE
14	FLT_14_TUCOINT6_CARLISLE_230kV_1PH	STABLE	STABLE	STABLE
15	FLT_15_TUCOINT6_JONES_230kV_3PH	STABLE	STABLE	STABLE
16	FLT_16_TUCOINT6_JONES_230kV_1PH	STABLE	STABLE	STABLE
17	FLT_17_TUCOINT6_TUCOINT3_230_115kV_3PH	STABLE	STABLE	STABLE
18	FLT_18_TUCOINT6_TUCOINT3_230_115kV_3PH	STABLE	STABLE	STABLE
19	FLT_19_TUCOINT7_OKU_345kV_3PH_PO_TUCOINT7_Border	UNSTABLE	UNSTABLE	UNSTABLE

FERC LVRT Compliance

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

LVRT compliance was not restudied for this analysis. Please refer to DISIS-2013-001-1 for LVRT compliance for wind farms.

IV. Conclusion

DISIS-2013-001 Interconnection Customers have requested an Impact Study to determine the impacts of interconnecting generation to the SPP Transmission System.

With all Base Case Network Upgrades in service, previously assigned Network Upgrades in service, and the newly assigned Network Upgrades in service, the Group 6 projects were found to remain

All generators in the monitored areas remained stable for the modeled Category 'B' disturbances. For Category 'C' disturbances, generation curtailment will be required.

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

Nothing in this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer any right to receive transmission service.

Appendix A: 2014 Winter Peak Stability Plots

(Available on request)

Appendix B: 2015 Summer Peak Stability Plots

(Available on request)

Appendix C: 2024 Summer Peak Stability Plots

(Available on request)