

Definitive Interconnection System Impact Re-Study for Generation Interconnection Requests

Southwest Power Pool
Engineering Department
Generation Interconnection

(DISIS-2009-001-4 Study)
January 2013



SPP RESTRICTED

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Engineering Department
Tariff Studies – Generation Interconnection

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Date	Rev.	Comment
January 2013	0	Restudy

Executive Summary

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 Impact Study. This restudy is being conducted to account for higher queued request withdrawals. The customers will be referred to in this study as the DISIS-2009-001 Interconnection Customers. This Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling 2,079.2 MW of new generation which would be located within the transmission systems of American Electric Power West (AEPW), Midwest Energy Inc. (MIDW), Missouri Public Service (MIPU), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Omaha Public Power District (OPPD), Southwestern Public Service (SPS), and Sunflower Electric Power Corporation / Mid-Kansas Electric Power LLC (SUNC)/(MKEC). The various generation interconnection requests have differing proposed in-service dates¹. The generation interconnection requests included in this DISIS are listed in Appendix A by their queue number, amount, 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, 2,079.2 MW of nameplate generation may be interconnected with transmission system reinforcements within the SPP transmission system. Previously performed dynamic stability analysis and additional power flow analysis for power factor requirements has determined the need for reactive. Previously performed dynamic stability analysis has determined that the transmission system will remain stable with the assigned Network Upgrades and Interconnection Facilities to the DISIS.

The need for reactive compensation in accordance with Order No. 661-A for wind farm interconnection requests and those requirements were determined in the previous Impact Study DISIS-2009-001.

The total estimated minimum cost for interconnecting the studied interconnection requests is \$86,400,000. These costs are shown in Appendix E and Appendix F. This cost does not include additional network constraints in the SPP transmission system that were identified are shown in Appendix H.

Interconnection Service to DISIS-2009-001 interconnection customers is contingent upon a higher queued customers paying for certain required network upgrades and other Base Case upgrades being placed in service. The in service date for the DISIS customers will be deferred until the construction of these network upgrades can be completed.

The Finney-Holcomb 345kV 2nd circuit is no longer considered a contingent upgrade for the DISIS-2009-001 cluster.

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 Customer's that proceed to the Facility Study will be provided a new in-service date based on the completion of the Facility Study.

Network Constraints listed in Appendix G are in the local area of the new generation when this generation is injected throughout the SPP footprint for the Energy Resource (ER) Interconnection Request. 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.

These costs do not include the Interconnection Customer Interconnection Facilities as defined by the SPP Open Access Transmission Tariff (OATT). 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 Impact Study. The customers will be referred to in this study as the DISIS-2009-001 Interconnection Customers. This Impact Study analyzes the interconnecting of multiple generation interconnection requests associated with new generation totaling 2,079.2 MW of new generation which would be located within the transmission systems of American Electric Power West (AEPW), Midwest Energy Inc. (MIDW), Missouri Public Service (MIPU), Nebraska Public Power District (NPPD), Oklahoma Gas and Electric (OKGE), Omaha Public Power District (OPPD), Southwestern Public Service (SPS), and Sunflower Electric Power Corporation / Mid-Kansas Electric Power LLC (SUNC)/(MKEC). The various generation interconnection requests have differing proposed in-service dates². The generation interconnection requests included in this Impact Cluster Study are listed in Appendix A by their queue number, amount, area, requested interconnection point, proposed interconnection point, and the requested in-service date.

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.

Model Development

Interconnection Requests Included in the DISIS-2009-001-4 Study

SPP has included all interconnection requests that submitted a Definitive Interconnection System Impact Study request no later than September 30, 2009 and were subsequently accepted by Southwest Power Pool under the terms of the Large Generation Interconnection Procedures (LGIP) that became effective June 2, 2009.

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

Previous Queued Projects

The previous queued projects included in this study are listed in Appendix B. In addition to the Base Case Upgrades, the previous queued projects 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.

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 Customer's that proceed to the Facility Study will be provided a new in-service date based on the completion of the Facility Study.

Development of Base Cases

Power flow - The 2012 series Transmission Service Request (TSR) Models 2013 spring 2013 summer and winter peaks, and 2018 summer and winter peaks, and 2023 summer peak scenario 0 peak cases were used for this study. Each of the control areas' resources were then re-dispatched using current dispatch orders.

Stability – The stability analysis was not performed for this study.

Base Case Upgrades

The following facilities are part of the SPP Transmission Expansion Plan or the Balanced Portfolio. These facilities have been approved 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-2009-001 Customers have no potential cost for the below listed projects. However, the DISIS-2009-001 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 customers.

- Hitchland 230/115kV area projects³
 - Hitchland – Moore County 230kV, (placed in-service in 2012)
 - Hitchland – Ochitree 230kV Project, schedule for 2/1/2013 in-service
- Valliant – Hugo – Sunnyside 345kV, (placed in-service in 2012)⁴
- Rose Hill – Sooner 345kV, (placed in-service in 2012)⁵
- Balanced Portfolio Projects⁶:
 - 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
 - Spearville – Post Rock 345kV, (placed in service in 2012)
 - Post Rock 345/230kV autotransformer, (placed in-service in 2012)
 - Post Rock – Axtell 345kV, (placed in-service in 2012)
 - Cleveland – Sooner 345kV, scheduled for 12/31/2012 in-service
 - Tap Stillwell – Swissvale 345kV line at West Gardner, scheduled for 12/31/2012 in-service
- Priority Projects⁵
 - Hitchland – Woodward double circuit 345kV, scheduled for 6/30/2014 in-service
 - Hitchland 345/230kV circuit #2 autotransformer

³ Approved 230kV upgrades are based on SPP 2007 STEP. Upgrades may need to be re-evaluated in the system impact study.

⁴ SPP Transmission Service Projects identified in SPP-2006-AG3-AFS-11.

⁵ SPP Regional Reliability Project. Approved based on an order of the Kansas Corporation Commission issued in Docket no. 07-WSEE-715-MIS.

⁶ Notice to Construct (NTC) issued June 2009

⁵ Notice to Construct issued June, 2010

- 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

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-2010-002 study and are assumed to be in service. This list may not be all inclusive. The DISIS-2010-002 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-2010-002 Customer Generation Facilities in service dates may need to be delayed until the completion of the following upgrades.

- Upgrades assigned to 1st Cluster (ICS-2008-001) Interconnection Customers:
 - Amarillo - Swisher 230kV CKT 1 Rerate replace line traps
 - Clinton Jct - GEN-2007-032 Tap - Clinton 138kV rerate

Potential Upgrades Not in the Base Case

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

Regional Groupings

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

To determine interconnection impacts, twelve different dispatch variations 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 80% nameplate of maximum generation. The wind generating plants in the other areas were modeled at 20% nameplate of maximum generation. This process created twelve different scenarios with each group being studied at 80% nameplate rating. These projects were dispatched as Energy Resources with equal distribution across the SPP footprint. 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. Each interconnection request was also modeled separately at 100% nameplate for certain analyses.

Peaking units were not dispatched in the 2013 spring model. To study peaking units' impacts, the 2013 summer and winter peak and 2018 summer and winter peak, and 2023 summer peak models was chosen and peaking units were modeled at 100% of the nameplate rating and wind generating facilities were modeled at 10% of the nameplate rating.

Stability - For each group, all interconnection requests (wind and non-wind) were modeled at 100% nameplate of maximum generation in both winter and summer seasonal models. The wind

interconnection requests in the other areas were modeled at 20% nameplate of maximum generation while fossil units were modeled at 100% in the other areas. This process created twelve different scenarios with each group being studied at 100% nameplate rating. These projects were dispatched as Energy Resources with equal distribution across the SPP footprint.

Identification of Network Constraints

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.

Determination of Cost Allocated Network Upgrades

Cost Allocated Network Upgrades of wind generation interconnection requests were determined using the 2013 spring model. Cost Allocated Network Upgrades of peaking units was determined using the 2018 summer peak model. Once a determination of the required Network Upgrades was made, a power flow model of the 2011 spring case was developed with all cost allocated Network Upgrades in-service. A MUST FCITC analysis was performed to determine the Power Transfer Distribution Factors (PTDF), defined as a distribution factor with system impact conditions 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 Z1 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.

Interconnection Facilities

The requirement to interconnect the 2,079.2 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 total for interconnection facilities owned by transmission owners and network upgrades is approximately \$86,400,000.

Network Constraints in the AEPW, MIDW, MIPU, NPPD, OKGE, OPPD, SPS, and SUNC/MKEC transmission systems that were identified are shown in Appendix G. 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.

Powerflow

Powerflow Analysis Methodology

The Southwest Power Pool (SPP) Criteria states that:

“The transmission system of the SPP region shall be planned and constructed so that the contingencies as set forth in the Criteria will meet the applicable NERC Reliability Standards for transmission planning. All MDWG power flow models shall be tested to verify compliance with the System Performance Standards from NERC Table 1 – Category A.”

The ACCC function of PSS/E was used to simulate contingencies, including single and multiple facility (i.e. breaker-to-breaker, etc.) outages, within all of the control areas of SPP and other control areas external to SPP and the resulting data analyzed. This satisfies the “more probable” contingency testing criteria mandated by NERC and the SPP criteria.

Power flow Analysis

A power flow analysis was conducted for each Interconnection Customer’s facility using modified versions of the 2013 spring peak the 2013 summer and winter peak models, and 2016 summer and winter 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. The available seasonal models used were through the 2023 Winter Peak.

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 additional criteria violations will occur on the OKGE, NPPD, and SUNC/MKEC transmission systems under steady state and contingency conditions in the peak seasons.

Cluster Group 1 (Woodward Area)

The Woodward area contains approximately 250 MW of new interconnection requests in addition to the 2,523.8 MW of prior queued interconnection requests. No new constraints were found in this area.

Cluster Group 2 (Hitchland Area)

The Hitchland area contains 0 MW of interconnection request in addition to the 1,217.9 MW of previous queued generation interconnection requests. No new constraints were found in this area.

Cluster Group 3 (Spearville Area)

The Spearville area contains 498.9 MW of interconnection requests and 1,831 MW of previous queued interconnection requests. Constraints were observed in the Judson Large area. To mitigate these issues, a second 115kV circuit from Judson Large – North Judson Large – Spearville was added. In addition, a Spearville 345/115kV autotransformer was added.

MONTCOMMONNAME	RATEB	TC%LOADING	CONTNAME
'CIMARRON RIVER PLANT - CIMARRON RIVER TAP 115KV CKT 1'	89.6	112.1142	'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'
'CIMARRON RIVER PLANT - CIMARRON RIVER TAP 115KV CKT 1'	89.6	114.1036	'SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1'
'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	129.5	115.5462	'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'
'CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1'	129.5	114.0867	'SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1'
'CUDAHY - G08-79T 115.00 115KV CKT 1'	129.5	120.1011	'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'
'CUDAHY - G08-79T 115.00 115KV CKT 1'	129.5	118.729	'SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1'
'CUDAHY - KISMET 3 115.00 115KV CKT 1'	129.5	116.8988	'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'
'CUDAHY - KISMET 3 115.00 115KV CKT 1'	129.5	115.4061	'SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1'
'GREENSBURG - SSTARTP3 115.00 115KV CKT 1'	129.5	118.4735	'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'
'GREENSBURG - SSTARTP3 115.00 115KV CKT 1'	129.5	118.4483	'SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1'
'GREENSBURG - SUN CITY 115KV CKT 1'	129.5	110.615	'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'

'GREENSBURG - SUN CITY 115KV CKT 1'	129.5	110.5649	'SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1'
'MEDICINE LODGE - SUN CITY 115KV CKT 1'	129.5	108.0344	'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'
'MEDICINE LODGE - SUN CITY 115KV CKT 1'	129.5	107.9752	'SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1'
'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'	177.7	100.0731	'CUDAHY - KISMET 3 115.00 115KV CKT 1'
'NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1'	177.7	102.5075	'CUDAHY - G08-79T 115.00 115KV CKT 1'

Cluster Group 4 (NW Kansas Group)

The NW Kansas area contains 302 MW in addition to the 1,367 MW of previously queued generation in the area. No new constraints were found in this area.

Cluster Group 5 (Amarillo Area)

The Amarillo area contains 322 MW of interconnection requests in addition to the 1,200 MW of previously queued interconnection requests in this area. No new constraints were found in this area. The Finney-Holcomb 2nd 345kV circuit was not found to be required for the requests in Group 5.

Cluster Group 6 (South Panhandle/New Mexico)

The South Panhandle area contains 0 MW of interconnection request in addition to the 1,204 MW of previous queued generation interconnection requests. No new constraints were found in this area.

Cluster Group 7 (Southwestern Oklahoma)

The Southwestern Oklahoma area contains 250.8 MW of interconnection requests in addition to the 1,317.2 MW of previous queued generation in the area. No new constraints were found in this area.

Cluster Group 8 (South Central Kansas/North Oklahoma)

The South Central Kansas/North Oklahoma area contains 60 MW of interconnection requests in addition to the 1,193 MW of previous queued generation in the area. No new constraints were found in this area.

Cluster Group 9/10 (Nebraska)

The Nebraska area contains 315.5 MW of interconnection requests in addition to the 782 MW of previous queued generation in the area. Previously identified constraints in the area included overloads on the Albion – Petersburg 115kV line and Petersburg – Neligh 115kV lines. To mitigate these constraints, the Petersburg-Albion and Petersburg – Neligh lines will need to have line structures raised to accommodate a higher line rating. The Fort Randall – Kelley 230kV line was found to have a lower rating in the Facility Study of 192MVA. This requires the raising of structures to accommodate GEN-2008-086N2.

MONTCOMMONNAME	RATEB	TC%LOADING	CONTNAME
'KELLY - MADISONCO 230.00 230KV CKT 1'	192	118.8834	'BASE CASE'
'KELLY - MADISONCO 230.00 230KV CKT 1'	192	131.39583	'ONEILL - SPENCER 115KV CKT 1'
'KELLY - MADISONCO 230.00 230KV CKT 1'	192	139.84105	'FT RANDAL - UTICA JCT 230KV CKT 1'
'KELLY - MADISONCO 230.00 230KV CKT 1'	192	134.43229	'FT RANDAL - SIOUX CITY 230KV CKT 1'

'KELLY - MADISONCO 230.00 230KV CKT 1'	192	132.63802	'HOSKINS - RAUN 345KV CKT 1'
'KELLY - MADISONCO 230.00 230KV CKT 1'	192	131.8099	'FT RANDAL - SPENCER 115KV CKT 1'
'KELLY - MADISONCO 230.00 230KV CKT 1'	192	136.22656	'FT THOMPSON - GRAND ISLAND 345KV CKT 1'

Cluster Group 12 (Northwest Arkansas)

The Northwest Arkansas area contains 0 MW of interconnection requests in addition to the 0 MW of previous queued generation in the area. No new constraints were found in this area.

Cluster Group 13 (Northwest Missouri)

The Northwest Missouri area contains 80 MW of interconnection requests in addition to the 300 MW of previous queued generation in the area.

Cluster Group 14 (South Oklahoma)

The South Oklahoma area contains 0 MW of interconnection requests in addition to the 0 MW of previous queued generation in the area. No new constraints were found in this area.

Stability Analysis

The stability analysis was not re-performed for this restudy.

Conclusion

The minimum cost of interconnecting all of the interconnection requests included in this Impact Cluster Study is estimated at \$86,400,000 for the Allocated Network Upgrades and Transmission Owner Interconnection Facilities are listed in Appendix E and F.

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).

Appendix

A: Generation Interconnection Requests Considered for Impact Study

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A: Generation Interconnection Requests Considered for Impact Study

Request	Amount	Service	Area	Requested Point of Interconnection	Proposed Point of Interconnection	Requested In-Service Date
GEN-2006-037N1	75.0	ER	NPPD	Broken Bow 115kV	Broken Bow 115kV	1/1/2010
GEN-2006-044N	40.5	ER	OPPD	North Petersburg 115kV	North Petersburg 115kV	1/1/2010
GEN-2007-040	200.0	ER	SUNCMKEC	Buckner 345kV	Buckner 345kV	12/15/2010
GEN-2008-023	150.0	ER	AEPW	Hobart Junction 138kV	Hobart Junction 138kV	12/1/2010
GEN-2008-025	101.0	ER	SUNCMKEC	Ruleton 115kV	Ruleton 115kV	11/1/2009
GEN-2008-029	250.0	ER	OKGE	Woodward EHV 138kV	Woodward EHV 138kV	1/1/2010
GEN-2008-051	322.0	ER	SPS	Potter County 345kV	Potter County 345kV	12/31/2010
GEN-2008-079	98.9	ER	SUNCMKEC	Tap Cudahy - Ft Dodge 115kV	Tap Cudahy - Ft Dodge 115kV	12/1/2010
GEN-2008-086N02	200.0	ER	NPPD	Tap Ft Randle - Columbus (Madison County) 230kV	Tap Ft Randle - Columbus (Madison County) 230kV	
GEN-2008-092	201.0	ER	MIDW	Knoll 115kV	Knoll 230kV	12/1/2011
GEN-2008-124	200.0	ER	SUNCMKEC	Spearville 230kV	Spearville 345kV	1/1/2016
GEN-2008-129	80.0	ER	MIPU	Pleasant Hill 161kV	Pleasant Hill 161kV	5/1/2009
GEN-2009-016	100.8	ER	AEPW	Falcon Road 138kV	Falcon Road 138kV	12/1/2011
GEN-2009-025	60.0	ER	OKGE	Kaycoop 69kV	Tap Deer Creek - Sinclair Blackwell 69kV	12/31/2011
TOTAL		2,079.2				

*request dependent upon Priority Projects or Balanced Portfolio may be delayed until 12/31/2014.
Other projects in service date to be determined after Facility Study.

B: Prior Queued Interconnection Requests

See next page

B: Prior Queued Interconnection Requests

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
ASGI-2010-006	150	AECI	Tap Fairfax (AECI) - Shilder (AEPW) 138kV	AECI queue Affected Study
GEN-2001-014	96	WFEC	Ft Supply 138kV	On-Line
GEN-2001-026	74	WFEC	Washita 138kV	On-Line
GEN-2001-033	180	SPS	San Juan Tap 230kV	On-Line
GEN-2001-036	80	SPS	Norton 115kV	On-Line
GEN-2001-037	102	OKGE	FPL Moreland Tap 138kV	On-Line
GEN-2001-039A	105	SUNCMKEC	Tap Greensburg - Ft Dodge (Shooting Star Tap) 115kV	On Schedule for 2012
GEN-2001-039M	99	SUNCMKEC	Central Plains Tap 115kV	On-Line
GEN-2002-004	200	WERE	Latham 345kV	On-Line at 150MW
GEN-2002-005	120	WFEC	Red Hills Tap 138kV	On-Line
GEN-2002-008	240	SPS	Hitchland 345kV	On-Line at 120MW
GEN-2002-009	80	SPS	Hansford 115kV	On-Line
GEN-2002-022	240	SPS	Bushland 230kV	On-Line
GEN-2002-023N	0.8	NPPD	Harmony 115kV	On-Line
GEN-2002-025A	150	SUNCMKEC	Spearville 230kV	On-Line
GEN-2003-004 GEN-2004-023 GEN-2005-003	151.2	WFEC	Washita 138kV	On-Line
GEN-2003-005	100	WFEC	Anadarko - Paradise (Blue Canyon) 138kV	On-Line
GEN-2003-006A	200	SUNCMKEC	Elm Creek 230kV	On-Line
GEN-2003-019	250	MIDW	Smoky Hills Tap 230kV	On-Line
GEN-2003-020	160	SPS	Martin 115kV	On-Line at 80MW
GEN-2003-021N	75	NPPD	Ainsworth Wind Tap 115kV	On-Line
GEN-2003-022	120	AEPW	Washita 138kV	On-Line
GEN-2004-005N	30	NPPD	St Francis 115kV	On Suspension
GEN-2004-014	154.5	SUNCMKEC	Spearville 230kV	On Schedule for 2012
GEN-2004-020	27	AEPW	Washita 34.5kV	On-Line
GEN-2004-023N	75	NPPD	Columbus Co 115kV	On-Line
GEN-2005-005	18	OKGE	FPL Moreland Tap 138kV	IA Pending
GEN-2005-008	120	OKGE	Woodward 138kV	On-Line
GEN-2005-012	250	SUNCMKEC	Spearville 345kV	On Schedule for 2012
GEN-2005-013	201	WERE	Tap Latham - Neosho (Caney River) 345kV	On-Line
GEN-2006-002	101	AEPW	Sweetwater 230kV	On-Line
GEN-2006-006	205.5	SUNCMKEC	Spearville 345kV	IA Pending
GEN-2006-014	300	MIPU	Tap Maryville - Midway (Nodway Co) 161kV	On Suspension
GEN-2006-018	170	SPS	TUCO Interchange 230kV	On-Line
GEN-2006-020N	42	NPPD	Bloomfield 115kV	On-Line
GEN-2006-020S	18.9	SPS	DWS Frisco 115kV	On Schedule for 3/2012
GEN-2006-021	101	SUNCMKEC	Flat Ridge Tap 138kV	On-Line
GEN-2006-022	150	SUNCMKEC	Ninnescah 115kV	On Suspension
GEN-2006-024S	19.8	WFEC	Buffalo Bear Tap 69kV	On-Line
GEN-2006-026	604	SPS	Hobbs 230kV & Hobbs 115kV	On-Line
GEN-2006-031	75	MIDW	Knoll 115kV	On-Line
GEN-2006-032	200	MIDW	South Hays 230kV	On Suspension
GEN-2006-035	225	AEPW	Sweetwater 230kV	On-Line at 132MW
GEN-2006-038N005	80	NPPD	Broken Bow 115kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
GEN-2006-038N019	80	NPPD	Petersburg North 115kV	On-Line
GEN-2006-040	108	SUNCMKEC	Mingo 115kV	On Suspension
GEN-2006-043	99	AEPW	Sweetwater 230kV	On-Line
GEN-2006-044	370	SPS	Hitchland 345kV	On Schedule for 2012
GEN-2006-045	240	SPS	Tap Potter - Plant X 230kV (South Randle County) 230kV	On Suspension
GEN-2006-046	131	OKGE	Dewey 138kV	On-Line
GEN-2006-047	240	SPS	Tap Bushland - Deaf Smith (Buffalo) 230kV	On Suspension
GEN-2007-011	135	SUNCMKEC	Syracuse 115kV	On Suspension
GEN-2007-011N08	81	NPPD	Bloomfield 115kV	On-Line
GEN-2007-015	135	WERE	Tap Kelly(WERE) - S1399(OPPD) 161kV	On Schedule 2014
GEN-2007-021	201	OKGE	Tatonga 345kV	On Schedule for 2014
GEN-2007-025	300	WERE	Viola 345kV	On Schedule for 2012
GEN-2007-032	150	WFEC	Tap Clinton Junction - Clinton 138kV	On Schedule for 2013
GEN-2007-038	200	SUNCMKEC	Spearville 345kV	On Schedule for 2015
GEN-2007-043	200	OKGE	Minco 345kV	On-Line
GEN-2007-044	300	OKGE	Tatonga 345kV	On Schedule for 2014
GEN-2007-046	199.5	SPS	Hitchland 115kV	On Schedule for 2014
GEN-2007-048	400	SPS	Tap Amarillo S - Swisher 230kV	On Schedule for 2014
GEN-2007-050	170	OKGE	Woodward EHV 138kV	On-Line at 150MW
GEN-2007-052	150	WFEC	Anadarko 138kV	On-Line
GEN-2007-057	34.5	SPS	Moore County East 115kV	On Schedule for 2014
GEN-2007-062	765	OKGE	Woodward EHV 345kV	On Schedule for 2014
GEN-2008-003	101	OKGE	Woodward EHV 138kV	On-Line
GEN-2008-008	60	SPS	Graham 69kV	On Suspension
GEN-2008-009	60	SPS	San Juan Tap 230kV	On Schedule for 2014
GEN-2008-013	300	OKGE	Tap Wichita - Woodring (Hunter) 345kV	On-Line
GEN-2008-017	300	SUNCMKEC	Setab 345kV	On Schedule for 2014
GEN-2008-018	405	SPS	Finney 345kV	On Schedule for 2012
GEN-2008-019	300	OKGE	Tatonga 345kV	On Schedule for 2015
GEN-2008-021	42.0	WERE	Wolf Creek 345kV	On-Line
GEN-2008-1190	60	OPPD	S1399 161kV	On-Line
Gray County Wind (Montezuma)	110	SUNCMKEC	Gray County Tap 115kV	On-Line
Llano Estacado (White Deer)	80	SPS	Llano Wind 115kV	On-Line
NPPD Distributed (Broken Bow)	8.3	NPPD	Broken Bow 115kV	On-Line
NPPD Distributed (Burwell)	3	NPPD	Ord 115kV	On-Line
NPPD Distributed (Columbus Hydro)	45	NPPD	Columbus 115kV	On-Line
NPPD Distributed (North Platte - Lexington)	54	NPPD	Multiple: Jeffrey 115kV, John_1 115kV, John_2 115kV	On-Line
NPPD Distributed (Ord)	10.8	NPPD	Ord 115kV	On-Line
NPPD Distributed (Stuart)	2.1	NPPD	Ainsworth 115kV	On-Line
SPS Distributed (Dumas 19th St)	20	SPS	Dumas 19th Street 115kV	On-Line
SPS Distributed (Etter)	20	SPS	Etter 115kV	On-Line
SPS Distributed (Hopi)	10	SPS	Hopi 115kV	On-Line
SPS Distributed (Jal)	10	SPS	S Jal 115kV	On-Line
SPS Distributed (Lea Road)	10	SPS	Lea Road 115kV	On-Line
SPS Distributed (Monument)	10	SPS	Monument 115kV	On-Line
SPS Distributed (Moore E)	25	SPS	Moore East 115kV	On-Line
SPS Distributed (Ocotillo)	10	SPS	Ocotillo 115kV	On-Line

Request	Amount	Area	Requested/Proposed Point of Interconnection	Status or In-Service Date
SPS Distributed (Sherman)	20	SPS	Sherman 115kV	On-Line
SPS Distributed (Spearman)	10	SPS	Spearman 69kV	On-Line
SPS Distributed (TC-Texas County)	20	SPS	Texas County 115kV	On-Line
TOTAL 12,935.9				

C: Study Groupings

See next page.

C. Study Groups

GROUP 1: WOODWARD AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-014	96.0	WFEC	Ft Supply 138kV
GEN-2001-037	102.0	OKGE	FPL Moreland Tap 138kV
GEN-2005-005	18.0	OKGE	FPL Moreland Tap 138kV
GEN-2005-008	120.0	OKGE	Woodward 138kV
GEN-2006-024S	19.8	WFEC	Buffalo Bear Tap 69kV
GEN-2006-046	131.0	OKGE	Dewey 138kV
GEN-2007-021	201.0	OKGE	Tatonga 345kV
GEN-2007-043	200.0	OKGE	Minco 345kV
GEN-2007-044	300.0	OKGE	Tatonga 345kV
GEN-2007-050	170.0	OKGE	Woodward EHV 138kV
GEN-2007-062	765.0	OKGE	Woodward EHV 345kV
GEN-2008-003	101.0	OKGE	Woodward EHV 138kV
GEN-2008-019	300.0	OKGE	Tatonga 345kV
PRIOR QUEUED SUBTOTAL	2,523.8		
GEN-2008-029	250.0	OKGE	Woodward EHV 138kV
CURRENT CLUSTER SUBTOTAL	250.0		
AREA TOTAL	2,773.8		

GROUP 2: HITCHLAND AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2002-008	240.0	SPS	Hitchland 345kV
GEN-2002-009	80.0	SPS	Hansford 115kV
GEN-2003-020	160.0	SPS	Martin 115kV
GEN-2006-020S	18.9	SPS	DWS Frisco 115kV
GEN-2006-044	370.0	SPS	Hitchland 345kV
GEN-2007-046	199.5	SPS	Hitchland 115kV
GEN-2007-057	34.5	SPS	Moore County East 115kV
SPS Distributed (Dumas 19th St)	20.0	SPS	Dumas 19th Street 115kV
SPS Distributed (Etter)	20.0	SPS	Etter 115kV
SPS Distributed (Moore E)	25.0	SPS	Moore East 115kV
SPS Distributed (Sherman)	20.0	SPS	Sherman 115kV
SPS Distributed (Spearman)	10.0	SPS	Spearman 69kV
SPS Distributed (TC-Texas County)	20.0	SPS	Texas County 115kV
PRIOR QUEUED SUBTOTAL	1,217.9		
AREA TOTAL	1,217.9		

GROUP 3: SPEARVILLE AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-039A	105.0	SUNCMKEC	Tap Greensburg - Ft Dodge (Shooting Star Tap) 115kV
GEN-2002-025A	150.0	SUNCMKEC	Spearville 230kV
GEN-2004-014	154.5	SUNCMKEC	Spearville 230kV
GEN-2005-012	250.0	SUNCMKEC	Spearville 345kV
GEN-2006-006	205.5	SUNCMKEC	Spearville 345kV
GEN-2006-021	101.0	SUNCMKEC	Flat Ridge Tap 138kV
GEN-2006-022	150.0	SUNCMKEC	Ninnescah 115kV
GEN-2007-038	200.0	SUNCMKEC	Spearville 345kV
GEN-2008-018	405.0	SPS	Finney 345kV
Gray County Wind (Montezuma)	110.0	SUNCMKEC	Gray County Tap 115kV
PRIOR QUEUED SUBTOTAL	1,831.0		
GEN-2007-040	200.0	SUNCMKEC	Buckner 345kV
GEN-2008-079	98.9	SUNCMKEC	Tap Cudahy - Ft Dodge 115kV
GEN-2008-124	200.0	SUNCMKEC	Spearville 345kV
CURRENT CLUSTER SUBTOTAL	498.9		
AREA TOTAL	2,329.9		

GROUP 4: NW KANSAS AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-039M	99.0	SUNCMKEC	Central Plains Tap 115kV
GEN-2003-006A	200.0	SUNCMKEC	Elm Creek 230kV
GEN-2003-019	250.0	MIDW	Smoky Hills Tap 230kV
GEN-2006-031	75.0	MIDW	Knoll 115kV
GEN-2006-032	200.0	MIDW	South Hays 230kV
GEN-2006-040	108.0	SUNCMKEC	Mingo 115kV
GEN-2007-011	135.0	SUNCMKEC	Syracuse 115kV
GEN-2008-017	300.0	SUNCMKEC	Setab 345kV
PRIOR QUEUED SUBTOTAL	1,367.0		
GEN-2008-025	101.0	SUNCMKEC	Ruleton 115kV
GEN-2008-092	201.0	MIDW	Knoll 230kV
CURRENT CLUSTER SUBTOTAL	302.0		
AREA TOTAL	1,669.0		

GROUP 5: AMARILLO AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2002-022	240.0	SPS	Bushland 230kV
GEN-2006-045	240.0	SPS	Tap Potter - Plant X 230kV (South Randle County) 230kV
GEN-2006-047	240.0	SPS	Tap Bushland - Deaf Smith (Buffalo) 230kV
GEN-2007-048	400.0	SPS	Tap Amarillo S - Swisher 230kV
Llano Estacado (White Deer)	80.0	SPS	Llano Wind 115kV
PRIOR QUEUED SUBTOTAL	1,200.0		
GEN-2008-051	322.0	SPS	Potter County 345kV
CURRENT CLUSTER SUBTOTAL	322.0		
AREA TOTAL	1,522.0		

GROUP 6: S-TX PANHANDLE/NW AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-033	180.0	SPS	San Juan Tap 230kV
GEN-2001-036	80.0	SPS	Norton 115kV
GEN-2006-018	170.0	SPS	TUCO Interchange 230kV
GEN-2006-026	604.0	SPS	Hobbs 230kV & Hobbs 115kV
GEN-2008-008	60.0	SPS	Graham 69kV
GEN-2008-009	60.0	SPS	San Juan Tap 230kV
SPS Distributed (Hopi)	10.0	SPS	Hopi 115kV
SPS Distributed (Jal)	10.0	SPS	S Jal 115kV
SPS Distributed (Lea Road)	10.0	SPS	Lea Road 115kV
SPS Distributed (Monument)	10.0	SPS	Monument 115kV
SPS Distributed (Ocotillo)	10.0	SPS	Ocotillo 115kV
PRIOR QUEUED SUBTOTAL	1,204.0		
AREA TOTAL	1,204.0		

GROUP 7: SW OKLAHOMA AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2001-026	74.0	WFEC	Washita 138kV
GEN-2002-005	120.0	WFEC	Red Hills Tap 138kV
GEN-2003-004 GEN-2004-023 GEN-2005-003	151.2	WFEC	Washita 138kV
GEN-2003-005	100.0	WFEC	Anadarko - Paradise (Blue Canyon) 138kV
GEN-2003-022	120.0	AEPW	Washita 138kV
GEN-2004-020	27.0	AEPW	Washita 34.5kV
GEN-2006-002	101.0	AEPW	Sweetwater 230kV
GEN-2006-035	225.0	AEPW	Sweetwater 230kV
GEN-2006-043	99.0	AEPW	Sweetwater 230kV
GEN-2007-032	150.0	WFEC	Tap Clinton Junction - Clinton 138kV
GEN-2007-052	150.0	WFEC	Anadarko 138kV
PRIOR QUEUED SUBTOTAL	1,317.2		
GEN-2008-023	150.0	AEPW	Hobart Junction 138kV
GEN-2009-016	100.8	AEPW	Falcon Road 138kV
CURRENT CLUSTER SUBTOTAL	250.8		
AREA TOTAL	1,568.0		

GROUP 8: N-OK/S-KS AREA			
Request	Capacity	Area	Proposed Point of Interconnection
ASGI-2010-006	150.0	AECI	Tap Fairfax (AECI) - Shilder (AEPW) 138kV
GEN-2002-004	200.0	WERE	Latham 345kV
GEN-2005-013	201.0	WERE	Tap Latham - Neosho (Caney River) 345kV
GEN-2007-025	300.0	WERE	Viola 345kV
GEN-2008-013	300.0	OKGE	Tap Wichita - Woodring (Hunter) 345kV
GEN-2008-021	42.0	WERE	Wolf Creek 345kV
PRIOR QUEUED SUBTOTAL	1,193.0		
GEN-2009-025	60.0	OKGE	Tap Deer Creek - Sinclair Blackwell 69kV
CURRENT CLUSTER SUBTOTAL	60.0		
AREA TOTAL	1,253.0		

GROUP 9/10: NEBRASKA AREA			
Request	Capacity	Area	Proposed Point of Interconnection
GEN-2002-023N	0.8	NPPD	Harmony 115kV
GEN-2003-021N	75.0	NPPD	Ainsworth Wind Tap 115kV
GEN-2004-005N	30.0	NPPD	St Francis 115kV
GEN-2004-023N	75.0	NPPD	Columbus Co 115kV
GEN-2006-020N	42.0	NPPD	Bloomfield 115kV
GEN-2006-038N005	80.0	NPPD	Broken Bow 115kV
GEN-2006-038N019	80.0	NPPD	Petersburg North 115kV
GEN-2007-011N08	81.0	NPPD	Bloomfield 115kV
GEN-2007-015	135.0	WERE	Tap Kelly(WERE) - S1399(OPPD) 161kV
GEN-2008-1190	60.0	OPPD	S1399 161kV
NPPD Distributed (Broken Bow)	8.3	NPPD	Broken Bow 115kV
NPPD Distributed (Burwell)	3.0	NPPD	Ord 115kV
NPPD Distributed (Columbus Hydro)	45.0	NPPD	Columbus 115kV
NPPD Distributed (North Platte - Lexington)	54.0	NPPD	Multiple: Jeffrey 115kV, John_1 115kV, John_2 115kV
NPPD Distributed (Ord)	10.8	NPPD	Ord 115kV
NPPD Distributed (Stuart)	2.1	NPPD	Ainsworth 115kV
PRIOR QUEUED SUBTOTAL	782.0		
GEN-2006-037N1	75.0	NPPD	Broken Bow 115kV
GEN-2006-044N	40.5	OPPD	North Petersburg 115kV
GEN-2008-086N02	200.0	NPPD	Tap Ft Randle - Columbus (Madison County) 230kV
CURRENT CLUSTER SUBTOTAL	315.5		
AREA TOTAL	1,097.5		

GROUP 12: NW AR AREA

Request	Capacity	Area	Proposed Point of Interconnection
AREA TOTAL	0.0		

GROUP 13: NW MISSOURI AREA

Request	Capacity	Area	Proposed Point of Interconnection
GEN-2006-014	300.0	MIPU	Tap Maryville - Midway (Nodway Co) 161kV
PRIOR QUEUED SUBTOTAL	300.0		
GEN-2008-129	80.0	MIPU	Pleasant Hill 161kV
CURRENT CLUSTER SUBTOTAL	80.0		
AREA TOTAL	300.0		

GROUP 14: S OKLAHOMA AREA

Request	Capacity	Area	Proposed Point of Interconnection
AREA TOTAL	0.0		

CLUSTER TOTAL (CURRENT STUDY)	2,079.2	MW
PQ TOTAL (PRIOR QUEUED)	12,935.9	MW
CLUSTER TOTAL (INCLUDING PRIOR QUEUED)	15,015.1	MW

D: Proposed Point of Interconnection One line Diagrams

See Facility Studies posted for each individual request

E: Cost Allocation per Interconnection Request

Appendix E. - Cost Allocation Per Request

(Including Previously Allocated Network Upgrades*)

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
GEN-2006-037N1			
GEN-2006-037N1 Interconnection Costs See Online Diagram	Current Study Allocation	\$700,000.00	\$700,000.00
	Current Study Total	\$700,000.00	
GEN-2006-044N			
GEN-2006-044N Interconnection Costs See Online Diagram	Current Study Allocation	\$1,400,000.00	\$1,400,000.00
Neligh - Petersburg 115KV CKT 1 Per GEN-2006-044N Impact Restudy	Current Study Allocation	\$540,000.00	\$540,000.00
Albion - Petersburg 115KV CKT1 Line re-rating to 100 ⁰ C	Current Study Allocation	\$360,000.00	\$360,000.00
	Current Study Total	\$2,300,000.00	
GEN-2007-040			
GEN-2007-040 Interconnection Costs See Online Diagram	Current Study Allocation	\$22,000,000.00	\$22,000,000.00
Comanche - Medicine Lodge 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Spearville - Comanche 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Medicine Lodge - Wichita 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge-Woodward 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$194,972,759.00
PostRock - Spearville 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
Hitchland - Woodward 345kV CKT 1 Priority Project: Hitchland-Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$247,005,793.00
	Current Study Total	\$22,000,000.00	
GEN-2008-023			
GEN-2008-023 Interconnection Costs See Online Diagram	Current Study Allocation	\$1,038,000.00	\$1,038,000.00
Gracemont Transformer 345/138/13.8KV CKT 1 Priority Project: Gracemont Transformer 345/138/13.8KV CKT 1	Previously Allocated		\$8,000,000.00
Clinton Junction - Elk City 138KV CKT 1 Replaced terminal equipment	Previously Allocated		\$0.00

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if necessary.

Interconnection Request

Upgrade Type

Allocated Costs

E + C Costs

Current Study Total \$1,038,000.00

GEN-2008-025

GEN-2008-025 Interconnection Costs See Online Diagram	Current Study Allocation	\$1,767,858.00	\$1,767,858.00
Spearville - Comanche 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Comanche - Medicine Lodge 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Central Plains - Setab 115KV CKT 1 Per GEN-2007-013 Facility Study	Previously Allocated		\$4,800,000.00
Medicine Lodge - Wichita 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00

Current Study Total \$1,767,858.00

GEN-2008-029

GEN-2008-029 Interconnection Costs See Online Diagram	Current Study Allocation	\$4,610,000.00	\$4,610,000.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge-Woodward 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$194,972,759.00
Medicine Lodge - Wichita 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: TUCO-Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		\$148,727,500.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: TUCO-Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		\$148,727,500.00
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
PostRock - Spearville 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00

Current Study Total \$4,610,000.00

GEN-2008-051

GEN-2008-051 Interconnection Costs See Online Diagram	Current Study Allocation	\$2,346,379.00	\$2,346,379.00
Hitchland - Woodward 345kV CKT 1 Priority Project: Hitchland-Woodward Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$247,005,793.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge-Woodward 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$194,972,759.00
Medicine Lodge - Wichita 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if necessary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
Border - Woodward 345KV CKT 1 Balanced Portfolio: TUCO-Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		\$148,727,500.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: TUCO-Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		\$148,727,500.00
	Current Study Total	\$2,346,379.00	
GEN-2008-079			
GEN-2008-079 Interconnection Costs See Oonline Diagram	Current Study Allocation	\$3,850,000.00	\$3,850,000.00
Spearville (SPEARVLX) 345/115/13.8KV Transformer CKT 1 Install 345/230/13.8kV Transformer CKT 1	Current Study Allocation	\$14,000,000.00	\$14,000,000.00
Judson Large - North Judson Large 115KV CKT 2 Construct approximately 1 mile of new 115kV for 2nd circuit	Current Study Allocation	\$6,113,000.00	\$6,113,000.00
North Judson Large - Spearville 115KV CKT 2 Construct approximately 15 miles of new 115kV for 2nd circuit	Current Study Allocation	\$9,660,000.00	\$9,660,000.00
Comanche - Medicine Lodge 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Spearville - Comanche 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Medicine Lodge - Wichita 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge-Woodward 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$194,972,759.00
PostRock - Spearville 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
	Current Study Total	\$33,623,000.00	

GEN-2008-086N2			
GEN-2008-086N2 Interconnection Costs See Oonline Diagram	Current Study Allocation	\$6,400,000.00	\$6,400,000.00
Kelly - MadisonCO 230KV CKT 1 Total E & C Cost for Fort Randall-Madison-Kelly Project	Current Study Allocation	\$493,000.00	\$493,000.00
Ft Randal - Kelly 230.00 230KV CKT 1 Total E & C Cost for Fort Randall-Madison-Kelly Project	Current Study Allocation	\$2,407,000.00	\$2,407,000.00
	Current Study Total	\$9,300,000.00	

GEN-2008-092			
GEN-2008-092 Interconnection Costs See Oonline Diagram	Current Study Allocation	\$1,140,505.00	\$1,140,505.00
PostRock - Spearville 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if necessary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
Comanche - Medicine Lodge 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Spearville - Comanche 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Medicine Lodge - Wichita 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Current Study Total		\$1,140,505.00	

GEN-2008-124

GEN-2008-124 Interconnection Costs See Online Diagram	Current Study Allocation	\$50,000.00	\$50,000.00
Spearville - Comanche 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Comanche - Medicine Lodge 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Medicine Lodge - Wichita 345KV CKT 1 Priority Project: Spearville-Comanche-Med Lodge-Wichita Dbl 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$356,300,000.00
Axtell - PostRock 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge-Woodward 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$194,972,759.00
PostRock - Spearville 345KV CKT 1 Balanced Portfolio: Spearville-PostRock-Axtell 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$112,700,000.00
Border - Tuco Interchange 345KV CKT 1 Balanced Portfolio: TUCO-Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		\$148,727,500.00
Border - Woodward 345KV CKT 1 Balanced Portfolio: TUCO-Woodward 345kV (Total Project E&C Cost Shown)	Previously Allocated		\$148,727,500.00
Current Study Total		\$50,000.00	

GEN-2008-129

GEN-2008-129 Interconnection Costs See Online Diagram	Current Study Allocation	\$1.00	\$1.00
KC South - Longview 161KV CKT 1 Replace terminal equipment to increase limit to conductor rating	Current Study Allocation	\$150,000.00	\$150,000.00
Current Study Total		\$150,001.00	

GEN-2009-016

GEN-2009-016 Interconnection Costs See Online Diagram	Current Study Allocation	\$4,543,000.00	\$4,543,000.00
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* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if necessary.

Interconnection Request	Upgrade Type	Allocated Costs	E + C Costs
Clinton Junction - Elk City 138KV CKT 1 Replaced terminal equipment	Previously Allocated		\$0.00
Gracemont Transformer 345/138/13.8KV CKT 1 Priority Project: Gracemont Transformer 345/138/13.8KV CKT 1	Previously Allocated		\$8,000,000.00
Medicine Lodge - Woodward 345KV CKT 1 Priority Project: Med Lodge-Woodward 345kV CKT (Total Project E&C Cost Shown)	Previously Allocated		\$194,972,759.00
	Current Study Total	\$4,543,000.00	
GEN-2009-025			
GEN-2009-025 Interconnection Costs See Online Diagram	Current Study Allocation	\$2,889,212.00	\$2,889,212.00
	Current Study Total	\$2,889,212.00	

* Current Study Requests' Costs of Previously Allocated Network Upgrades will be determined by a restudy, if necessary.

F: Cost Allocation per Proposed Study Network Upgrade

Appendix F. - Cost Allocation Per Upgrade Facility

Upgrade Facility	Allocated Costs	E + C Costs
Albion - Petersburg 115KV CKT1 Line re-rating to 100°C GEN-2006-044N	\$360,000.00	\$360,000.00
Total	\$360,000.00	
Ft Randal - Kelly 230.00 230KV CKT 1 Total E & C Cost for Fort Randall-Madison-Kelly Project GEN-2008-086N2	\$2,407,000.00	\$2,407,000.00
Total	\$2,407,000.00	
GEN-2006-037N1 Interconnection Costs See Online Diagram GEN-2006-037N1	\$700,000.00	\$700,000.00
Total	\$700,000.00	
GEN-2006-044N Interconnection Costs See Online Diagram GEN-2006-044N	\$1,400,000.00	\$1,400,000.00
Total	\$1,400,000.00	
GEN-2007-040 Interconnection Costs See Online Diagram GEN-2007-040	\$22,000,000.00	\$22,000,000.00
Total	\$22,000,000.00	
GEN-2008-023 Interconnection Costs See Online Diagram GEN-2008-023	\$1,038,000.00	\$1,038,000.00
Total	\$1,038,000.00	
GEN-2008-025 Interconnection Costs See Online Diagram GEN-2008-025	\$1,767,858.00	\$1,767,858.00
Total	\$1,767,858.00	
GEN-2008-029 Interconnection Costs See Online Diagram GEN-2008-029	\$4,610,000.00	\$4,610,000.00
Total	\$4,610,000.00	
GEN-2008-051 Interconnection Costs See Online Diagram GEN-2008-051	\$2,346,379.00	\$2,346,379.00
Total	\$2,346,379.00	

Upgrade Facility	Allocated Costs	E + C Costs
GEN-2008-079 Interconnection Costs		\$3,850,000.00
See Online Diagram		
GEN-2008-079	\$3,850,000.00	
Total	\$3,850,000.00	
GEN-2008-086N2 Interconnection Costs		\$6,400,000.00
See Online Diagram		
GEN-2008-086N2	\$6,400,000.00	
Total	\$6,400,000.00	
GEN-2008-092 Interconnection Costs		\$1,140,505.00
See Online Diagram		
GEN-2008-092	\$1,140,505.00	
Total	\$1,140,505.00	
GEN-2008-124 Interconnection Costs		\$50,000.00
See Online Diagram		
GEN-2008-124	\$50,000.00	
Total	\$50,000.00	
GEN-2008-129 Interconnection Costs		\$1.00
See Online Diagram		
GEN-2008-129	\$1.00	
Total	\$1.00	
GEN-2009-016 Interconnection Costs		\$4,543,000.00
See Online Diagram		
GEN-2009-016	\$4,543,000.00	
Total	\$4,543,000.00	
GEN-2009-025 Interconnection Costs		\$2,889,212.00
See Online Diagram		
GEN-2009-025	\$2,889,212.00	
Total	\$2,889,212.00	
Judson Large - North Judson Large 115KV CKT 2		\$6,113,000.00
Construct approximately 1 mile of new 115kV for 2nd circuit		
GEN-2008-079	\$6,113,000.00	
Total	\$6,113,000.00	
KC South - Longview 161KV CKT 1		\$150,000.00
Replace terminal equipment to increase limit to conductor rating		
GEN-2008-129	\$150,000.00	
Total	\$150,000.00	
Kelly - MadisonCO 230KV CKT 1		\$493,000.00
Total E & C Cost for Fort Randall-Madison-Kelly Project		

Upgrade Facility	Allocated Costs	E + C Costs
GEN-2008-086N2	\$493,000.00	
Total	\$493,000.00	
<hr/>		
Neligh - Petersburg 115KV CKT 1		\$540,000.00
Per GEN-2006-044N Impact Restudy		
GEN-2006-044N	\$540,000.00	
Total	\$540,000.00	
<hr/>		
North Judson Large - Spearville 115KV CKT 2		\$9,660,000.00
Construct approximately 15 miles of new 115kV for 2nd circuit		
GEN-2008-079	\$9,660,000.00	
Total	\$9,660,000.00	
<hr/>		
Spearville (SPEARVLX) 345/115/13.8KV Transformer CKT 1		\$14,000,000.00
Install 345/230/13.8kV Transformer CKT 1		
GEN-2008-079	\$14,000,000.00	
Total	\$14,000,000.00	
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Current Study Upgrades Total		\$86,457,955.00

G: Power Flow ACCC Analysis (Constraints Used for Mitigation)

See next page.

EVENT	TYPE	SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATE	TDF	TC%LOAD	CONTNAME
ISLAND-GE	FDNS	00G08_086N02		0	23SP	G08_086N	TO->FRON	KELLY - MADISONCO 230.00 230KV CKT 1'	192	0.76967	103.9	FT RANDAL 230/13.8KV TRANSFORMER CKT 1'
ISLAND-GE	FDNS	00G08_086N02		0	23SP	G08_086N	TO->FRON	KELLY - MADISONCO 230.00 230KV CKT 1'	192	0.76967	105	FT RANDAL 115/13.8KV TRANSFORMER CKT 1'
ISLAND-GE	FDNS	00G08_086N02		0	23SP	G08_086N	TO->FRON	KELLY - MADISONCO 230.00 230KV CKT 1'	192	0.76967	110.7	DEERCREEK 3345.00 345/13.8KV TRANSFORMER CKT 1'
	FDNS	00G08_086N02		0	23SP	G08_086N	TO->FRON	KELLY - MADISONCO 230.00 230KV CKT 1'	192	0.77051	114.6162	LN-WAPA6'
	FDNS	00G08_086N02		0	23SP	G08_086N	TO->FRON	KELLY - MADISONCO 230.00 230KV CKT 1'	192	0.7633	106.3648	TRF-KELLY'
	FDNS	00G08_086N02		0	23SP	G08_086N	TO->FRON	KELLY - MADISONCO 230.00 230KV CKT 1'	192	0.76111	114.7821	TRF-HOSKINS'
NCONV	FNSL-Itera	00G08_129		0	23SP	G08_129		Non-Converged Contingency	0	0.03195	9999	SERCW-11'

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

H-0

Definitive Interconnection System Impact Study for Grouped Generation Interconnection Requests – (DISIS-2009-001-4)

SPP RESTRICTED

EVENT	TYP	SOLUTION	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONT	COMMON	NAME	RATE	B	TDF	BC%LOAD	TC%LOAD	CONT	NAME
		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.77223	125.3853	'FT THOMPSON - GRAND ISLAND 345KV CKT 1'			
ISLAND-GE		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76967	111.4	'COUNCIL BLUFFS 345/24.0KV TRANSFORMER CKT 1'			
ISLAND-GE		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76967	111.6	'COUNCIL BLUFFS 345/26.0KV TRANSFORMER CKT 1'			
		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.7699	106.7683	'WITTEN 4 230.00 () 230/115/13.8KV TRANSFORMER CKT 1			
		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.77068	111.2247	'FT THOMPSON (FT2 KU1A) 345/230/13.8KV TRANSFORMER CKT 1			
		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.77068	111.2304	'FT THOMPSON (FT2 KU1B) 345/230/13.8KV TRANSFORMER CKT 1			
ISLAND-GE		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76967	103.9	'FT RANDAL 230/13.8KV TRANSFORMER CKT 1'			
ISLAND-GE		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76967	103.9	'FT RANDAL 230/13.8KV TRANSFORMER CKT 1'			
ISLAND-GE		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76967	103.9	'FT RANDAL 230/13.8KV TRANSFORMER CKT 1'			
ISLAND-GE		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76967	105	'FT RANDAL 115/13.8KV TRANSFORMER CKT 1'			
ISLAND-GE		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76967	110.7	'DEERCREEK 3345.00 345/13.8KV TRANSFORMER CKT 1			
		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.77051	114.6162	'LN-WAPA6'			
		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.7633	106.3648	'TRF-KELLY'			
		FDNS	00G08_086N02		0	23SP	G08_086N02	TO->FRON	'KELLY - MADISONCO	230.00 230KV CKT 1'	192	0.76111	114.7821	'TRF-HOSKINS'			
		FDNS	00G08_092		0	23SP	G08_092	TO->FRON	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'		99	0.04606	119.4995	'KNOLL 230 (KNOLL T1) 230/115/11.49KV TRANSFORMER CKT 1'			
NCONV		FNSL-Itera	00G08_129		0	23SP	G08_129		'SERCW-11'		0	0.03195	9999	'BASE CASE'			
		FDNS		0	0	23SP	G08_092	TO->FRON	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'		99	0.04606	114.0197	'KNOLL 230 (KNOLL T1) 230/115/11.49KV TRANSFORMER CKT 1'			