Interim Operational Impact Study for Generation Interconnection Request

GEN-2012-013

July, 2012
Generation Interconnection

Southwest Power Pool

Executive Summary

<OMITTED TEXT> (Customer) has requested an Interim Operation Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection for a total of 99 MW of Wind Turbine generation within the balancing authority of Sunflower Electric Power (SUNC) in Gray County, Kansas. Customer has requested this Interim Operation Study to determine the impacts of interconnecting its generating facility to the transmission system before such time that SPP can complete the required interconnection studies. Interim Operation Studies are conducted under GIA Section 11A.

This interim Operation Impact Study consists of conducting two impact analyses, one being for system conditions on December 31, 2013 and the second for system conditions on December 31, 2014

This study assumed that only the higher queued projects identified in Table 3A or Table 3B of this study might go into service before the completion of all Network Upgrades might be identified in DISIS-2012-002. If any additional generation projects not identified in Table 2 but with queue priority equal to or over the study projects, listed in Table 4A or Table 4B, request to go into commercial operation before all Network Upgrades might be identified through the DISIS-2012-002 study process as required, then this study must be conducted again to determine whether sufficient limited interconnection service exists to interconnect the GEN-2012-013 interconnection requests in addition to all higher priority requests in operation or pending operation.

A power flow analysis shows that the Customers Wind Turbine facilities can interconnect a maximum of 14 MW of interconnection capacity for system conditions as of December 31, 2013 and 0 MW of interconnection capacity for system conditions as of December 31, 2014. Powerflow analysis was based on both summer and winter peak conditions and light loading cases. The power flow analysis was conducted to account for impacts of interconnecting the plant to the rest of the SUNC transmission system for the system condition as it will be on December 31, 2013 and December 31, 2014. This interconnection request was studied for Energy Resource Interconnection Service (ERIS) only in this LOIS.

The Interconnection Customer’s intent with this Interconnection Request to increase the capacity of the existing Gray County wind farm will allow the maximum interconnection and injection of 124MW of generation until such time that network upgrades can be completed.

In accordance with section 11.5 of the Interim GIA, the security required to begin Interim Interconnection Service is $20,000,000.

The construction lead time to construct the necessary facilities required for Limited Operation or Interim Operation will be determined by the Transmission Owner during the Facility Study. Any proposed in service date will be contingent upon the completion of the substation or additions.

The generation facilities were studied with a total of 99 MW. This Impact study addresses the dynamic stability effects of interconnecting the plants to the rest of the SUNC transmission system for the system condition as it will be on December 31, 2013 and December 31, 2014. Two seasonal base cases were used in the study to analyze the stability impacts of the proposed generation facility. The cases studied were modified 2012 summer peak and 2012 winter peak cases that were adjusted to reflect system conditions at the requested in-service date. Each case was modified to include prior queued projects that are listed in the body of the report. Fifty-nine (59) contingencies were identified for use in this study. Siemens 2.3 MW Wind Turbines were modeled using information provided by the Customer.

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

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Introduction

<OMITTED TEXT> (Customer) has requested an Interim Operation Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of 99 MW of Wind Turbine generation within the balancing authority of Sunflower Electric Power Corporation (SUNC) in Gray County, Kansas. Customer has requested this separate Interim Operation Study to determine the impacts of interconnecting their generating facilities to the transmission system before such time that SPP can complete the required interconnection studies. Interim Operation Studies are conducted under GIA Section 11A.

This Impact study addresses the power flow and dynamic stability effects of interconnecting the plant to the rest of the SUNC transmission system for the system condition as it will be on December 31, 2013 and December 31, 2014. The Wind Turbine generation facilities were studied with a total of 99 MW. Three seasonal base cases were used in the study to analyze the power flow impacts of the proposed generation facility. The cases studied were modified version of the 2012 spring, 2013 summer, and 2013 winter to reflect the system condition at the requests in-service data. Two seasonal base cases were used in the study to analyze the stability impacts of the proposed generation facility. The cases studied were modified versions of the 2012 summer peak and 2012 winter peak to reflect the system conditions at the requested in-service date. Each case was modified to include prior queued projects that are listed in the body of the report. Fifty-nine (59) contingencies were identified for this study.

Purpose

The purpose of this Interim Operation Impact Study (IOIS) is to evaluate the impact of the proposed interconnection on the reliability of the Transmission System. The IOIS considers the Base Case as well as all Generating Facilities (and with respect to (b) below, any identified Network Upgrades associated with such higher queued interconnection) that, on the date the IOIS is commenced:

a) are directly interconnected to the Transmission System;
b) are interconnected to Affected Systems and may have an impact on the Interconnection Request;
c) have a pending higher queued Interconnection Request to interconnect to the Transmission System listed in Tabel 3A or Table 3B; or
d) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

Any changes to these assumptions, for example, one or more of the previously queued projects not included in this study signing an interconnection agreement, may require a re-study of this request 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.

Facilities

Generating Facility

This project was modeled as an equivalent wind turbine generator with the information provided by the customers for a total of 99MW of generation interconnection. The wind turbine is connection to an equivalent 0.69/34.5kV generator step unit (GSU). The high side of the GSU is connected to the 34.5/115kV substation transformer. An 115kV transmission line connects the Customer's substation transformer to the POI.

Interconnection Facility

The Point of Interconnection for GEN-2012-013 will be the Transmission Owners Haggard 115kV substation. Figure 1 shows one-line illustrations of the facilities and the POIs. Figure 2 shows a one-line bus interconnection of the Point of Interconnections.

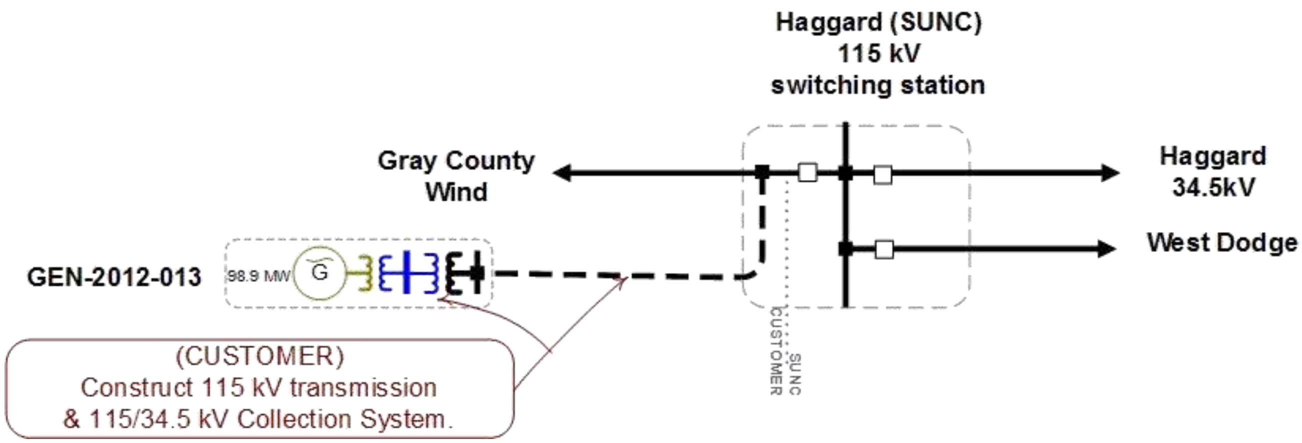

Figure 1: GEN-2012-013 Facility and Proposed Interconnection Configurations

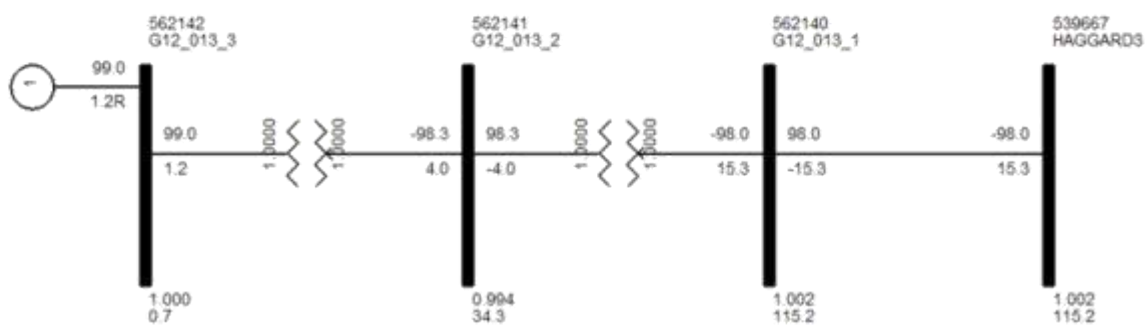

Figure 2: GEN-2012-013 Bus Interconnection

Network Upgrade Security for Interim Interconnection Service.

In accordance with Section 11.A.2.7 of the Attachment V., the Interconnection Customer is required to place security in the amount of any shared Network Uprades and 100% of the cost of non-shared Network Upgrade necessary to accommodate the interconnection of the Generating Facility. In accordance with powerflow results in Table 1A., the transmission facilities from Haggard to Judson Large will need to be rebuilt to accommodate the GEN-2012-013 interconnection request. The following network upgrades are needed -

- Haggard – West Dodge 115kV line – Reconductor/Rebuild 20.5 miles of 115kV line.
- W Dodge – S Dodge 115kV line – Reconductor/Rebuild 8.8 miles of 115kV line
- S Dodge – Judson Large – Reconductor 4.3 miles of 115kV line.

Estimated Costs - $20,000,000

The interconnection customer will be required to provide security in the amount of $20,000,000 to enter into an Interim GIA.

Powerflow Analysis

A powerflow analysis was conducted for the Interconnection Customers facilities using a modified version of the 2012 spring, 2013 summer, and 2013 winter seasonal models. The output of the Interconnection Customers facilities were offset in the model by a reduction in output of existing online SPP generation. This method allows the request to be studied as an Energy Resource (ERIS) Interconnection Request. This analysis was conducted assuming that previous queued requests listed in Table 3A or Table 3B is in-service.

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 single contingencies in portions of or all of the control area of SUNC and other control areas within SPP and the resulting data analyzed. This satisfies the "more probable" contingency testing criteria mandated by NERC and the SPP criteria.

Higher queued projects listed in Table 4A and Table 4A were not modeled as in service. If any of these come in service, this study will need to be performed again to determine if any limited interconnection service is available.

The ACCC analysis indicates that the Customers projects can interconnect 14 MW of generation into the SUNC transmission system for system conditions as of December 31, 2013 and 0 MW of generation into the SUNC transmission system for system conditions as of December 31, 2014. This interconnection request was studied for Energy Resource Interconnection Service (ERIS) only in this IOIS.

***Table 1A**: ACCC Analysis for GEN-2012-013 with system conditions as of December 31, 2013*

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	MW Available	CONTNAME
13G	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.99558	176.9691	14.0	BASE CASE
13WP	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.99578	175.9755	15.1	BASE CASE
13SP	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.99695	171.0569	20.6	BASE CASE
13G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99558	158.6255	27.9	BASE CASE
13G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99558	156.7073	25.2	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
13SP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99695	152.9992	34.8	BASE CASE
13G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99558	151.1582	32.5	GEN539670 4-JUDSON LARGE GENERATOR
13SP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99695	149.2162	35.1	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
13G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99558	148.4324	40.3	BASE CASE
13SP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99695	147.3917	37.4	GEN539670 4-JUDSON LARGE GENERATOR
13G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99558	146.1983	38.9	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
13G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99558	141.1404	45.5	GEN539670 4-JUDSON LARGE GENERATOR
13G	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.99646	139.6639	55.2	BASE CASE
13SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99695	137.8043	53.2	BASE CASE
13SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99695	133.555	55.4	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
13SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99695	132.0696	57.3	GEN539670 4-JUDSON LARGE GENERATOR
13WP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	143.4	143.4	0.99578	129.9949	55.8	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
13SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99695	129.6246	60.5	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
13SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99695	129.6225	60.5	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
13G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99646	126.3024	67.1	BASE CASE
13WP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	143.4	143.4	0.99578	125.9527	61.6	GEN539670 4-JUDSON LARGE GENERATOR
13WP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	143.4	143.4	0.99578	123.761	64.8	BASE CASE
13WP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	164.7	170.7	0.99578	117.5785	68.9	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
13G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99646	117.0905	76.8	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
13G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99646	116.2063	79.4	BASE CASE
13G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99646	115.7055	78.6	GEN539670 4-JUDSON LARGE GENERATOR

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	MW Available	CONTNAME
13WP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	164.7	170.7	0.99578	115.601	73.2	BASE CASE
13WP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	164.7	170.7	0.99578	113.7831	75.4	GEN539670 4-JUDSON LARGE GENERATOR
12G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99646	107.095	89.8	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
12G	G12_013	FROM->TO	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1	165.1	177.7	0.99558	106.4736	87.4	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
12G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99646	105.9765	91.2	GEN539670 4-JUDSON LARGE GENERATOR
13SP	G12_013	TO->FROM	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1	165.1	177.7	0.33645	105.4875	70.0	GEN539670 4-JUDSON LARGE GENERATOR
12G	G12_013	TO->FROM	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1	165.1	177.7	0.99558	101.0734	97.1	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
12G	G12_013	TO->FROM	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1	165.1	177.7	0.99558	100	99.0	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1

***Table 1B**: ACCC Analysis for GEN-2012-013 with system conditions as of December 31, 2014*

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	MW Available	CONTNAME
14G	G12_013	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.27017	128.9267	0	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
14G	G12_013	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.27017	128.4597	0	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
14G	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.9955	177.0824	13.8	BASE CASE
13WP	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.99577	175.983	15.1	BASE CASE
14SP	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.99694	171.0521	20.6	BASE CASE
14G	G12_013	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.27042	121.7415	22.1	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
14G	G12_013	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.27042	121.2482	23.9	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
14G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.9955	157.4299	24.3	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.9955	158.745	27.8	BASE CASE
14G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.9955	151.4687	32.0	GEN539670 4-JUDSON LARGE GENERATOR
14SP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99694	152.9944	34.8	BASE CASE
14SP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99694	149.3174	34.9	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14SP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.99694	147.3886	37.4	GEN539670 4-JUDSON LARGE GENERATOR
14G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.9955	146.8581	38.0	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14G	G12_013	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	100	100	0.27017	116.0272	39.7	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	MW Available	CONTNAME
14G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.9955	148.5405	40.1	BASE CASE
14G	G12_013	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	100	100	0.27017	115.5817	41.3	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
14G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.9955	141.4223	45.1	GEN539670 4-JUDSON LARGE GENERATOR
14SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99694	137.8008	53.2	BASE CASE
14SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99694	133.6388	55.3	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14G	G12_013	FROM->TO	HAGGARD - WEST DODGE 115KV CKT 1	110	110	0.9964	139.5464	55.3	BASE CASE
14WP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	143.4	143.4	0.99577	130.0885	55.7	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99694	132.0671	57.3	GEN539670 4-JUDSON LARGE GENERATOR
14SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99694	129.6517	60.5	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
14SP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.99694	129.624	60.5	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
14WP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	143.4	143.4	0.99577	125.9591	61.6	GEN539670 4-JUDSON LARGE GENERATOR
14WP	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	143.4	143.4	0.99577	123.7683	64.8	BASE CASE
14G	G12_013	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	100	100	0.27042	109.1405	65.2	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
14SP	G12_013	TO->FROM	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1	165.1	177.7	0.34462	106.3019	66.5	GEN539670 4-JUDSON LARGE GENERATOR
14G	G12_013	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	100	100	0.27042	108.6639	67.0	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
14G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.9964	126.1987	67.3	BASE CASE
14G	G12_013	TO->FROM	MULLERGREN - SPEARVILLE 230KV CKT 1	330.3	355.3	0.29605	102.6036	67.8	POST ROCK - SPEARVILLE 345KV CKT 1
14WP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	164.7	170.7	0.99577	117.6655	68.7	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14WP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	164.7	170.7	0.99577	115.6078	73.2	BASE CASE
14WP	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	164.7	170.7	0.99577	113.7891	75.4	GEN539670 4-JUDSON LARGE GENERATOR
14G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.9964	117.5098	76.2	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14G	G12_013	TO->FROM	SOUTH DODGE - WEST DODGE 115KV CKT 1	120.7	129.5	0.9964	115.9071	78.3	GEN539670 4-JUDSON LARGE GENERATOR
14G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.9964	116.0865	79.5	BASE CASE
14G	G12_013	FROM->TO	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1	165.1	177.7	0.9955	106.9554	86.6	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1
14G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.9964	107.4351	89.3	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	MW Available	CONTNAME
14G	G12_013	TO->FROM	NORTH JUDSON LARGE SUB - SOUTH DODGE 115KV CKT 1	120.7	129.5	0.9964	106.1337	91.0	GEN539670 4-JUDSON LARGE GENERATOR
14G	G12_013	FROM->TO	G01_039AT 115.00 - GREENSBURG 115KV CKT 1	120.7	129.5	0.48444	102.3185	92.8	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
14G	G12_013	FROM->TO	G01_039AT 115.00 - GREENSBURG 115KV CKT 1	120.7	129.5	0.48444	101.5614	94.8	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
14G	G12_013	TO->FROM	MULLERGREN - SPEARVILLE 230KV CKT 1	330.3	355.3	0.29629	100.3364	95.0	POST ROCK - SPEARVILLE 345KV CKT 1
14G	G12_013	TO->FROM	JUDSON LARGE - NORTH JUDSON LARGE SUB 115KV CKT 1	165.1	177.7	0.9955	101.0533	97.1	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1

Stability Analysis

Contingencies Simulated

Fifty-nine (59) contingencies were considered for the transient stability simulations. These contingencies included three phase faults and single phase line faults at locations defined by SPP. Single-phase line faults were simulated by applying a 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.

The faults that were defined and simulated are listed in Table 1 below.

***Table 1**: Contingencies Evaluated*

Cont. No.	Cont. Name	Description
1.	FLT_01_HAGGARD3_HAGGARD1_115_34.5kV_3PH	3 phase fault on the Haggard 115kV (539667) to Haggard (539712) 34.5kV transformer, near Haggard 115kV. a. Apply fault at Haggard 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
2.	FLT_02_NFTDODG3_FTDODGE3_115kV_3PH	3 phase fault on the N. Fort Dodge (539771) to Fort Dodge (539671) 115kV line, near N. Fort Dodge. a. Apply fault at N. Fort Dodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
3.	FLT_03_NFTDODG3_FTDODGE3_115kV_1PH	*Single phase fault and sequence like previous*
4.	FLT_04_NFTDODG3_SPEARVL4_115kV_3PH	3 phase fault on the N. Fort Dodge (539771) to Spearville (539694) 115kV line, near N. Fort Dodge. a. Apply fault at N. Fort Dodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
5.	FLT_05_NFTDODG3_SPEARVL4_115kV_1PH	*Single phase fault and sequence like previous*
6.	FLT_06_FTDODGE3_CUDAHY3_115kV_3PH	3 phase fault on the Fort Dodge (539671) to Cudahy (539659) 115kV line, near Fort Dodge. a. Apply fault at Fort Dodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
7.	FLT_07_FTDODGE3_CUDAHY3_115kV_1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
8.	FLT_08_FTDODGE3_G01039APOI_115kV_3PH	3 phase fault on the Fort Dodge (539671) to GEN-2001-039A Tap (579025) 115kV line, near Fort Dodge. a. Apply fault at Fort Dodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
9.	FLT_09_FTDODGE3_G01039APOI_115kV_1PH	*Single phase fault and sequence like previous*
10.	FLT_10_G01039APOI_GRNBURG3_115kV_3PH	3 phase fault on the GEN-2001-039A Tap (579025) to Greensburg (539664) 115kV line, near GEN-2001-039A Tap. a. Apply fault at GEN-2001-039A Tap 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
11.	FLT_11_G01039APOI_GRNBURG3_115kV_1PH	*Single phase fault and sequence like previous*
12.	FLT_12_GRNBURG3_SUNCITY3_115kV_3PH	3 phase fault on the Greensburg (539664) to Sun City (539697) 115kV line, near Greensburg. a. Apply fault at Greensburg 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
13.	FLT_13_GRNBURG3_SUNCITY3_115kV_1PH	*Single phase fault and sequence like previous*
14.	FLT_14_SUNCITY3_MEDLDG3_115kV_3PH	3 phase fault on the Sun City (539697) to Medicine Lodge (539673) 115kV line, near Sun City. a. Apply fault at Sun City 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
15.	FLT_15_SUNCITY3_MEDLDG3_115kV_1PH	*Single phase fault and sequence like previous*
16.	FLT_16_MEDLDG3_SAWYER3_115kV_3PH	3 phase fault on the Medicine Lodge (539697) to Sawyer (539649) 115kV line, near Medicine Lodge. a. Apply fault at Medicine Lodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
17.	FLT_17_MEDLDG3_SAWYER3_115kV_1PH	*Single phase fault and sequence like previous*
18.	FLT_18_MEDLDG3_MEDLDG4_115_138kV_3PH	3 phase fault on the Medicine Lodge 115kV (539697) to Medicine Lodge (539674) 138kV transformer, near Medicine Lodge 115kV. a. Apply fault at Medicine Lodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
19.	FLT_19_CUDAHY3_KISMET3_115kV_3PH	3 phase fault on the Cudahy (539659) to Kismet (539646) 115kV line, near Cudahy. a. Apply fault at Cudahy 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
20.	FLT_20_CUDAHY3_KISMET3_115kV_1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
21.	FLT_21_KISMET3_CMRIVTP3_115kV_3PH	3 phase fault on the Kismet (539646) to Cimarron River Tap (539652) 115kV line, near Kismet. a. Apply fault at Kismet 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
22.	FLT_22_KISMET3_CMRIVTP3_115kV_1PH	*Single phase fault and sequence like previous*
23.	FLT_23_CMRIVTP3_CIMPLT3_115kV_3PH	3 phase fault on the Cimarron River Tap (539652) to Cimarron River Station (539654) 115kV line, near Cimarron River Tap. a. Apply fault at Cimarron River Tap 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
24.	FLT_24_CMRIVTP3_CIMPLT3_115kV_1PH	*Single phase fault and sequence like previous*
25.	FLT_25_CMRIVTP3_ELIBER3_115kV_3PH	3 phase fault on the Cimarron River Tap (539652) to East Liberty (539672) 115kV line, near Cimarron River Tap. a. Apply fault at Cimarron River Tap 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
26.	FLT_26_CMRIVTP3_ELIBER3_115kV_1PH	*Single phase fault and sequence like previous*
27.	FLT_27_SPEARVL4_SPEARVL6_115_230kV_3PH	3 phase fault on the Spearville 115kV (539694) to Spearville 230kV (539695) transformer, near Spearville 115kV. a. Apply fault at Spearville 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
28.	FLT_28_SPEARVL6_MULGREN6_230kV_3PH	3 phase fault on the Spearville (539695) to Mullergren (539679) 230kV line, near Spearville. a. Apply fault at Spearville 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.
29.	FLT_29_SPEARVL6_MULGREN6_230kV_1PH	*Single phase fault and sequence like previous*
30.	FLT_30_SPEARVL6_SPERVIL7_230_345kV_3PH	3 phase fault on the Spearville 230kV (539695) to Spearville 138kV (531469) transformer, near Spearville 230kV. a. Apply fault at Spearville 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
31.	FLT_31_MULGREN6_SHAYS6_230kV_3PH	3 phase fault on the Mullergren (539679) to South Hays (530582) 230kV line, near Mullergren. a. Apply fault at Mullergren 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.
32.	FLT_32_MULGREN6_SHAYS6_230kV_1PH	*Single phase fault and sequence like previous*
33.	FLT_33_MULGREN6_HEIZER6_230kV_3PH	3 phase fault on the Mullergren (539679) to Heizer (530680) 230kV line, near Mullergren. a. Apply fault at Mullergren 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.

Cont. No.	Cont. Name	Description
34.	FLT_34_MULGREN6_HEIZER6_230kV_1PH	*Single phase fault and sequence like previous*
35.	FLT_35_MULGREN6_CIRCLE6_230kV_3PH	3 phase fault on the Mullergren (539679) to Circle (532871) 230kV line, near Mullergren. a. Apply fault at Mullergren 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.
36.	FLT_36_MULGREN6_CIRCLE6_230kV_1PH	*Single phase fault and sequence like previous*
37.	FLT_37_MULGREN6_GRTBEND3_230_115kV_3PH	3 phase fault on the Mullergren 230kV (539679) to Great Bend 115kV (539678) transformer, near Mullergren. a. Apply fault at Mullergren 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
38.	FLT_38_SHAYS6_POSTROCK6_230kV_3PH	3 phase fault on the South Hays (530582) to Post Rock (530584) 230kV line, near South Hays. a. Apply fault at South Hays 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.
39.	FLT_39_SHAYS6_POSTROCK6_230kV_1PH	*Single phase fault and sequence like previous*
40.	FLT_40_SHAYS6_SHAYS3_230_115kV_3PH	3 phase fault on the South Hays 230kV (539679) to South Hays 115kV (530553) transformer, near South Hays 230kV bus. a. Apply fault at South Hays 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
41.	FLT_41_POSTROCK6_KNOLL6_230kV_3PH	3 phase fault on the Post Rock (530584) to Knoll (530558) 230kV line, near Post Rock. a. Apply fault at Post Rock 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.
42.	FLT_42_POSTROCK6_KNOLL6_230kV_1PH	*Single phase fault and sequence like previous*
43.	FLT_43_POSTROCK6_POSTROCK7_230_345kV_3PH	3 phase fault on the Post Rock 230kV (530584) to Post Rock 345kV (530583) transformer, near Post Rock 230kV bus. a. Apply fault at Post Rock 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
44.	FLT_44_KNOLL6_SMOKYHL6_230kV_3PH	3 phase fault on the Knoll (530558) to Smoky Hills (530592) 230kV line, near Knoll a. Apply fault at Knoll 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.
45.	FLT_45_KNOLL6_SMOKYHL6_230kV_1PH	*Single phase fault and sequence like previous*
46.	FLT_46_KNOLL6_KNOLL3_230_115kV_3PH	3 phase fault on the Knoll 230kV (530558) to Knoll 115kV (530561) transformer, near Knoll 230kV bus. a. Apply fault at Knoll 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Cont. No.	Cont. Name	Description
47.	FLT_47_POSTROCK7_SPERVIL7_345kV_3PH	3 phase fault on the Post Rock (530583) to Spearville (531469) 345kV line, near Post Rock. a. Apply fault at Post Rock 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.
48.	FLT_48_POSTROCK7_SPERVIL7_345kV_1PH	*Single phase fault and sequence like previous*
49.	FLT_49_SPERVIL7_GRAYCO_345kV_3PH	3 phase fault on the Spearville (531469) to Gray County (579284) 345kV line, near Spearville. a. Apply fault at Spearville 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.
50.	FLT_50_SPERVIL7_GRAYCO_345kV_1PH	*Single phase fault and sequence like previous*
51.	FLT_51_GRAYCO_HOLCOMB7_345kV_3PH	3 phase fault on the Gray County (579284) to Holcomb (531449) 345kV line, near Gray County. a. Apply fault at Gray County 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
52.	FLT_52_GRAYCO_HOLCOMB7_345kV_1PH	*Single phase fault and sequence like previous*
53.	FLT_53_HOLCOMB7_FINNEY7_345kV_3PH	3 phase fault on the Holcomb (531449) to Finney (523853) 345kV line, near Holcomb. a. Apply fault at Holcomb 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.
54.	FLT_54_HOLCOMB7_FINNEY7_345kV_1PH	*Single phase fault and sequence like previous*
55.	FLT_55_HOLCOMB7_SETAB7_345kV_3PH	3 phase fault on the Holcomb (531449) to Setab (531465) 345kV line, near Holcomb. a. Apply fault at Holcomb 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.
56.	FLT_56_HOLCOMB7_SETAB7_345kV_1PH	*Single phase fault and sequence like previous*
57.	FLT_57_HOLCOMB7_HOLCOMB3_345_115kV_3PH	3 phase fault on the Holcomb 345kV (531449) to Holcomb 115kV (531448) transformer, near Holcomb 230kV bus. a. Apply fault at Holcomb 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
58.	FLT_58_WDODGE3_NWDODG3_115kV_3PH	3 phase fault on the W. Dodge (539699) bus. a. Apply fault at W. Dodge 115kV bus. b. Clear fault after 5 cycles.
59.	FLT_59_WDODGE3_NWDODG3_115kV_1PH	*Single phase fault and sequence like previous*

Further Model Preparation

The base cases contain prior queued projects for system conditions on December 31, 2013 are shown in Table 3A. The base case contains prior queued projects for system conditions on December 31, 2014 are shown in Table 3B.

The Wind Turbine generation from the study customer and the previously queued customers were dispatched into the SPP footprint.

Initial simulations were carried out on both base cases and cases with the added generation for a no-disturbance run of 20 seconds to verify the numerical stability of the model. All cases were confirmed to be stable.

Table 2A*: Prior Queued Projects Included*

Project	MW
Montezuma	110
GEN-2001-039A	105
GEN-2002-025A	150
GEN-2003-019	250
GEN-2004-014	100
GEN-2005-012	160
GEN-2006-021	101
GEN-2007-040	133

Table 3B*: Prior Queued Projects Included*

Project	MW
Montezuma	110
GEN-2001-039A	105
GEN-2002-025A	150
GEN-2003-019	250
GEN-2004-014	100
GEN-2005-012	160
GEN-2006-021	101
GEN-2007-040	133
GEN-2008-018	300

The projects listed in Table 4A are higher or equally queued projects that are not included in the analysis of system conditions on December 31, 2013. The projects listed in Table 4B are higher or equally queued projects that are no included in the analysis of system conditions on December 31, 2014. If any of these projects come into service, this study will need to be re-performed to determine if any limited service is available.

***Table 4A**: Prior Queued Projects Not Included with system condition as of December 31, 2013*

Project	MW
GEN-2004-014	54.5
GEN-2005-012	90
GEN-2006-006	205.5
GEN-2006-022	150
GEN-2007-038	200
GEN-2007-040	67
GEN-2008-018	405
GEN-2008-079	98.9
GEN-2008-124	200
GEN-2010-009	165.6
GEN-2010-015	200.1
GEN-2010-029	450
GEN-2010-045	197.8
GEN-2010-049	49.6
GEN-2010-052	301.3
GEN-2010-053	199.8
GEN-2010-061	180
GEN-2011-008	600
GEN-2011-016	200.1
GEN-2011-017	299
GEN-2011-023	299
GEN-2011-043	150
GEN-2011-044	150
GEN-2012-003	22.5
GEN-2012-011	200
GEN-2012-012	200

***Table 4B**: Prior Queued Projects Not Included with system condition as of December 31, 2014*

Project	MW
GEN-2004-014	54.5
GEN-2005-012	90
GEN-2006-006	205.5
GEN-2006-022	150
GEN-2007-038	200
GEN-2007-040	67
GEN-2008-018	105
GEN-2008-079	98.9
GEN-2008-124	200

Project	MW
GEN-2010-009	165.6
GEN-2010-015	200.1
GEN-2010-029	450
GEN-2010-045	197.8
GEN-2010-049	49.6
GEN-2010-052	301.3
GEN-2010-053	199.8
GEN-2010-061	180
GEN-2011-008	600
GEN-2011-016	200.1
GEN-2011-017	299
GEN-2011-023	299
GEN-2011-043	150
GEN-2011-044	150
GEN-2012-003	22.5
GEN-2012-011	200
GEN-2012-012	200

Results

Results of the stability analysis are summarized in Table 4. These results are valid for GEN-2012-013 interconnecting with Forty-three (43) Siemens 2.3 MW Wind Turbine Generators with a generation amount up to 98.9 MW. The results indicate that with the study project, GEN-2012-013, at maximum output and the existing generation project, Gray County Wind (Montezuma Wind) restricted to a maximum output of 50MW (148.9MW maximum from both projects), the transmission system remains stable for all contingencies studied. However, the powerflow analysis has determined a lower limit for GEN-2012-013; the powerflow analysis limits the interconnection to 14MW.

***Table 4**: Contingencies Evaluated*

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
1.	FLT_01_HAGGARD3_HAGGARD1_115_34.5kV_3PH	3 phase fault on the Haggard 115kV (539667) to Haggard (539712) 34.5kV transformer, near Haggard 115kV.	Stable	Stable
2.	FLT_02_NFTDODG3_FTDODGE3_115kV_3PH	3 phase fault on the N. Fort Dodge (539771) to Fort Dodge (539671) 115kV line, near N. Fort Dodge.	Stable	Stable
3.	FLT_03_NFTDODG3_FTDODGE3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
4.	FLT_04_NFTDODG3_SPEARVL4_115kV_3PH	3 phase fault on the N. Fort Dodge (539771) to Spearville (539694) 115kV line, near N. Fort Dodge.	Stable	Stable
5.	FLT_05_NFTDODG3_SPEARVL4_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
6.	FLT_06_FTDODGE3_CUDAHY3_115kV_3PH	3 phase fault on the Fort Dodge (539671) to Cudahy (539659) 115kV line, near Fort Dodge.	Stable	Stable
7.	FLT_07_FTDODGE3_CUDAHY3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
8.	FLT_08_FTDODGE3_G01039APOI_115kV_3PH	3 phase fault on the Fort Dodge (539671) to GEN-2001-039A Tap (579025) 115kV line, near Fort Dodge.	Stable	Stable
9.	FLT_09_FTDODGE3_G01039APOI_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
10.	FLT_10_G01039APOI_GRNBURG3_115kV_3PH	3 phase fault on the GEN-2001-039A Tap (579025) to Greensburg (539664) 115kV line, near GEN-2001-039A Tap.	Stable	Stable
11.	FLT_11_G01039APOI_GRNBURG3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
12.	FLT_12_GRNBURG3_SUNCITY3_115kV_3PH	3 phase fault on the Greensburg (539664) to Sun City (539697) 115kV line, near Greensburg.	Stable	Stable
13.	FLT_13_GRNBURG3_SUNCITY3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
14.	FLT_14_SUNCITY3_MEDLDG3_115kV_3PH	3 phase fault on the Sun City (539697) to Medicine Lodge (539673) 115kV line, near Sun City.	Stable	Stable
15.	FLT_15_SUNCITY3_MEDLDG3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
16.	FLT_16_MEDLDG3_SAWYER3_115kV_3PH	3 phase fault on the Medicine Lodge (539697) to Sawyer (539649) 115kV line, near Medicine Lodge.	Stable	Stable
17.	FLT_17_MEDLDG3_SAWYER3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
18.	FLT_18_MEDLDG3_MEDLDG4_115_138kV_3PH	3 phase fault on the Medicine Lodge 115kV (539697) to Medicine Lodge (539674) 138kV transformer, near Medicine Lodge 115kV.	Stable	Stable
19.	FLT_19_CUDAHY3_KISMET3_115kV_3PH	3 phase fault on the Cudahy (539659) to Kismet (539646) 115kV line, near Cudahy.	Stable	Stable
20.	FLT_20_CUDAHY3_KISMET3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
21.	FLT_21_KISMET3_CMRIVTP3_115kV_3PH	3 phase fault on the Kismet (539646) to Cimarron River Tap (539652) 115kV line, near Kismet.	Stable	Stable
22.	FLT_22_KISMET3_CMRIVTP3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
23.	FLT_23_CMRIVTP3_CIMPLT3_115kV_3PH	3 phase fault on the Cimarron River Tap (539652) to Cimarron River Station (539654) 115kV line, near Cimarron River Tap.	Stable	Stable
24.	FLT_24_CMRIVTP3_CIMPLT3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
25.	FLT_25_CMRIVTP3_ELIBER3_115kV_3PH	3 phase fault on the Cimarron River Tap (539652) to East Liberty (539672) 115kV line, near Cimarron River Tap.	Stable	Stable
26.	FLT_26_CMRIVTP3_ELIBER3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
27.	FLT_27_SPEARVL4_SPEARVL6_115_230kV_3PH	3 phase fault on the Spearville 115kV (539694) to Spearville 230kV (539695) transformer, near Spearville 115kV.	Stable	Stable
28.	FLT_28_SPEARVL6_MULGREN6_230kV_3PH	3 phase fault on the Spearville (539695) to Mullergren (539679) 230kV line, near Spearville.	Stable	Stable
29.	FLT_29_SPEARVL6_MULGREN6_230kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
30.	FLT_30_SPEARVL6_SPERVIL7_230_345kV_3PH	3 phase fault on the Spearville 230kV (539695) to Spearville 138kV (531469) transformer, near Spearville 230kV.	Stable	Stable
31.	FLT_31_MULGREN6_SHAYS6_230kV_3PH	3 phase fault on the Mullergren (539679) to South Hays (530582) 230kV line, near Mullergren.	Stable	Stable

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
32.	FLT_32_MULGREN6_SHAYS6_230kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
33.	FLT_33_MULGREN6_HEIZER6_230kV_3PH	3 phase fault on the Mullergren (539679) to Heizer (530680) 230kV line, near Mullergren.	Stable	Stable
34.	FLT_34_MULGREN6_HEIZER6_230kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
35.	FLT_35_MULGREN6_CIRCLE6_230kV_3PH	3 phase fault on the Mullergren (539679) to Circle (532871) 230kV line, near Mullergren.	Stable	Stable
36.	FLT_36_MULGREN6_CIRCLE6_230kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
37.	FLT_37_MULGREN6_GRTBEND3_230_115kV_3PH	3 phase fault on the Mullergren 230kV (539679) to Great Bend 115kV (539678) transformer, near Mullergren.	Stable	Stable
38.	FLT_38_SHAYS6_POSTROCK6_230kV_3PH	3 phase fault on the South Hays (530582) to Post Rock (530584) 230kV line, near South Hays.	Stable	Stable
39.	FLT_39_SHAYS6_POSTROCK6_230kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
40.	FLT_40_SHAYS6_SHAYS3_230_115kV_3PH	3 phase fault on the South Hays 230kV (539679) to South Hays 115kV (530553) transformer, near South Hays 230kV bus.	Stable	Stable
41.	FLT_41_POSTROCK6_KNOLL6_230kV_3PH	3 phase fault on the Post Rock (530584) to Knoll (530558) 230kV line, near Post Rock.	Stable	Stable
42.	FLT_42_POSTROCK6_KNOLL6_230kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
43.	FLT_43_POSTROCK6_POSTROCK7_230_345kV_3PH	3 phase fault on the Post Rock 230kV (530584) to Post Rock 345kV (530583) transformer, near Post Rock 230kV bus.	Stable	Stable
44.	FLT_44_KNOLL6_SMOKYHL6_230kV_3PH	3 phase fault on the Knoll (530558) to Smoky Hills (530592) 230kV line, near Knoll	Stable	Stable
45.	FLT_45_KNOLL6_SMOKYHL6_230kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
46.	FLT_46_KNOLL6_KNOLL3_230_115kV_3PH	3 phase fault on the Knoll 230kV (530558) to Knoll 115kV (530561) transformer, near Knoll 230kV bus.	Stable	Stable
47.	FLT_47_POSTROCK7_SPERVIL7_345kV_3PH	3 phase fault on the Post Rock (530583) to Spearville (531469) 345kV line, near Post Rock.	Stable	Stable
48.	FLT_48_POSTROCK7_SPERVIL7_345kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
49.	FLT_49_SPERVIL7_GRAYCO_345kV_3PH	3 phase fault on the Spearville (531469) to Gray County (579284) 345kV line, near Spearville.	Stable	Stable
50.	FLT_50_SPERVIL7_GRAYCO_345kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
51.	FLT_51_GRAYCO_HOLCOMB7_345kV_3PH	3 phase fault on the Gray County (579284) to Holcomb (531449) 345kV line, near Gray County.	Stable	Stable
52.	FLT_52_GRAYCO_HOLCOMB7_345kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
53.	FLT_53_HOLCOMB7_FINNEY7_345kV_3PH	3 phase fault on the Holcomb (531449) to Finney (523853) 345kV line, near Holcomb.	Stable	Stable
54.	FLT_54_HOLCOMB7_FINNEY7_345kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable
55.	FLT_55_HOLCOMB7_SETAB7_345kV_3PH	3 phase fault on the Holcomb (531449) to Setab (531465) 345kV line, near Holcomb.	Stable	Stable
56.	FLT_56_HOLCOMB7_SETAB7_345kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
57.	FLT_57_HOLCOMB7_HOLCOMB3_345_115kV_3PH	3 phase fault on the Holcomb 345kV (531449) to Holcomb 115kV (531448) transformer, near Holcomb 230kV bus.	Stable	Stable
58.	FLT_58_WDODGE3_NWDODG3_115kV_3PH	3 phase fault on the W. Dodge (539699) bus.	Stable	Stable
59.	FLT_59_WDODGE3_NWDODG3_115kV_1PH	*Single phase fault and sequence like previous*	Stable	Stable

FERC LVRT Compliance

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

With generator output dispatched for both facilities at 124MW, fault contingencies were developed to verify that wind farms remain on line when the POI voltage is drawn down to 0.0 pu. These contingencies are shown in Table 5.

***Table 5**: Contingencies Evaluated*

Cont. Name	Description
FLT_01_HAGGARD3_HAGGARD1_115_34.5kV_3PH	3 phase fault on the Haggard 115kV (539667) to Haggard (539712) 34.5kV transformer, near Haggard 115kV. a. Apply fault at Haggard 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
FLT_02_NFTDODG3_FTDODGE3_115kV_3PH	3 phase fault on the N. Fort Dodge (539771) to Fort Dodge (539671) 115kV line, near N. Fort Dodge. a. Apply fault at N. Fort Dodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT_04_NFTDODG3_SPEARVL4_115kV_3PH	3 phase fault on the N. Fort Dodge (539771) to Spearville (539694) 115kV line, near N. Fort Dodge. a. Apply fault at N. Fort Dodge 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT_58_WDODGE3_NWDODG3_115kV_3PH	3 phase fault on the W. Dodge (539699) bus.

The prior queued project wind farms remained online for the fault contingencies described in this section and for all the fault contingencies described in the Contingencies Simulated section. GEN-2012-013 is found to be in compliance with FERC Order #661A conditioned upon the operating limits described in this report.

Conclusion

<OMITTED TEXT> (Customer) has requested a Interim Operation Impact Study for limited interconnection service of 99 MW of Wind Turbine generation within the balancing authority of Sunflower Electric Power (SUNC) in Gray County, Kansas, in accordance with section 11A of the Standard Generation Interconnection Procedures Agreement (GIA) in the SPP OATT.

Power flow analysis showed that the Customers Wind Turbine facilities can interconnect 14 MW of Wind Turbine generation. The interconnection requests were studied for Energy Resource Interconnection Service (ERIS) only in this IOIS.

The construction lead time to construct the substation or additions Haggard substation will be determined by the Transmission Owner during the Facility Study. Any proposed in service date will be contingent upon the completion of the substation or additions.

The stability analysis results of this study show that with the study project, GEN-2012-013, at maximum output and the existing generation project, Gray County Wind (Montezuma Wind) restricted to a maximum output of 50MW (148.9MW maximum from both projects), the Wind Turbine generation facility and the transmission system will remain stable for the studied contingencies.

The security to be provided by the Intereconnection Customer to proceed with Interim Interconnection Service is $20,000,000.

The projects listed in Table 4A or Table 4B are higher or equally queued projects that are not included in this analysis. If any of these projects come into service, this study will need to be re-performed to determine if any limited interconnection service is available.

The estimates do not include any costs associated with the deliverability of the energy to final customers. These costs are determined by separate studies if the Customer requests transmission service through Southwest Power Pool's OASIS. It should be noted that the models used for simulation do not contain all SPP transmission service.