Limited Operational Impact Study For Generation Interconnection Request GEN-2007-046

SPP Generation Interconnection

(#GEN-2007-046)

August 2011

Executive Summary

<OMITTED TEXT> (Customer) has requested a Limited Operation Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of 199.5 MW of wind generation within the balancing authority of Southwestern Public Service (SPS) in Texas County, Oklahoma. Customer has requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting its generating facility to the transmission system before all required Network Upgrades identified in the ICS-2008-001-4 Impact Re-Study can be placed into service. Limited Operation Studies are conducted under GIA Section 5.9.

This study assumed that only the higher queued projects identified in Table 3 of this study might go into service before the completion of all Network Upgrades identified in ICS-2008-001-4. If any additional generation projects not identified in Table 3 but with queue priority equal to or over GEN-2007-046 request to go into commercial operation before all Network Upgrades identified through the ICS-2008-001-4 study process as required, then this study must be conducted again to determine whether sufficient limited interconnection capacity exists to interconnect the GEN-2007-046 interconnection request in addition to all higher priority requests in operation or pending operation. These projects are listed in Table 4.

A power flow analysis showed that the Customer's wind facility is limited to an interconnection capacity of 169.5 MW of generation on its requested in-service date of December 31, 2012. Power flow analysis was based on both summer and winter peak conditions and light loading cases.

The wind generation facility was studied with one hundred thirty-three (133) G.E. 1.5 MW wind turbine generators. This Impact study addresses the dynamic stability effects of interconnecting the plant to the rest of the SPS transmission system for the system condition as it will be on December 31, 2012. Two seasonal base cases were used in the study to analyze the stability impacts of the proposed generation facility. The cases studied were modified 2011 summer peak and 2011 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. Forty-two (42) contingencies were identified for use in this study. The G.E. 1.5 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.

1.0 Introduction

<OMITTED TEXT> (Customer) has requested an Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of 199.5 MW of wind generation within the balancing authority of Southwestern Public Service (SPS) in Texas County, Oklahoma. Customer has requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting its generating facility to the transmission system before all required Network Upgrades identified in the ICS-2008-001 Impact Study can be placed into service. Limited Operation Studies are conducted under GIA Section 5.9.

This Impact study addresses the dynamic stability effects of interconnecting the plant to the rest of the SPS transmission system for the system condition as it will be on December 31, 2012. The wind generation facility was studied with one hundred thirty-three (133) G.E. 1.5 MW wind turbine generators. 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 2011 summer peak and 2011 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. Forty-two (42) contingencies were identified for this study.

2.0 Purpose

The purpose of this Limited Operation Interconnection Study (LOIS) is to evaluate the impact of the proposed interconnection on the reliability of the Transmission System. The LOIS 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 LOIS 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 Table 3; 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.

3.0 Facilities

3.1 Generating Facility

The project was modeled as an equivalent wind turbine generator of 199.5 MW output. The wind turbine is connected 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. A 115kV transmission line connects the Customer’s substation transformer to the POI.

3.2 Interconnection Facility

The Point of Interconnection will be at the Transmission Owners Hitchland 115kV switching station. Figure 1 shows a one-line illustration of the facility and the proposed POI. Figure 2 shows a one-line bus interconnection of the Point of Interconnection.

Cost to interconnect on a Limited basis is estimated at $545,411.

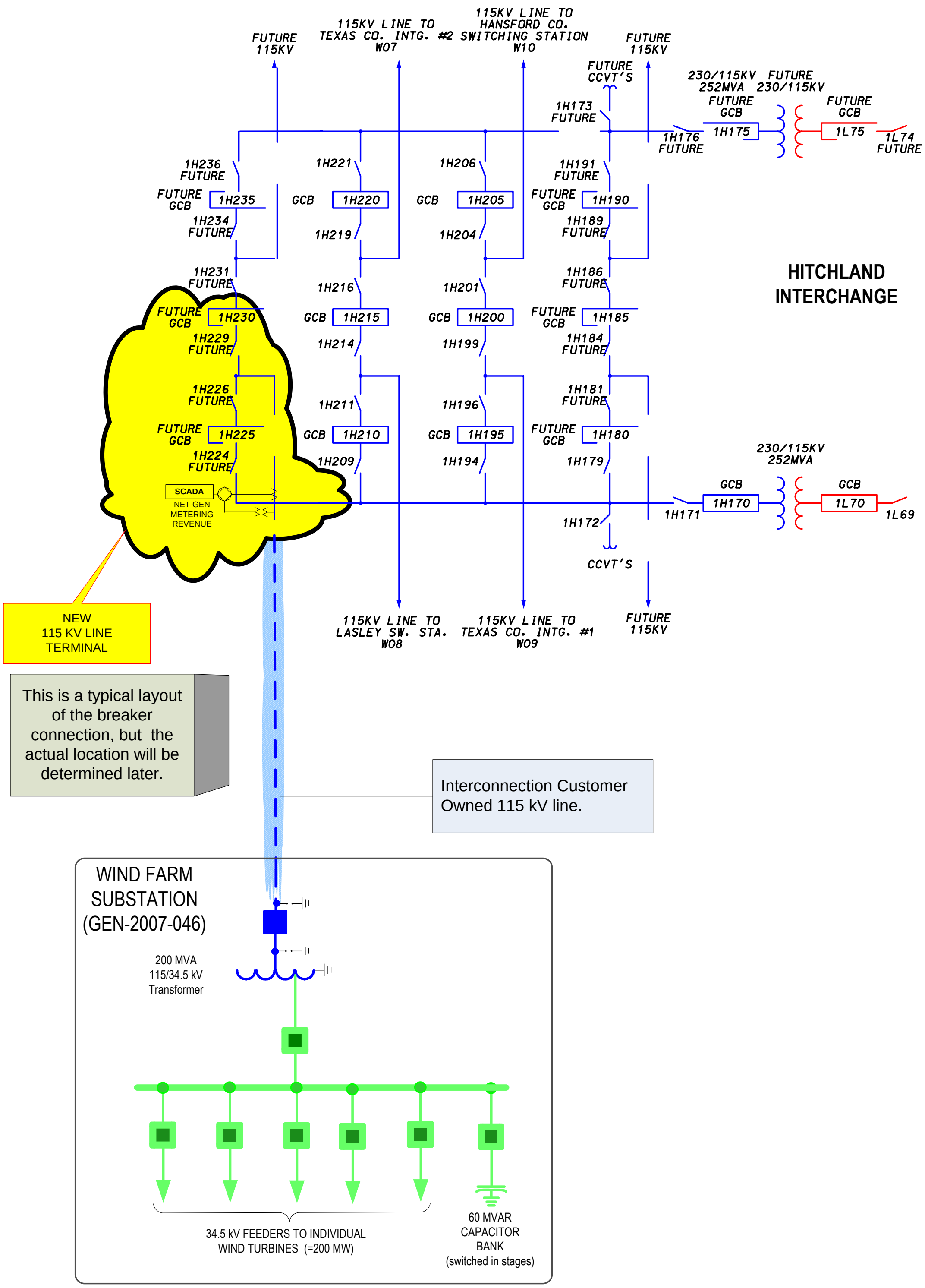

Figure 1: GEN-2007-046 Facility and Proposed Interconnection Configuration

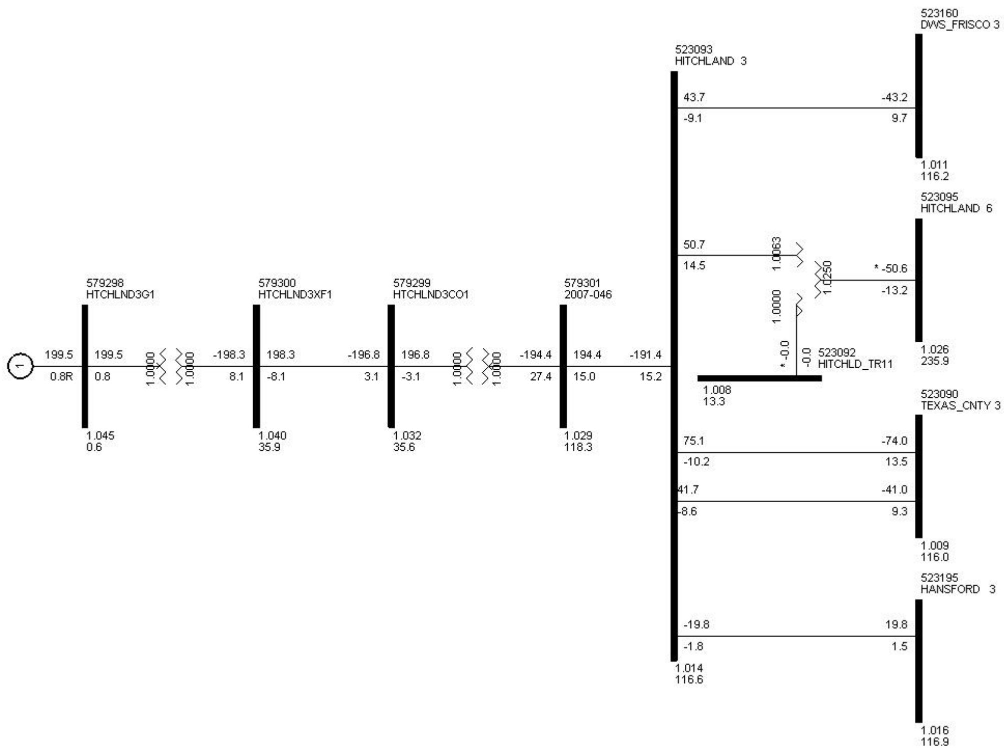

Figure 2: GEN-2007-046 Bus Interconnection

4.0 Power Flow Analysis

A power flow analysis was conducted for the Interconnection Customer's facility using a modified version of the 2011 spring, 2012 summer, and 2012 winter seasonal models. The output of the Interconnection Customer's facility was 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 3 were 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 SPS 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 4 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 indicated that outlet constraints occur once the Customer's project is interconnected at 169.5 MW into the SPS transmission system.

Table 1: ACCC Analysis

SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	TDF	TC%LOADING	MW Available	CONTNAME
11G	G07_046	‘FROM->TO’	‘ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1’	287	287	0.32889	103.4553	169.8	‘FINNEY SWITCHING STATION – HOLCOMB 345KV CKT 1’
11G	G07_046	‘FROM->TO’	‘ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1’	287	287	0.32889	100.2363	197.9	‘FINNEY SWITCHING STATION – HOLCOMB 345KV CKT 1’

5.0 Stability Analysis

5.1 Contingencies Simulated

Forty-two (42) 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 2 below.

Table 2: Contingencies Evaluated

Cont. No.	Cont. Name	Description
1	FLT01_3PH	3 phase fault on the Hitchland (523097) to Conestoga (560029) 345kV line, near Hitchland. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
2	FLT02_1PH	Single phase fault on the line in previous fault. a. Apply fault. 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	FLT03_3PH	3 phase fault on the Hitchland (523097) to Potter Co. (523961) 345kV line, near Hitchland. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
4	FLT04_1PH	Single phase fault on the line in previous fault. a. Apply fault. 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	FLT05_3PH	3 phase fault on the Hitchland (523095) 230kV – Hitchland (523097) 345kV transformer on the 230kV bus a. Apply fault at the Hitchland 230kV bus b. Clear fault after 5 cycles by tripping the faulted line.
6	FLT06_3PH	3 phase fault on the Hitchland (523095) – Moore Co. (523309) 230kV line, near Hitchland. a. Apply fault at the Hitchland 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.
7	FLT07_1PH	*Single phase fault and sequence like previous*
8	FLT08_3PH	3 phase fault on the Potter Co. (523959) – Moore Co. (523309) 230kV line, near Potter Co.. a. Apply fault at the Moore Co. 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.
9	FLT09_1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
10	FLT10_3PH	3 phase fault on the Pringle (523267) – Harrington (523979) 230kV line, near Pringle. a. Apply fault at the Pringle 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.
11	FLT11_1PH	*Single phase fault and sequence like previous*
12	FLT12_3PH	3 phase fault on the Conestoga (560029) to Finney (523853) 345kV line, near Conestoga. a. Apply fault at the Conestoga 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
13	FLT13_1PH	Single phase fault on the line in previous fault. a. Apply fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT14_3PH	3 phase fault on the Holcomb (531449) – Setab (531465) 345kV line, near Holcomb. a. Apply fault at the 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.
15	FLT15_1PH	*Single phase fault and sequence like previous*
16	FLT16_3PH	3 phase fault on the Holcomb (531449) to Spearville (531469) 345kV line, near Holcomb. a. Apply fault at the Conestoga 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
17	FLT17_1PH	Single phase fault on the line in previous fault. a. Apply fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
18	FLT18_3PH	3 phase fault on the Frisco (523160) – Lasley (531465) 115kV line, near Frisco. a. Apply fault at the Frisco 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.
19	FLT19_1PH	*Single phase fault and sequence like previous*
20	FLT20_3PH	3 phase fault on the Hitchland (523093) – Frisco (523160) 115kV line, near Hitchland. a. Apply fault at the Hitchland 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
21	FLT21_1PH	*Single phase fault and sequence like previous*
22	FLT22_3PH	3 phase fault on the Hitchland (523093) 115kV – Hitchland (523095) 230kV transformer on the 115kV bus a. Apply fault at the Hitchland 115kV bus b. Clear fault after 5 cycles by tripping the faulted line.
23	FLT23_3PH	3 phase fault on the Pringle (523266) – Spearman (523186) 115kV line, near Pringle. a. Apply fault at the Pringle 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	FLT24_1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
25	FLT25_3PH	3 phase fault on the Moore Co. (523308) 115kV – Moore Co. (523309) 230kV transformer on the 115kV bus a. Apply fault at the Moore Co. 115kV bus b. Clear fault after 5 cycles by tripping the faulted line.
26	FLT26_3PH	3 phase fault on the Spearman (523186) – Spearman Sub (523203) 115kV line, near Spearman. a. Apply fault at the Spearman 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
27	FLT27_1PH	*Single phase fault and sequence like previous*
28	FLT28_3PH	3 phase fault on the Texas Co. (523090) – Texas Co. PS (5236106) 115kV line, near Texas Co.. a. Apply fault at the Texas Co. 115kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
29	FLT29_3PH	3 phase fault on the Pringle (523266) 115kV – Pringle (523267) 230kV transformer on the 115kV bus a. Apply fault at the Pringle 115kV bus b. Clear fault after 5 cycles by tripping the faulted line.
30	FLT30_3PH	3 phase fault on the Hutchison (523546) 115kV – Hutchison (523551) 230kV transformer on the 115kV bus a. Apply fault at the Hutchison 115kV bus b. Clear fault after 5 cycles by tripping the faulted line.
31	FLT31_3PH	3 phase fault on the Tatonga (515407) to Woodward (515375) 345kV line, near Tatonga. a. Apply fault at the Tatonga 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
32	FLT32_1PH	Single phase fault on the line in previous fault. a. Apply fault. 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.
33	FLT33_3PH	3 phase fault on the Finney (523853) to Holcomb (531449) 345kV line, near Finney. a. Apply fault at the Finney 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
34	FLT34_1PH	Single phase fault on the line in previous fault. a. Apply fault. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
35	FLT35_3PH	3 phase fault on the Herring Tap (523352) – Riverview (523377) 115kV line, near Herring Tap. a. Apply fault at the Herring 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.
36	FLT36_1PH	*Single phase fault and sequence like previous*
37	FLT37_3PH	3 phase fault on the Herring Tap (523352) – Sneed (523366) 115kV line, near Herring Tap. a. Apply fault at the Herring 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.
38	FLT38_1PH	*Single phase fault and sequence like previous*

Cont. No.	Cont. Name	Description
39	FLT39_3PH	3 phase fault on the Hitchland (523093) – Texas Co. (523090) 115kV line, near Hitchland. a. Apply fault at the Hitchland 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.
40	FLT40_1PH	*Single phase fault and sequence like previous*
41	FLT41_3PH	3 phase fault on the Hitchland (523093) – Hansford (523195) 115kV line, near Hitchland. a. Apply fault at the Hitchland 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.
42	FLT42_1PH	*Single phase fault and sequence like previous*

5.2 Further Model Preparation

The base cases contain prior queued projects as shown in Table 3.

The wind 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 3: Prior Queued Projects Included

Project	MW
GEN-2002-008	120
GEN-2002-009	80
GEN-2002-022	240
GEN-2003-020	160
GEN-2006-044	250
GEN-2006-045	240
GEN-2006-047	240
GEN-2008-018	369

The projects listed in Table 4 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 capacity is available.

Table 4: Prior Queued Projects Not Included

Project	MW
GEN-2002-008	120
GEN-2005-017	340
GEN-2006-020	20
GEN-2006-044	120
GEN-2006-049	400
GEN-2007-057	35
GEN-2008-018	36

5.3 Results

Results of the stability analysis are summarized in Table 5. These results are valid for GEN-2007-046 interconnecting with a generation amount of 169.5 MW. The results indicate that for all contingencies studied the transmission system remains stable.

Table 5: Results of Simulated Contingencies

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
1	FLT01_3PH	3 phase fault on the Hitchland (523097) to Conestoga (560029) 345kV line, near Hitchland.	Stable	Stable
2	FLT02_1PH	Single phase fault on the line in previous fault.	Stable	Stable
3	FLT03_3PH	3 phase fault on the Hitchland (523097) to Potter Co. (523961) 345kV line, near Hitchland.	Stable	Stable
4	FLT04_1PH	Single phase fault on the line in previous fault. a. Apply fault.	Stable	Stable
5	FLT05_3PH	3 phase fault on the Hitchland (523095) 230kV – Hitchland (523097) 345kV transformer on the 230kV bus	Stable	Stable
6	FLT06_3PH	3 phase fault on the Hitchland (523095) – Moore Co. (523309) 230kV line, near Hitchland.	Stable	Stable
7	FLT07_1PH	*Single phase fault and sequence like previous*	Stable	Stable
8	FLT08_3PH	3 phase fault on the Potter Co. (523959) – Moore Co. (523309) 230kV line, near Potter Co..	Stable	Stable
9	FLT09_1PH	*Single phase fault and sequence like previous*	Stable	Stable
10	FLT10_3PH	3 phase fault on the Pringle (523267) – Harrington (523979) 230kV line, near Pringle.	Stable	Stable
11	FLT11_1PH	*Single phase fault and sequence like previous*	Stable	Stable
12	FLT12_3PH	3 phase fault on the Conestoga (560029) to Finney (523853) 345kV line, near Conestoga.	Stable	Stable
13	FLT13_1PH	Single phase fault on the line in previous fault.	Stable	Stable
14	FLT14_3PH	3 phase fault on the Holcomb (531449) – Setab (531465) 345kV line, near Holcomb.	Stable	Stable
15	FLT15_1PH	*Single phase fault and sequence like previous*	Stable	Stable
16	FLT16_3PH	3 phase fault on the Holcomb (531449) to Spearville (531469) 345kV line, near Holcomb.	Stable	Stable
17	FLT17_1PH	Single phase fault on the line in previous fault.	Stable	Stable

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
18	FLT18_3PH	3 phase fault on the Frisco (523160) – Lasley (531465) 115kV line, near Frisco.	Stable	Stable
19	FLT19_1PH	*Single phase fault and sequence like previous*	Stable	Stable
20	FLT20_3PH	3 phase fault on the Hitchland (523093) – Frisco (523160) 115kV line, near Hitchland.	Stable	Stable
21	FLT21_1PH	*Single phase fault and sequence like previous*	Stable	Stable
22	FLT22_3PH	3 phase fault on the Hitchland (523093) 115kV – Hitchland (523095) 230kV transformer on the 115kV bus	Stable	Stable
23	FLT23_3PH	3 phase fault on the Pringle (523266) – Spearman (523186) 115kV line, near Pringle.	Stable	Stable
24	FLT24_1PH	*Single phase fault and sequence like previous*	Stable	Stable
25	FLT25_3PH	3 phase fault on the Moore Co. (523308) 115kV – Moore Co. (523309) 230kV transformer on the 115kV bus	Stable	Stable
26	FLT26_3PH	3 phase fault on the Spearman (523186) – Spearman Sub (523203) 115kV line, near Spearman.	Stable	Stable
27	FLT27_1PH	*Single phase fault and sequence like previous*	Stable	Stable
28	FLT28_3PH	3 phase fault on the Texas Co. (523090) – Texas Co. PS (5236106) 115kV line, near Texas Co..	Stable	Stable
29	FLT29_3PH	3 phase fault on the Pringle (523266) 115kV – Pringle (523267) 230kV transformer on the 115kV bus	Stable	Stable
30	FLT30_3PH	3 phase fault on the Hutchison (523546) 115kV – Hutchison (523551) 230kV transformer on the 115kV bus	Stable	Stable
31	FLT31_3PH	3 phase fault on the Tatonga (515407) to Woodward (515375) 345kV line, near Tatonga.	Stable	Stable
32	FLT32_1PH	Single phase fault on the line in previous fault.	Stable	Stable
33	FLT33_3PH	3 phase fault on the Finney (523853) to Holcomb (531449) 345kV line, near Finney.	Stable	Stable
34	FLT34_1PH	Single phase fault on the line in previous fault.	Stable	Stable
35	FLT35_3PH	3 phase fault on the Herring Tap (523352) – Riverview (523377) 115kV line, near Herring Tap.	Stable	Stable
36	FLT36_1PH	*Single phase fault and sequence like previous*	Stable	Stable
37	FLT37_3PH	3 phase fault on the Herring Tap (523352) – Sneed (523366) 115kV line, near Herring Tap.	Stable	Stable
38	FLT38_1PH	*Single phase fault and sequence like previous*	Stable	Stable
39	FLT39_3PH	3 phase fault on the Hitchland (523093) – Texas Co. (523090) 115kV line, near Hitchland.	Stable	Stable
40	FLT40_1PH	*Single phase fault and sequence like previous*	Stable	Stable
41	FLT41_3PH	3 phase fault on the Hitchland (523093) – Hansford (523195) 115kV line, near Hitchland.	Stable	Stable
42	FLT42_1PH	*Single phase fault and sequence like previous*	Stable	Stable

5.4 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.

Four fault contingencies were developed to verify that the wind farm will remain on-line when the POI voltage is drawn down to 0.0 pu. These contingencies are shown in Table 6.

Table 6: LVRT Fault Contingencies

Cont. Name	Description
FLT20_3PH	3 phase fault on the Hitchland (523093) – Frisco (523160) 115kV line, near Hitchland. a. Apply fault at the Hitchland 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.
FLT22_3PH	3 phase fault on the Hitchland (523093) 115kV – Hitchland (523095) 230kV transformer on the 115kV bus a. Apply fault at the Hitchland 115kV bus b. Clear fault after 5 cycles by tripping the faulted line.
FLT39_3PH	3 phase fault on the Hitchland (523093) – Texas Co. (523090) 115kV line, near Hitchland. a. Apply fault at the Hitchland 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.
FLT41_3PH	3 phase fault on the Hitchland (523093) – Hansford (523195) 115kV line, near Hitchland. a. Apply fault at the Hitchland 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.

The project wind farm remained online for the fault contingencies described in this section and for all the fault contingencies described in section 5.1. GEN-2007-046 is found to be in compliance with FERC Order #661A.

6.0 Conclusion

<OMITTED TEXT> (Customer) has requested a Limited Operation Impact Study for limited interconnection service of 199.5 MW of wind generation within the balancing authority of Southwestern Public Service (SPS) in Texas County, Oklahoma. Limited Operation Studies are conducted under GIA Section 5.9.

Power flow analysis showed that the Customer's wind facility can interconnect 169.5 MW of wind generation on a limited operation basis.

Stability analysis results show that the wind generation facility and the transmission system remain stable for all contingencies studied. Also, GEN-2007-046 is found to be in compliance with FERC Order #661A.

The projects listed in Table 4 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 capacity 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.