



***Limited Operational
Impact Study
For
Generation Interconnection
Request
GEN-2008-051***

***SPP Generation
Interconnection***

(#GEN-2008-051)

January 2013

Executive Summary

<OMITTED TEXT> (Customer) has executed an Interconnection Agreement under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of 322 MW of wind generation within the balancing authority of Southwestern Public Service (SPS) in Potter County, Texas. SPP is not able to complete the required network upgrades in time for the Customer's requested in-service date of June 1, 2012. Therefore, Customer has requested this Limited Operation Impact Study (LOIS) to determine the impacts of interconnecting its generating facility to the transmission system before all required Network Upgrades identified in the DISIS-2009-001-3 posted on April 14, 2011 can be placed into service. Limited Operation Studies are conducted under GIA Section 5.9 of the SPP OATT.

This study assumed that only those projects with queue priority equal to or over GEN-2008-051, which are identified in Table 3 of this study, might go into service before the completion of all Network Upgrades identified in DISIS-2009-001-3. This study also assumed that all other additional generation projects with queue priority equal to or over GEN-2008-051, those listed in Table 4 of this report, will NOT go into commercial operation before the completion of all Network Upgrades identified in DISIS-2009-001-3 study process as required. If any of these projects go into commercial operation then this study must be conducted again to determine whether sufficient interconnection capacity exists to interconnect the GEN-2008-051 interconnection request in addition to all higher priority requests in operation or pending operation.

This Impact study addresses the thermal loading and 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.

Power flow analysis studies included the prior queued projects listed in Table 3. The analysis showed that with additional system upgrades for Limited Operation that can be scheduled to be in-service prior to the requested service date, the customer's wind facility can interconnect 218.5 MW of generation capacity into the SPS transmission system. Powerflow analysis was based on both summer and winter peak conditions and light loading cases.

The power factor requirements for GEN-2008-051 are outlined in its Generation Interconnection Agreement.

The wind generation facility was studied with ninety-five (95) Siemens 2.3 MW wind turbine generators. The stability study results show that the transmission system remains stable for all simulated contingencies and conditions studied for the Customer facility with prior queued projects listed in Table 3. If the Customer changes generation technology, this LOIS will be considered invalid and the Customer will not be allowed to interconnect on a limited basis.

Two seasonal base cases were used in the study to analyze the stability impacts of the proposed generation facility. The cases studied were modified 2013 summer peak and 2013 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. Thirty-nine (39) contingencies were identified for use in this study. The 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.

1.0 Introduction

<OMITTED TEXT> (Customer) has executed an Interconnection Agreement under the Southwest Power Pool Open Access Transmission Tariff (OATT) for interconnection of 322 MW of wind generation within the balancing authority of Southwestern Public Service (SPS) in Potter County, Texas. SPP is not able to complete the required network upgrades in time for the Customer's requested in-service date of June 1, 2012. Therefore, Customer has requested this Limited Operation Impact Study (LOIS) to determine the impacts of interconnecting its generating facility to the transmission system before all required Network Upgrades identified in the DISIS-2009-001-3 posted on April 14, 2011 can be placed into service. Limited Operation Studies are conducted under GIA Section 5.9 of the SPP OATT.

This Impact study addresses the thermal loading and dynamic stability effects of interconnecting the plant to the rest of the SPS transmission system for the system condition as it will be on June 1, 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 2013 summer peak and 2013 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. Thirty-nine (39) contingencies were identified for use in this study. The Siemens 2.3 MW wind turbines were modeled using information provided by the Customer.

2.0 Purpose

The purpose of this Limited Operational Impact 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:

1. are directly interconnected to the Transmission System;
2. are interconnected to Affected Systems and may have an impact on the Interconnection Request;
3. have a pending higher queued Interconnection Request to interconnect to the Transmission System listed in Table 3; or
4. 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.

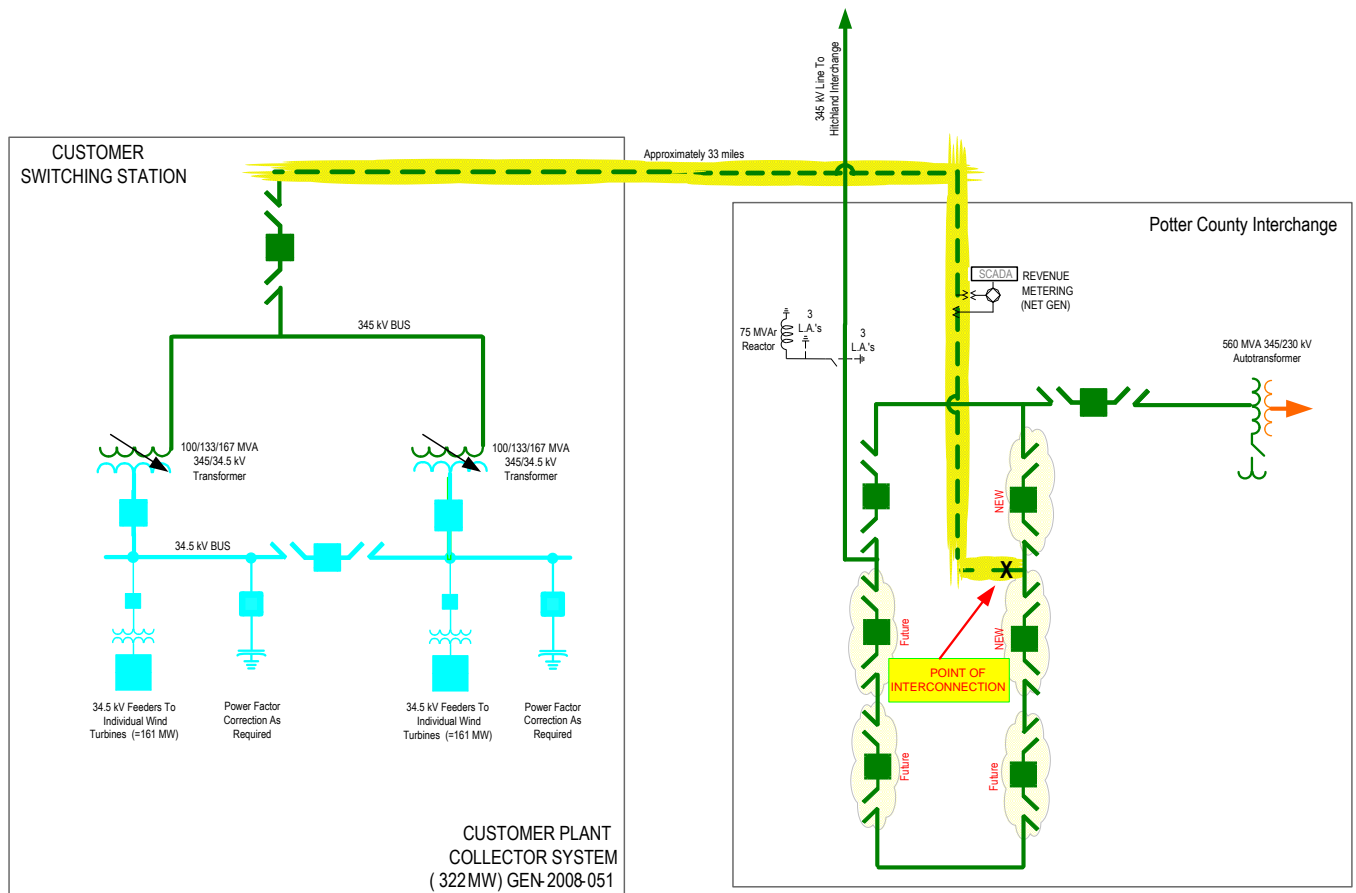
3.0 Facilities

3.1 Generating Facility

The project was modeled as equivalent wind turbine generators of 161 MW and 57.5 MW (218.5 MW total) output. The wind turbines are connected to equivalent 0.69/34.5KV generator step units (GSU). The high side of each GSU is connected to a 34.5/345kV substation transformer. A 345kV transmission line connects the Customer's substation transformer to the POI.

3.2 Interconnection Facility

The Point of Interconnection (POI) will be at the Potter County 345kV Interchange. Figure 1 shows the facility and proposed POI at the proposed interim in-service date. Figure 2 shows the One Line to the Point of Interconnection.



PRELIMINARY ONE LINE DRAWING
FOR ILLUSTRATION PURPOSE ONLY
NOT FOR CONSTRUCTION

Figure 1: GEN-2008-051 Facility and Proposed Interconnection Configuration

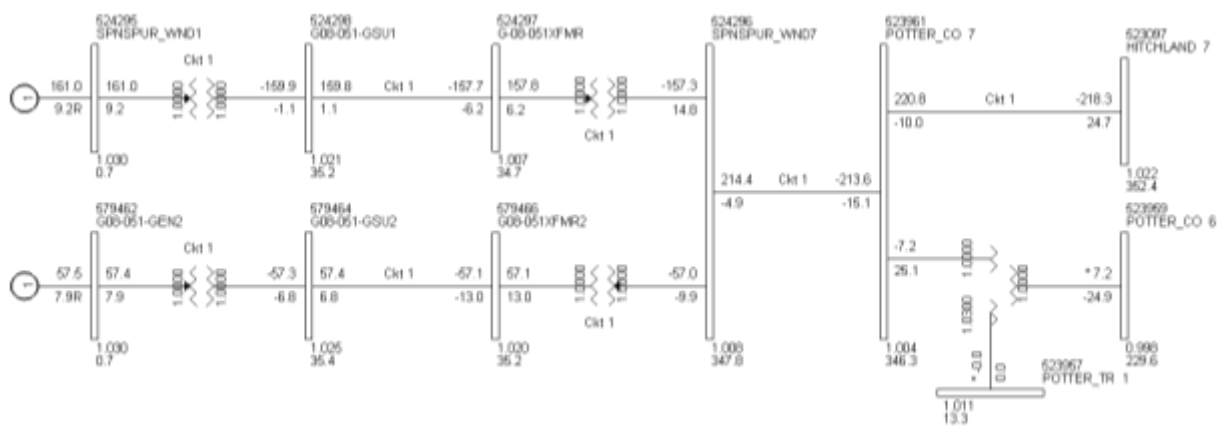


Figure 2: GEN-2008-051 One Line Bus Interconnection

4.0 Power Flow Analysis

A powerflow analysis was conducted for the Interconnection Customer's facility using a modified version of the 2013 spring, 2013 summer, and 2013 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 operation service is available.

The ACCC analysis indicates that as a result of the Customer's project at full nameplate power the SPS transmission system may experience thermal overloads with higher queued projects listed in Table 3 modeled as in service. These analysis results are listed in Table 1.

With the rating of the Harrington-Nichols 230kV lines being raised to 735MVA, a maximum allowable interconnection capability of 218.5 MW, ninety-five (95) 2.3 MW turbines, is allowable.

Table 1: ACCC Analysis for 322MW

GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONTCOMMONNAME	RATEA	RATEB	DF	TC% LOADING	CONTNAME	MW Intrconnection Available*
5	0	13G	G08_051	'TO->FROM'	'GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1'	319	351	0.22258	101.1651	'OKLAUNION - TUCO INTERCHANGE 345KV CKT 1'	303.6
5	0	13G	G08_051	'FROM->TO'	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'	319	351	0.30348	106.1732	'FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1'	250.6
5	0	13G	G08_051	'TO->FROM'	'GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1'	319	351	0.27552	108.0615	'FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1'	219.3
5	0	13G	G08_051	'FROM->TO'	'ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1'	287	287	0.30348	100.1328	'FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1'	320.7
5	0	13G	G08_051	'FROM->TO'	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'	319	351	0.30348	105.9267	'FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1'	253.4
5	0	13G	G08_051	'TO->FROM'	'GRAPEVINE INTERCHANGE - NICHOLS STATION 230KV CKT 1'	319	351	0.27552	107.8336	'FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1'	222.2

5.0 Power Factor Analysis

The power factor requirements for GEN-2008-051 are outlined in its Generation Interconnection Agreement.

6.0 Stability Analysis

6.1 Contingencies Simulated

Thirty-nine (39) contingencies were considered for the transient stability simulations. These contingencies included three phase and single phase transmission line faults and transformer 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 below in Table 2.

Table 2: Fault Definitions

Cont. No.	Cont. Name	Description
1	FLT_01_HITCHLAND7_POTTERCO7_345kV_3PH	3 phase fault on the Hitchland (523097) to Potter County (523961) 345kV line, near Hitchland. a. Apply fault at the Hitchland 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
2	FLT_02_HITCHLAND7_POTTERCO7_345kV_1PH	<i>Single phase fault and sequence like previous</i>
3	FLT_03_POTTERCO7_HITCHLAND7_345kV_3PH	3 phase fault on the Potter County (523961) to Hitchland (523097) 345kV line, near Potter Co. a. Apply fault at the Potter Co. 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
4	FLT_04_POTTERCO7_HITCHLAND7I_345kV_1PH	<i>Single phase fault and sequence like previous</i>
5	FLT_05_POTTERCO7_POTTERCO6_345_230kV_3PH	3 phase fault on the Potter County 345kV (523961) to 230kV (523959) transformer, near the 345kV bus. a. Apply fault at the Potter Co. 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
6	FLT_06_POTTERCO6_MOORECO6_230kV_3PH	3 phase fault on the Potter County (523959) to Moore County (523309) 230kV line, near Potter Co. a. Apply fault at the Potter 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.
7	FLT_07_POTTERCO6_MOORECO6_230kV_1PH	<i>Single phase fault and sequence like previous</i>

Cont. No.	Cont. Name	Description
8	FLT_08_POTTERCO6_HARRNGEST6_230kV_3PH	3 phase fault on the Potter County (523959) to Harrington East (523979) 230kV line, near Potter Co. a. Apply fault at the Potter 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	FLT_09_POTTERCO6_HARRNGEST6_230kV_1PH	<i>Single phase fault and sequence like previous</i>
10	FLT_10_POTTERCO6_BUSHLAND6_230kV_3PH	3 phase fault on the Potter County (523959) to Bushland (524267) 230kV line, near Potter Co. a. Apply fault at the Potter 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.
11	FLT_11_POTTERCO6_BUSHLAND6_230kV_1PH	<i>Single phase fault and sequence like previous</i>
12	FLT_12_POTTERCO6_PLANTX6_230kV_3PH	3 phase fault on the Potter County (523959) to Plant X (525481) 230kV line, near Potter Co. a. Apply fault at the Potter 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.
13	FLT_13_POTTERCO6_PLANTX6_230kV_1PH	<i>Single phase fault and sequence like previous</i>
14	FLT_14_POTTERCO6_CHERRY6_230kV_3PH	3 phase fault on the Potter County (523959) to Cherry (524010) 230kV line, near Potter Co. a. Apply fault at the Potter 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.
15	FLT_15_POTTERCO6_CHERRY6_230kV_1PH	<i>Single phase fault and sequence like previous</i>
16	FLT_16_TUCOINT6_TUCOINT7_230_345kV_3PH	3 phase fault on the Tuco 230kV (525830) to 345kV (525832) transformer, near the 230kV bus. a. Apply fault at the Tuco 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
17	FLT_17_GRAPEVINE6_NICHOLS6_230kV_3PH	3 phase fault on the Grapevine (523771) to Nichols (524044) 230kV line, near Grapevine. a. Apply fault at the Grapevine 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.
18	FLT_18_GRAPEVINE6_NICHOLS6_230kV_1PH	<i>Single phase fault and sequence like previous</i>

Cont. No.	Cont. Name	Description
19	FLT_19_CONWAY3_YARN ELL3_115kV_3PH	3 phase fault on the Conway (524079) to Yarnell (524072) 115kV line, near Conway. a. Apply fault at the Conway 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_CONWAY3_YARN ELL3_115kV_1PH	<i>Single phase fault and sequence like previous</i>
21	FLT_21_CONWAY3_KIRB Y3_115kV_3PH	3 phase fault on the Conway (524079) to Kirby (524088) 115kV line, near Conway. a. Apply fault at the Conway 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_CONWAY3_KIRB Y3_115kV_1PH	<i>Single phase fault and sequence like previous</i>
23	FLT_23_GRAPEVINE6_GR APEVINE3_230_115kV_3PH	3 phase fault on the Grapevine 230kV (523771) to 115kV (523770) transformer, near the 230kV bus. a. Apply fault at the Grapevine 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
24	FLT_24_TUCOINT7_OKU7_ 345kV_3PH	3 phase fault on the Tuco (525832) to Oklaunion (511456) 345kV line, near Tuco. a. Apply fault at the Tuco 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
25	FLT_25_TUCOINT7_OKU7_ 345kV_1PH	<i>Single phase fault and sequence like previous</i>
26	FLT_26_KIRBY3_MCCELL AN3_115kV_3PH	3 phase fault on the Kirby (524088) to McClellan (523804) 115kV line, near Kirby. a. Apply fault at the Kirby 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	FLT_27_KIRBY3_MCCELL AN3_115kV_1PH	<i>Single phase fault and sequence like previous</i>
28	FLT_28_NWTAP2_NORTH W2_69kV_3PH	3 phase fault on the Northwest Tap (524096) to Northwest (524105) 69kV line, near Northwest. a. Apply fault at the Northwest 69kV 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_NWTAP2_NORTH W2_69kV_1PH	<i>Single phase fault and sequence like previous</i>

Cont. No.	Cont. Name	Description
30	FLT_30_NWTAP2_SONCY2_69kV_3PH	3 phase fault on the Northwest Tap (524096) to Soncy (524200) 69kV line, near Northwest. a. Apply fault at the Northwest 69kV 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.
31	FLT_31_NWTAP2_SONCY2_69kV_1PH	<i>Single phase fault and sequence like previous</i>
32	FLT_32_NORTHW2_NORTH3_69_115kV_3PH	3 phase fault on the Northwest 115/69kV autotransformer on the 69kV bus (524105) a. Apply fault at the Northwest 69kV 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.
33	FLT_33_COULTER2_COULTER3_69_115kV_3PH	3 phase fault on the Coulter 115/69kV autotransformer on the 69kV bus (524305) a. Apply fault at the Coulter 69kV 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.
34	FLT_34_BUSHLAND6_BUSHLND3_230_115kV_3PH	3 phase fault on the Bushland 230kV (524267) to 115kV (524266) transformer, near the 230kV bus. a. Apply fault at the Bushland 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
35	FLT_35_NORTHW3_SUNSET3_115kV_3PH	3 phase fault on the Northwest (524106) to Sunset (524249) 115kV line, near Northwest. a. Apply fault at the Northwest 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	FLT_36_NORTHW3_SUNSET3_115kV_1PH	<i>Single phase fault and sequence like previous</i>
37	FLT_37_NICHOLS3_CHERRY3_115kV_3PH	3 phase fault on the Nichols (524043) to Cherry (524009) 115kV line, near Nichols. a. Apply fault at the Nichols 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	FLT_38_NICHOLS3_CHERRY3_115kV_1PH	<i>Single phase fault and sequence like previous</i>
39	FLT_39_NICHOLS6_NICHOLS3_230_115kV_3PH	3 phase fault on the Nichols 230kV (524044) to 115kV (524043) transformer, near the 230kV bus. a. Apply fault at the Nichols 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

6.2 Further Model Preparation

The base cases contain higher or equally 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
Llano Estacado	80
GEN-2001-033	180
GEN-2001-036	80
GEN-2002-008	120
GEN-2002-009	80
GEN-2002-022	240
GEN-2003-020	160
GEN-2006-018	170
GEN-2006-044	370
GEN-2006-047	240
GEN-2008-008	60
GEN-2007-048	400

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

Table 4: Prior Queued Projects Not Included

Project	MW
GEN-2002-008	120
GEN-2006-045	240

6.3 Results

Results of the stability analysis are summarized in Table 5. The results indicate that for all contingencies studied the transmission system remains stable with the inclusion of equally or higher queued projects listed in Table 3.

Table 5: Results of Simulated Contingencies

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
1	FLT_01_HITCHLAND7_POTTERCO7_345kV_3PH	3 phase fault on the Hitchland (523097) to Potter County (523961) 345kV line, near Hitchland.	Stable	Stable
2	FLT_02_HITCHLAND7_POTTERCO7_345kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
3	FLT_03_POTTERCO7_HITCHLAND7_345kV_3PH	3 phase fault on the Potter County (523961) to Hitchland (523097) 345kV line, near Potter Co.	Stable	Stable
4	FLT_04_POTTERCO7_HITCHLAND7I_345kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
5	FLT_05_POTTERCO7_POTTERCO6_345_230kV_3PH	3 phase fault on the Potter County 345kV (523961) to 230kV (523959) transformer, near the 345kV bus.	Stable	Stable

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
6	FLT_06_POTTERCO6_MOORECO6_230kV_3PH	3 phase fault on the Potter County (523959) to Moore County (523309) 230kV line, near Potter Co.	Stable	Stable
7	FLT_07_POTTERCO6_MOORECO6_230kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
8	FLT_08_POTTERCO6_HARRINGTON6_230kV_3PH	3 phase fault on the Potter County (523959) to Harrington East (523979) 230kV line, near Potter Co.	Stable	Stable
9	FLT_09_POTTERCO6_HARRINGTON6_230kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
10	FLT_10_POTTERCO6_BUSHLAND6_230kV_3PH	3 phase fault on the Potter County (523959) to Bushland (524267) 230kV line, near Potter Co.	Stable	Stable
11	FLT_11_POTTERCO6_BUSHLAND6_230kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
12	FLT_12_POTTERCO6_PLANTX6_230kV_3PH	3 phase fault on the Potter County (523959) to Plant X (525481) 230kV line, near Potter Co.	Stable	Stable
13	FLT_13_POTTERCO6_PLANTX6_230kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
14	FLT_14_POTTERCO6_CHERRY6_230kV_3PH	3 phase fault on the Potter County (523959) to Cherry (524010) 230kV line, near Potter Co.	Stable	Stable
15	FLT_15_POTTERCO6_CHERRY6_230kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
16	FLT_16_TUCOINT6_TUCOINT7_230_345kV_3PH	3 phase fault on the Tuco 230kV (525830) to 345kV (525832) transformer, near the 230kV bus.	Stable	Stable
17	FLT_17_GRAPEVINE6_NICHOLS6_230kV_3PH	3 phase fault on the Grapevine (523771) to Nichols (524044) 230kV line, near Grapevine.	Stable	Stable
18	FLT_18_GRAPEVINE6_NICHOLS6_230kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
19	FLT_19_CONWAY3_YARNELL3_115kV_3PH	3 phase fault on the Conway (524079) to Yarnell (524072) 115kV line, near Conway.	Stable	Stable
20	FLT_20_CONWAY3_YARNELL3_115kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
21	FLT_21_CONWAY3_KIRBY3_115kV_3PH	3 phase fault on the Conway (524079) to Kirby (524088) 115kV line, near Conway.	Stable	Stable
22	FLT_22_CONWAY3_KIRBY3_115kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
23	FLT_23_GRAPEVINE6_GRAPEVINE3_230_115kV_3PH	3 phase fault on the Grapevine 230kV (523771) to 115kV (523770) transformer, near the 230kV bus.	Stable	Stable
24	FLT_24_TUCOINT7_OKU7_345kV_3PH	3 phase fault on the Tuco (525832) to Oklaunion (511456) 345kV line, near Tuco.	Stable	Stable
25	FLT_25_TUCOINT7_OKU7_345kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
26	FLT_26_KIRBY3_MCCLELLAN3_115kV_3PH	3 phase fault on the Kirby (524088) to McClellan (523804) 115kV line, near Kirby.	Stable	Stable

Cont. No.	Cont. Name	Description	2011 Summer	2011 Winter
27	FLT_27_KIRBY3_MCCELLA N3_115kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
28	FLT_28_NWTAP2_NORTH W2_69kV_3PH	3 phase fault on the Northwest Tap (524096) to Northwest (524105) 69kV line, near Northwest.	Stable	Stable
29	FLT_29_NWTAP2_NORTH W2_69kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
30	FLT_30_NWTAP2_SONCY2_69kV_3PH	3 phase fault on the Northwest Tap (524096) to Soncy (524200) 69kV line, near Northwest.	Stable	Stable
31	FLT_31_NWTAP2_SONCY2_69kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
32	FLT_32_NORTHW2_NORTH W3_69_115kV_3PH	3 phase fault on the Northwest 115/69kV autotransformer on the 69kV bus (524105)	Stable	Stable
33	FLT_33_COULTER2_COULTER3_69_115kV_3PH	3 phase fault on the Coulter 115/69kV autotransformer on the 69kV bus (524305)	Stable	Stable
34	FLT_34_BUSHLAND6_BUS HLND3_230_115kV_3PH	3 phase fault on the Bushland 230kV (524267) to 115kV (524266) transformer, near the 230kV bus.	Stable	Stable
35	FLT_35_NORTHW3_SUNSET T3_115kV_3PH	3 phase fault on the Northwest (524106) to Sunset (524249) 115kV line, near Northwest.	Stable	Stable
36	FLT_36_NORTHW3_SUNSET T3_115kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
37	FLT_37_NICHOLS3_CHERRY Y3_115kV_3PH	3 phase fault on the Nichols (524043) to Cherry (524009) 115kV line, near Nichols.	Stable	Stable
38	FLT_38_NICHOLS3_CHERRY Y3_115kV_1PH	<i>Single phase fault and sequence like previous</i>	Stable	Stable
39	FLT_39_NICHOLS6_NICHOLS3_230_115kV_3PH	3 phase fault on the Nichols 230kV (524044) to 115kV (524043) transformer, near the 230kV bus.	Stable	Stable

6.4 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.

Two 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
FLT_03_POTTERCO7_HITC HLAND7_345kV_3PH	3 phase fault on the Potter County (523961) to Hitchland (523097) 345kV line, near Potter Co. a. Apply fault at the Potter Co. 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line.
FLT_05_POTTERCO7_POTT ERCO6_345_230kV_3PH	3 phase fault on the Potter County 345kV (523961) to 230kV (523959) transformer, near the 345kV bus. a. Apply fault at the Potter Co. 345kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

The project wind farm remained online for the fault contingency described in this section and for all the fault contingencies described in section 6.1. GEN-2008-051 is found to be in compliance with FERC Order #661A.

7.0 Conclusion

<OMITTED TEXT> (Customer) has requested a Limited Operation Impact Study for interconnection service of 322MW of wind generation within the balancing authority of Southwestern Public Service in Potter County, Texas, in accordance with Section 5.9 of the GIA.

The results of this study show that the wind generation facility and the transmission system remain stable for all contingencies studied. Also, GEN-2008-051 is found to be in compliance with FERC Order #661A.

With the inclusion of only the equally or higher queued projects listed in Table 3, limited operation of the interconnection of 218.5 MW can be accommodated before the inclusion of all the network upgrades listed in DISIS-2009-001-3 are completed.

The power factor requirements for GEN-2008-051 are outlined in its Generation Interconnection Agreement.

The projects 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 operation capacity is available.

These 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.