Impact Study of Limited Operation for Generator Interconnection

ASGI-2013-001

July 2013
Generator Interconnection

SPP Southwest Power Pool

Executive Summary

<OMITTED TEXT> (Customer; ASGI-2013-001) has requested a Limited Operation System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for 11.5 MW of wind generation to be interconnected as an Energy Resource (ER) behind the meter of a substation on the Transmission System of Southwestern Public Service (SPS) in Carson County, Texas. ASGI-2013-001, under GIA Section 5.9, has requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting to the transmission system before all required Network Upgrades identified in the DISIS-2013-001 (or most recent iteration) Impact Study can be placed into service.

This LOIS addresses the effects of interconnecting the plant to the rest of the transmission system for the system topology and conditions as expected in January 2014. ASGI-2013-001 is requesting the interconnection of five (5) Siemens 2.3MW wind turbine generators and associated facilities into the PanTex South 115kV substation. For the typical LOIS, both a power flow and transient stability analysis are conducted. The LOIS assumes that only the higher queued projects listed within Table 1 of this study might go into service before the completion of all Network Upgrades identified within Table 2 of this report. If additional generation projects, listed within Table 3, with queue priority equal to or higher than the study project request rights to go into commercial operation before all Network Upgrades identified within Table 2 of this report are completed, this LOIS may need to be restudied to ensure that interconnection service remains for the ASGI-2013-001 request.

Power flow analysis from this LOIS has determined that the ASGI-2013-001 request can interconnect its 11.5 MW of generation as an Energy Resource prior to the completion of the required Network Upgrades, listed within Table 2 of this report. Should any other projects, other than those listed within Table 1 of this report, come into service an additional study may be required to determine if any limited operation service is available. It should be noted that although this LOIS analyzed many of the most probable contingencies, it is not an all-inclusive list that can account for every operational situation. Additionally, the generator may not be able to inject any power onto the Transmission System due to constraints that fall below the threshold of mitigation for a Generator Interconnection request. Because of this, it is likely that the Customer may be required to reduce their generation output to 0 MW under certain system conditions to allow system operators to maintain the reliability of the transmission network.

Transient stability analysis for this LOIS has determined that the transmission system will remain stable for the thirty six (36) selected faults for the limited operation interconnection of ASGI-2013-001 and will meet Low Voltage Ride Through (LVRT) requirements of FERC Order #661A.

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 must be requested on Southwest Power Pool's OASIS by the Customer.

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Purpose

<OMITTED TEXT> (Interconnection Customer) has requested a restudy of a Limited Operation System Impact Study (LOIS) under the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT) for an interconnection request into the Transmission System of Southwestern Public Service (SPS).

The purpose of this study is to evaluate the impacts of interconnecting the ASGI-2013-001 request of 11.5 MW comprised of five (5) Siemens 2.3MW Siemens SWT 2.3 MW VS wind turbine generators and associated facilities interconnecting into the PanTex South 115kV substation in Carson County, Texas. The Customer has requested this amount to be studied as an Energy Resource (ER) with a Limited Operation Interconnection Service to commence on or around January of 2014.

Both power flow and transient stability analysis were conducted for this Limited Operation Interconnection Service. Limited Operation Studies are conducted under GIA Section 5.9.

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 1; 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 requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this LOIS at the expense of the Customer.

Nothing within this System Impact Study constitutes a request for transmission service or confers upon the Interconnection Customer any right to receive transmission service rights. Should the Customer require transmission service, those rights should be requested through SPP's Open Access Same-Time Information System (OASIS).

This LOIS study included prior queued generation interconnection requests. Those listed within Table 1 are the generation interconnection requests that are assumed to have rights to either full or partial interconnection service prior to the requested 1/2014 in-service of ASGI-2013-001 for this LOIS. Also listed in Table 1 are both the amount of MWs of interconnection service expected at the effective time of this study and the total MWs requested of interconnection service, the fuel type, the point of interconnection (POI), and the current status of each particular prior queued request.

Table 1: Generation Requests Included within LOIS

Project	MW	Total MW	Fuel Source	POI	Status
Llano Estacado (White Deer)	80.0	80.0	Wind	Llano Wind 115kV	In Service
GEN-2002-022	240.0	240.0	Wind	Bushland 230kV	In Service
GEN-2006-047	240.0	240.0	Wind	Tap Bushland - Deaf Smith (Buffalo) 230kV	On Suspension
GEN-2007-048	400.0	400.0	Wind	Tap Amarillo S - Swisher 230kV	On Schedule for 2014
GEN-2008-051	322.0	322.0	Wind	Potter County 345kV	161MW in service / 161MW on schedule for 2013
GEN-2008-088	50.6	50.6	Wind	Vega 69kV	On Schedule for 2014

This LOIS was required because the Customer is requesting interconnection prior to the completion of all of their required upgrades listed within the latest iteration of their Definitive Interconnection System Impact Study (DISIS). Table 2 below lists the required upgrade projects for which this request has cost responsibility. ASGI-2013-001 was included within the DISIS-2013-001 that was posted July 31, 2013. These reports can be located here at the following GI Study URL: http://sppoasis.spp.org/documents/swpp/transmission/GenStudies.cfm?YearType=2013_Impact_Studies

Table 2: Upgrade Projects not included but Required for Full Interconnection Service

Upgrade Project	Type	Description	Status
Woodward - Border – TUCO 345kV	Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Balanced Portfolio Project	Current Estimated In-Service date of 6/30/2014
Hitchland - Woodward Dbl 345kV	Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Priority Project	Current Estimated In-Service date of 6/30/2014
TUCO 345/230kV Autotransformer CKT 2	Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Balanced Portfolio Project	Current Estimated In-Service date of 5/19/2014
TUCO 345/230/13.2kV Autotransformer CKT 3	Most recent iteration of DISIS 2012-002. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build GI upgrade	Not yet authorized
Woodward 345/138kV Autotransformer CKT 2	Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Balanced Portfolio Project	Current Estimated In-Service date of 5/19/2014

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial

operation, may require a re-study of this LOIS at the expense of the Customer. The higher or equally queued projects that were not included in this study are listed in Table 3. While this list is not all inclusive it is a list of the most probable and affecting prior queued requests that were not included within this LOIS, either because no request for an LOIS has been made or the request is on suspension, etc.

Table 3: Higher or Equally Queued GI Requests not included within LOIS

Project	Remainder MW	Total MW	Fuel	POI	Status
-NA-					

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

Facilities

Generating Facility

ASGI-2013-001 Interconnection Customer's request to interconnect a total of 11.5 MW is comprised of five (5) Siemens 2.3MW wind turbine generators and associated interconnection facilities.

Interconnection Facilities

The POI for ASGI-2013-001 Interconnection Customer is at the PanTex South 115kV substation in Carson County, Texas. Figure 1 depicts the one-line diagram of the local transmission system including the POI as well as the power flow model representing the request.

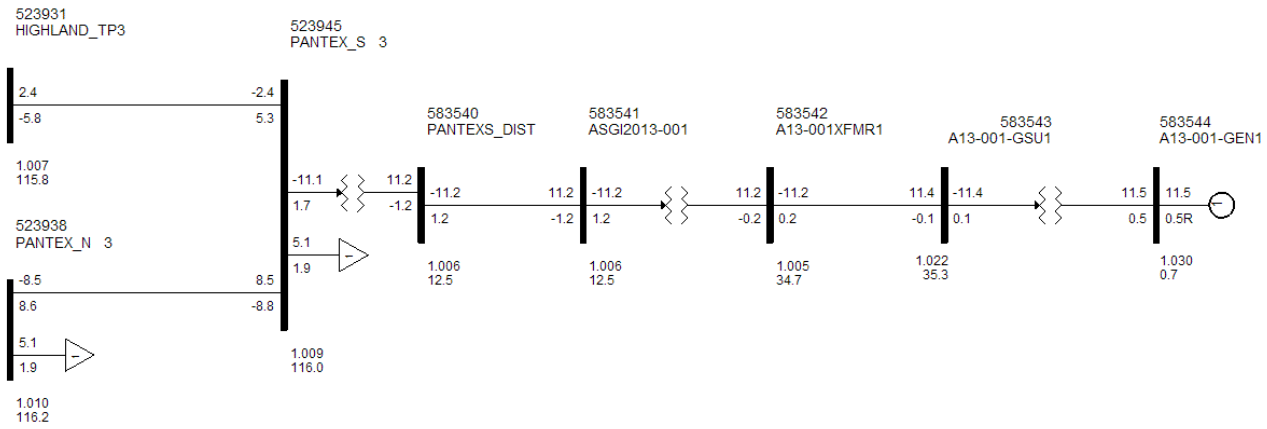

Figure1: Proposed POI Configuration and Request Power Flow Model

Base Case Network Upgrades

The Network Upgrades included within the cases used for this LOIS study are those facilities that are a part of the SPP Transmission Expansion Plan or the Balanced Portfolio projects that have in-service dates prior to the ASGI-2013-001 LOIS requested in-service date of January 2014. These facilities have an approved Notification to Construct (NTC), or are in construction stages and expected to be in-service at the effective time of this study. No other upgrades were included for this LOIS. If for some reason, construction on these projects is delayed or discontinued, a restudy may be needed to determine the interconnection service availability of the Customer.

Power Flow Analysis

Power flow analysis is used to determine if the transmission system can accommodate the injection from the request without violating thermal or voltage transmission planning criteria.

Model Preparation

Power flow analysis was performed using modified versions of the 2012 series of transmission service request study models including the 2014 (spring, summer, and winter) seasonal models. To incorporate the Interconnection Customer's request, a re-dispatch of existing generation within SPP was performed with respect to the amount of the Customer's injection and the interconnecting Balancing Authority. This method allows the request to be studied as an Energy Resource (ERIS) Interconnection Request. For this LOIS, only the previous queued requests listed in Table 1 were assumed to be in-service.

Study Methodology and Criteria

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

The contingency set includes all SPP control area branches and ties 69kV and above, first tier Non-SPP control area branches and ties 115 kV and above, any defined contingencies for these control areas, and generation unit outages for the SPP control areas with SPP reserve share program redispatch.

The monitor elements include all SPP control area branches, ties, and buses 69 kV and above, and all first tier Non-SPP control area branches and ties 69 kV and above. NERC Power Transfer Distribution Flowgates for SPP and first tier Non-SPP control area are monitored. Additional NERC Flowgates are monitored in second tier or greater Non-SPP control areas. Voltage monitoring was performed for SPP control area buses 69 kV and above.

Results

The LOIS ACCC analysis indicates that the Customer can interconnect its 11.5 MW of generation into the SPS transmission system as requested before all required upgrades listed within the DISIS-2013-001 study can be placed into service. Should any other GI projects, other than those listed within Table 1 of this report, come into service an additional study may be required to determine if any limited operation service is available.

ACCC results for the LOIS can be found in Tables 4, and 5 below. Generator Interconnection Energy Resource analysis doesn't mitigate for those issues in which the affecting GI request has less than a 20% OTDF, Table 5 and results listed within Appendix A are provided for informational purposes only so that the Customer understands there may be operational conditions when they may be required to reduce their output to maintain system reliability.

Curtailment and System Reliability

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

Table 4: Interconnection Constraints for Mitigation of ASGI-2013-001 LOIS @ 11.5MW

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	Max Interconnect MW Available	Contingency
All	5		None					11.5	

Table 5: Additional Constraints of ASGI-2013-001 LOIS @ 11.5MW Not for Mitigation

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	Contingency
All	5		None					

Stability Analysis

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

Model Preparation

Transient stability analysis was performed using modified versions of the 2012 series of Model Development Working Group (MDWG) dynamic study models including the 2014 summer and 2013 winter peak dynamic cases. The cases were adapted to resemble the power flow study cases with regards to prior queued generation requests and topology. Finally the prior queued and study generation was dispatched into the SPP footprint. Initial simulations are then carried out for a no-disturbance run of twenty (20) seconds to verify the numerical stability of the model.

Disturbances

The thirty-six (36) contingencies were identified for the Limited Operation scenario for use in this study. These faults are listed within Table 6. These contingencies included three-phase faults and single-phase line faults at locations defined by SPP. Single-phase line faults were simulated by applying fault impedance to the positive sequence network at the fault location to represent the effect of the negative and zero sequence networks on the positive sequence network. The fault impedance was computed to give a positive sequence voltage at the specified fault location of approximately 60% of pre-fault voltage. This method is in agreement with SPP current practice.

With exception to transformers, the typical sequence of events for a three-phase and single-phase fault is as follows:

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

Transformer faults are typically only performed for three-phase faults, unless otherwise noted. Additionally the sequence of events for a transformer is to 1) apply a three-phase fault for five (5) cycles and 2) clear the fault by tripping the affected transformer facility. Unless otherwise noted there will be no re-closing into a transformer fault.

Table 6: Contingencies Evaluated for Limited Operation

Contingency Number and Name		Description
1	FLT_01_POTTERCO7_HITCHLAND7_345kV_3PH	3 phase fault on the Potter Co. (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. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
2	FLT_02_POTTERCO7_HITCHLAND7_345kV_1PH	*Single phase fault and sequence like previous*
3	FLT_03_TUCOINT7_BORDER7_345kV_3PH	3 phase fault on the Tuco (525832) to Border (562309) 345kV line, near Tuco. a. Apply fault at the Tuco 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
4	FLT_04_TUCOINT7_BORDER7_345kV_1PH	*Single phase fault and sequence like previous*
5	FLT_05_G13017TAP_OKU7_345kV_3PH	3 phase fault on the GEN-2013-017-Tap (560700) to Oklaunion (511456) 345kV line, near GEN-2013-017-Tap. a. Apply fault at the GEN-2013-017-Tap 345kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
6	FLT_06_G13017TAP_OKU7_345kV_1PH	*Single phase fault and sequence like previous*
7	FLT_07_POTTERCO6_MOORECNTY6_230kV_3PH	3 phase fault on the Potter Co. (523959) to Moore Co. (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.
8	FLT_08_POTTERCO6_MOORECNTY6_230kV_1PH	*Single phase fault and sequence like previous*
9	FLT_09_POTTERCO6_PLANTX6_230kV_3PH	3 phase fault on the Potter Co. (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.
10	FLT_10_POTTERCO6_PLANTX6_230kV_1PH	*Single phase fault and sequence like previous*

Contingency Number and Name		Description
11	FLT_11_HARRNGEST6_PRINGLE6_230kV_3PH	3 phase fault on the Harrington (523979) to Pringle (523267) 230kV line, near Harrington. a. Apply fault at the Harrington 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
12	FLT_12_HARRNGEST6_PRINGLE6_230kV_1PH	*Single phase fault and sequence like previous*
13	FLT_13_NICHOLS6_HUTCHISON6_230kV_3PH	3 phase fault on the Nichols (524044) to Hutchinson Co. Intg. (523551) 230kV line, near Nichols. a. Apply fault at the Nichols 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
14	FLT_14_NICHOLS6_HUTCHISON6_230kV_1PH	*Single phase fault and sequence like previous*
15	FLT_15_NICHOLS6_GRAPEVINE6_230kV_3PH	3 phase fault on the Nichols (524044) to Grapevine (523771) 230kV line, near Nichols. a. Apply fault at the Nichols 230kV bus. b. Clear fault after 5 cycles by tripping the faulted line. c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
16	FLT_16_NICHOLS6_GRAPEVINE6_230kV_1PH	*Single phase fault and sequence like previous*
17	FLT_17_BUFFALO_DEAFSMITH6_230kV_3PH	3 phase fault on the Buffalo (560009) to Deaf Smith (524623) 230kV line, near Buffalo. a. Apply fault at the Buffalo 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_BUFFALO_DEAFSMITH6_230kV_1PH	*Single phase fault and sequence like previous*
19	FLT_19_G07048TAP_SWISHER6_230kV_3PH	3 phase fault on the GEN-2007-048-Tap (560164) to Swisher Co. (525213) 230kV line, near GEN-2007-048-Tap. a. Apply fault at the GEN-2007-048-Tap 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.
20	FLT_20_G07048TAP_SWISHER6_230kV_1PH	*Single phase fault and sequence like previous*
21	FLT_21_PANTEXS3_HIGHLANDTP3_115kV_3PH	3 phase fault on the Pantex South (523945) to Highland Park Tap (523931) 115kV line, near Pantex South. a. Apply fault at the Pantex South 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.

Contingency Number and Name		Description
22	FLT_22_PANTEXS3_HIGHLANDTP3_115kV_1PH	*Single phase fault and sequence like previous*
23	FLT_23_PANTEXS3_PANTEXN3_115kV_3PH	3 phase fault on the Pantex South (523945) to Pantex North (523938) 115kV line, near Pantex South. a. Apply fault at the Pantex South 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_PANTEXS3_PANTEXN3_115kV_1PH	*Single phase fault and sequence like previous*
25	FLT_25_MARTIN3_HUTCHS3_115kV_3PH	3 phase fault on the Martin (523928) to Hutchinson Co. Intg. (523546) 115kV line, near Martin. a. Apply fault at the Martin 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_MARTIN3_HUTCHS3_115kV_1PH	*Single phase fault and sequence like previous*
27	FLT_27_CONWAY3_KIRBY3_115kV_3PH	3 phase fault on the Conway (524079) to Kirby Sw. Sta. (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.
28	FLT_28_CONWAY3_KIRBY3_115kV_1PH	*Single phase fault and sequence like previous*
29	FLT_29_POTTERCO6_POTTERCO7_230_345kV_3PH	3 phase fault on the Potter Co. 345kV (523961) / 230kV (523959) / 13.2kV (523957) transformer, near Potter Co. 230kV. a. Apply fault at the Potter Co. 230kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
30	FLT_30_HUTCHS3_HUTCHISON6_115_230kV_3PH	3 phase fault on the Hutchinson Co. Intg. 230kV (523551) / 115kV (523546) / 12.8kV (523541) transformer, near Hutchinson Co. Intg. 115kV. a. Apply fault at the Hutchinson Co. Intg. 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
31	FLT_31_NICHOLS3_NICHOLS6_115_230kV_3PH	3 phase fault on the Nichols 230kV (524044) / 115kV (524043) / 13.2kV (524041) transformer, near Nichols 115kV. a. Apply fault at the Nichols 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.
32	FLT_32_HUTCHS3_HUTCHISON2_115_69kV_3PH	3 phase fault on the Hutchinson Co. Intg. 115kV (523546) / 69kV (523543) / 13.2kV (523542) transformer, near Hutchinson Co. Intg. 115kV ckt 1. a. Apply fault at the Hutchinson Co. Intg. 115kV bus. b. Clear fault after 5 cycles by tripping the faulted transformer.

Contingency Number and Name		Description
33	FLT_33_PO_HUTCHISON6_HUTCHS3_PANTEXS3_HIGHLANDTP3_115kV_3PH	**Prior outage** on the Hutchinson Co. Intg. (523551) 230kV / 115kV (523546) / 12.8kV (523541) transformer ckt 1: 3 phase fault on the Pantex South (523945) to Highland Park Tap (523931) 115kV line, near Pantex South 115kV. a. Prior Outage Hutchinson Co. Intg. 230/115/12.8 kV transformer. b. Apply fault at the Pantex South 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (c) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (c) and remove fault.
34	FLT_34_PO_HUTCHISON6_HUTCHS3_PANTEXS3_HIGHLANDTP3_115kV_1PH	*Single phase fault and sequence like previous*
35	FLT_35_PO_NICHOLS6_NICHOLS3_MARTIN3_HUTCHS3_115kV_3PH	**Prior outage** on the Nichols 230kV (524044) / 115kV (524043) / 13.2kV (524041) transformer ckt 1: 3 phase fault on the Martin (523928) to Hutchinson Co. Intg. (523546) 115kV line, near Martin 115kV. a. Prior Outage Nichols 230/115kV transformer ckt 1. b. Apply fault at the Martin 115kV bus. c. Clear fault after 5 cycles by tripping the faulted line. d. Wait 20 cycles, and then re-close the line in (c) back into the fault. e. Leave fault on for 5 cycles, then trip the line in (c) and remove fault.
36	FLT_36_PO_NICHOLS6_NICHOLS3_MARTIN3_HUTCHS3_115kV_1PH	*Single phase fault and sequence like previous*

Results

Results of the stability analysis are summarized in Table 7. These results are valid for ASGI-2013-001 interconnecting with a generation amount up to 11.5 MW

Table 7: Fault Analysis Results for Limited Operation

Contingency Number and Name		2014SP	2013WP
1	FLT_01_POTTERCO7_HITCHLAND7_345kV_3PH	Stable	Stable
2	FLT_02_POTTERCO7_HITCHLAND7_345kV_1PH	Stable	Stable
3	FLT_03_TUCOINT7_BORDER7_345kV_3PH	Stable	Stable
4	FLT_04_TUCOINT7_BORDER7_345kV_1PH	Stable	Stable
5	FLT_05_G13017TAP_OKU7_345kV_3PH	Stable	Stable
6	FLT_06_G13017TAP_OKU7_345kV_1PH	Stable	Stable
7	FLT_07_POTTERCO6_MOORECNTY6_230kV_3PH	Stable	Stable
8	FLT_08_POTTERCO6_MOORECNTY6_230kV_1PH	Stable	Stable
9	FLT_09_POTTERCO6_PLANTX6_230kV_3PH	Stable	Stable
10	FLT_10_POTTERCO6_PLANTX6_230kV_1PH	Stable	Stable
11	FLT_11_HARRNGEST6_PRINGLE6_230kV_3PH	Stable	Stable
12	FLT_12_HARRNGEST6_PRINGLE6_230kV_1PH	Stable	Stable
13	FLT_13_NICHOLS6_HUTCHISON6_230kV_3PH	Stable	Stable
14	FLT_14_NICHOLS6_HUTCHISON6_230kV_1PH	Stable	Stable
15	FLT_15_NICHOLS6_GRAPEVINE6_230kV_3PH	Stable	Stable

	Contingency Number and Name	2014SP	2013WP
16	FLT_16_NICHOLS6_GRAPEVINE6_230kV_1PH	Stable	Stable
17	FLT_17_BUFFALO_DEAFSMITH6_230kV_3PH	Stable	Stable
18	FLT_18_BUFFALO_DEAFSMITH6_230kV_1PH	Stable	Stable
19	FLT_19_G07048TAP_SWISHER6_230kV_3PH	Stable	Stable
20	FLT_20_G07048TAP_SWISHER6_230kV_1PH	Stable	Stable
21	FLT_21_PANTEXS3_HIGHLANDTP3_115kV_3PH	Stable	Stable
22	FLT_22_PANTEXS3_HIGHLANDTP3_115kV_1PH	Stable	Stable
23	FLT_23_PANTEXS3_PANTEXN3_115kV_3PH	Stable	Stable
24	FLT_24_PANTEXS3_PANTEXN3_115kV_1PH	Stable	Stable
25	FLT_25_MARTIN3_HUTCHS3_115kV_3PH	Stable	Stable
26	FLT_26_MARTIN3_HUTCHS3_115kV_1PH	Stable	Stable
27	FLT_27_CONWAY3_KIRBY3_115kV_3PH	Stable	Stable
28	FLT_28_CONWAY3_KIRBY3_115kV_1PH	Stable	Stable
29	FLT_29_POTTERCO6_POTTERCO7_230_345kV_3PH	Stable	Stable
30	FLT_30_HUTCHS3_HUTCHISON6_115_230kV_3PH	Stable	Stable
31	FLT_31_NICHOLS3_NICHOLS6_115_230kV_3PH	Stable	Stable
32	FLT_32_HUTCHS3_HUTCHISON2_115_69kV_3PH	Stable	Stable
33	FLT_33_PO_HUTCHISON6_HUTCHS3_PANTEXS3_HIGHLANDTP3_115kV_3PH	Stable	Stable
34	FLT_34_PO_HUTCHISON6_HUTCHS3_PANTEXS3_HIGHLANDTP3_115kV_1PH	Stable	Stable
35	FLT_35_PO_NICHOLS6_NICHOLS3_MARTIN3_HUTCHS3_115kV_3PH	Stable	Stable
36	FLT_36_PO_NICHOLS6_NICHOLS3_MARTIN3_HUTCHS3_115kV_1PH	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.

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 8.

Table 8: LVRT Contingencies

	Contingency Number and Name	Description
1	FLT_21_PANTEXS3_HIGHLANDTP3_115kV_3PH	3 phase fault on the Pantex South (523945) to Highland Park Tap (523931) 115kV line, near Pantex South.
2	FLT_23_PANTEXS3_PANTEXN3_115kV_3PH	3 phase fault on the Pantex South (523945) to Pantex North (523938) 115kV line, near Pantex South.

The required prior queued project wind farms remained online for the fault contingencies described in this section as well as the fault contingencies described in the Disturbances section of this report. ASGI-2013-001 is found to be in compliance with FERC Order #661A.

Conclusion

<OMITTED TEXT> (Interconnection Customer, ASGI-2013-001) has requested a Limited Operation System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for 11.5 MW of wind generation to be interconnected as an Energy Resource (ER) into a transmission facility of Southwestern Public Service (SPS) in Carson County, Texas. The point of interconnection will be the Pantex South 115kV substation in Carson County, Texas. ASGI-2013-001, under GIA Section 5.9, has requested this Limited Operation Interconnection Study (LOIS) to determine the impacts of interconnecting to the transmission system before all required Network Upgrades identified in the DISIS-2013-001 (or most recent iteration) Impact Study can be placed into service.

Power flow analysis from this LOIS has determined that the ASGI-2013-001 request can interconnect prior to the completion of the required Network Upgrades, listed within Table 2 of this report.

Transient stability analysis indicates that the transmission system will remain stable for the contingencies listed within Table with the addition of ASGI-2013-001 generation. Additionally, ASGI-2013-001 was found to be in compliance with FERC Order #661A when studied as listed within this report.

Any changes to these assumptions, for example, one or more of the previously queued requests not included within this study execute an interconnection agreement and commencing commercial operation, may require a re-study of this LOIS 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.

A. Additional Constraints Maximum Wind Scenario (Not for Mitigation)

See next page.

SOLUTIONTYPE	GROUP	SCENARIO	SEASON	SOURCE	DIRECTION	MONITORED ELEMENT	RATE B	TDF	TC%LOADING	CONTINGENCY
FDNS	05ALL	0	13G	ASGI_13_001	'FROM->TO'	'BUFFALO 230.00 - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1'	350.5669	0.08029	101.2317	'GEN525562 1-TOLK GEN #2 24 KV'
FDNS	05ALL	0	13G	ASGI_13_001	'FROM->TO'	'BUFFALO 230.00 - DEAF SMITH COUNTY INTERCHANGE 230KV CKT 1'	350.5669	0.05636	101.9664	'BUSHLAND INTERCHANGE - POTTER COUNTY INTERCHANGE 230KV CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04125	119.563	'ELK CITY 230KV - SWEETWATER 230KV CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04125	119.5602	'ELK CITY 230KV (ELKCTY-6) 230/138/13.8KV TRANSFORMER CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04125	116.501	'GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04125	116.3365	'SPP-SWPS-02A'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04125	110.4766	'STATELINE INTERCHANGE - STLN-DEMARC6 230KV CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04125	110.4487	'STLN-DEMARC6 - SWEETWATER 230KV CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04125	110.2714	'SPP-SWPS-02'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.04121	117.7425	'SPP-SWPS-03'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.03708	134.1148	'NORTHWEST - TATONGA7 345.00 345KV CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.03708	117.486	'TATONGA7 345.00 - WOODWARD DISTRICT EHV 345KV CKT 1'
FDNS	05ALL	0	13G	ASGI_13_001	'TO->FROM'	'FPL SWITCH - WOODWARD 138KV CKT 1'	153	0.03387	119.113	'DBL-WICH-THI'