Impact Study of Limited Operation for Generator Interconnection

GEN-2012-002

October 2012
Generation Interconnection

SPP Southwest Power Pool

Executive Summary

<OMITTED TEXT> (Interconnection Customer; GEN-2012-002) has requested a System ImpactStudy under the Southwest Power Pool Open Access Transmission Tariff (OATT) for 101.2 MW of wind generation to be interconnected as an Energy Resource (ER) into the transmission system of Sunflower Electric Power Corporation (SUNC) in Scott County, Kansas. GEN-2012-002, 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-2012-001 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 on December 31, 2013. GEN-2012-002 is requesting the interconnection of forty-four (44) Siemens 2.3 MW wind turbine generators and associated facilities into a tap on the Scott City – Pile 115kV. For the LOIS, both a power flow and transient stability analysis were 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 not identified in Table 1 but with queue priority equal to or higher than the study project, GEN-2012-002, request rights to go into commercial operation before all Network Upgrades identified within Table 2 of this report, then this LOIS may need to be restudied to ensure that interconnection service remains for the GEN-2012-002 request.

A restudy of the DISIS-2012-001 cluster study was also performed to account for the withdrawal of prior queued project(s) a restudy of the affected areas within the DISIS-2012-001, was also completed through power flow analysis to verify the initial findings from the DISIS-2012-001 still remain valid.

Power flow analysis, from both the LOIS and the DISIS-2012-001 restudy contained within this report, has determined that the GEN-2012-002 request can interconnect 101.2 MW prior to the completion of the required Network Upgrades, listed within Table 2 of this report.

Transient Stability analysis, from this LOIS has determined that the transmission system will remain stable for the forty-five (45) selected faults for the limited operation interconnection of GEN-2012-002.

A restudy of the DISIS-2012-001 has indicated that the Customer will be responsible for $9,000,000 (2012) of interconnection facilities and network upgrades in order to be granted full interconnection service.

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 System Impact Study under the Southwest Power Pool (SPP) Open Access Transmission Tariff (OATT) for an interconnection request on the transmission system of Sunflower Electric Power Corporation (SUNC).

The purpose of this study is to evaluate the impacts of interconnecting GEN-2012-002 request of 101.2 MW comprised of forty-four (44) Siemens 2.3 MW wind turbine generators and associated facilities interconnecting into a tap on the Scott City – Pile 115kV SUNC transmission line in Scott County, Kansas. The Customer's 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 the Limited Operation Interconnection Service study. Additionally, a restudy of the power flow portion of the DISIS-2012-001 affected areas were performed to evaluate the validity of the original study results due to the withdrawal of a prior queued generation interconnection request. 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 need transmission service they should request those rights through SPP's Open Access Same-Time Information System (OASIS).

Both the Limited Operation scenario and the DISIS-2012-001 affected areas scenarios included prior queued generation interconnection requests. Those listed within Table 1 are the prior queued requests that are assumed to have rights to either full or partial interconnection service prior to the requested 1/2014 in-service of GEN-2012-002 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 point of interconnection (POI), and the current status of each particular prior queued request.

Table 1: Prior Queued Projects Included within LOIS

Project	MW	Total MW	POI	Status
Montezuma	110.0	110.0	Haggard 115kV	Commercial Operation
GEN-2001-039A	105.0	105.0	Tap Greensburg – Ft. Dodge 115kV	IA Executed/On Schedule
GEN-2001-039M	100.0	100.0	Central Plains 115kV	Commercial Operation
GEN-2002-025A	150.0	150.0	Spearville 230kV	Commercial Operation
GEN-2003-006A	200.0	200.0	Elm Creek 230kV	Commercial Operation
GEN-2003-019	250.0	250.0	Smoky Hills 230kV	Commercial Operation
GEN-2004-014	100.0	154.5	Spearville 230kV	IA Executed/On Schedule
GEN-2005-012	160.0	250.0	Spearville 345kV	IA Executed/On Schedule
GEN-2007-040	132.0	200.1	Buckner 345kV	IA Executed/On Schedule
GEN-2008-018	300.0	405.0	Finney 345kV	IA Executed/On Schedule
GEN-2008-079	99.2	99.2	Tap Cudahy – Ft Dodge 115kV	IA Executed/On Schedule
GEN-2010-009	165.6	165.6	Buckner 345kV	IA Executed/On Schedule
GEN-2010-057	201.0	201.0	Rice County 230kV	IA Executed/On Schedule

The prior queued projects used in the restudy of the DISIS-2012-001 affected areas are the same as those listed within Appendix B of the DISIS study that was posted[1] on 7/26/2012, with the exception of GEN-2010-053, which recently withdrew.

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.

[1] DISIS-2012-001 report posted 7/26/2012 at http://sppoasis.spp.org/documents/swpp/transmission/studies/files/2012_Generation_Studies/DISIS-2012-001_7-26-12_final.pdf

Facilities

Generating Facility

GEN-2012-002 Interconnection Customer's request to interconnect a total of 101.2 MW is comprised of forty-four (44) Siemens 2.3 MW wind turbine generators and associated interconnection facilities.

Interconnection Facilities

The POI for GEN-2012-002 Interconnection Customer is at a tap on the Scott City – Pile 115kV SUNC transmission line in Scott County, Kansas. Figure 1 depicts the one-line diagram of the SUNC 115kV transmission system including the POI as well as the power flow model representing the request.

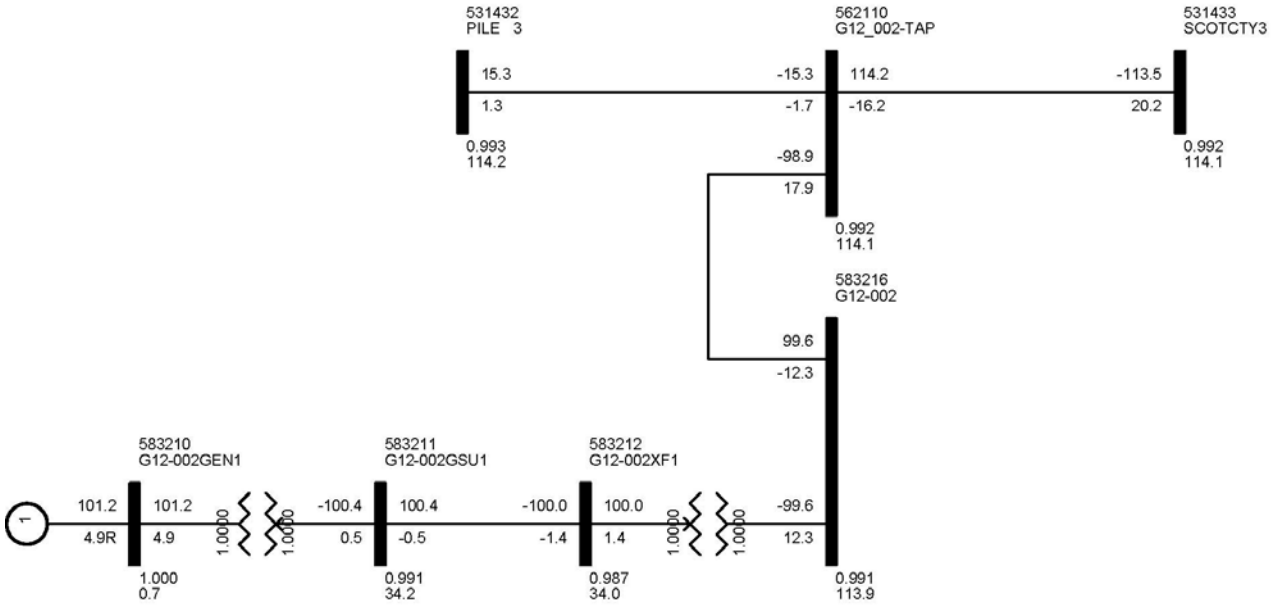

Figure 1: Proposed POI Configuration and Request Power Flow Model

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 or the Priority Projects. These facilities have an approved Notice 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 discontinued, a restudy may be needed to determine the interconnection service availability of the Customer.

The Network Upgrades included within the DISIS restudy cases are listed within the report[1] posted 7/26/2012.

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 2011 series of transmission service request study models including the 2012 (spring, summer, and winter) and 2017 (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. For the re-study of the affected areas within the DISIS-2012-001, all of the requests, with the exception of GEN-2010-053, listed within Appendices A and B of the DISIS report[1] posted on 7/26/2012 were included either as prior queued or concurrently studied requests.

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

Results

The LOIS ACCC analysis indicates that the Customer can interconnect 101.2 MW of generation into the SUNC transmission system as requested before all upgrades listed in Table 2 can be placed into service.

ACCC results for the LOIS can be found in Table 3 below. The results listed within Table 3 shows that there should be enough interconnection availability on the transmission system until the 2017 Summer Peak when thermal violations begin to show up at which point a second 345/115/13.8kV transformer at Holcomb will be needed to mitigate outlet constraints at the GEN-2012-002 POI.

Table 4 shows the ACCC results for the restudy of the affected areas of the DISIS-2012-001. Again, the same issue of outlet constraints show up for the 2017 Summer Peak however, with the additional generation that is included within the DISIS-2012-001, an overload on the Setab 345/115/13.8kV transformer shows up within the 2012 Spring Peak season. This earlier season overload confirms that a restudy will be needed, should any additional generation with queue priority equal to or higher than GEN-2012-002 come on-line before this Customer.

The second Holcomb 345/115/13.8kV transformer will be a required DISIS ER upgrade that at this time will need to be placed into service before the 2017 Summer Peak. The cost of this Network Upgrade is estimated at $4,000,000 ($2012). Also, should additional generation customers execute an interconnection agreement and go into service before the installation of the second Holcomb transformer upgrade, a restudy of this LOIS will be required and may either 1) limit the output of

the generating facility and/or 2) require the second Holcomb transformer to be placed into service at an earlier date.

Additional ACCC results can be found within the Appendix. Appendix A details the thermal issues associated with the LOIS study. Appendix B details the thermal constraints associated with the DISIS-2012-001 restudy. These ACCC results fall below the 20% transmission distribution factor (TDF) and do not require mitigation for ER interconnection service. They are being provided to help the customer understand that although constraints with a TDF of 20% or greater require mitigation, the transmission system could still be constrained with ER upgrades in service.

Network Upgrades and Good-Faith Estimates

The upgrades listed within Table 2 of this LOIS detail the Network Upgrades that will be required for interconnection under the DISIS and/or this LOIS. While this LOIS is not limiting the output of this facility until all of the upgrades within Table 2 are completed, it should be noted that any changes to these assumptions, for example, one or more of the previously queued requests not included within Table 1 of this study execute an interconnection agreement and commence commercial operation, a re-study of this LOIS at the expense of the Customer may be required.

Table 2: Required Network Upgrade Projects

Project & Description	Current Allocated Cost*	Total Cost	Need Date	Current Requirement*	
				for LOIS	for DISIS
GEN-2012-002 POI • 3-breaker ring-bus and associated equipment tap into Scott City – Pile 115kV	$5M	$5M	COD	**YES**	**YES**
Holcomb 345/115/13.8 kV Transformer CKT 2 • Install second 345/115kV transformer at Holcomb	$4M	$4M	2017SP	NO	**YES**
Beaver County – Gray County 345kV • Previously Allocated project	$0	$170.2M	TBD	NO	**YES**
Beaver – Woodward 345kV DBL CKT • Previously Allocated project	$0	$226.8M	TBD	NO	**YES**
Beaver County 345kV Expansion • Previously Allocated project	$0	$3.5M	TBD	NO	**YES**
Clark – Thistle 345kV DBL CKT • Previously Allocated project	$0	$291.1M	TBD	NO	**YES**
Finney Switching Station – Holcomb 345kV CKT 2 • Previously Allocated project	$0	$10.5M	TBD	NO	**YES**
Hitchland 345/230 Transformer CKT 2 • Previously Allocated project	$0	$8.9M	TBD	NO	**YES**
Mullergren – Reno 345kV DBL CKT • Previously Allocated project	$0	$210.9M	TBD	NO	**YES**
Spearville – Mullergren 345kV DBL CKT • Previously Allocated project	$0	$196.3M	TBD	NO	**YES**
	$9M	**TOTAL**			

*Costs and requirements subject to change by restudies for changes in status of higher queued projects

Table 3: Interconnection Constraints for Mitigation of GEN-2012-002 LOIS

Season	Group	Direction	Monitored Element	Rate A (MVA)	Rate B (MVA)	TDF	TC% Loading	Contingency
2017 SP	04G12_02	FROM->TO	G12_002T 115.00 - SCOTT CITY 115KV CKT 1	165	198	0.85	102.5	HOLCOMB (HOLCOMB) 345/115/13.8KV TRANSFORMER CKT 1

Table 4: Interconnection Constraints for GEN-2012-002 DISIS-2012-001 Re-study

Season	Group	Direction	Monitored Element	Rate A (MVA)	Rate B (MVA)	TDF	TC% Loading	Contingency
2012 G	04G12_02	FROM->TO	SETAB (SETAB) 345/115/13.8KV TRANSFORMER CKT 1	280	280	0.72	101.2	HOLCOMB (HOLCOMB) 345/115/13.8KV TRANSFORMER CKT 1
2017 SP	00G12_02	FROM->TO	HOLCOMB (HOLCOMB) 345/115/13.8KV TRANSFORMER CKT 1	336	336	0.87	102.2	G12_002T 115.00 - SCOTT CITY 115KV CKT 1
2017 SP	00G12_02	FROM->TO	G12_002T 115.00 - SCOTT CITY 115KV CKT 1	165	198	0.85	123.7	HOLCOMB (HOLCOMB) 345/115/13.8KV TRANSFORMER CKT 1

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 2011 series of Model Development Working Group (MDWG) dynamic study models including the 2012 (spring and summer) seasonal models. The cases are then adapted to resemble the power flow study cases with regards to prior queued generation requests and topology. Finally the prior queued and study generation 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 forty-five (45) contingencies were identified for the Limited Operation scenario for use in this study. These faults are listed within Table 5. 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 5: Contingencies Evaluated for Limited Operation

	Contingency Number and Name	Description
1	FLT_G1202TAP_PILE_115kV_3PH	*3-Phase fault on the GEN-2012-002 Tap – Pile 115kV near the GEN-2012-002 bus.*
2	FLT_G1202TAP_PILE_115kV_1PH	*Single-phase fault similar to previous fault.*
3	FLT_G1202TAP_SCOTTCITY3_115kV_3PH	*3-Phase fault on the GEN-2012-002 Tap – Scott City 115kV near the GEN-2012-002 bus.*
4	FLT_G1202TAP_SCOTTCITY3_115kV_1PH	*Single-phase fault similar to previous fault.*
5	FLT_DOBSON_PILE_115kV_3PH	*3-Phase fault on the Dobson – Pile 115kV near the Dobson bus.*

	Contingency Number and Name	Description
6	FLT_DOBSON_PILE_115kV_1PH	*Single-phase fault similar to previous fault.*
7	FLT_DOBSON_MORRIS_115kV_3PH	*3-Phase fault on the Dobson – Morris 115kV near the Dobson bus.*
8	FLT_DOBSON_MORRIS_115kV_1PH	*Single-phase fault similar to previous fault.*
9	FLT_DOBSON_KSAVEWTP_115kV_3PH	*3-Phase fault on the Dobson – KS Ave Water Treatment Plant 115kV near the Dobson bus.*
10	FLT_DOBSON_KSAVEWTP_115kV_1PH	*Single-phase fault similar to previous fault.*
11	FLT_DOBSON_LOWETAP_115kV_3PH	*3-Phase fault on the Dobson – Lowe Tap 115kV near the Dobson bus.*
12	FLT_DOBSON_LOWETAP_115kV_1PH	*Single-phase fault similar to previous fault.*
13	FLT_SCOTTCITY3_SCOTTCTY2_115_69kV_3PH	*3-Phase fault on the Scott City 115/69kV transformer near the Scott City 115kV bus.*
14	FLT_SCOTTCITY3_SETAB_115kV_3PH	*3-Phase fault on the Scott City – Setab 115kV near the Scott City bus.*
15	FLT_SCOTTCITY3_SETAB_115kV_1PH	*Single-phase fault similar to previous fault.*
16	FLT_SCOTTCITY3_MANNGTAP_115kV_3PH	*3-Phase fault on the Scott City – Manning Tap 115kV near the Scott City bus.*
17	FLT_SCOTTCITY3_MANNGTAP_115kV_1PH	*Single-phase fault similar to previous fault.*
18	FLT_SETAB3_CTYSERV_115kV_3PH	*3-Phase fault on the Setab – City Services 115kV near the Setab bus.*
19	FLT_SETAB3_CTYSERV_115kV_1PH	*Single-phase fault similar to previous fault.*
20	FLT_SETAB3_CNTRLPLNS_115kV_3PH	*3-Phase fault on the Setab – Central Plains Tap 115kV near the Setab bus.*
21	FLT_SETAB3_CNTRLPLNS_115kV_1PH	*Single-phase fault similar to previous fault.*
22	FLT_SETAB7_SETAB3_345_115kV_3PH	*3-Phase fault on the Setab 345/115kV transformer near the Setab 345kV bus.*
23	FLT_SETAB7_MINGO7_345kV_3PH	*3-Phase fault on the Setab – Mingo 345kV near the Setab bus.*
24	FLT_SETAB7_MINGO7_345kV_1PH	*Single-phase fault similar to previous fault.*
25	FLT_SETAB7_HOLCOMB7_345kV_3PH	*3-Phase fault on the Setab – Holcomb 345kV near the Setab bus.*
26	FLT_SETAB7_HOLCOMB7_345kV_1PH	*Single-phase fault similar to previous fault.*
27	FLT_MINGO7_REDWILLOW_345kV_3PH	*3-Phase fault on the Mingo – Red Willow 345kV near the Mingo bus.*
28	FLT_MINGO7_REDWILLOW_345kV_1PH	*Single-phase fault similar to previous fault.*
29	FLT_HOLCOMB7_FINNEY7_345kV_3PH	*3-Phase fault on the Holcomb – Finney 345kV near the Holcomb bus.*
30	FLT_HOLCOMB7_FINNEY7_345kV_1PH	*Single-phase fault similar to previous fault.*
31	FLT_HOLCOMB7_GRAYCO_345kV_3PH	*3-Phase fault on the Holcomb – Gray County(Buckner) 345kV near the Holcomb bus.*
32	FLT_HOLCOMB7_GRAYCO_345kV_1PH	*Single-phase fault similar to previous fault.*
33	FLT_HOLCOMB7_HOLCOMB3_345_115kV_3PH	*3-Phase fault on the Holcomb 345/115kV near the Holcomb 345kV bus.*
34	FLT_HOLCOMB3_PLYMELL_115kV_3PH	*3-Phase fault on the Holcomb – Plymell 115kV near the Holcomb bus.*
35	FLT_HOLCOMB3_PLYMELL_115kV_1PH	*Single-phase fault similar to previous fault.*
36	FLT_FINNEY_HITCHLND7_345kV_3PH	*3-Phase fault on the Finney – Hitchland 345kV near the Finney bus.*
37	FLT_FINNEY_HITCHLND7_345kV_1PH	*Single-phase fault similar to previous fault.*
38	FLT_SPEARVLL7_GRAYCO_345kV_3PH	*3-Phase fault on the Spearville – Gray County(Buckner) 345kV near the Spearville bus.*
39	FLT_SPEARVLL7_GRAYCO_345kV_1PH	*Single-phase fault similar to previous fault.*
40	FLT_SPEARVLL7_POSTRCK7_345kV_3PH	*3-Phase fault on the Spearville – Post Rock 345kV near the Holcomb bus.*
41	FLT_SPEARVLL7_POSTRCK7_345kV_1PH	*Single-phase fault similar to previous fault.*
42	FLT_SPEARVLL7_SPEARVLL6_345_230kV_3PH	*3-Phase fault on the Spearville 345/230kV transformer near the Spearville 345kV bus.*
43	FLT_POSTRCK7_POSTRCK6_345_230kV_3PH	*3-Phase fault on the Post Rock 345/230kV near the Post Rock 345kV bus.*
44	FLT_POSTRCK7_AXTELL_345kV_3PH	*3-Phase fault on the Post Rock – Axtell 345kV near the Post Rock bus.*
45	FLT_POSTRCK7_AXTELL_345kV_1PH	*Single-phase fault similar to previous fault.*

Power Factor Analysis

No additional power factor analysis was performed for this study. Prior power factor requirements determined during the DISIS-2012-001 are still considered valid.

Results

Results of the stability analysis are summarized in Table 6. These results are valid for GEN-2012-002 interconnecting with a generation amount up to 101.2 MW. The results indicate that the transmission system remains stable for all contingencies studied.

Table 6: Fault Analysis Results for Limited Operation

	Contingency Number and Name	2012 SP	2012 WP
1	FLT_G1202TAP_PILE_115kV_3PH	Stable	Stable
2	FLT_G1202TAP_PILE_115kV_1PH	Stable	Stable
3	FLT_G1202TAP_SCOTTCITY3_115kV_3PH	Stable	Stable
4	FLT_G1202TAP_SCOTTCITY3_115kV_1PH	Stable	Stable
5	FLT_DOBSON_PILE_115kV_3PH	Stable	Stable
6	FLT_DOBSON_PILE_115kV_1PH	Stable	Stable
7	FLT_DOBSON_MORRIS_115kV_3PH	Stable	Stable
8	FLT_DOBSON_MORRIS_115kV_1PH	Stable	Stable
9	FLT_DOBSON_KSAVEWTP_115kV_3PH	Stable	Stable
10	FLT_DOBSON_KSAVEWTP_115kV_1PH	Stable	Stable
11	FLT_DOBSON_LOWETAP_115kV_3PH	Stable	Stable
12	FLT_DOBSON_LOWETAP_115kV_1PH	Stable	Stable
13	FLT_SCOTTCITY3_SCOTTCTY2_115_69kV_3PH	Stable	Stable
14	FLT_SCOTTCITY3_SETAB_115kV_3PH	Stable	Stable
15	FLT_SCOTTCITY3_SETAB_115kV_1PH	Stable	Stable
16	FLT_SCOTTCITY3_MANNGTAP_115kV_3PH	Stable	Stable
17	FLT_SCOTTCITY3_MANNGTAP_115kV_1PH	Stable	Stable
18	FLT_SETAB3_CTYSERV_115kV_3PH	Stable	Stable
19	FLT_SETAB3_CTYSERV_115kV_1PH	Stable	Stable
20	FLT_SETAB3_CNTRLPLNS_115kV_3PH	Stable	Stable
21	FLT_SETAB3_CNTRLPLNS_115kV_1PH	Stable	Stable
22	FLT_SETAB7_SETAB3_345_115kV_3PH	Stable	Stable
23	FLT_SETAB7_MINGO7_345kV_3PH	Stable	Stable
24	FLT_SETAB7_MINGO7_345kV_1PH	Stable	Stable
25	FLT_SETAB7_HOLCOMB7_345kV_3PH	Stable	Stable
26	FLT_SETAB7_HOLCOMB7_345kV_1PH	Stable	Stable
27	FLT_MINGO7_REDWILLOW_345kV_3PH	Stable	Stable
28	FLT_MINGO7_REDWILLOW_345kV_1PH	Stable	Stable
29	FLT_HOLCOMB7_FINNEY7_345kV_3PH	Stable	Stable
30	FLT_HOLCOMB7_FINNEY7_345kV_1PH	Stable	Stable
31	FLT_HOLCOMB7_GRAYCO_345kV_3PH	Stable	Stable
32	FLT_HOLCOMB7_GRAYCO_345kV_1PH	Stable	Stable
33	FLT_HOLCOMB7_HOLCOMB3_345_115kV_3PH	Stable	Stable
34	FLT_HOLCOMB3_PLYMELL_115kV_3PH	Stable	Stable
35	FLT_HOLCOMB3_PLYMELL_115kV_1PH	Stable	Stable
36	FLT_FINNEY_HITCHLND7_345kV_3PH	Stable	Stable
37	FLT_FINNEY_HITCHLND7_345kV_1PH	Stable	Stable
38	FLT_SPEARVLL7_GRAYCO_345kV_3PH	Stable	Stable
39	FLT_SPEARVLL7_GRAYCO_345kV_1PH	Stable	Stable
40	FLT_SPEARVLL7_POSTRCK7_345kV_3PH	Stable	Stable
41	FLT_SPEARVLL7_POSTRCK7_345kV_1PH	Stable	Stable
42	FLT_SPEARVLL7_SPEARVLL6_345_230kV_3PH	Stable	Stable
43	FLT_POSTRCK7_POSTRCK6_345_230kV_3PH	Stable	Stable
44	FLT_POSTRCK7_AXTELL_345kV_3PH	Stable	Stable
45	FLT_POSTRCK7_AXTELL_345kV_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 7.

Table 7: LVRT Contingencies

	Contingency Number and Name	Description
1	FLT_G1202TAP_PILE_115kV_3PH	*3-Phase fault on the GEN-2012-002 Tap – Pile 115kV near the GEN-2012-002 bus.*
2	FLT_G1202TAP_PILE_115kV_1PH	*Single-phase fault similar to previous fault.*
3	FLT_G1202TAP_SCOTTCITY3_115kV_3PH	*3-Phase fault on the GEN-2012-002 Tap – Scott City 115kV near the GEN-2012-002 bus.*
4	FLT_G1202TAP_SCOTTCITY3_115kV_1PH	*Single-phase fault similar to previous fault.*

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. GEN-2012-002 is found to be in compliance with FERC Order #661A.

Conclusion

<OMITTED TEXT> (Interconnection Customer; GEN-2012-002) has requested a System ImpactStudy under the Southwest Power Pool Open Access Transmission Tariff (OATT) for 101.2 MW of wind generation to be interconnected as an Energy Resource (ER) into the transmission system of Sunflower Electric Power Corporation (SUNC) in Scott County, Kansas. GEN-2012-002, 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 Table 2 can be placed into service.

Power flow analysis indicates that the Customer (GEN-2012-002) can inject up to and including 101.2 MW of generation into the transmission system. This generation interconnection customer only requested to be studied as an Energy Resource (ER).

Transient stability analysis indicates that the transmission system will remain stable for the contingencies listed within Table 5 with the addition of GEN-2012-002 generation. Additionally, GEN-2012-002 was found to be in compliance with FERC Order #661A when studied as listed within this report.

A restudy of the DISIS-2012-001 has indicated that the Customer will be responsible for $9M (2012) of transmission system improvements in order to be granted full interconnection service. Of the $9M, $4M will be required to add a second 345/115/13.8kV transformer at SUNC's Holcomb substation to mitigate injection issues at the Customer's POI. The remaining $5M is associated with the Customer's 115kV POI Network Upgrades.

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.

Appendix

Appendix A – GEN-2012-002 LOIS Constraints <20%

These results are the constraints associated with a TDF below 20%, or those not requiring mitigation for those requests asking for ERIS.

Season	Group	Direction	Monitored Element	Rate A (MVA)	Rate B (MVA)	TDF	TC% Loading	Contingency
12G	04ALL	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.05	166.8	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.05	165.9	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	126.0	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	126.0	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	122.7	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	122.6	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SEWARD - ST JOHN 115KV CKT 1'	79.7	88	0.04	119.9	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'
12G	03G12_02	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.04	118.3	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.14	116.2	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.14	116.1	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	112.6	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	03G12_02	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.05	112.4	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	03G12_02	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.05	111.9	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	110.5	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	109.5	'G11-17T 345.00 - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	109.5	'G11-17T 345.00 - SPEARVILLE 345KV CKT 1'
12G	04ALL	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	330.3	355.3	0.17	108.7	'G11-17T 345.00 - SPEARVILLE 345KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.04	108.7	'G11-17T 345.00 - SPEARVILLE 345KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.04	108.7	'G11-17T 345.00 - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.14	108.6	'CIRCLE - MULLERGREN 230KV CKT 1'
12G	04ALL	'TO->FROM'	'MULLERGREN - SPEARVILLE 230KV CKT 1'	330.3	355.3	0.17	108.6	'G11-17T 345.00 - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	108.2	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
12G	04ALL	'FROM->TO'	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'	280	308	0.08	107.9	'RENO COUNTY - SUMMIT 345KV CKT 1'

12G	04G12_02	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.05	107.9	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03	107.5	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03	107.5	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04G12_02	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.05	107.4	'RENO COUNTY - WICHITA 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	107.0	'G11-17T 345.00 - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	107.0	'G11-17T 345.00 - SPEARVILLE 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03	106.8	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03	106.8	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'CIRCLE (CIRCLE1X) 230/115/13.8KV TRANSFORMER CKT 1'	280	308	0.08	106.8	'RENO COUNTY - SUMMIT 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	106.7	'FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	106.7	'CIRCLE - MULLERGREN 230KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.13	106.5	'AXTELL - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.05	106.4	'CIRCLE - MULLERGREN 230KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	106.0	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03	105.8	'MULLERGREN - SPEARVILLE 230KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.04	105.4	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.04	105.2	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	104.6	'FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.04	104.6	'CIRCLE - MULLERGREN 230KV CKT 1'
12G	04ALL	'FROM->TO'	'SEWARD - ST JOHN 115KV CKT 1'	79.7	88	0.04	104.2	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SEWARD - ST JOHN 115KV CKT 1'	79.7	88	0.04	104.2	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03	103.8	'SEWARD - ST JOHN 115KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03	103.8	'SPP-MKEC-06'
12G	04ALL	'FROM->TO'	'SEWARD - ST JOHN 115KV CKT 1'	79.7	88	0.05	103.2	'CIRCLE - MULLERGREN 230KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	102.9	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	102.8	'AXTELL - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10	102.5	'GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.14	102.5	'FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	102.5	'MIDW-CATB05'

12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	102.5	'HUNTSVILLE - ST_JOHN 115KV CKT 1'
12G	04ALL	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04	102.3	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'ST JOHN - ST_JOHN 115KV CKT 1'	86	86	0.04	102.2	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	110	110	0.04	102.0	'Hitchland Interchange - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'FLATRDG3 - HARPER 138KV CKT 1'	110	110	0.04	102.0	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'TO->FROM'	'HAYS PLANT - SOUTH HAYS 115KV CKT 1'	80	88	0.04	101.9	'KNOLL 230 - POSTROCK6 230.00 230KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	101.6	'HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1'
12G	04ALL	'FROM->TO'	'G01_039AT 115.00 - GREENSBURG 115KV CKT 1'	120.7	129.5	0.03	101.2	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'
12G	04ALL	'FROM->TO'	'MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1'	100	110	0.03	106.8	'FINNEY SWITCHING STATION - STEVENSCO 345.00 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10	101.0	'GEN532652 1-JEFFREY ENERGY CENTER UNIT 2'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10	101.0	'GEN532653 1-JEFFREY ENERGY CENTER UNIT 3'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	100.9	'LAWTON EASTSIDE - OKLAUNION 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10	100.9	'JEFFREY ENERGY CENTER - SUMMIT 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	100.8	'AXTELL - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.10	100.6	'GEN532651 1-JEFFREY ENERGY CENTER UNIT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	100.6	'MIDW-CATB05'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	100.6	'HUNTSVILLE - ST_JOHN 115KV CKT 1'
12G	04ALL	'FROM->TO'	'Harrington Station Mid Bus - NICHOLS STATION 230KV CKT 2'	478	617	0.07	100.4	'HARRINGTON STATION - NICHOLS STATION 230KV CKT 1'
12G	04ALL	'FROM->TO'	'GREENSBURG - SUN CITY 115KV CKT 1'	120.7	129.5	0.04	100.4	'G11-17T 345.00 - SPEARVILLE 345KV CKT 1'
12G	04ALL	'FROM->TO'	'GREENSBURG - SUN CITY 115KV CKT 1'	120.7	129.5	0.04	100.3	'G11-17T 345.00 - POST ROCK 345KV CKT 1'
12G	04ALL	'FROM->TO'	'MEDICINE LODGE (MED-LDG4) 138/115/2.72KV TRANSFORMER CKT 1'	56	65	0.03	100.2	'SPP-SWPS-03'
12G	04ALL	'FROM->TO'	'HARRINGTON STATION - NICHOLS STATION 230KV CKT 1'	478	617	0.07	100.1	'Harrington Station Mid Bus - NICHOLS STATION 230KV CKT 2'
12G	03G12_02	'FROM->TO'	'Harrington Station Mid Bus - NICHOLS STATION 230KV CKT 2'	478	617	0.07	96.2	'HARRINGTON STATION - NICHOLS STATION 230KV CKT 1'
12G	03G12_02	'FROM->TO'	'HARRINGTON STATION - NICHOLS STATION 230KV CKT 1'	478	617	0.07	95.8	'Harrington Station Mid Bus - NICHOLS STATION 230KV CKT 2'

Appendix B – GEN-2012-002 DISIS Constraints <20%

These results are the constraints associated with a TDF below 20%, or those not requiring mitigation for those requests asking for ERIS.

Season	Group	Direction	Monitored Element	Rate A (MVA)	Rate B (MVA)	TDF	TC% Loading	Contingency
12G	03ALL	'FROM->TO'	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'	400	440	0.03	123.0	'BENTON - WICHITA 345KV CKT 1'
12G	03ALL	'FROM->TO'	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'	400	440	0.03	122.1	'BENTON - WICHITA 345KV CKT 1'
12G	03ALL	'TO->FROM'	'DEAF SMITH COUNTY INTERCHANGE - S-RANDLCO 230.00 230KV CKT 1'	318	350	0.04	117.1	'PLANT X STATION - S-RANDLCO 230.00 230KV CKT 1'
12G	03ALL	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03	116.9	'AXTELL - POST ROCK 345KV CKT 1'
12G	03ALL	'FROM->TO'	'EVANS ENERGY CENTER NORTH - MAIZE 138KV CKT 1'	382	382	0.04	110.0	'BENTON - WICHITA 345KV CKT 1'
12G	03ALL	'TO->FROM'	'CHISHOLM - MAIZE 138KV CKT 1'	382	382	0.04	107.5	'BENTON - WICHITA 345KV CKT 1'
12G	03ALL	'TO->FROM'	'BENTON - WICHITA 345KV CKT 1'	956	956	0.12	106.4	'G08-13T 345.00 - WOODRING 345KV CKT 1'
12G	03ALL	'TO->FROM'	'CIMARRON - MATTHEWSON 345.00 345KV CKT 1'	956	956	0.10	105.6	'MATTHEWSON 345.00 - NORTHWEST 345KV CKT 1'
12G	03ALL	'TO->FROM'	'CIMARRON - MATTHEWSON 345.00 345KV CKT 2'	956	956	0.10	105.6	'MATTHEWSON 345.00 - NORTHWEST 345KV CKT 1'
12G	3	'FROM->TO'	'EVANS ENERGY CENTER NORTH - MAIZE 138KV CKT 1'	382	382	0.04	100.2	'BENTON - WICHITA 345KV CKT 1'
12G	3	'FROM->TO'	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'	400	440	0.04	98.8	'BENTON - WICHITA 345KV CKT 1'
12G	3	'FROM->TO'	'WICHITA (WICHT12X) 345/138/13.8KV TRANSFORMER CKT 1'	400	440	0.04	98.4	'BENTON - WICHITA 345KV CKT 1'
12G	3	'TO->FROM'	'CHISHOLM - MAIZE 138KV CKT 1'	382	382	0.04	97.5	'BENTON - WICHITA 345KV CKT 1'
12G	3	'FROM->TO'	'SMOKYHL6 230.00 - SUMMIT 230KV CKT 1'	319	319	0.03	97.0	'AXTELL - POST ROCK 345KV CKT 1'
12G	3	'TO->FROM'	'DEAF SMITH COUNTY INTERCHANGE - S-RANDLCO 230.00 230KV CKT 1'	318	350	0.04	96.2	'PLANT X STATION - S-RANDLCO 230.00 230KV CKT 1'
12G	4	'FROM->TO'	'SETAB (SETAB) 345/115/13.8KV TRANSFORMER CKT 1'	280	280	0.72	95.6	'HOLCOMB (HOLCOMB) 345/115/13.8KV TRANSFORMER CKT 1'
12G	4	'FROM->TO'	'SETAB (SETAB) 345/115/13.8KV TRANSFORMER CKT 1'	280	280	0.72	95.6	'HOLCOMB (HOLCOMB) 345/115/13.8KV TRANSFORMER CKT 1'