

Impact Study of Limited Operation for Generator Interconnection

GEN-2009-008

March 2013
Generation Interconnection



Executive Summary

<OMITTED TEXT> (Customer; GEN-2009-008) has requested a Limited Operation System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for 198.9 MW of wind generation to be interconnected as an Energy Resource (ER) into the Transmission System of Midwest Energy (MIDW) in Ness County, Kansas. GEN-2009-008, 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-2010-001 (or most recent iteration) Impact Study can be placed into service.

The Customer has requested a restudy of the LOIS that was previously performed and posted to SPP OASIS on August 31, 2011. That study can be found at the following web address: http://sppoasis.spp.org/documents/swpp/transmission/studies/files/2009_Generation_Studies/GEN-2009-008_LOIS_8-31-11.pdf. The Customer has requested a restudy of this LOIS to confirm that adequate interconnection service remains after the withdrawals and Commercial Operation commencement of certain higher queued projects.

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 March 2014. GEN-2009-008 is requesting the interconnection of one hundred seventeen (117) General Electric 1.7 MW wind turbine generators and associated facilities into the 230kV South Hays 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 GEN-2009-008 request.

Power flow analysis from this LOIS has determined that the GEN-2009-008 request can interconnect 198.9 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.

The GEN-2009-008 Interconnection request is currently in the process of being restudied for the requested modification to change wind turbines from General Electric 1.6 MW to General Electric 1.7 MW. Transient stability analysis for this LOIS has determined that with reactive equipment

identified in the GEN-2009-008 turbine restudy, the transmission system will remain stable for the eighty-one (81) selected faults for the limited operation interconnection of GEN-2009-008 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.

Table of Contents

Executive Summary	i
Table of Contents	iii
Purpose	1
Facilities	4
Generating Facility	4
Interconnection Facilities	4
Base Case Network Upgrades	4
Power Flow Analysis	5
Model Preparation	5
Study Methodology and Criteria	5
Results	5
Limited Operation and System Reliability	6
Stability Analysis	12
Model Preparation	12
Disturbances.....	12
Results	15
FERC LVRT Compliance.....	16
Conclusion	18

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 Midwest Energy (MIDW).

The purpose of this study is to reevaluate the impacts of interconnecting GEN-2009-008 request of 198.9 MW comprised of one hundred seventeen (117) General Electric 1.7 MW wind turbine generators and associated facilities interconnecting into the 230kV South Hays substation in Ness County, Kansas. 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 March of 2014.

The Customer has requested a restudy of the LOIS that was previously performed and posted to SPP OASIS on August 31, 2011. That study can be found at the following web address: http://sppoasis.spp.org/documents/swpp/transmission/studies/files/2009_Generation_Studies/GEN-2009-008_LOIS_8-31-11.pdf. The Customer has requested a restudy of this LOIS to confirm that adequate interconnection service remains after the withdrawals and Commercial Operation commencement of certain higher queued projects.

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 3/2014 in-service of GEN-2009-008 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
GEN-2001-039A	105.0	105.0	Wind	Tap Greensburg - Ft Dodge (Shooting Star Tap) 115kV	Commercial Operation
GEN-2001-039M	99.0	99.0	Wind	Central Plains Tap 115kV	Commercial Operation
GEN-2002-025A	150.0	150.0	Wind	Spearville 230kV	Commercial Operation
GEN-2003-006A	200.0	200.0	Wind	Elm Creek 230kV	Commercial Operation
GEN-2003-019	250.0	250.0	Wind	Smoky Hills Tap 230kV	Commercial Operation
GEN-2004-014	154.5	154.5	Wind	Spearville 230kV	Commercial Operation
GEN-2005-012	167.0	250.0	Wind	Spearville 345kV	Commercial Operation
GEN-2006-021	101.0	101.0	Wind	Flat Ridge Tap 138kV	Commercial Operation
GEN-2007-040	132.0	200.0	Wind	Buckner 345kV	Commercial Operation
GEN-2008-018	405.0	405.0	Wind	Finney 345kV	IA Executed/On Schedule
GEN-2008-079	98.9	98.9	Wind	Tap Cudahy - Ft Dodge 115kV	Commercial Operation
GEN-2009-008	199.5	199.5	Wind	South Hays 230kV	IA Executed/On Suspension
GEN-2009-020	48.3	48.3	Wind	Tap Nekoma - Bazine 69kV	IA Executed/On Suspension
GEN-2010-009	165.6	165.6	Wind	Buckner 345kV	Commercial Operation

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. GEN-2009-008 was included within the DISIS-2010-001 that was posted July 30, 2010. The cluster has been restudied a number of times since the original posting. These reports can be located here at the following GI Study URL:

http://sppoasis.spp.org/documents/swpp/transmission/GenStudies.cfm?YearType=2010_Impact_Studies.

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

Upgrade Project	Type	Description	Status
PostRock 345/230/13.8kV Autotransformer CKT 2	GIA Appendix A (2ca) Shared Network Upgrade to be designed, constructed, and owned by the Transmission Owner.	DISIS-2010-001 Customers	Not authorized to begin construction
South Hays – Hays Plant – Vine Street 115kV CKT 1 (Rebuild approx. 4 miles of 115kV)	GIA Appendix A (2ca) Shared Network Upgrade to be designed, constructed, and owned by the Transmission Owner.	DISIS-2010-001 Customers	Not authorized to begin construction
Hitchland 345/230kV Autotransformer CKT 2	Most recent iteration of DISIS 2010-001. 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
Spearville – Clark – Thistle 345kV Dbl CKT	Most recent iteration of DISIS 2010-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Priority Project	Current Estimated In-Service date of 12/31/2014
Thistle – Wichita 345kV Dbl CKT	Most recent iteration of DISIS 2010-001. Previous Network Upgrade not responsibility of Customer but required to support full interconnection.	Build Priority Project	Current Estimated In-Service date of 12/31/2014

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
GEN-2005-012	83.0	250.0	Wind	Spearville 345kV	IA Executed/On Schedule for 2015
GEN-2006-006	205.5	205.5	Wind	Spearville 345kV	IA Executed/On Schedule for 2015
GEN-2006-032	200.0	200.0	Wind	South Hays 230kV	IA Executed/On Suspension
GEN-2006-040	108.0	108.0	Wind	Mingo 115kV	IA Executed/On Suspension
GEN-2007-011	135.0	135.0	Wind	Syracuse 115kV	IA Executed/On Suspension
GEN-2007-038	200.0	200.0	Wind	Spearville 345kV	IA Executed/On Schedule for 08/25/2015
GEN-2007-040	68.0	200.0	Wind	Buckner 345kV	IA Executed/On Schedule for 2012
GEN-2008-017	300.0	300.0	Wind	Setab 345kV	IA Executed/On Schedule for 10/2015
GEN-2008-025	101.0	101.0	Wind	Ruleton 115kV	IA Executed/On Schedule for 06/01/2015
GEN-2008-092	201.0	201.0	Wind	Knoll 230kV	IA Pending
GEN-2008-124	200.1	200.1	Wind	Spearville 345kV	IA Executed/On Schedule for 01/01/2016
GEN-2010-015	200.1	200.1	Wind	Spearville 345kV	IA Executed/On Schedule for 01/01/2015

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

GEN-2009-008 Interconnection Customer’s request to interconnect a total of 198.9 MW is comprised of one hundred seventeen (117) General Electric 1.7 MW wind turbine generators and associated interconnection facilities.

Interconnection Facilities

The POI for GEN-2009-008 Interconnection Customer is through a tap on the South Hays 230kV substation in Ness County, Kansas. 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.

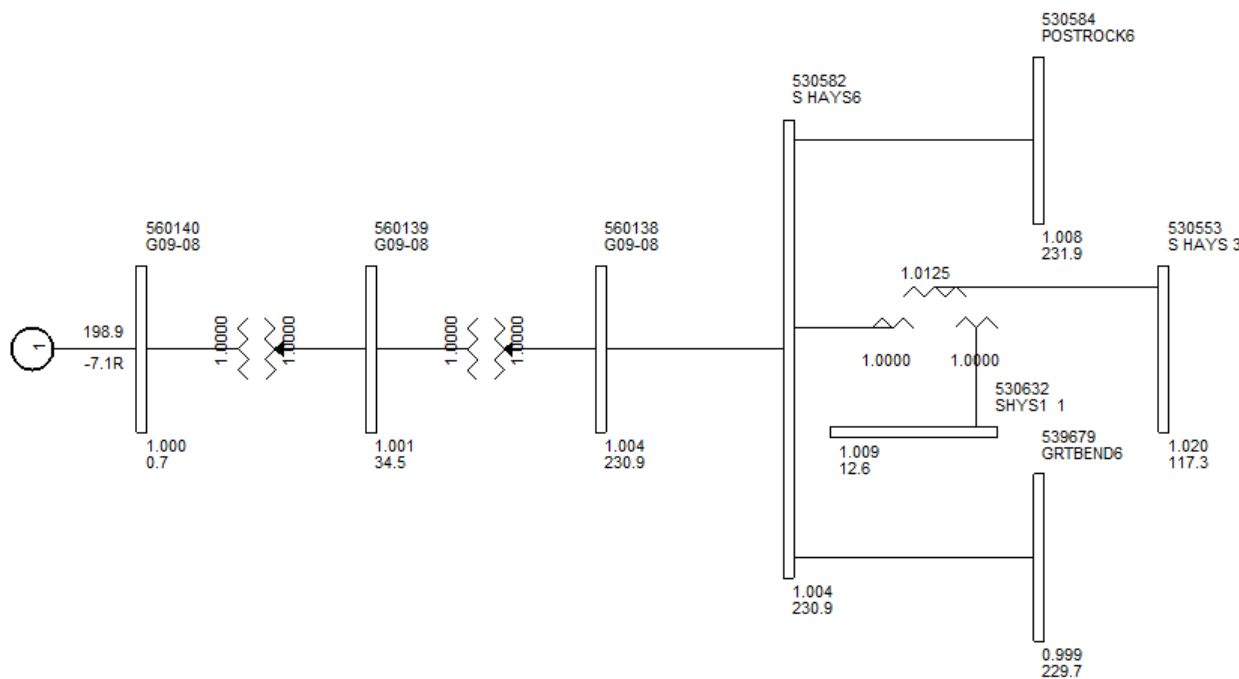


Figure 1: Proposed POI Configuration and Request Power Flow Model

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 projects that have in-service dates prior to the GEN-2009-008 LOIS requested in-service date of March 2014. 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 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 generation into the MIDW transmission system as requested before all required upgrades listed within the DISIS-2010-001 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, 5 and Appendix A 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 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.

Limited Operation and System Reliability

In no way does this study guarantee limited operation for all periods of time. It should be noted that although this LOIS 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 GEN-2009-008 LOIS @ 198.9MW

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	Max MW Available	Contingency
All	04G09_008		None					198.9	
All	03G09_008		None					198.9	
All	4		None					198.9	
All	3		None					198.9	

Table 5: Additional Constraints of GEN-2009-008 LOIS @ 198.9MW

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	ATC Available	Contingency
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	108.3	0	BASE CASE
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	116.1	0	LAWTON EASTSIDE - OKLAUNION 345KV CKT 1
Spring	03G09_008	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.047	110.1	0	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	133.7	0	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	113.0	0	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	116.8	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
Spring	03G09_008	TO->FROM	HAYS PLANT - SOUTH HAYS 115KV CKT 1	83	99	0.162	137.1	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	03G09_008	TO->FROM	KNOLL - N HAYS3 115.00 115KV CKT 1	83	99	0.162	104.5	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	03G09_008	FROM->TO	HAYS PLANT - VINE STREET 115KV CKT 1	80	88	0.162	131.0	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	03G09_008	TO->FROM	N HAYS3 115.00 - VINE STREET 115KV CKT 1	83	99	0.162	109.1	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.039	111.9	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.043	113.6	0	KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.031	118.6	0	POST ROCK - SPEARVILLE 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.046	113.5	0	AXTELL - POST ROCK 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.043	117.0	0	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	114.9	0	HUNTSVILLE - ST_JOHN 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	113.9	0	HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	121.8	0	ST JOHN - ST_JOHN 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.041	112.5	0	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	112.8	0	EMPORIA ENERGY CENTER - WICHITA 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	111.9	0	RENO COUNTY - SUMMIT 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.044	119.5	0	RENO COUNTY - WICHITA 345KV CKT 1
Spring	03G09_008	FROM->TO	MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1	100	110	0.067	113.1	0	RENO COUNTY - WICHITA 345KV CKT 1

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	ATC Available	Contingency
Spring	03G09_008	FROM->TO	MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1	100	110	0.067	113.0	0	RENO COUNTY - WICHITA 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	112.4	0	ROSE HILL - WOLF CREEK 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	104.8	0	LACYGNE - WOLF CREEK 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	119.8	0	CIRCLE - MULLERGREN 230KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	113.0	0	CENTENNIAL - COWSKIN 138KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	112.1	0	CENTENNIAL - WACO 138KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	115.7	0	45TH ST4 138.00 - COWSKIN 138KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	114.6	0	EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	115.8	0	45TH ST4 138.00 - EVANS ENERGY CENTER SOUTH 138KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	113.9	0	HOOVER NORTH - LAKERIDGE 138KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	104.6	0	CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
Spring	03G09_008	FROM->TO	ST JOHN - ST JOHN 115KV CKT 1	86	86	0.037	100.6	0	FLATRDG3 - HARPER 138KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	114.5	0	CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	114.6	0	CUDAHY - KISMET 3 115.00 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	115.1	0	CUDAHY - G08-79T 115.00 115KV CKT 1
Spring	03G09_008	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.054	101.4	0	GREENSBURG - SUN CITY 115KV CKT 1
Spring	03G09_008	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.054	106.2	0	GREENSBURG - SSTARTP3 115.00 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.030	100.9	0	GREAT BEND TAP - MULLERGREN 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.030	101.0	0	GREAT BEND TAP - SEWARD 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.031	116.3	0	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	112.5	0	GRAND ISLAND - SWEETWATER 345KV CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	112.0	0	Hitchland Interchange (H TB80155502) 345/230/13.2KV TRANSFORMER CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.038	112.5	0	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.038	112.5	0	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.031	115.8	0	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	115.0	0	MIDW-CATB05
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	108.3	0	NC1_GEN-NEBRASKA CITY 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	113.4	0	SPP-SWPS-03
Spring	03G09_008	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.047	110.3	0	SPP-SWPS-05
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	133.8	0	SPP-SWPS-05
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	113.4	0	SPP-WERE-32
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	112.7	0	GEN514805 1-SOONER UNIT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	112.4	0	GEN514806 1-SOONER UNIT 2
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.2	0	GEN523971 1-HARRINGTON GEN #1 24 KV
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.2	0	GEN523972 1-HARRINGTON GEN #2 24 KV

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	ATC Available	Contingency
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.2	0	GEN523973 1-HARRINGTON GEN #3 24 KV
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.3	0	GEN525561 1-TOLK GEN #1 24 KV
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.0	0	GEN525562 1-TOLK GEN #2 24 KV
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	115.5	0	GEN532722 1-EVANS ENERGY CENTER UNIT 2
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	119.3	0	GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.3	0	GEN539670 4-JUDSON LARGE GENERATOR
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	104.5	0	GEN539753 1-CLR_2 0.6900
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.8	0	GEN539767 1-GRAY COUNTY WIND FARM
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.1	0	GEN560140 1-G09-08 0.7000
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	104.2	0	GEN560209 1-G07-40 0.5750
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.8	0	GEN560232 1-G08-79 0.5750
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.2	0	GEN560238 1-G10-09 0.6900
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.4	0	GEN560514 1-G04_014 0.6900
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.7	0	GEN560522 1-G05-12 0.6900
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.4	0	GEN640009 1-COOPER NUCLEAR STATION
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.3	0	GEN640010 1-GERALD GENTLEMAN STATION UNIT 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.5	0	GEN640011 2-GERALD GENTLEMAN STATION UNIT 2
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	104.5	0	GEN645001 1-FORT CALHOUN 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.8	0	GEN645011 1-NEBRASKA CITY 1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.4	0	GEN645012 2-NEBRASKA CITY 2
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	104.4	0	GEN659103 1-ANTELOPE VALLEY UNIT1
Spring	03G09_008	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	104.4	0	GEN659107 2-ANTELOPE VALLEY UNIT2
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	106.7	0	BASE CASE
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	114.5	0	LAWTON EASTSIDE - OKLAUNION 345KV CKT 1
Spring	3	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.047	108.1	0	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	131.4	0	FINNEY SWITCHING STATION - Hitchland Interchange 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	111.4	0	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	114.9	0	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
Spring	3	TO->FROM	HAYS PLANT - SOUTH HAYS 115KV CKT 1	83	99	0.162	130.5	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	3	FROM->TO	HAYS PLANT - VINE STREET 115KV CKT 1	80	88	0.162	123.5	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	3	TO->FROM	N HAYS3 115.00 - VINE STREET 115KV CKT 1	83	99	0.162	102.4	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.039	110.2	0	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.043	111.7	0	KNOLL 230 - SMOKYHL6 230.00 230KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.031	117.2	0	POST ROCK - SPEARVILLE 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.046	111.4	0	AXTELL - POST ROCK 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.043	115.0	0	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	113.0	0	HUNTSVILLE - ST_JOHN 115KV CKT 1

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	ATC Available	Contingency
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	112.0	0	HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	119.9	0	ST JOHN - ST JOHN 115KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.041	110.8	0	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	111.2	0	EMPORIA ENERGY CENTER - WICHITA 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	110.3	0	RENO COUNTY - SUMMIT 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.044	117.6	0	RENO COUNTY - WICHITA 345KV CKT 1
Spring	3	FROM->TO	MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1	100	110	0.067	110.8	0	RENO COUNTY - WICHITA 345KV CKT 1
Spring	3	FROM->TO	MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1	100	110	0.067	110.7	0	RENO COUNTY - WICHITA 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	110.9	0	ROSE HILL - WOLF CREEK 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	103.2	0	LACYGNE - WOLF CREEK 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	117.8	0	CIRCLE - MULLERGREN 230KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	111.5	0	CENTENNIAL - COWSKIN 138KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	110.5	0	CENTENNIAL - WACO 138KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	114.1	0	45TH ST4 138.00 - COWSKIN 138KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	113.0	0	EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	114.2	0	45TH ST4 138.00 - EVANS ENERGY CENTER SOUTH 138KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	112.3	0	HOOVER NORTH - LAKERIDGE 138KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	103.1	0	CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	112.9	0	CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	113.0	0	CUDAHY - KISMET 3 115.00 115KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	113.5	0	CUDAHY - G08-79T 115.00 115KV CKT 1
Spring	3	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.054	103.5	0	GREENSBURG - SSTARTP3 115.00 115KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.031	114.8	0	NORTH JUDSON LARGE SUB - SPEARVILLE 115KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	110.9	0	GRAND ISLAND - SWEETWATER 345KV CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.037	110.5	0	Hitchland Interchange (H TB80155502) 345/230/13.2KV TRANSFORMER CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.038	110.8	0	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.038	110.8	0	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.031	114.3	0	SPEARVILLE (SPEARVL6) 230/115/13.8KV TRANSFORMER CKT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.042	113.1	0	MIDW-CATB05
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	106.7	0	NC1_GEN-NEBRASKA CITY 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	111.8	0	SPP-SWPS-03
Spring	3	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.047	108.3	0	SPP-SWPS-05
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.047	131.7	0	SPP-SWPS-05
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	111.8	0	SPP-WERE-32

Season	Dispatch Group	Flow	Monitored Element	RATEA (MVA)	RATEB (MVA)	TDF	TC% LOADING	ATC Available	Contingency
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	111.2	0	GEN514805 1-SOONER UNIT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	110.9	0	GEN514806 1-SOONER UNIT 2
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.6	0	GEN523971 1-HARRINGTON GEN #1 24 KV
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.6	0	GEN523972 1-HARRINGTON GEN #2 24 KV
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.6	0	GEN523973 1-HARRINGTON GEN #3 24 KV
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.7	0	GEN525561 1-TOLK GEN #1 24 KV
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.3	0	GEN525562 1-TOLK GEN #2 24 KV
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	113.9	0	GEN532722 1-EVANS ENERGY CENTER UNIT 2
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	117.8	0	GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.9	0	GEN539753 1-CLR_2 0.6900
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.2	0	GEN539767 1-GRAY COUNTY WIND FARM
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.9	0	GEN560140 1-G09-08 0.7000
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.6	0	GEN560209 1-G07-40 0.5750
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.6	0	GEN560238 1-G10-09 0.6900
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	100.9	0	GEN560514 1-G04_014 0.6900
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.1	0	GEN560522 1-G05-12 0.6900
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.8	0	GEN640009 1-COOPER NUCLEAR STATION
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.9	0	GEN645001 1-FORT CALHOUN 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.3	0	GEN645011 1-NEBRASKA CITY 1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	101.8	0	GEN645012 2-NEBRASKA CITY 2
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.8	0	GEN659103 1-ANTELOPE VALLEY UNIT1
Spring	3	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	102.8	0	GEN659107 2-ANTELOPE VALLEY UNIT2

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 eighty-one (81) 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_SHAYS6_POSTROCK2_230kV_3PH	3-Phase fault on the South Hays – Post Rock 230kV line near the South Hays 230kV bus.
2	FLT_02_SHAYS6_POSTROCK2_230kV_1PH	Single-phase fault similar to previous fault.
3	FLT_03_POSTROCK2_KNOLL6_230kV_3PH	3-Phase fault on the Post Rock– Knoll 230kV line near the Post Rock 230kV bus.
4	FLT_04_POSTROCK2_KNOLL6_230kV_1PH	Single-phase fault similar to previous fault.
5	FLT_05_KNOLL6_SMKYHLS6_230kV_3PH	3-Phase fault on the Knoll – Smokey Hills 230kV line near the Knoll 230kV bus.
6	FLT_06_KNOLL6_SMKYHLS6_230kV_1PH	Single-phase fault similar to previous fault.
7	FLT_07_SMKYHLS6_SUMMIT6_230kV_3PH	3-Phase fault on the Smokey Hills – Summit 230kV line near the Smokey Hills 230kV bus.
8	FLT_08_SMKYHLS6_SUMMIT6_230kV_1PH	Single-phase fault similar to previous fault.
9	FLT_09_SHAYS6_GRTBEND6_230kV_3PH	3-Phase fault on the South Hays – Mullergren 230kV line near the South Hays 230kV bus.
10	FLT_10_SHAYS6_GRTBEND6_230kV_1PH	Single-phase fault similar to previous fault.
11	FLT_11_GRTBEND6_HEIZER6_230kV_3PH	3-Phase fault on the Mullergren – Heizer 230kV line near the Mullergren 230kV bus.
12	FLT_12_GRTBEND6_HEIZER6_230kV_1PH	Single-phase fault similar to previous fault.
13	FLT_13_GRTBEND6_CIRCLE6_230kV_3PH	3-Phase fault on the Mullergren – Circle 230kV line near the Mullergren 230kV bus.
14	FLT_14_GRTBEND6_CIRCLE6_230kV_1PH	Single-phase fault similar to previous fault.
15	FLT_15_GRTBEND6_SPEARV6_230kV_3PH	3-Phase fault on the Mullergren – Spearville 230kV line near the Mullergren 230kV bus.
16	FLT_16_GRTBEND6_SPEARV6_230kV_1PH	Single-phase fault similar to previous fault.
17	FLT_17_CIRCLE6_RICE6_230kV_3PH	3-Phase fault on the Circle – Rice 230kV line near the Circle 230kV bus.
18	FLT_18_CIRCLE6_RICE6_230kV_1PH	Single-phase fault similar to previous fault.
19	FLT_19_CIRCLE6_EMCPHER6_230kV_3PH	3-Phase fault on the Circle – East McPherson 230kV line near the Circle 230kV bus.
20	FLT_20_CIRCLE6_EMCPHER6_230kV_1PH	Single-phase fault similar to previous fault.
21	FLT_21_EMCPHER6_SUMMIT6_230kV_3PH	3-Phase fault on the East McPherson – Summit 230kV line near the East McPherson 230kV bus.
22	FLT_22_EMCPHER6_SUMMIT6_230kV_1PH	Single-phase fault similar to previous fault.
23	FLT_23_SHAYS3_HAYS3_115kV_3PH	3-Phase fault on the South Hays – Hays 115kV line near the South Hays 115kV bus.
24	FLT_24_SHAYS3_HAYS3_115kV_1PH	Single-phase fault similar to previous fault.
25	FLT_25_KNOLL3_SALINE3_115kV_3PH	3-Phase fault on the Knoll – Saline 115kV line near the Knoll 115kV bus.
26	FLT_26_KNOLL3_SALINE3_115kV_1PH	Single-phase fault similar to previous fault.
27	FLT_27_KNOLL3_NHAYS3_115kV_3PH	3-Phase fault on the Knoll – North Hays 115kV line near the Knoll 115kV bus.
28	FLT_28_KNOLL3_NHAYS3_115kV_1PH	Single-phase fault similar to previous fault.
29	FLT_29_KNOLL3_REDLINE3_115kV_3PH	3-Phase fault on the Knoll – Redline 115kV line near the Knoll 115kV bus.
30	FLT_30_KNOLL3_REDLINE3_115kV_1PH	Single-phase fault similar to previous fault.
31	FLT_31_GRTBEND3_HEIZER3_115kV_3PH	3-Phase fault on the Great Bend – Heizer 115kV line near the Great Bend 115kV bus.
32	FLT_32_GRTBEND3_HEIZER3_115kV_1PH	Single-phase fault similar to previous fault.
33	FLT_33_GRTBEND3_ELLSWTP3_115kV_3PH	3-Phase fault on the Great Bend – Pioneer Tap N.115kV line near the Great Bend 115kV bus.
34	FLT_34_GRTBEND3_ELLSWTP3_115kV_1PH	Single-phase fault similar to previous fault.
35	FLT_35_GRTBEND3_GBENDTP3_115kV_3PH	3-Phase fault on the Great Bend – Great Bend N. Tap 115kV line near the Great Bend 115kV bus.
36	FLT_36_GRTBEND3_GBENDTP3_115kV_1PH	Single-phase fault similar to previous fault.
37	FLT_37_HEIZER3_LAXTAP3_115kV_3PH	3-Phase fault on the Heizer – Lacross Tap 115kV line near the Heizer 115kV bus.
38	FLT_38_HEIZER3_LAXTAP3_115kV_1PH	Single-phase fault similar to previous fault.
39	FLT_39_ELLSWTP3_ROLLHLS3_115kV_3PH	3-Phase fault on the Pioneer Tap N.– Rolling Hills 115kV line near the Pioneer Tap N. 115kV bus.

Contingency Number and Name		Description
40	FLT_40_ELLSWTP3_ROLLHLS3_115kV_1PH	Single-phase fault similar to previous fault.
41	FLT_41_ELLSWTP3_RUSSELL3_115kV_3PH	3-Phase fault on the Pioneer Tap N.– Russells 115kV line near the Pioneer Tap N. 115kV bus.
42	FLT_42_ELLSWTP3_RUSSELL3_115kV_1PH	Single-phase fault similar to previous fault.
43	FLT_43_SETAB7_HOLCOMB_345kV_3PH	3-Phase fault on the Setab – Holcomb 345kV line near the Setab 345kV bus.
44	FLT_44_SETAB7_HOLCOMB_345kV_1PH	Single-phase fault similar to previous fault.
45	FLT_45_HOLCOMB_FINNEY_345kV_3PH	3-Phase fault on the Holcomb – Finney 345kV line near the Holcomb 345kV bus.
46	FLT_46_HOLCOMB_FINNEY_345kV_1PH	Single-phase fault similar to previous fault.
47	FLT_47_FINNEY_HITCHLAND7_345kV_3PH	3-Phase fault on the Finney– Hitchland 345kV line near the Finney 345kV bus.
48	FLT_48_FINNEY_HITCHLAND7_345kV_1PH	Single-phase fault similar to previous fault.
49	FLT_49_HOLCOMB_BUCKNER7_345kV_3PH	3-Phase fault on the Holcomb – Buckner 345kV line near the Holcomb 345kV bus.
50	FLT_50_HOLCOMB_BUCKNER7_345kV_1PH	Single-phase fault similar to previous fault.
51	FLT_51_BUCKNER7_SPERVIL7_345kV_3PH	3-Phase fault on the Buckner – Spearville 345kV line near the Buckner 345kV bus.
52	FLT_52_BUCKNER7_SPERVIL7_345kV_1PH	Single-phase fault similar to previous fault.
53	FLT_53_SPERVIL7_POSTROCK7_345kV_3PH	3-Phase fault on the Spearville – Post Rock 345kV line near the Spearville 345kV bus.
54	FLT_54_SPERVIL7_POSTROCK7_345kV_1PH	Single-phase fault similar to previous fault.
55	FLT_55_POSTROCK7_AXTELL3_345kV_3PH	3-Phase fault on the Post Rock – Axtell 345kV line near the Post Rock 345kV bus.
56	FLT_56_POSTROCK7_AXTELL3_345kV_1PH	Single-phase fault similar to previous fault.
57	FLT_57_AXTELL3_PAULINE3_345kV_3PH	3-Phase fault on the Axtell – Pauline 345kV line near the Axtell 345kV bus.
58	FLT_58_AXTELL3_PAULINE3_345kV_1PH	Single-phase fault similar to previous fault.
59	FLT_59_AXTELL3_SWEETW3_345kV_3PH	3-Phase fault on the Axtell – Sweetwater 345kV line near the Axtell 345kV bus.
60	FLT_60_AXTELL3_SWEETW3_345kV_1PH	Single-phase fault similar to previous fault.
61	FLT_61_SETAB7_MINGO7_345kV_3PH	3-Phase fault on the Setab – Mingo 345kV line near the Setab 345kV bus.
62	FLT_62_SETAB7_MINGO7_345kV_1PH	Single-phase fault similar to previous fault.
63	FLT_63_MINGO7_REDWILO3_345kV_3PH	3-Phase fault on the Mingo – Red Willow 345kV line near the Mingo 345kV bus.
64	FLT_64_MINGO7_REDWILO3_345kV_1PH	Single-phase fault similar to previous fault.
65	FLT_65_SETAB7_SETAB3_345_115kV_3PH	3-Phase fault on the Setab 345kV/115kV transformer near the Setab 345kV bus.
66	FLT_66_MINGO7_MINGO3_345_115kV_3PH	3-Phase fault on the Mingo 345kV/115kV transformer near the Mingo 345kV bus.
67	FLT_67_SPERVIL7_SPEARVL6_345_230kV_3PH	3-Phase fault on the Spearville 345kV/230kV transformer near the Spearville 345kV bus.
68	FLT_68_POSTROCK7_POSTROCK6_345_230kV_3PH	3-Phase fault on the Post Rock 345kV/230kV transformer near the Post Rock 345kV bus.
69	FLT_69_AXTELL3_AXTELL7_345_115kV_3PH	3-Phase fault on the Axtell 345kV/115kV transformer near the Axtell 115kV bus.
70	FLT_70_HOLCOMB7_HOLCOMB3_345_115kV_3PH	3-Phase fault on the Holcomb 345kV/115kV transformer near the Holcomb 345kV bus.
71	FLT_71_KNOLL6_KNOLL3_230_115kV_3PH	3-Phase fault on the Knoll 230kV/115kV transformer near the Knoll 230kV bus.
72	FLT_72_CIRCLE6_CIRCLE3_230_115kV_3PH	3-Phase fault on the Circle 230kV/115kV transformer near the Circle 230kV bus.
73	FLT_73_RICE6_RICE3_230_115kV_3PH	3-Phase fault on the Rice 230kV/115kV transformer near the Rice 230kV bus.
74	FLT_74_EMCPHER6_EMCPHER3_230kV_3PH	3-Phase fault on the East McPherson 230kV/115kV transformer near the East McPherson 230kV bus.
75	FLT_75_SPEARVL6_SPEARVL3_230_115kV_3PH	3-Phase fault on the Spearville 230kV/115kV transformer near the Spearville 230kV bus.

Contingency Number and Name		Description
76	FLT_76_SHAYS6_SHAYS3_230_115kV_3PH	3-Phase fault on the South Hays 230kV/115kV transformer near the South Hays 115kV bus.
77	FLT_77_CONCOR6_CONCOR3_230_115kV_3PH	3-Phase fault on the Concordia 230kV/115kV transformer near the Concordia 230kV bus.
78	FLT_78_HEIZER6_HEIZER3_230_115kV_3PH	3-Phase fault on the Heizer 230kV/115kV transformer near the Heizer 230kV bus.
79	FLT_79_NEKOMA3_NEKOMA2_115_69kV_3PH	3-Phase fault on the Nekoma 115kV/69kV transformer near the Nekoma 115kV bus.
80	FLT_80_HEIZER3_HEIZER2_115_69kV_3PH	3-Phase fault on the Heizer 115kV/69kV transformer near the Heizer 115kV bus.
81	FLT_81_SEWRDMW3_SEWARD2_115_69kV_3PH	3-Phase fault on the Seward 115kV/69kV transformer near the Seward 69kV bus.

Results

Results of the stability analysis are summarized in Table 7. These results are valid for GEN-2009-008 interconnecting with a generation amount up to 198.9 MW with reactive equipment identified in the GEN-2009-008 Turbine Restudy. The results indicate that the transmission system remains stable for all contingencies studied. The plots will be available upon request.

Table 7: Fault Analysis Results for Limited Operation

Contingency Number and Name		2014SP	2013WP
1	FLT_01_SHAYS6_POSTROCK2_230kV_3PH	Stable	Stable
2	FLT_02_SHAYS6_POSTROCK2_230kV_1PH	Stable	Stable
3	FLT_03_POSTROCK2_KNOLL6_230kV_3PH	Stable	Stable
4	FLT_04_POSTROCK2_KNOLL6_230kV_1PH	Stable	Stable
5	FLT_05_KNOLL6_SMKYHLS6_230kV_3PH	Stable	Stable
6	FLT_06_KNOLL6_SMKYHLS6_230kV_1PH	Stable	Stable
7	FLT_07_SMKYHLS6_SUMMIT6_230kV_3PH	Stable	Stable
8	FLT_08_SMKYHLS6_SUMMIT6_230kV_1PH	Stable	Stable
9	FLT_09_SHAYS6_GRTBEND6_230kV_3PH	Stable	Stable
10	FLT_10_SHAYS6_GRTBEND6_230kV_1PH	Stable	Stable
11	FLT_11_GRTBEND6_HEIZER6_230kV_3PH	Stable	Stable
12	FLT_12_GRTBEND6_HEIZER6_230kV_1PH	Stable	Stable
13	FLT_13_GRTBEND6_CIRCLE6_230kV_3PH	Stable	Stable
14	FLT_14_GRTBEND6_CIRCLE6_230kV_1PH	Stable	Stable
15	FLT_15_GRTBEND6_SPEARV6_230kV_3PH	Stable	Stable
16	FLT_16_GRTBEND6_SPEARV6_230kV_1PH	Stable	Stable
17	FLT_17_CIRCLE6_RICE6_230kV_3PH	Stable	Stable
18	FLT_18_CIRCLE6_RICE6_230kV_1PH	Stable	Stable
19	FLT_19_CIRCLE6_EMCPHER6_230kV_3PH	Stable	Stable
20	FLT_20_CIRCLE6_EMCPHER6_230kV_1PH	Stable	Stable
21	FLT_21_EMCPHER6_SUMMIT6_230kV_3PH	Stable	Stable
22	FLT_22_EMCPHER6_SUMMIT6_230kV_1PH	Stable	Stable
23	FLT_23_SHAYS3_HAYS3_115kV_3PH	Stable	Stable
24	FLT_24_SHAYS3_HAYS3_115kV_1PH	Stable	Stable
25	FLT_25_KNOLL3_SALINE3_115kV_3PH	Stable	Stable
26	FLT_26_KNOLL3_SALINE3_115kV_1PH	Stable	Stable
27	FLT_27_KNOLL3_NHAYS3_115kV_3PH	Stable	Stable
28	FLT_28_KNOLL3_NHAYS3_115kV_1PH	Stable	Stable
29	FLT_29_KNOLL3_REDLINE3_115kV_3PH	Stable	Stable
30	FLT_30_KNOLL3_REDLINE3_115kV_1PH	Stable	Stable
31	FLT_31_GRTBEND3_HEIZER3_115kV_3PH	Stable	Stable

	Contingency Number and Name	2014SP	2013WP
32	FLT_32_GRTBEND3_HEIZER3_115kV_1PH	Stable	Stable
33	FLT_33_GRTBEND3_ELLSWTP3_115kV_3PH	Stable	Stable
34	FLT_34_GRTBEND3_ELLSWTP3_115kV_1PH	Stable	Stable
35	FLT_35_GRTBEND3_GBENDTP3_115kV_3PH	Stable	Stable
36	FLT_36_GRTBEND3_GBENDTP3_115kV_1PH	Stable	Stable
37	FLT_37_HEIZER3_LAXTAP3_115kV_3PH	Stable	Stable
38	FLT_38_HEIZER3_LAXTAP3_115kV_1PH	Stable	Stable
39	FLT_39_ELLSWTP3_ROLLHLS3_115kV_3PH	Stable	Stable
40	FLT_40_ELLSWTP3_ROLLHLS3_115kV_1PH	Stable	Stable
41	FLT_41_ELLSWTP3_RUSSELL3_115kV_3PH	Stable	Stable
42	FLT_42_ELLSWTP3_RUSSELL3_115kV_1PH	Stable	Stable
43	FLT_43_SETAB7_HOLCOMB_345kV_3PH	Stable	Stable
44	FLT_44_SETAB7_HOLCOMB_345kV_1PH	Stable	Stable
45	FLT_45_HOLCOMB_FINNEY_345kV_3PH	Stable	Stable
46	FLT_46_HOLCOMB_FINNEY_345kV_1PH	Stable	Stable
47	FLT_47_FINNEY_HITCHLAND7_345kV_3PH	Stable	Stable
48	FLT_48_FINNEY_HITCHLAND7_345kV_1PH	Stable	Stable
49	FLT_49_HOLCOMB_BUCKNER7_345kV_3PH	Stable	Stable
50	FLT_50_HOLCOMB_BUCKNER7_345kV_1PH	Stable	Stable
51	FLT_51_BUCKNER7_SPERVIL7_345kV_3PH	Stable	Stable
52	FLT_52_BUCKNER7_SPERVIL7_345kV_1PH	Stable	Stable
53	FLT_53_SPERVIL7_POSTROCK7_345kV_3PH	Stable	Stable
54	FLT_54_SPERVIL7_POSTROCK7_345kV_1PH	Stable	Stable
55	FLT_55_POSTROCK7_AXTELL3_345kV_3PH	Stable	Stable
56	FLT_56_POSTROCK7_AXTELL3_345kV_1PH	Stable	Stable
57	FLT_57_AXTELL3_PAULINE3_345kV_3PH	Stable	Stable
58	FLT_58_AXTELL3_PAULINE3_345kV_1PH	Stable	Stable
59	FLT_59_AXTELL3_SWEETW3_345kV_3PH	Stable	Stable
60	FLT_60_AXTELL3_SWEETW3_345kV_1PH	Stable	Stable
61	FLT_61_SETAB7_MINGO7_345kV_3PH	Stable	Stable
62	FLT_62_SETAB7_MINGO7_345kV_1PH	Stable	Stable
63	FLT_63_MINGO7_REDWILO3_345kV_3PH	Stable	Stable
64	FLT_64_MINGO7_REDWILO3_345kV_1PH	Stable	Stable
65	FLT_65_SETAB7_SETAB3_345_115kV_3PH	Stable	Stable
66	FLT_66_MINGO7_MINGO3_345_115kV_3PH	Stable	Stable
67	FLT_67_SPERVIL7_SPEARVL6_345_230kV_3PH	Stable	Stable
68	FLT_68_POSTROCK7_POSTROCK6_345_230kV_3PH	Stable	Stable
69	FLT_69_AXTELL3_AXTELL7_345_115kV_3PH	Stable	Stable
70	FLT_70_HOLCOMB7_HOLCOMB3_345_115kV_3PH	Stable	Stable
71	FLT_71_KNOLL6_KNOLL3_230_115kV_3PH	Stable	Stable
72	FLT_72_CIRCLE6_CIRCLE3_230_115kV_3PH	Stable	Stable
73	FLT_73_RICE6_RICE3_230_115kV_3PH	Stable	Stable
74	FLT_74_EMCPHER6_EMCPHER3_230kV_3PH	Stable	Stable
75	FLT_75_SPEARVL6_SPEARVL3_230_115kV_3PH	Stable	Stable
76	FLT_76_SHAYS6_SHAYS3_230_115kV_3PH	Stable	Stable
77	FLT_77_CONCOR6_CONCOR3_230_115kV_3PH	Stable	Stable
78	FLT_78_HEIZER6_HEIZER3_230_115kV_3PH	Stable	Stable
79	FLT_79_NEKOMA3_NEKOMA2_115_69kV_3PH	Stable	Stable
80	FLT_80_HEIZER3_HEIZER2_115_69kV_3PH	Stable	Stable
81	FLT_81_SEWRDMW3_SEWARD2_115_69kV_3PH	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_01_SHAYS6_POSTROCK2_230kV_3PH	3-Phase fault on the South Hays – Post Rock 230kV line near the South Hays 230kV bus.
2	FLT_09_SHAYS6_GRTBEND6_230kV_3PH	3-Phase fault on the South Hays – Mullergren 230kV line near the South Hays 230kV bus.
3	FLT_76_SHAYS6_SHAYS3_230_115kV_3PH	3-Phase fault on the South Hays 230kV/115kV transformer near the South Hays 115kV bus.

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-2009-008 is found to be in compliance with FERC Order #661A.

Conclusion

<OMITTED TEXT> (Interconnection Customer, GEN-2009-008) has requested a Limited Operation System Impact Study under the Southwest Power Pool Open Access Transmission Tariff (OATT) for 198.9 MW of wind generation to be interconnected as an Energy Resource (ER) into a transmission facility of Midwest Energy (MIDW) in Ness County, Kansas. The point of interconnection will be the 230kV South Hays substation. GEN-2009-008, 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-2010-001 (or most recent iteration) Impact Study can be placed into service.

Power flow analysis from this LOIS has determined that the GEN-2009-008 request can interconnect prior to the completion of the required Network Upgrades, listed within Table 2 of this report. Additional constraints that are not mitigated by interconnection analysis are listed in Table 5 and Appendix A.

Transient stability analysis indicates that with the reactive equipment identified in the GEN-2009-008 turbine restudy, the transmission system will remain stable for the contingencies listed within Table 6 with the addition of GEN-2009-008 generation. Additionally, GEN-2009-008 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.

SEASON	GROUP	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (%MVA)	CONTINGENCY NAME
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	109.5311	BASE CASE
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	133.3347	BASE CASE
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03419	115.3121	LAWTON EASTSIDE - OKLAUNION 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03419	139.9318	LAWTON EASTSIDE - OKLAUNION 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03603	113.2296	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03603	137.5527	Hitchland Interchange - POTTER COUNTY INTERCHANGE 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03462	113.3758	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03462	137.725	GRAPEVINE INTERCHANGE - STATELINE INTERCHANGE 230KV CKT 1
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.21484	107.775	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.04514	124.5178	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.04514	150.3996	FINNEY SWITCHING STATION - HOLCOMB 345KV CKT 1
13G	03ALL	TO->FROM	HAYS PLANT - SOUTH HAYS 115KV CKT 1	83	99	0.16195	105.9841	KNOLL 230 - POSTROCK6 230.00 230KV CKT 1
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.25001	109.7643	AXTELL - POST ROCK 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.04421	117.4506	AXTELL - POST ROCK 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.04421	142.4339	AXTELL - POST ROCK 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.04142	122.6543	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.04142	148.2499	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.0402	115.01	HUNTSVILLE - ST_JOHN 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.0402	139.6459	HUNTSVILLE - ST_JOHN 115KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.0402	114.0939	HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.0402	138.5487	HUNTSVILLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.0402	120.5883	ST JOHN - ST_JOHN 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.0402	146.0116	ST JOHN - ST_JOHN 115KV CKT 1
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.20603	103.1799	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03957	117.7768	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03957	142.6909	BUCKNER7 345.00 - HOLCOMB 345KV CKT 1
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.17948	101.1784	JEFFREY ENERGY CENTER - SUMMIT 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03458	113.0664	EMPORIA ENERGY CENTER - WICHITA 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03458	137.3746	EMPORIA ENERGY CENTER - WICHITA 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03493	112.9574	RENO COUNTY - SUMMIT 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03493	137.2417	RENO COUNTY - SUMMIT 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.04199	123.0285	RENO COUNTY - WICHITA 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.04199	148.7986	RENO COUNTY - WICHITA 345KV CKT 1
13G	03ALL	FROM->TO	MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1	100	110	0.06749	151.5678	RENO COUNTY - WICHITA 345KV CKT 1
13G	03ALL	FROM->TO	MOUNDRIDGE (MOUND10X) 138/115/13.8KV TRANSFORMER CKT 1	100	110	0.06749	151.3054	RENO COUNTY - WICHITA 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03431	112.8916	ROSE HILL - WOLF CREEK 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03431	137.1929	ROSE HILL - WOLF CREEK 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03422	106.1337	LACYGNE - WOLF CREEK 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03422	129.4694	LACYGNE - WOLF CREEK 345KV CKT 1
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.23344	108.0581	CIRCLE - MULLERGREN 230KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.04439	118.4053	CIRCLE - MULLERGREN 230KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.04439	143.4717	CIRCLE - MULLERGREN 230KV CKT 1
13G	03ALL	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.07686	101.1595	CIRCLE - MULLERGREN 230KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	113.8341	CENTENNIAL - COWSKIN 138KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	138.3425	CENTENNIAL - COWSKIN 138KV CKT 1
13G	03ALL	FROM->TO	ST JOHN - ST_JOHN 115KV CKT 1	86	86	0.037	100.589	CLEARWATER - MILAN TAP 138KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	116.4135	45TH ST4 138.00 - COWSKIN 138KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	141.3672	45TH ST4 138.00 - COWSKIN 138KV CKT 1

SEASON	GROUP	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (%MVA)	CONTINGENCY NAME
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03435	115.2835	EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03435	140.0286	EVANS ENERGY CENTER SOUTH - LAKERIDGE 138KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	116.5306	45TH ST4 138.00 - EVANS ENERGY CENTER SOUTH 138KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	141.5045	45TH ST4 138.00 - EVANS ENERGY CENTER SOUTH 138KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03333	106.7979	GILL ENERGY CENTER SOUTH - GILL ENERGY CENTER WEST 138KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03333	130.2966	GILL ENERGY CENTER SOUTH - GILL ENERGY CENTER WEST 138KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03435	114.5913	HOOVER NORTH - LAKERIDGE 138KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03435	139.2203	HOOVER NORTH - LAKERIDGE 138KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03491	106.3953	CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03491	129.7288	CIRCLE - HUTCHINSON ENERGY CENTER 115KV CKT 1
13G	03ALL	FROM->TO	ST JOHN - ST_JOHN 115KV CKT 1	86	86	0.037	107.0248	FLATRDG3 - HARPER 138KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03482	115.0666	CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03482	139.6097	CIMARRON RIVER TAP - KISMET 3 115.00 115KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03482	115.2132	CUDAHY - KISMET 3 115.00 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03482	139.7327	CUDAHY - KISMET 3 115.00 115KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03482	115.7217	CUDAHY - G08-79T 115.00 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03482	140.3447	CUDAHY - G08-79T 115.00 115KV CKT 1
13G	03ALL	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.05268	106.726	GREENSBURG - SUN CITY 115KV CKT 1
13G	03ALL	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.05268	111.2863	GREENSBURG - SSTARTP3 115.00 115KV CKT 1
13G	03ALL	FROM->TO	ST JOHN - ST_JOHN 115KV CKT 1	86	86	0.037	102.9138	HARPER - MILAN TAP 138KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03482	115.7229	G08-79T 115.00 - JUDSON LARGE 115KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03482	140.3455	G08-79T 115.00 - JUDSON LARGE 115KV CKT 1
13G	03ALL	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.05268	105.3395	MEDICINE LODGE - SUN CITY 115KV CKT 1
13G	03ALL	FROM->TO	SEWARD - ST JOHN 115KV CKT 1	80.3	80.3	0.05268	102.7001	BARBER 3 115.00 - MEDICINE LODGE 115KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03613	112.7337	AXTELL - PAULINE 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03613	136.9907	AXTELL - PAULINE 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03543	113.6414	GRAND ISLAND - SWEETWATER 345KV CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03543	138.028	GRAND ISLAND - SWEETWATER 345KV CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03532	112.928	Hitchland Interchange (H TB80155502) 345/230/13.2KV TRANSFORMER CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03532	137.2116	Hitchland Interchange (H TB80155502) 345/230/13.2KV TRANSFORMER CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03603	114.2741	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03603	138.7462	POTTER COUNTY INTERCHANGE (WAUK 90343-A) 345/230/13.2KV TRANSFORMER CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.036	116.3971	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.036	141.1358	SPEARVILLE (SPEARVL) 345/230/13.8KV TRANSFORMER CKT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.0402	115.0174	MIDW-CATB05
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.0402	139.6517	MIDW-CATB05
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	109.5311	NC1_GEN-NEBRASKA CITY 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	133.3347	NC1_GEN-NEBRASKA CITY 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03463	113.7203	SPP-SWPS-03
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03463	138.1185	SPP-SWPS-03
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03603	113.063	SPP-SWPS-04
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03603	137.3627	SPP-SWPS-04
13G	03ALL	FROM->TO	ST JOHN - ST_JOHN 115KV CKT 1	86	86	0.037	102.02	SPP-MKEC-05
13G	03ALL	FROM->TO	ST JOHN - ST_JOHN 115KV CKT 1	86	86	0.037	101.9651	SPP-WEPL-03
13G	03ALL	FROM->TO	ST JOHN - ST_JOHN 115KV CKT 1	86	86	0.037	100.5337	SPP-WEPL-03A
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03435	114.085	SPP-WERE-32

SEASON	GROUP	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (%MVA)	CONTINGENCY NAME
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03435	138.6307	SPP-WERE-32
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	113.1189	GEN514805 1-SOONER UNIT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	137.4459	GEN514805 1-SOONER UNIT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	112.9174	GEN514806 1-SOONER UNIT 2
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	137.2111	GEN514806 1-SOONER UNIT 2
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.2945	GEN523971 1-HARRINGTON GEN #1 24 KV
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.4902	GEN523971 1-HARRINGTON GEN #1 24 KV
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.2908	GEN523972 1-HARRINGTON GEN #2 24 KV
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.4853	GEN523972 1-HARRINGTON GEN #2 24 KV
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.3258	GEN523973 1-HARRINGTON GEN #3 24 KV
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.5252	GEN523973 1-HARRINGTON GEN #3 24 KV
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	104.3076	GEN525561 1-TOLK GEN #1 24 KV
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	127.3655	GEN525561 1-TOLK GEN #1 24 KV
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	104.1029	GEN525562 1-TOLK GEN #2 24 KV
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	127.1321	GEN525562 1-TOLK GEN #2 24 KV
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	119.8454	GEN531447 1-HOLCOMB GENERATOR
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	106.439	GEN531495 1-CNTRLPLWG1 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	129.7941	GEN531495 1-CNTRLPLWG1 0.6900
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.18572	101.0578	GEN532651 1-JEFFREY ENERGY CENTER UNIT 1
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.18572	101.4419	GEN532652 1-JEFFREY ENERGY CENTER UNIT 2
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.18572	101.4406	GEN532653 1-JEFFREY ENERGY CENTER UNIT 3
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	115.5092	GEN532722 1-EVANS ENERGY CENTER UNIT 2
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	140.1646	GEN532722 1-EVANS ENERGY CENTER UNIT 2
13G	03ALL	FROM->TO	SMOKYHL6 230.00 - SUMMIT 230KV CKT 1	319	319	0.18572	101.9447	GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	119.0212	GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	144.144	GEN532751 1-WOLF CREEK GENERATING STATION UNIT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	122.3239	GEN539670 4-JUDSON LARGE GENERATOR
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.344	GEN539753 1-CLR_2 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.5478	GEN539753 1-CLR_2 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	110.3175	GEN539762 1-SSWIND 1 34.500
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	122.3842	GEN539767 1-GRAY COUNTY WIND FARM
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	103.3728	GEN560140 1-G09-08 0.7000
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	126.2831	GEN560140 1-G09-08 0.7000
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.0508	GEN560209 1-G07-40 0.5750
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.2115	GEN560209 1-G07-40 0.5750
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	103.9114	GEN560238 1-G10-09 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	126.9086	GEN560238 1-G10-09 0.6900
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	101.676	GEN560279 1-G08-18 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	124.3534	GEN560279 1-G08-18 0.6900
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.3721	GEN560514 1-G04_014 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.5713	GEN560514 1-G04_014 0.6900
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	103.6295	GEN560522 1-G05-12 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	126.5852	GEN560522 1-G05-12 0.6900
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	106.5939	GEN560669 1-G10_057 0.6900
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	129.9549	GEN560669 1-G10_057 0.6900
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.4343	GEN640009 1-COOPER NUCLEAR STATION
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.6371	GEN640009 1-COOPER NUCLEAR STATION
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	102.7326	GEN640010 1-GERALD GENTLEMAN STATION UNIT 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	125.5535	GEN640010 1-GERALD GENTLEMAN STATION UNIT 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	102.8751	GEN640011 2-GERALD GENTLEMAN STATION UNIT 2

SEASON	GROUP	DIRECTION	MONITORED ELEMENT	RATEA (MVA)	RATEB (MVA)	TDF	TC%LOADING (%MVA)	CONTINGENCY NAME
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	125.7169	GEN640011 2-GERALD GENTLEMAN STATION UNIT 2
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	106.335	GEN645001 1-FORT CALHOUN 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	129.6723	GEN645001 1-FORT CALHOUN 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.7812	GEN645011 1-NEBRASKA CITY 1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	129.037	GEN645011 1-NEBRASKA CITY 1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	105.421	GEN645012 2-NEBRASKA CITY 2
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	128.6239	GEN645012 2-NEBRASKA CITY 2
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	106.1671	GEN659103 1-ANTELOPE VALLEY UNIT1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	129.4822	GEN659103 1-ANTELOPE VALLEY UNIT1
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	106.1671	GEN659107 2-ANTELOPE VALLEY UNIT2
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	129.4822	GEN659107 2-ANTELOPE VALLEY UNIT2
13G	03ALL	TO->FROM	CLEARWATER - MILAN TAP 138KV CKT 1	110	110	0.03429	100	GEN659118 1-LARAMIE RIVER UNIT1
13G	03ALL	FROM->TO	HARPER - MILAN TAP 138KV CKT 1	95.6	95.6	0.03429	122.4748	GEN659118 1-LARAMIE RIVER UNIT1