Southwest Power Pool

Impact Study for Generation Interconnection Request GEN – 2004 – 017

SPP Tariff Studies

(#GEN-2004-017)

October 2005

SUMMARY

Burns & McDonnell Consulting performed the following Study at the request of the Southwest Power Pool (SPP) for Generation Interconnection request Gen-2004-017. The request for interconnection was placed with SPP in accordance SPP's Open Access Transmission Tariff, which covers new generation interconnections on SPP's transmission system.

Pursuant to the tariff, Burns & McDonnell Consulting was asked to perform a detailed Impact Study of the generation interconnection request to satisfy the Impact Study Agreement executed by the requesting customer and SPP.

Generation Interconnection Impact Study

for

SPP Queue Position GEN-2004-017

October 5, 2005

PROJECT NO. 40193

Burns & McDonnell
SINCE 1898

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Burns & McDonnell was retained by the Southwest Power Pool (SPP) to perform a stability study in order to evaluate the impact of a proposed 250 MW combined-cycle plant within the service territory of Empire District Electric Company (EMDE) in Cherokee county, Kansas. The proposed plant will consist of two generating units of 170 MW and 80 MW and will be interconnected to a 161 kV bus of the Riverton facility in the EMDE system. The Riverton substation is connected through a 161 kV line to the Neosho substation that is the closest connection to the 345 kV network. <Omitted Text> requested a study of 100% MW generation case. When stability problems occur, reduced generation cases were to be run to determine the maximum MW output with no upgrades. Two sets of load flow cases and stability database for 2010 Summer Peak and 2007 Fall were provided by SPP. Twenty six three-phase and single-line-to-ground faults were simulated for the two study cases using the fault definitions provided by SPP.

Five prior queued projects were required to be added to the base case. Some of the prior queued projects were provided as included in the load flow model, and others were added to the model based on the information provided. For GEN-2004-017, two generators of 170 MW and 80 MW were attached to the 161 kV bus of the Riverton substation, and the output was dispatched to the EMDE load. The dynamic models for the proposed plant were created based on the data sheets for the generating facility and the generator step-up transformer. Since the data for the excitation system and the turbine governor was not available, typical model data for a generating system of similar size was used for the present study.

Based on the results of the stability analysis, it is concluded that the proposed combined-cycle plant does not adversely impact the stability of the SPP system. Therefore, system reinforcement due to dynamic stability is not required. For the faults near GEN-2002-004 substation, the wind turbines at GEN-2002-004 and GEN-2004-010 showed slowly-damped oscillations and were tripped for the faults near the Rosehill substation. The stability analysis results indicate that the system will remain stable for all the faults studied.

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PART I

INTRODUCTION

PART I
INTRODUCTION

STUDY SCOPE

Burns & McDonnell was retained by the Southwest Power Pool (SPP) to perform a stability study in order to evaluate the impact of a proposed 250 MW combined-cycle plant within the service territory of Empire District Electric Company (EDE) in Cherokee county, Kansas. The proposed plant will consist of two generating units of 170 MW and 80 MW and will be interconnected to a 161 kV bus of the Riverton facility in the EMDE system. <Omitted Text> requested a study of 100% MW generation case. When stability problems occur, reduced generation cases were to be run to determine the maximum MW output with no upgrades. Two sets of load flow cases and stability database for 2010 Summer Peak and 2007 Fall were provided by SPP. Twenty six three-phase and single-line-to-ground faults were simulated for the two study cases using the fault definitions provided by SPP.

SYSTEM DESCRIPTION

The proposed plant will be interconnected to a 161 kV bus in the Riverton substation. Figure I-1 shows the system map around the Riverton and Neosho substations. The Riverton substation is connected through a 161 kV line to the Neosho substation that is the closest connection to the 345 kV network. The rated output of the plant is 250 MW, comprised of a 170 MW gas turbine unit and an 80 MW steam turbine unit. The generation from the plant is assumed to be dispatched to the entire EMDE area load.

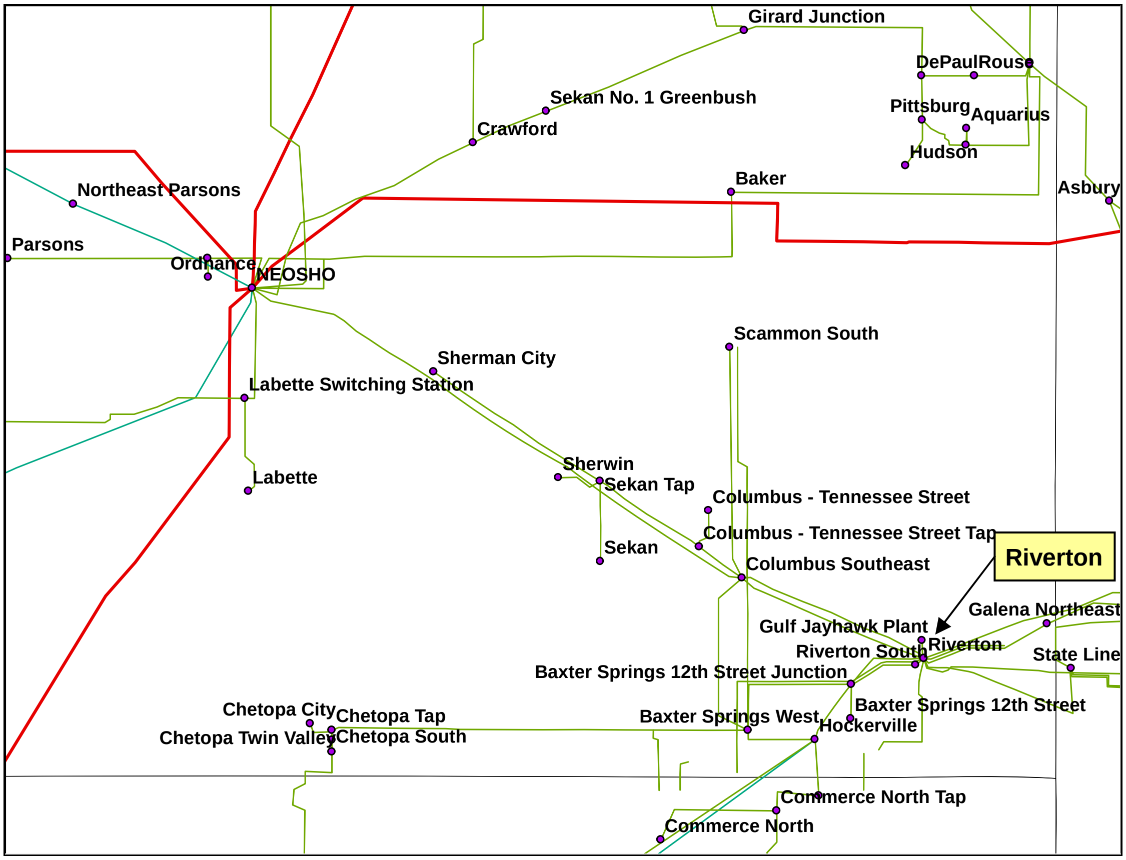

FIGURE I-1
SYSTEM MAP OF THE RIVERTON AND NEOSHO AREA

LIMITATIONS

In the preparation of this report, the information provided to Burns & McDonnell by others was used by Burns & McDonnell to make certain assumptions with respect to conditions which may exist in the future. While Burns & McDonnell believes the assumptions made are reasonable for the purposes of this report, Burns & McDonnell makes no representation that the conditions assumed will, in fact, occur. In addition, while Burns & McDonnell has no reason to believe that the information provided by others, and on which this report is based, is inaccurate in any material respect, Burns & McDonnell has not independently verified such information and cannot guarantee its accuracy or completeness. To the extent that actual future conditions differ from those assumed herein or from the information provided to Burns & McDonnell, the actual results will vary from those presented.

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PART II

DATA PREPARATION

PART II
DATA PREPARATION

STUDY CASES

SPP provided the data for the 2007 Fall and 2010 Summer peak study cases in the form of PSS/E v29 load flow saved case and dynamic raw data files. The IDEV and IPLAN files to compile and link user-written models were also provided.

Five prior queued projects were required to be added to the base case. Table II-1 shows the prior queued projects and the study project. Some of the prior queued projects were provided as included in the load flow model. The output of GEN-2004-005 had been included in the model at 200 MW. For the study, the output was increased to the 100% rated output of 275 MW and was dispatched to the load of City Utilities of Springfield, Missouri (SPRM). GEN-2004-010 was added to the model using the IPLAN routine for Vestas wind turbines. The output from GEN-2004-010 was dispatched to the load of the areas MIPU, KACP, EMDE, and SPRM.

For GEN-2004-017, two generators of 170 MW and 80 MW were attached to the 161 kV bus of the Riverton substation, and the output was dispatched to the EMDE load. Appendix A provides the summary of the load flow cases used for the simulation.

TABLE II-1
PROJECTS ADDED TO THE MODEL

Project	Location	Control Area	Output	Dynamic Model Type	Note
GEN-2002-004	RH-Neosho 345kV	WERE	200 MW	Vestas V80 Wind Turbine	
GEN-2004-005	Southwest	SPRM	275 MW	GENCLS	output increased
GEN-2004-008	Iatan	KACP	900 MW	GENROU	
GEN-2004-010	RH-Neosho 345kV	WERE	300 MW	Vestas V80 Wind Turbine	added
GEN-2004-013	Atchison	KACP	900 MW	GENROU	
GEN-2004-017	Riverton	EMDE	250 MW	GENROU x 2	added, study project

DYNAMIC MODELS

The dynamic models for the combined-cycle plant were created based on the data sheets for the generating facility and the generator step-up transformer. Since the data for the excitation system and the turbine governor was not available, typical model data for a generating system of similar size was used for the present study. Table II-2 shows the dynamic model data used for the study in the PSS/E DYRE format.

TABLE II-2
DYNAMIC MODEL DATA FOR GEN-2004-017

```
/***** GEN-2004-017 ***********************************************
949  'GENROU' 1     9.1000      0.04200     2.5000      0.15000
        7.145      0.0000      1.5200      1.4400      0.16400
        0.3200     0.11800     0.10900     0.2000      0.3900    /
949  'IEEET1' 1     0.0000      50.00       0.06000     1.00
       -1.000     -0.0470      0.5240      0.0750      1.0000
        0.0000     3.220       0.72000     4.29        0.28000   /
949  'IEESGO' 1     0.2000      0.0000      0.30000     0.05000
        5.0000     0.50000     20.00       0.69000     0.0000
        1.0000     0.0        /

950  'GENROU' 1     6.5660      0.02300     0.48700     0.04900
        7.800      0.0000      2.0600      1.9640      0.27100
        0.4200     0.17800     0.14800     0.1300      0.4500    /
950  'IEEET3' 1     0.0000      120.00      0.1500      1.2000
       -1.200      0.5000      0.0200      0.6570      1.1900
        2.670      4.1200      1.0000                            /
950  'GAST'   1     0.0500      0.4000      0.1000      3.0000
        1.000      2.0000      1.0000      0.0000      0.0000    /
/*****************************************************************
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PART III

STABILITY ANALYSIS

PART III
STABILITY ANALYSIS

METHODOLOGY AND ASSUMPTIONS

Stability analysis was performed using PTI's PSS/E dynamic simulation program version 29. To ensure that the stability models are properly constructed, a steady state run was performed for five second, and the results showed flat responses for all of the variables monitored.

Twenty six fault definitions were provided by SPP for the stability analysis as shown in Table III-1. Single-line-to-ground faults were simulated by applying a fault impedance to the positive sequence network to represent the effect of the negative and zero sequence networks. Since the actual fault MVA's at the faulted substations were not available, fault impedances were chosen such that the voltage at the bus with the SLG fault dropped to below 0.5 pu during the fault. Each simulation was performed with a 0.1-second steady-state run followed by the disturbance.

TABLE III-1
DISTURBANCE DEFINITIONS

Fault ID	Description
FLT01_3PH	3-phase fault Fault on the Oronogo Jct. Bus (59467) to Riverton (59469) 161 kV line, near Oronogo Jct. a. Apply Fault at the Oronogo Jct. Bus (59467). b. Clear Fault after 5 cycles by removing the line from Oronogo Jct. Bus (59467) to Riverton (59469) c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT02_1PH	1-phase fault Same as FLT01_3PH above
FLT03_3PH	3-phase fault Fault on the State Line (59498) to Riverton (59469) 161 kV line, near State Line a. Apply Fault at the State Line Bus (59498). b. Clear Fault after 5 cycles by removing the line from State Line (59498) to Riverton (59469) c. Wait 20 cycles, and then re-close the line in (b) back into the fault. a. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT04_1PH	1-phase fault Same as FLT03_3PH above

TABLE III-1
DISTURBANCE DEFINITIONS (CONTINUED)

Fault ID	Description
FLT05_3PH	3-phase fault Fault on the Hockerville Bus (59487) to Riverton (59469) 161 kV line, near Hockerville. a. Apply Fault at the Hockerville Bus (59487). b. Clear Fault after 5 cycles by removing the line from Hockerville Bus (59487) to Riverton (59469) c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT06_1PH	1-phase fault Same as FLT05_3PH above
FLT07_3PH	3-phase fault Fault on the Columbus SE Bus (59465) to Riverton (59469) 161 kV line, near Columbus SE. a. Apply Fault at the Columbus SE Bus (59465). b. Clear Fault after 5 cycles by removing the line from Columbus SE Bus (59465) to Riverton (59469) c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT08_1PH	1-phase fault Same as FLT07_3PH above
FLT09_3PH	3-phase fault Fault on the Columbus SE Bus (59465) to Neosho (56937) 161 kV line, near Neosho. a. Apply fault at the Neosho bus (56937). b. Clear fault after 5 cycles by tripping the line from Columbus SE Bus (59465) to Neosho (56937). c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT10_1PH	1-phase fault Same as FLT09_3PH above
FLT11_3PH	3-phase fault Fault on the Marmaton (56934) to Neosho (56937) 161 kV line, near Marmaton. a. Apply fault at the Marmaton bus (56934). b. Clear fault after 5 cycles by tripping the line from Marmaton (56932) to Neosho (56937). c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT12_1PH	1-phase fault Same as FLT11_3PH above
FLT13_3PH	3-phase fault Fault on the Neosho (56793) to Morgan (96045) 345 kV line, near Morgan. a. Apply fault at the Morgan bus (96045). b. Clear fault after 5 cycles by tripping the line from Neosho (56793) to Morgan (96045). c. Wait 30 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT14_1PH	1-phase fault Same as FLT13_3PH above

TABLE III-1
DISTURBANCE DEFINITIONS (CONTINUED)

Fault ID	Description
FLT15_3PH	3-phase fault Fault on the Morgan (96045) to Brookline (59984) 345 kV line, near Brookline a. Apply fault at the Brookline bus (59984). b. Clear fault after 5 cycles by tripping the line Morgan (96045) to Brookline (59984). c. Wait 30 cycles, and then re-close line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT16_1PH	1-phase fault Same as FLT15_3PH above
FLT17_3PH	3-phase fault Fault on the Springfield (52692) to La Russel (59479) 161 kV line, near La Russel a. Apply fault at the La Russel bus (59479). b. Clear fault after 5 cycles by tripping the line from Springfield (52692) to La Russel (59479). c. Wait 20 cycles, and then re-close line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT18_1PH	1-phase fault Same as FLT17_3PH above
FLT19_3PH	3-phase fault Fault on the Brookline (59969) to Springfield (52692) 161 kV line, near Springfield a. Apply fault at the Springfield bus (52692). b. Clear fault after 5 cycles by tripping the line from Brookline (59969) to Springfield (52692). c. Wait 20 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT20_1PH	1-phase fault Same as FLT19_3PH above
FLT21_3PH	3-phase fault Fault on the Neosho (56793) to Lacygne (57981) 345 kV line, near Lacygne. a. Apply fault at the Lacygne bus (57981). b. Clear fault after 5 cycles by tripping the line from Neosho (56793) to Lacygne (57981). c. Wait 30 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT22_1PH	1-phase fault Same as FLT21_3PH above
FLT23_3PH	3-phase fault Fault on the Neosho (56793) to Delaware (53929) 345 kV line, near Delaware a. Apply fault at the Delaware bus (53929). b. Clear fault after 5 cycles by tripping the line from Neosho (56793) to Delaware (53929). c. Wait 30 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT24_1PH	1-phase fault Same as FLT23_3PH above

TABLE III-1
DISTURBANCE DEFINITIONS (CONTINUED)

Fault ID	Description
FLT25_3PH	3-phase fault Fault on the Neosho (56793) to Rose Hill (56794) 345 kV line, near Rose Hill a. Apply fault at the Rose Hill bus (56794). (This will trip the prior queued projects Gen-2002-04 and Gen-2004-010 since these are connected by a 4-breaker ring bus switching station.) b. Clear fault after 5 cycles by tripping the line from Neosho (56793) to Rose Hill (53929). c. Wait 30 cycles, and then re-close the line in (b) back into the fault. d. Leave fault on for 5 cycles, then trip the line in (b) and remove fault.
FLT26_1PH	1-phase fault Same as FLT25_3PH above

ANALYSIS RESULTS

Simulations were run for a 10-second duration to check for proper machine damping. The results of the 26 fault simulations for each of the two study cases showed no instability problem. Table III-2 is the summary of the simulation results. The stability analysis results indicate that the system will remain stable for all the faults studied. For the faults near the GEN-2002-004 substation, the wind turbines at GEN-2002-004 and GEN-2004-010 showed slowly-damped oscillations and were tripped for the faults near the Rosehill substation.

TABLE III-2
STABILITY SIMULATION RESULTS

Fault ID	Fault Location	Stability Result	
		2007 Fall	2010 Summer
FLT01_3PH	Oronogo Jct. (59467) - Riverton (59469) 161 kV line, near Oronogo Jct.	Stable	Stable
FLT02_1PH	Oronogo Jct. (59467) - Riverton (59469) 161 kV line, near Oronogo Jct.	Stable	Stable
FLT03_3PH	State Line (59498) - Riverton (59469) 161 kV line, near State Line	Stable	Stable
FLT04_1PH	State Line (59498) - Riverton (59469) 161 kV line, near State Line	Stable	Stable
FLT05_3PH	Hockerville (59487) - Riverton (59469) 161 kV line, near Hockerville	Stable	Stable
FLT06_1PH	Hockerville (59487) - Riverton (59469) 161 kV line, near Hockerville	Stable	Stable
FLT07_3PH	Columbus SE (59465) - Riverton (59469) 161 kV line, near Columbus SE	Stable	Stable
FLT08_1PH	Columbus SE (59465) - Riverton (59469) 161 kV line, near Columbus SE	Stable	Stable
FLT09_3PH	Columbus SE (59465) - Neosho (56937) 161 kV line, near Neosho	Stable	Stable
FLT10_1PH	Columbus SE (59465) - Neosho (56937) 161 kV line, near Neosho	Stable	Stable
FLT11_3PH	Marmaton (56934) - Neosho (56937) 161 kV line, near Marmaton	Stable	Stable
FLT12_1PH	Marmaton (56934) - Neosho (56937) 161 kV line, near Marmaton	Stable	Stable
FLT13_3PH	Neosho (56793) - Morgan (96045) 345 kV line, near Morgan	Stable	Stable
FLT14_1PH	Neosho (56793) - Morgan (96045) 345 kV line, near Morgan	Stable	Stable
FLT15_3PH	Morgan (96045) - Brookline (59984) 345 kV line, near Brookline	Stable	Stable
FLT16_1PH	Morgan (96045) - Brookline (59984) 345 kV line, near Brookline	Stable	Stable
FLT17_3PH	Springfield (52692) - La Russel (59479) 161 kV line, near La Russel	Stable	Stable
FLT18_1PH	Springfield (52692) - La Russel (59479) 161 kV line, near La Russel	Stable	Stable
FLT19_3PH	Brookline (59969) - Springfield (52692) 161 kV line, near Springfield	Stable	Stable
FLT20_1PH	Brookline (59969) - Springfield (52692) 161 kV line, near Springfield	Stable	Stable
FLT21_3PH	Neosho (56793) - Lacygne (57981) 345 kV line, near Lacygne	Stable	Stable
FLT22_1PH	Neosho (56793) - Lacygne (57981) 345 kV line, near Lacygne	Stable	Stable
FLT23_3PH	Neosho (56793) - Delaware (53929) 345 kV line, near Delaware	Stable	Stable
FLT24_1PH	Neosho (56793) - Delaware (53929) 345 kV line, near Delaware	Stable	Stable
FLT25_3PH	Neosho (56793) - Rose Hill (56794) 345 kV line, near Rose Hill	WT, Stable	WT, Stable
FLT26_1PH	Neosho (56793) - Rose Hill (56794) 345 kV line, near Rose Hill	WT, Stable	WT, Stable

WT: wind farms tripped (GEN-2002-004 and GEN-2004-010)

PART IV

CONCLUSIONS

PART IV
CONCLUSIONS

Based on the results of the stability analysis, it is concluded that the proposed combined-cycle plant does not adversely impact the stability of the SPP system. Therefore, system reinforcement due to dynamic stability is not required. For the faults near GEN-2002-004 substation, the wind turbines at GEN-2002-004 and GEN-2004-010 showed slowly-damped oscillations and were tripped for the faults near the Rosehill substation. The stability analysis results indicate that the system will remain stable for all the faults studied.

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APPENDIX A

LOAD FLOW CASE SUMMARY

2010 SUMMER PEAK CASE

Provided Model

SPP MDWG 04 STABILITY;2010 SUM PEAK; MODIFIED — AREA TOTALS
GEN-2004-012 BASECASE INCLUDING PRIOR QUEUED — IN MW/MVAR

AREA	FROM GENERATION	TO LOAD	TO BUS SHUNT	TO LINE SHUNT	FROM CHARGING	TO NET INT	LOSSES	DESIRED NET INT
536	6768.7	5837.7	0.0	5.3	0.0	749.2	178.4	750.0
WERE	1021.6	983.4	-891.9	30.6	1147.7	-142.0	2162.2	
540	1571.5	2027.2	0.0	0.0	0.0	-497.6	41.7	-497.6
MIPU	454.8	536.8	-129.6	0.0	138.7	-236.0	421.5	
541	4297.3	3887.5	0.0	0.0	0.0	325.9	93.7	325.9
KACP	1389.6	900.0	-356.1	0.0	556.9	37.5	1367.2	
544	1120.9	1160.5	0.0	0.0	0.0	-74.6	35.0	-74.6
EMDE	125.6	129.8	-146.5	0.0	82.7	-30.0	254.9	
546	791.2	869.4	0.0	0.0	0.0	-89.0	10.8	-89.0
SPRM	375.1	221.5	0.0	0.0	71.4	75.0	149.9	
SUBTOTAL	14549.5	13782.3	0.0	5.3	0.0	413.9	359.7	414.7
	3366.7	2771.5	-1524.0	30.6	1997.4	-295.5	4355.8	
TOTALS	689029.3	670309.1	161.4	904.1	0.0	0.0	17646.1	-650.2
	173229.3	203697.7	-128310.2	5240.2	162775.8	0.0	255380.2	

After adding GEN-2004-017 AND GEN-2004-010

SPP MDWG 04 STABILITY;2010 SUM PEAK; MODIFIED — AREA TOTALS
GEN-2004-012 BASECASE INCLUDING PRIOR QUEUED — IN MW/MVAR

AREA	FROM GENERATION	TO LOAD	TO BUS SHUNT	TO LINE SHUNT	FROM CHARGING	TO NET INT	LOSSES	DESIRED NET INT
536	7071.4	5835.8	0.0	5.3	0.0	1048.4	183.6	1049.2
WERE	901.0	982.6	-1052.4	30.6	1144.8	-162.5	2220.4	
540	1571.7	2099.2	0.0	0.0	0.0	-571.4	43.8	-571.4
MIPU	495.8	554.2	-127.9	0.0	137.9	-235.0	441.5	
541	4297.1	4023.7	0.0	0.0	0.0	184.3	99.2	184.3
KACP	1473.5	928.5	-353.7	0.0	554.7	12.8	1442.8	
544	1369.1	1431.9	0.0	0.0	0.0	-113.3	50.5	-113.3
EMDE	235.2	157.9	-142.4	0.0	81.2	-54.6	355.4	
546	865.6	971.2	0.0	0.0	0.0	-119.3	13.6	-119.3
SPRM	438.0	245.8	0.0	0.0	70.3	80.2	182.4	
SUBTOTAL	15174.8	14361.8	0.0	5.3	0.0	428.7	390.7	429.5
	3543.5	2869.0	-1676.3	30.6	1988.9	-359.2	4642.6	
TOTALS	689623.9	670868.2	161.4	904.0	0.0	0.0	17681.4	-635.4
	173490.9	203784.6	-128457.3	5239.7	162759.2	0.0	255685.7	

2007 FALL CASE

Provided Model

2004 SERIES, NERC/MMWG BASE CASE LIBRARY — AREA TOTALS
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE) — IN MW/MVAR

AREA	FROM GENERATION	TO LOAD	TO BUS SHUNT	TO LINE SHUNT	FROM CHARGING	TO NET INT	LOSSES	DESIRED NET INT
536	4561.8	3838.6	0.0	4.9	0.0	554.8	163.9	555.0
WERE	625.3	832.0	-811.0	28.4	1006.3	-322.8	1878.3	
540	626.8	1131.1	0.0	0.0	0.0	-531.0	26.6	-531.0
MIPU	138.8	315.0	-118.4	0.0	226.5	-66.2	234.2	
541	4308.5	2110.8	0.0	0.0	0.0	2145.0	58.4	2145.0
KACP	647.1	495.2	-263.1	0.0	564.8	50.8	930.1	
544	700.7	771.8	0.0	0.0	0.0	-92.0	20.9	-92.0
EMDE	15.7	67.8	-95.0	0.0	85.8	-28.5	157.3	
546	327.1	436.7	0.0	0.0	0.0	-114.0	4.4	-114.0
SPRM	124.5	110.6	0.0	0.0	73.9	19.0	68.8	
SUBTOTAL	10525.0	8289.0	0.0	4.9	0.0	1962.8	274.1	1963.0
	1551.5	1820.6	-1287.5	28.5	1957.3	-347.8	3268.8	
TOTALS	489732.0	477351.0	185.5	470.1	0.0	0.0	11716.3	745.0
	68064.9	140898.7	-94374.8	5599.9	161402.6	0.0	177344.3	

After adding GEN-2004-017 AND GEN-2004-010

2004 SERIES, NERC/MMWG BASE CASE LIBRARY — AREA TOTALS
FUTURE FALL, GI MODEL (LOADS FROM 2005 FALL-GENS FUTURE) — IN MW/MVAR

AREA	FROM GENERATION	TO LOAD	TO BUS SHUNT	TO LINE SHUNT	FROM CHARGING	TO NET INT	LOSSES	DESIRED NET INT
536	4865.9	3838.4	0.0	4.9	0.0	855.1	167.7	855.0
WERE	487.7	831.9	-981.1	28.5	1004.5	-335.8	1921.9	
540	625.9	1197.1	0.0	0.0	0.0	-599.2	27.8	-599.2
MIPU	166.2	332.5	-117.3	0.0	225.6	-70.8	246.6	
541	4307.3	2234.4	0.0	0.0	0.0	2017.8	61.1	2017.7
KACP	694.7	522.9	-261.7	0.0	563.0	27.8	970.1	
544	950.9	1073.8	0.0	0.0	0.0	-155.7	32.6	-155.6
EMDE	93.9	93.1	-93.5	0.0	84.7	-59.7	238.7	
546	596.7	741.5	0.0	0.0	0.0	-156.1	11.3	-156.1
SPRM	300.8	184.5	0.0	0.0	73.1	51.5	137.9	
SUBTOTAL	11346.6	9085.3	0.0	4.9	0.0	1961.9	300.5	1961.8
	1743.3	1964.8	-1453.6	28.5	1950.9	-387.0	3515.1	
TOTALS	490553.6	478138.9	185.5	470.1	0.0	0.0	11750.0	743.8
	68346.6	141038.8	-94538.6	5599.7	161391.8	0.0	177638.7	

APPENDIX B

STABILITY RESULT PLOTS

PROVIDED ON REQUEST