



SPP *Southwest Power Pool*

***System Impact Study
SPP-2004-001-2
For The Designation of a New
Network Resource
Requested By
Empire District Electric Company***

***For a Reserved Amount of 150 MW
From 1/1/2005
To 1/1/2025***

SPP Engineering, Tariff Studies

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ATTACHMENT: *SPP-2004-001-2 Tables*

1. Executive Summary

Empire District Electric Company has requested a system impact study to designate a New Network Resource in the Westar Control Area for 150 MW to serve EDE Network Load in the EDE Control Area. The period of the service requested is from 1/1/2005 to 1/1/2025. The request is for OASIS reservation numbers 634282, 634284, and 634285.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 150 MW request while maintaining system reliability.

The service was modeled from the source in WR to EDE load. The new source location causes new facility overloads on the SPP and Non-SPP transmission system, as well as increasing the loading on previously overloaded facilities. Tables 1.1 and 2.1 summarize the results of the system impact analyses for the new source location for Scenario 1. Table 1.1 lists SPP facility overloads identified. Table 2.1 lists Non-SPP facility overloads identified. Tables 1.2 and 2.2 summarize the results of the system impact analyses for the new source location for Scenario 2. Table 1.2 lists SPP facility overloads identified. Table 2.2 lists Non-SPP facility overloads identified.

Three facilities were identified for the WR to EDE study that limit the ATC to 0MW after the requested start date. The upgrade assigned to the BULL SHOALS - BULL SHOALS HES 161kV line has an estimated in-service date of 6/1/2006. This facility is a summer limit only and would therefore defer service to a start date of 10/1/2005. The AECI Jamesville 161/69/13.8kV Transformers 1 and 2 limit the service to 0MW beginning in the 2005 Summer Peak. The EDE planned upgrades for relieving the facility have an estimated in-service date of 6/1/2007. An AECI mitigation plan will be in effect for the 2005 and 2006 Summer Peak prior to the completion of the EDE upgrades. The Chamber Springs – Tontitown 161kV line was identified as limit to service for the 2005 Summer and 2005 Winter cases. This facility is scheduled to be upgraded by the summer of 2007. Expediting the upgrade is not possible to accommodate the requested start date for the WR to EDE service.

Curtailed of previously confirmed service and unit redispatch were evaluated as an option for relieving the impact on the Chamber Springs – Tontitown 161kV line. The amount and time period of curtailment required for possible confirmed Oasis Reservations is documented in Table 3. Generation shift factors and applicable redispatch relief pairs are documented in Table 4. SPP will work with the customer and the applicable party to reach an agreement concerning the curtailment of confirmed service and the redispatch of units. The curtailment or redispatch requirements would be called upon prior to implementing NERC TLR Level 5a.

If a curtailment or redispatch option is agreed upon for relieving the impact on the Chamber Springs – Tontitown 161kV line, the probable deferred start date will be 10/1/2005. If no redispatch or curtailment option is given for relieving the impact on this facility, the start date of the requested service may be delayed until the upgrade of the limiting facility is completed. The current estimated completion date for the upgrades relieving the Chamber Springs – Tontitown 161kV line is 6/1/2007. The final ATC, upgrade solutions, cost assignments, complete evaluation of renewal rights, and available redispatch and curtailment options will be determined upon the completion of the facility study.

2. Introduction

Empire District Electric Company has requested a system impact study to designate a New Network Resource in the WR Control Area for 150 MW to serve EDE Network Load in the EDE Control Area. The principal objective of this study is to identify the restraints on the SPP Regional Tariff System that may limit the requested service.

This study includes steady-state contingency analyses (PSS/E function ACCC) and Available Transfer Capability (ATC) analyses. The steady-state analyses consider the impact of the 150 MW requests on transmission line loading and transmission bus voltages for system intact and system outages of single and selected multiple transmission lines and transformers on the SPP systems and first tier Non - SPP systems.

3. Study Methodology

A. Description

The system impact analysis was conducted to determine the steady-state impact of the 150 MW transfer on the SPP and first tier Non - SPP systems. The steady-state analysis was done to ensure current SPP Criteria and NERC Planning Standards requirements are fulfilled. The Southwest Power Pool conforms to the NERC Planning Standards, which provide the strictest requirements, related to voltage violations and thermal overloads during normal conditions and during a contingency. It requires that all facilities be within normal operating ratings for normal system conditions and within emergency ratings after a contingency.

The contingency set includes all SPP facilities 69kV and above, SPP First Tier facilities 115 kV and above, and any defined contingencies for these areas. The monitor elements include all SPP and first tier Non-SPP facilities 69 kV and above.

B. Model Updates

SPP used eleven seasonal models to study the WR to EDE 150 MW transfer for the requested service period. The SPP 2004 Series Cases 2004/05 Winter Peak (04WP), 2005 April Minimum (05AP), 2005 Spring Peak (05G), 2005 Summer Peak (05SP), 2005 Summer Shoulder (05SH), 2005 Fall Peak (05FA), 2005/06 Winter Peak (05WP), 2007 Summer Peak (07SP), 2007/08 Winter Peak (07WP), 2010 Summer Peak (10SP), and 2010/11 Winter Peak (10WP) were used to study the impact of 150 MW transfer on the system during the requested service period of 1/1/2005 to 1/1/2025.

The chosen base case models were modified to reflect the most current modeling information. The cases were modified to reflect firm transfers during the requested service period that were not already included in the SPP 2004 Series Cases. From the eleven seasonal models, two system scenarios were developed. Scenario 1 includes confirmed West to East transfers not already included in the January 2004 base case series models, SPS exporting, and the Lamar HVDC Tie flowing from SPS to Lamar, and ERCOT exporting. Scenario 2 includes confirmed East to West transfers not already included in the January 2004 base case series models, SPS importing, and the Lamar HVDC Tie flowing from Lamar to SPS, and ERCOT importing.

C. Transfer Analysis

Using the selected cases both with and without the transfer modeled, the PSS/E Activity ACCC was run on the cases and compared to determine the facility overloads caused or impacted by the transfers. The PSS/E options chosen to conduct the analysis can be found in Appendix A.

D. Upgrade Analysis

This system impact study does not include analysis with the assigned upgrades modeled. To determine the final cost and possible start date of the requested service, additional analysis will be performed to determine the impact of modeling the assigned upgrades for the request.

4. Study Results

A. Study Analysis Results

Tables 1.1, 2.1, 1.2, and 2.2 contain the steady-state analysis results of the System Impact Study. The Tables are in the attached workbook *SPP-2004-001-1 Tables*. The tables identify the seasonal case in which the event occurred, the facility control area location, applicable ratings of the overloaded facility, the loading percentage with and without the 150 MW transfer, and the estimated ATC value if calculated. Comments are provided in the tables to document any SPP or Non - SPP identification or assignment of the event, existing mitigations plans or criteria to disregard the event as a limiting constraint, upgrades and costs to mitigate a limiting constraint, or any specific study procedures associated with modeling an event.

Table 1.1 lists the SPP Facility Overloads caused or impacted by the 150 MW transfer for Scenario 1. Solutions with engineering and construction costs are provided in the tables.

Tables 2.1 lists overloads on first tier Non - SPP Regional Tariff participants' transmission systems caused or impacted by the 150 MW transfer for Scenario 1.

Table 1.2 lists the SPP Facility Overloads caused or impacted by the 150 MW transfer for Scenario 2. Solutions with engineering and construction costs are provided in the tables.

Tables 2.2 lists overloads on first tier Non - SPP Regional Tariff participants' transmission systems caused or impacted by the 150 MW transfer for Scenario 2.

Table 3 documents previously confirmed transmission service that when curtailed will relieve the impact on the Chamber Springs – Tontitown 161kV line.

Table 4 lists the Generation Shift Factors of applicable SPP units identified for the Chamber Springs – Tontitown 161kV line. Example relief pairs and redispatch amounts required to relieve the additional impact on the facility are provided.

Tables 1.1a and 1.2a document the modeling representation of the events identified in Tables 1.1 and 1.2 respectively to include bus numbers and bus names.

5. Conclusion

Three facilities were identified for the WR to EDE study that limit the ATC to 0MW after the requested start date. The upgrade assigned to the BULL SHOALS - BULL SHOALS HES 161kV line has an estimated in-service date of 6/1/2006. This facility is a summer limit only and would therefore defer service to a start date of 10/1/2005. The AECI Jamesville 161/69/13.8kV Transformers 1 and 2 limit the service to 0MW beginning in the 2005 Summer Peak. The EDE planned upgrades for relieving the facility have an estimated in-service date of 6/1/2007. An AECI mitigation plan will be in effect for the 2005 and 2006 Summer Peak prior to the completion of the EDE upgrades. The Chamber Springs – Tontitown 161kV line was identified as limit to service for the 2005 Summer and 2005 Winter cases. This facility is scheduled to be upgraded by the summer of 2007. Expediting the upgrade is not possible to accommodate the requested start date for the WR to EDE service.

Curtailed of previously confirmed service and unit redispatch were evaluated as an option for relieving the impact on the Chamber Springs – Tontitown 161kV line. The amount and time period of curtailment required for possible confirmed Oasis Reservations is documented in Table 3. Generation shift factors and applicable redispatch relief pairs are documented in Table 4. SPP will work with the customer and the applicable party to reach an agreement concerning the curtailment of confirmed service and the redispatch of units. The curtailment or redispatch requirements would be called upon prior to implementing NERC TLR Level 5a.

If a curtailment or redispatch option is agreed upon for relieving the impact on the Chamber Springs – Tontitown 161kV line, the probable deferred start date will be 10/1/2005. If no redispatch or curtailment option is given for relieving the impact on this facility, the start date of the requested service may be delayed until the upgrade of the limiting facility is completed. The current estimated completion date for the upgrades relieving the Chamber Springs – Tontitown 161kV line is 6/1/2007. The final ATC, upgrade solutions, cost assignments, complete evaluation of renewal rights, and available redispatch and curtailment options will be determined upon the completion of the facility study.

Appendix A

PSS/E CHOICES IN RUNNING LOAD FLOW PROGRAM AND ACCC

BASE CASES:

Solutions - Fixed slope decoupled Newton-Raphson solution (FDNS)

1. Tap adjustment – Stepping
2. Area interchange control – Tie lines only
3. Var limits – Apply immediately
4. Solution options - Phase shift adjustment
 - Flat start
 - Lock DC taps
 - Lock switched shunts

ACCC CASES:

Solutions – AC contingency checking (ACCC)

1. MW mismatch tolerance – 0.5
2. Contingency case rating – Rate B
3. Percent of rating – 100
4. Output code – Summary
5. Min flow change in overload report – 1mw
6. Excl'd cases w/ no overloads form report – YES
7. Exclude interfaces from report – NO
8. Perform voltage limit check – YES
9. Elements in available capacity table – 60000
10. Cutoff threshold for available capacity table – 99999.0
11. Min. contng. case Vltg chng for report – 0.02
12. Sorted output – None

Newton Solution:

1. Tap adjustment – Stepping
2. Area interchange control – Tie lines only
3. Var limits - Apply automatically
4. Solution options - Phase shift adjustment
 - Flat start
 - Lock DC taps
 - Lock switched shunts

SPP-2004-001-1 Scenario 1
 Table 1.1 - SPP Facility Overloads Caused or Impacted
 by 150 MW Transfer

Southwest Power Pool
 System Impact Study

Study Case	From Area	To Area	Monitored Branch Over 100% Rate B	Rate <MVA>	BC % Loading	TC % Loading		Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05SH	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	115.2	117.2	3.2	CHAMBER SPRINGS - FARMINGTON AECC 161KV	0	AEPW Upgrade Schedule Completion Date 6/1/2007	
05SH	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	103.5	105.4	3.2	FARMINGTON AECC - SOUTH FAYETTEVILLE 161KV	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	137.6	139.6	3.3	CHAMBER SPRINGS - FARMINGTON AECC 161KV	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	123.2	125.2	3.3	FARMINGTON AECC - SOUTH FAYETTEVILLE 161KV	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	103.8	105.7	3.0	FLINT CREEK - GENTRY REC 161KV	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	103.0	104.9	3.0	EAST CENTERTON - GENTRY REC 161KV	0	See Previous Upgrade Specified for Facility	
05WP	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	275	102.7	104.5	3.3	CHAMBER SPRINGS - FARMINGTON AECC 161KV	0	See Previous Upgrade Specified for Facility	
07SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	112.5	115.3	3.1	EUREKA SPRINGS - OSAGE CREEK (AECC) 161KV	0	Replaces the buswork at Bull Shoals	\$ 650,000
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	145.1	149.1	4.5	EUREKA SPRINGS - OSAGE CREEK (AECC) 161KV	0	See Previous Upgrade Specified for Facility	
10SP	EMDE	EMDE	JOPLIN SW - EXPLORER SPRING CITY TAP 69KV	39	87.6	102.1		SUB 184 - NEOSHO STH JCT. - SUB 314 - NEOSHO LINDE 69KV	150	Excluded due to EMDE Mitigation Plan	
Total Estimated Cost											\$ 650,000

Table 2.1 - Non-SPP Facility Overloads Caused or Impacted by 150 MW Transfer

Southwest Power Pool
System Impact Study

Study Case	From Area	To Area	Monitored Branch Over 100% Rate B	Rate <MVA>	BC % Loading	TC % Loading	Outaged Branch Causing Overload	Comment
05SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV1 1	56	104.5	113.4	96089 5JAMESV 161 WND 2 JAMESV2 2	EMDE Planned Upgrade - Estimated In-Service Date 6/1/2007
05SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV2 2	56	108.3	117.5	96089 5JAMESV 161 WND 2 JAMESV1 1	See Previous Upgrade Specified for Facility
07SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV1 1	56	117.8	128.3	96089 5JAMESV 161 WND 2 JAMESV2 2	See Previous Upgrade Specified for Facility
07SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV2 2	56	121.0	131.9	96089 5JAMESV 161 WND 2 JAMESV1 1	See Previous Upgrade Specified for Facility
07SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	112.5	115.3	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Replace the buswork at Bull Shoals
07SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	112.2	115.0	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV1 1	56	124.0	134.2	96089 5JAMESV 161 WND 2 JAMESV2 2	See Previous Upgrade Specified for Facility
10SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV2 2	56	127.5	137.8	96089 5JAMESV 161 WND 2 JAMESV1 1	See Previous Upgrade Specified for Facility
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	145.1	149.1	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	See Previous Upgrade Specified for Facility
10SP	ENTR	ENTR	99797 5HARR-S 161 to 99811 5HARR-E 161 CKT 1	223	153.1	156.3	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99797 5HARR-S 161 to 99812 5HARR-W 161 CKT 1	223	144.2	147.2	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	145.2	149.3	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	98.6	101.7	52680 BEAVER 5 161 to 53136 EUREKA 5 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	97.6	101.3	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99809 5FLIPN 161 to 99837 5SUMMIT 161 CKT 1	162	134.4	138.4	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99810 5GR FOR 161 to 99812 5HARR-W 161 CKT 1	223	111.9	114.5	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99811 5HARR-E 161 to 99837 5SUMMIT 161 CKT 1	162	122.0	125.9	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades

SPP-2004-001-1 Scenario 2
 Table 1.2 - SPP Facility Overloads Caused or Impacted
 by 150 MW Transfer

Southwest Power Pool
 System Impact Study

Study Case	From Area	To Area	Monitored Branch Over 100% Rate B	Rate <MVA>	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	100.3	103.7	BEE BRANCH (AECC) - QUITMAN 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
05SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	97.6	100.9	BEE BRANCH (AECC) - CLINTON 161KV	108	See Previous Upgrade Specified for Facility Identified in Scenario 1	
05SP	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	120.2	122.2	CHAMBER SPRINGS - FARMINGTON AECC 161KV	0	AEPW Upgrade Schedule Completion Date 6/1/2007	
05SP	AEPW	AEPW	CHAMBER SPRINGS - TONTITOWN 161KV	244	105.7	107.7	FARMINGTON AECC - SOUTH FAYETTEVILLE 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
07SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	118.4	121.2	EUREKA SPRINGS - OSAGE CREEK (AECC) 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
07SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	102.9	106.4	BEE BRANCH (AECC) - QUITMAN 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	149.9	154.3	EUREKA SPRINGS - OSAGE CREEK (AECC) 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	119.8	123.4	BEE BRANCH (AECC) - QUITMAN 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	116.3	120.0	BEE BRANCH (AECC) - CLINTON 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	113.5	117.1	CLINTON - CLINTON WEST (AECC) 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	107.8	111.0	BEAVER - EUREKA SPRINGS 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	105.9	111.1	SUB 438 - RIVERSIDE - TABLE ROCK 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	102.1	105.8	BULL SHOALS - LEAD HL 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	BULL SHOALS - BULL SHOALS HES 161KV	167	102.2	105.7	AECC BOTKINBURG - CLINTON WEST (AECC) 161KV	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	EMDE	SWPA	NEOSHO - SUB 184 - NEOSHO SOUTH JCT. 161KV	157	96.7	104.2	FLINT CREEK - SUB 392 - DECATUR SOUTH 161KV	66	Rebuild 161 kv line from 336 ACSR to 795 ACSR and replace terminal equipment	\$ 800,000
10SP	EMDE	EMDE	JOPLIN SW - EXPLORER SPRING CITY TAP 69KV	39	87.4	101.8	SUB 184 - NEOSHO STH JCT. - SUB 314 - NEOSHO LINDE 69KV	150	Excluded due to EMDE Mitigation Plan	
Total Estimated Cost										\$ 800,000

Table 2.2 - Non-SPP Facility Overloads Caused or Impacted
by 150 MW Transfer

Study Case	From Area	To Area	Monitored Branch Over 100% Rate B	Rate <MVA>	BC % Loading	TC % Loading	Outaged Branch Causing Overload	Comment
05SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	100.3	103.7	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
05SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	97.6	100.9	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
05SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	100.0	103.5	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	Relieved due to Entergy Planned Upgrades
05SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	97.2	100.6	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	Relieved due to Entergy Planned Upgrades
07SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV1 1	56	115.8	126.2	96089 5JAMESV 161 WND 2 JAMESV2 2	See Previous Upgrade Specified for Facility Identified in Scenario 1
07SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV2 2	56	118.9	129.8	96089 5JAMESV 161 WND 2 JAMESV1 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
07SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	118.4	121.2	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
07SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	102.9	106.4	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
07SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	118.3	121.0	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
07SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	102.5	106.0	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	Relieved due to Entergy Planned Upgrades
07SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	99.5	103.0	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV1 1	56	122.5	132.9	96089 5JAMESV 161 WND 2 JAMESV2 2	See Previous Upgrade Specified for Facility Identified in Scenario 1
10SP	AECI	AECI	96089 5JAMESV 161 WND 2 JAMESV2 2	84	125.9	136.6	96089 5JAMESV 161 WND 2 JAMESV1 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	149.9	154.3	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	119.8	123.4	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	116.3	120.0	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	See Previous Upgrade Specified for Facility Identified in Scenario 1
10SP	ENTR	ENTR	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	167	97.4	101.0	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99797 5HARR-S 161 to 99811 5HARR-E 161 CKT 1	223	151.7	155.5	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99797 5HARR-S 161 to 99812 5HARR-W 161 CKT 1	223	142.9	146.5	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	150.1	154.5	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	119.5	123.2	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99802 5BULLSH* 161 to 99809 5FLIPN 161 CKT 1	162	116.0	119.7	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99809 5FLIPN 161 to 99837 5SUMMIT 161 CKT 1	162	139.3	143.6	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99809 5FLIPN 161 to 99837 5SUMMIT 161 CKT 1	162	109.6	113.2	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99809 5FLIPN 161 to 99837 5SUMMIT 161 CKT 1	162	106.1	109.8	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99810 5GR FOR 161 to 99812 5HARR-W 161 CKT 1	223	110.8	113.8	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99811 5HARR-E 161 to 99837 5SUMMIT 161 CKT 1	162	126.8	130.9	53136 EUREKA 5 161 to 99832 5OSAGE # 161 CKT 1	Relieved due to Entergy Planned Upgrades
10SP	ENTR	ENTR	99811 5HARR-E 161 to 99837 5SUMMIT 161 CKT 1	162	98.0	101.5	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	Relieved due to Entergy Planned Upgrades

Limiting Facility: Chamber Springs to Tontitown 161kV Line
 Line Outage: Chamber Springs to Farmington AECC 161kV Line
 Date Redispatch Needed: 6/1/2005 - 10/1/2005 and 12/1/2005 - 4/1/2006
 Relief Amount: 4.9MW

Source	Sink	GSF
SPA_BVR #1 113.8	System Swing	-0.11946
SPA_BVR #2 113.8	System Swing	-0.11946
SPA_TBR1&2 113.8	System Swing	-0.04271
SPA_TBR3&4 113.8	System Swing	-0.04271
EMDE_OZD312 14.60	System Swing	-0.04126
AEPW_FLINTCR121.0	System Swing	-0.03966
EMDE_L1G382 113.2	System Swing	-0.02650
EMDE_L3G3821 18.0	System Swing	-0.02650
EMDE_L4G3821 18.0	System Swing	-0.02650
SPA_BSH #1 113.8	System Swing	-0.02501
SPA_BSH #2 113.8	System Swing	-0.02501
SPA_BSH3&4 113.8	System Swing	-0.02501
SPRM_SWPS#1 120.0	System Swing	-0.02322
EMDE_S2G439 118.0	System Swing	-0.02320
SPRM_JRGT1 113.8	System Swing	-0.02294
SPRM_JRGT2 113.8	System Swing	-0.02294
SPRM_JRPS#1 113.8	System Swing	-0.02286
EMDE_R7G167 113.2	System Swing	-0.02235
SPRM_MAC GT1 13.8	System Swing	-0.02146
EMDE_R10G167113.2	System Swing	-0.01997
EMDE_A1G349 113.8	System Swing	-0.01807
SPA_NFK #1 113.8	System Swing	-0.01797
SPA_STK #1 113.8	System Swing	-0.01632
AECJ_2ELDORTP69.0	System Swing	-0.01316
AEPW_ARSHILL114.8	System Swing	0.01010
AEPW_LIEBR3-113.8	System Swing	0.01030
SPA_RSK1&2 113.8	System Swing	0.01051
SPA_RSK3&4 113.8	System Swing	0.01051

Source	Sink	GSF
AEPW_NMARSHL269.0	System Swing	0.01096
AEPW_KNOXL4-113.8	System Swing	0.01106
AEPW_PIRKEY 123.4	System Swing	0.01110
AEPW_LEBROCG118.0	System Swing	0.01113
AEPW_ESTGAS1 18.0	System Swing	0.01115
AEPW_WILKE1-120.0	System Swing	0.01151
AEPW_NES1-1 14.4	System Swing	0.01183
AEPW_NES1-1A 18.0	System Swing	0.01183
AEPW_WELSH1-118.0	System Swing	0.01241
AEPW_NARROWS269.0	System Swing	0.01326
SPA_FTG1&2 113.8	System Swing	0.01336
SPA_WEB123 113.8	System Swing	0.01451
SPA_TEN1&2 113.8	System Swing	0.01451
SPA_EUF #1 113.8	System Swing	0.01466
SPA_BBOW#1 113.8	System Swing	0.01678
SPA_KEY1&2 113.8	System Swing	0.02004
AEPW_NARROWS269.0	System Swing	0.02068
AEPW_SWS1-1 13.8	System Swing	0.02115
AEPW_SWS3-1 24.0	System Swing	0.02115
SPA_DEN #1 113.8	System Swing	0.02126
AEPW_COM1-1 13.8	System Swing	0.02135
AEPW_WEL 4-1 13.8	System Swing	0.02148
AEPW_TPS2-1 13.8	System Swing	0.02709
AEPW_TPS4-1 13.8	System Swing	0.02709
AEPW_RSS1-1 24.0	System Swing	0.02859
AEPW_RSS2-1 22.0	System Swing	0.02859
AEPW_COGEN 1 18.0	System Swing	0.03732
AEPW_COGEN 3 18.0	System Swing	0.03732

Example relief pairs with redispatch amounts required to relieve facility by 4.9 MW

Source	Sink	Factor	Redispatch Amount (MW)
SPA_BVR #1 113.8	AEPW_COGEN 3 18.0	-0.15678	31
SPA_TBR1&2 113.8	AEPW_RSS2-1 22.0	-0.07130	69
EMDE_OZD312 14.60	AEPW_TPS4-1 13.8	-0.06835	72
EMDE_L1G382 113.2	AEPW_WEL 4-1 13.8	-0.04798	102
SPA_BSH3&4 113.8	AEPW_COM1-1 13.8	-0.04636	106
EMDE_S2G439 118.0	AEPW_SWS3-1 24.0	-0.04435	110
SPRM_JRGT1 113.8	AEPW_COGEN 1 18.0	-0.06026	81
SPRM_JRPS#1 113.8	AEPW_RSS1-1 24.0	-0.05145	95
SPA_NFK #1 113.8	SPA_BBOW#1 113.8	-0.03475	141
AECJ_2ELDORTP69.0	AEPW_COGEN 1 18.0	-0.05048	97

Factor = Source GSF Referenced to System Swing - Sink GSF Referenced to System Swing
 Redispatch Amount = Relief Amount / Factor

Amount of Curtailment Required for Oasis Reservation 619796

Monitored Branch Over 100% Rate B	Outaged Branch Causing Overload	Date Curtailment Needed	WR to EDE % Response	WR to EDE MW Impact	AEPW to EES (Oasis Reservation 619796) % Response	ATC (MW) Needed	Amount of Oasis Reservation 619796 Needed for Curtailment
CHAMBER SPRINGS - TONTITOWN 161KV	CHAMBER SPRINGS - FARMINGTON AECC 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.3	4.9	3.4	150	145
CHAMBER SPRINGS - TONTITOWN 161KV	FARMINGTON AECC - SOUTH FAYETTEVILLE 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.3	4.9	3.4	150	144
CHAMBER SPRINGS - TONTITOWN 161KV	FLINT CREEK - GENTRY REC 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.0	4.5	2.8	150	161
CHAMBER SPRINGS - TONTITOWN 161KV	EAST CENTERTON - GENTRY REC 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.0	4.5	2.8	150	161
CHAMBER SPRINGS - TONTITOWN 161KV	CHAMBER SPRINGS - FARMINGTON AECC 161KV	12/1/2005 - 4/1/2006 12/1/2006 - 4/1/2007	3.3	4.9	3.4	150	144

Amount of 619796 Needed for Curtailment = WR to EDE MW Impact / Oasis Reservation 619796 Response

Amount of Curtailment Required for Oasis Reservation 730036

Monitored Branch Over 100% Rate B	Outaged Branch Causing Overload	Date Curtailment Needed	WR to EDE % Response	WR to EDE MW Impact	AEPW to AMRN (Oasis Reservation 730036) % Response	ATC (MW) Needed	Amount of Oasis Reservation 730036 Needed for Curtailment
CHAMBER SPRINGS - TONTITOWN 161KV	CHAMBER SPRINGS - FARMINGTON AECC 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.3	4.9	4.1	150	121
CHAMBER SPRINGS - TONTITOWN 161KV	FARMINGTON AECC - SOUTH FAYETTEVILLE 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.3	4.9	4.1	150	120
CHAMBER SPRINGS - TONTITOWN 161KV	FLINT CREEK - GENTRY REC 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.0	4.5	3.4	150	133
CHAMBER SPRINGS - TONTITOWN 161KV	EAST CENTERTON - GENTRY REC 161KV	6/1/2005 - 10/1/2005 6/1/2006 - 10/1/2006	3.0	4.5	3.4	150	133
CHAMBER SPRINGS - TONTITOWN 161KV	CHAMBER SPRINGS - FARMINGTON AECC 161KV	12/1/2005 - 4/1/2006 12/1/2006 - 4/1/2007	3.3	4.9	4.1	150	120

Amount of 730036 Needed for Curtailment = WR to EDE MW Impact / Oasis Reservation 730036 Response

SPP-2004-001-1 Scenario 1
 Table 1.1a - Modeling Representation for Table 1.1
 Includes Bus Numbers and Bus Names

Southwest Power Pool
 System Impact Study

Study Case	From Area	To Area	Monitored Branch Over 100% Rate B	Rate <MVA>	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05SH	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITNS 161 CKT 1	244	115.2	117.2	53154 CHAMSPR5 161 to 53195 FARMGTNS 161 CKT 1	0	AEPW Upgrade Schedule Completion Date 6/1/2007	
05SH	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITNS 161 CKT 1	244	103.5	105.4	53157 SFAYTVL5 161 to 53195 FARMGTNS 161 CKT 1	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITNS 161 CKT 1	244	137.6	139.6	53154 CHAMSPR5 161 to 53195 FARMGTNS 161 CKT 1	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITNS 161 CKT 1	244	123.2	125.2	53157 SFAYTVL5 161 to 53195 FARMGTNS 161 CKT 1	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITNS 161 CKT 1	244	103.8	105.7	53139 FLINTRCS 161 to 53187 GENTRYRS 161 CKT 1	0	See Previous Upgrade Specified for Facility	
05SP	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITNS 161 CKT 1	244	103.0	104.9	53133 ECNTRTN5 161 to 53187 GENTRYRS 161 CKT 1	0	See Previous Upgrade Specified for Facility	
05WP	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITNS 161 CKT 1	275	102.7	104.5	53154 CHAMSPR5 161 to 53195 FARMGTNS 161 CKT 1	0	See Previous Upgrade Specified for Facility	
07SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	112.5	115.3	53136 EUREKA 5 161 to 99832 SOSAGE # 161 CKT 1	0	Replace the buswork at Bull Shoals	\$ 650,000
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	145.1	149.1	53136 EUREKA 5 161 to 99832 SOSAGE # 161 CKT 1	0	See Previous Upgrade Specified for Facility	
10SP	EMDE	EMDE	59438 EXP449T2 69 to 59592 JOP389 2 69 CKT 1	39	87.6	102.1	59543 NEO184 2 69 to 59563 LIN314 2 69 CKT 1	150	Excluded due to EMDE Mitigation Plan	
Total Estimated Cost										\$ 650,000

Study Case	From Area	To Area	Monitored Branch Over 100% Rate B	Rate <MVA>	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	100.3	103.7	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
05SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	97.6	100.9	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	108	See Previous Upgrade Specified for Facility Identified in Scenario 1	
05SP	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITN5 161 CKT 1	244	120.2	122.2	53154 CHAMSPR5 161 to 53195 FARMGTN5 161 CKT 1	0	AEPW Upgrade Schedule Completion Date 6/1/2007	
05SP	AEPW	AEPW	53154 CHAMSPR5 161 to 53170 TONTITN5 161 CKT 1	244	105.7	107.7	53157 SFAYTVL5 161 to 53195 FARMGTN5 161 CKT 1	0	See Previous Upgrade Specified for Facility	
07SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	118.4	121.2	53136 EUREKA 5 161 to 99832 SOSAGE # 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
07SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	102.9	106.4	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	-124	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	149.9	154.3	53136 EUREKA 5 161 to 99832 SOSAGE # 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	119.8	123.4	99519 5QUITMN 161 to 99799 5BEE BR 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	116.3	120.0	99799 5BEE BR 161 to 99807 5CLINTN 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	113.5	117.1	99806 5CLIN-W# 161 to 99807 5CLINTN 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	107.8	111.0	52680 BEAVER 5 161 to 53136 EUREKA 5 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	105.9	111.1	52672 TABLE R5 161 to 59497 RVSA38 5 161 CKT 1	0	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	102.1	105.8	52660 BULL SH5 161 to 99859 5LEAD HL 161 CKT 1	-85	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	SWPA	ENTR	52660 BULL SH5 161 to 99802 5BULLSH* 161 CKT 1	167	102.2	105.7	99806 5CLIN-W# 161 to 99847 5BOTKIN# 161 CKT 1	-94	See Previous Upgrade Specified for Facility Identified in Scenario 1	
10SP	EMDE	SWPA	52686 NEO SPA5 161 to 59471 NEO184 5 161 CKT 1	157	96.7	104.2	53139 FLINTCR5 161 to 59484 DEC392 5 161 CKT 1	66	Rebuild 161 kV line from 336 ACSR to 795 ACSR and replace terminal equipment	\$ 800,000
10SP	EMDE	EMDE	59438 EXP449T2 69 to 59592 JOP389 2 69 CKT 1	39	87.4	101.8	59543 NEO184 2 69 to 59563 LIN314 2 69 CKT 1	150	Excluded due to EMDE Mitigation Plan	
									Total Estimated Cost	\$ 800,000