



SPP *Southwest Power Pool*

*System Impact Study
SPP-2003-268-2
For Transmission Service
Requested By
Southwestern Public Service
Company*

From KCPL To SPS

*For a Redirected Amount Of 50 MW
From 1/1/2004 To 1/1/2005*

SPP Engineering, Tariff Studies

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ATTACHMENT: *SPP-2003-268-2 Tables*

1. Executive Summary

Southwestern Public Service Company has requested a system impact study for long-term Firm Point-to-Point transmission service from KCPL to SPS for 50 MW. The period of the service requested is from 1/1/2004 to 1/1/2005. The OASIS reservation number is 621161. This is a request to redirect the previously confirmed OASIS reservation 381170. Oasis Reservation 381170 is a 50 MW transfer from AMRN to SPS.

The principal objective of this study is to identify current system limitations using AC analyses and to determine the system upgrades necessary to provide the requested service.

Table 1 lists the SPP Facility Overloads caused or impacted by the requested service and includes solutions with engineering and construction costs to alleviate the limiting facilities. Table 2 includes Non - SPP Facility Overloads caused or impacted by the requested service.

Due to the inability to upgrade the limiting constraints identified within the reservation period, the ATC for the KCPL to SPS redirect is zero. Curtailment of previously confirmed service from AMRN to SPS (Oasis Reservation 381168 and 381169) and AEPW redispatch were evaluated as an option for relieving the additional impacts on the SPP facilities caused by the KCPL to SPS redirect. The amount and time period of curtailment required is documented in Table 3. Applicable AEPW redispatch is documented in Table 4. The curtailment and redispatch requirements would be called upon prior to implementing NERC TLR Level 5a. If SPS does not wish to curtail the amount of service required for the AEPW facility identified, SPS must reach an agreement with AEPW regarding the redispatch of AEPW units to relieve the impacts on that facility. If the customer agrees to curtail previously confirmed service and provides documentation of agreement with AEPW regarding the redispatch of AEPW units, the request for the redirect of service will be accepted.

2. Introduction

Southwestern Public Service Company has requested a system impact study for Point-to-Point Service from KCPS to SPS for 50 MW. The principal objective of this study is to identify the restraints on the SPP Regional Tariff System that may limit the requested service and determine the least cost solutions required to alleviate the limiting facilities.

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 50 MW transfer and the impact of the required upgrades for service on transmission line loading and transmission bus voltages for 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 50 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.

B. Model Updates

SPP used six seasonal models to study the KCPL to SPS 50 MW transfer for the requested service period. The SPP 2003 Series Cases 2003/2004 Winter Peak (03WP), 2004 April Minimum (04AP), 2004 Spring Peak (04G), 2004 Summer Peak (04SP), 2004 Fall Peak (04FA), and 2004 Winter Peak (04WP) were used to study the impact of the 50 MW transfer on the SPP system during the requested service period of 01/01/2004 to 01/01/2005. The Spring Peak models apply to April and May, the Summer Peak models apply to June through September, the Fall Peak models apply to October and November, and the Winter Peak models apply to December through March.

The chosen base case models were modified to reflect the most current modeling information. The cases were modified to reflect future firm transfers during the requested service period that were not already included in the January 2003 base case series models.

C. Transfer Analysis

Using the selected cases both with and without the requested transfer modeled, the PSS/E Activity ACCC was run on the cases and compared to determine the facility overloads caused or impacted by the transfer. 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 50 MW KCPL to SPS transfer.

4. Study Results

A. Study Analysis Results

Tables 1 and 2 contain the steady-state analysis results of the System Impact Study. The Tables are in the attached workbook *SPP-2003-268-2 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 studied transfer, and the estimated ATC value using interpolation 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 lists the SPP Facility Overloads caused or impacted by the 50 MW transfer. Solutions with engineering and construction costs are provided in the tables.

Table 2 lists overloads on first tier Non - SPP Regional Tariff participants' transmission systems caused or impacted by the 50 MW transfer. No Non – SPP facilities were identified.

Table 3 documents the amount of AMRN to SPS curtailment required for the time period needed for each limiting constraint.

Table 4 lists AEPW Generation Shift Factors for the TERRA NITROGEN TAP - VERDIGRIS 138KV line for the outage of NORTHEAST STATION - OWASSO SOUTH 138KV. These factors are provided for AEPW redispatch to relieve the facility loading by 0.3 MW from 6/1/2004 to 10/1/2004. Example relief pairs with redispatch amounts required to relieve facility by 0.3 MW are provided.

Table 1a documents the modeling representation of the events identified in Table 1 to include bus numbers and bus names.

5. Conclusion

Due to the inability to upgrade the limiting constraints identified within the reservation period, the ATC for the KCPL to SPS redirect is zero. Curtailment of previously confirmed service from AMRN to SPS (Oasis Reservation 381168 and 381169) and AEPW redispatch were evaluated as an option for relieving the additional impacts on the SPP facilities caused by the KCPL to SPS redirect. The amount and time period of curtailment required is documented in Table 3. Applicable AEPW redispatch is documented in Table 4. The curtailment and redispatch requirements would be called upon prior to implementing NERC TLR Level 5a. If SPS does not wish to curtail the amount of service required for the AEPW facility identified, SPS must reach an agreement with AEPW regarding the redispatch of AEPW units to relieve the impacts on that facility. If the customer agrees to curtail previously confirmed service and provides documentation of agreement with AEPW regarding the redispatch of AEPW units, the request for the redirect of service will be accepted.

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

Study Year	From Area	To Area	Monitored Branch Over 100% Rate B	Rate B	KCPL to SPS BC % Loading	KCPL to SPS TC % Loading	AMRN to SPS BC % Loading	AMRN to SPS TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
03WP	WERE	WERE	NORTH AMERICAN PHILIPS - NORTH AMERICAN PHILIPS JUNCTION (SOUTH) 115KV	160	100.3	102.0	100.3	101.7	EAST MCPHERSON - SUMMIT 230KV	0	Rebuild 0.88 miles and reconductor with 1192.5 ACSR.	\$ 417,200
03WP	WERE	WERE	NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	68	108.2	110.1	108.2	109.7	EAST MCPHERSON - SUMMIT 230KV	0	Tear down double circuit, build single circuit with 1192.5 ACSR.	\$ 7,800,000
04G	WERE	WERE	ANZIO - FORT JUNCTION SWITCHING STATION 115KV	92	104.2	104.9	104.2	104.8	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (EAST) 115KV	50	Westar Operating Directive 1217, Outage of Fort Junction - West Junction City 115kV Line	
04G	WERE	WERE	ATHENS SWITCHING STATION - COFFEY COUNTY NO. 4 VERNON 69KV	45	101.6	102.0	101.6	101.7	BENTON - WOLF CREEK 345KV	50	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	ATHENS SWITCHING STATION - COFFEY COUNTY NO. 4 VERNON 69KV	45	101.1	101.5	101.1	101.1	ROSE HILL - WOLF CREEK 345KV	50	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	COFFEY COUNTY NO. 4 VERNON - GREEN 69KV	45	102.9	103.4	102.9	103.0	BENTON - WOLF CREEK 345KV	50	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	COFFEY COUNTY NO. 4 VERNON - GREEN 69KV	45	102.4	102.8	102.4	102.4	ROSE HILL - WOLF CREEK 345KV	50	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 1	68	115.0	116.0	115.0	115.8	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 2	50	Invalid Contingency	
04G	WERE	WERE	KEREFORD JUNCTION - NORTHWEST LEAVENWORTH 115KV	68	105.0	105.1	105.0	105.1	ARNOLD - STRANGER CREEK 115KV	50	Westar Operating Directive 1200, Outage of Arnold to Stranger Creek 115KV	
04G	WERE	WERE	NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	68	105.0	106.9	105.0	106.5	EAST MCPHERSON - SUMMIT 230KV	0	See Previous Upgrade Specified for Facility	
04SP	WERE	WERE	AUBURN ROAD - KEENE 115KV	68	103.3	104.0	103.3	103.8	EAST MANHATTAN - JEFFREY ENERGY CENTER 230KV	50	Westar Operating Directive 633, Outage of East Manhattan - Jeffery Energy Center 230kV Line	
04SP	AEPW	AEPW	EAST CENTRAL HENRYETTA - OKMULGEE 138KV	105	102.3	103.3	102.3	103.1	HENRYETTA - KELCO 138KV	0	Replace Okmulgee Wavetrapp	\$ 40,000
04SP	AEPW	AEPW	EAST CENTRAL HENRYETTA - OKMULGEE 138KV	105	109.6	110.6	109.6	110.4	KELCO - OKMULGEE 138KV	0	See Previous Upgrade Specified for Facility	
04SP	AEPW	AEPW	EAST CENTRAL HENRYETTA - WEELETKA 138KV	105	105.4	106.3	105.4	106.1	KELCO - OKMULGEE 138KV	0	Replace Weleetka Wavetrapp	\$ 40,000
04SP	WERE	WERE	EAST STREET - WEST EMPORIA 115KV	92	102.6	103.1	102.6	103.1	MORRIS COUNTY - WEST EMPORIA 115KV	50	Westar Operating Directive 1209, Outage of Morris County - West Emporia 115kV Line	
04SP	OKGE	OKGE	PANTHER - SILVER LAKE 138KV	287	101.5	101.7	101.5	101.7	LONEOK - NORTHWEST 138KV	50	Upgrade completed by OKGE. Rate A/B = 478/478MVA	
04SP	WERE	WERE	ROSE HILL JUNCTION - WEAVER 69KV	43	101.6	102.7	101.6	102.3	EL PASO - FARBER 138KV	0	Move Rose Hill Jct. 69 kV load to Rose Hill 345/138 kV substation. Requires new transformer bay and a new 25 MVA 138-12 kV transformer.	\$ 1,400,000
04SP	AEPW	AEPW	TERRA NITROGEN TAP - VERDIGRIS 138KV	151	103.7	103.9	103.7	103.8	NORTHEAST STATION - OWASSO SOUTH 138KV	0	Solution Undetermined	
04FA	WERE	WERE	ANZIO - FORT JUNCTION SWITCHING STATION 115KV	92	110.4	111.2	110.4	111.1	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (EAST) 115KV	50	Westar Operating Directive 1217, Outage of Fort Junction - West Junction City 115kV Line	
04FA	WERE	WERE	AUBURN ROAD - KEENE 115KV	68	108.9	109.6	108.9	109.4	EAST MANHATTAN - JEFFREY ENERGY CENTER 230KV	50	Westar Operating Directive 633, Outage of East Manhattan - Jeffery Energy Center 230kV Line	
04FA	AEPW	AEPW	CATOOSA - LYNN LANE EAST TAP 138KV	235	99.8	100.3	99.8	100.2	BROKEN ARROW 101ST NORTH - ONETA 138KV	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	AEPW	AEPW	CATOOSA - LYNN LANE EAST TAP 138KV	235	102.3	102.8	102.3	102.7	WEKIWA 345/138KV TRANSFORMER	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	AEPW	AEPW	CATOOSA - LYNN LANE EAST TAP 138KV	235	102.3	102.8	102.3	102.7	TULSA NORTH - WEKIWA 345KV	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	AEPW	AEPW	CATOOSA - LYNN LANE EAST TAP 138KV	235	102.5	103.2	102.5	103.1	NORTHEAST STATION - ONETA 345KV	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	WERE	WERE	CIRCLEVILLE - HOYT HTI SWITCHING JUNCTION 115KV	97	101.1	101.3	101.1	100.8	HOYT - STRANGER CREEK 345KV	50	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04FA	WERE	WERE	EAST STREET - WEST EMPORIA 115KV	92	103.1	103.6	103.1	103.5	MORRIS COUNTY - WEST EMPORIA 115KV	50	Westar Operating Directive 1209, Outage of Morris County - West Emporia 115kV Line	
04FA	WERE	WERE	EXIDE JUNCTION - NORTH AMERICAN PHILIPS 115KV	196	103.1	103.9	103.1	103.7	EAST MCPHERSON - SUMMIT 230KV	0	Rebuild and reconductor 0.34 miles with 1192 ACSR.	\$ 95,200
04FA	WERE	WERE	EXIDE JUNCTION - SUMMIT 115KV	196	100.2	100.4	100.2	100.4	NORTHVIEW - SUMMIT 115KV	0	Rebuild and reconductor 4.94 miles with 1192 ACSR.	\$ 1,100,000
04FA	WERE	WERE	EXIDE JUNCTION - SUMMIT 115KV	196	108.9	109.7	108.9	109.6	EAST MCPHERSON - SUMMIT 230KV	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV	68	103.7	104.4	103.7	104.3	JEFFERY ENERGY CENTER - SUMMIT 345KV	50	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04FA	WERE	WERE	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV CKT 1	68	100.1	100.7	100.1	100.6	FORT JUNCTION SWITCHING STATION - MCDOWELL CREEK SWITCHING STATION 115KV CKT 2	50	Invalid Contingency	
04FA	WERE	WERE	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV	68	110.4	111.4	110.4	111.2	JEFFERY ENERGY CENTER - SUMMIT 345KV	50	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04FA	WERE	WERE	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 1	68	123.8	124.8	123.8	124.7	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 2	50	Invalid Contingency	
04FA	WERE	WERE	KEENE - SOUTH ALMA 115KV	68	103.3	104.0	103.3	103.9	EAST MANHATTAN - JEFFREY ENERGY CENTER 230KV	50	Westar Operating Directive 633, Outage of East Manhattan - Jeffery Energy Center 230kV Line	
04FA	WERE	WERE	NORTH AMERICAN PHILIPS - NORTH AMERICAN PHILIPS JUNCTION (SOUTH) 115KV	160	118.1	119.8	118.1	119.5	EAST MCPHERSON - SUMMIT 230KV	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	68	127.5	129.3	127.5	129.0	EAST MCPHERSON - SUMMIT 230KV	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 2	92	111.2	112.8	111.2	112.5	EAST MCPHERSON - SUMMIT 230KV CKT 1	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (EAST) 115KV	141	116.3	117.3	116.3	117.1	JEFFERY ENERGY CENTER - SUMMIT 345KV	50	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	

04FA	WERE	WERE	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (WEST) 115KV	141	99.5	100.6	99.5	100.4	JEFFERY ENERGY CENTER - SUMMIT 345KV	50	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04WP	AEPW	AEPW	CATOOSA - LYNN LANE EAST TAP 138KV	235	99.7	100.3	99.7	100.2	WEKIWA 345/138KV TRANSFORMER	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04WP	AEPW	AEPW	CATOOSA - LYNN LANE EAST TAP 138KV	235	99.7	100.3	99.7	100.2	TULSA NORTH - WEKIWA 345KV	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04WP	AEPW	AEPW	CATOOSA - LYNN LANE EAST TAP 138KV	235	99.8	100.5	99.8	100.3	NORTHEAST STATION - ONETA 345KV	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04WP	WERE	WERE	CIRCLEVILLE - HOYT HTI SWITCHING JUNCTION 115KV	97	102.5	102.6	102.5	102.2	HOYT - STRANGER CREEK 345KV	50	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04WP	WERE	WERE	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 1	68	103.3	104.3	103.3	104.1	FORT JUNCTION SWITCHING STATION - WEST JUNCTION CITY JUNCTION (EAST) 115KV CKT 2	50	Invalid Contingency	
04WP	WERE	WERE	NORTH AMERICAN PHILIPS - NORTH AMERICAN PHILIPS JUNCTION (SOUTH) 115KV	160	103.8	105.5	103.8	105.2	EAST MCPHERSON - SUMMIT 230KV	0	See Previous Upgrade Specified for Facility	
04WP	WERE	WERE	NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	68	112.1	113.9	112.1	113.6	EAST MCPHERSON - SUMMIT 230KV	0	See Previous Upgrade Specified for Facility	
04WP	WERE	WERE	WEST JUNCTION CITY - WEST JUNCTION CITY JUNCTION (EAST) 115KV	141	99.8	100.8	99.8	100.6	JEFFERY ENERGY CENTER - SUMMIT 345KV	50	Westar Operating Directive 402, Outage of Jeffery Energy Center - Summit 345kV	
											Total Estimated Cost (Without Curtailment of Service)	\$ 10,892,400

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Table 2 - Non-SPP Facilities Caused or Impacted
by the 50 MW Transfer

Southwest Power Pool
System Impact Study

Study Year	From Area	To Area	Monitored Branch Over 100% Rate B	Rate B	KCPL to SPS BC % Loading	KCPL to SPS TC % Loading	Outaged Branch Causing Overload
03WP			NONE				NONE
04AP			NONE				NONE
04G			NONE				NONE
04SP			NONE				NONE
04FA			NONE				NONE
04WP			NONE				NONE

Monitored Branch Over 100% Rate B	Outaged Branch Causing Overload	Date Curtailment Needed	KCPL to SPS % Response	AMRN to SPS % Response	*ATC (MW) Needed	Amount of AMRN to SPS (Oasis Reservations 381168 and 381169) Needed for Curtailment
NORTH AMERICAN PHILIPS - NORTH AMERICAN PHILIPS JUNCTION (SOUTH) 115KV	EAST MCPHERSON - SUMMIT 230KV	1/1/2004 - 4/1/2004	5.428	4.464	9	11
NORTH AMERICAN PHILIPS - NORTH AMERICAN PHILIPS JUNCTION (SOUTH) 115KV	EAST MCPHERSON - SUMMIT 230KV	10/1/2004 - 12/1/2004	5.392	4.422	9	11
NORTH AMERICAN PHILIPS - NORTH AMERICAN PHILIPS JUNCTION (SOUTH) 115KV	EAST MCPHERSON - SUMMIT 230KV	12/1/2004 - 1/1/2005	5.435	4.441	9	11
NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	EAST MCPHERSON - SUMMIT 230KV	1/1/2004 - 4/1/2004	2.489	2.047	9	11
NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	EAST MCPHERSON - SUMMIT 230KV	4/1/2004 - 6/1/2004	2.575	2.072	10	12
NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	EAST MCPHERSON - SUMMIT 230KV	10/1/2004 - 12/1/2004	2.472	2.040	9	11
NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 1	EAST MCPHERSON - SUMMIT 230KV	12/1/2004 - 1/1/2005	2.492	2.036	9	11
NORTH AMERICAN PHILIPS JUNCTION (SOUTH) - WEST MCPHERSON 115KV CKT 2	EAST MCPHERSON - SUMMIT 230KV	10/1/2004 - 12/1/2004	2.921	2.396	9	11
EXIDE JUNCTION - NORTH AMERICAN PHILIPS 115KV	EAST MCPHERSON - SUMMIT 230KV	10/1/2004 - 12/1/2004	3.156	2.575	9	11
EXIDE JUNCTION - SUMMIT 115KV	NORTHVIEW - SUMMIT 115KV	10/1/2004 - 12/1/2004	0.975	0.774	10	13
EXIDE JUNCTION - SUMMIT 115KV	EAST MCPHERSON - SUMMIT 230KV	10/1/2004 - 12/1/2004	3.180	2.593	9	11
EAST CENTRAL HENRYETTA - OKMULGEE 138KV	HENRYET4 - KELCO 138KV	6/1/2004 - 10/1/2004	2.039	1.692	8	10
EAST CENTRAL HENRYETTA - OKMULGEE 138KV	KELCO - OKMULGEE 138KV	6/1/2004 - 10/1/2004	2.006	1.657	9	11
EAST CENTRAL HENRYETTA - WELEETKA 138KV	KELCO - OKMULGEE 138KV	6/1/2004 - 10/1/2004	2.004	1.654	9	11
ROSE HILL JUNCTION - WEAVER 69KV	EL PASO - FARBER 138KV	6/1/2004 - 10/1/2004	0.915	0.611	17	25
TERRA NITROGEN TAP - VERDIGRIS 138KV	NORTHEAST STATION - OWASSO SOUTH 138KV	6/1/2004 - 10/1/2004	0.604	0.267	28	63

* ATC (MW) Needed = 50 MW - ATC (MW) from Table 1 + ATC (MW) Credit Given to the Redirected Path for Positive Impact Removed by the Original Path

ATC (MW) Credit = Redirect Amount (MW) * (%Response of Redirect Path) / (%Response Original Path)

** Amount (MW) Needed for Curtailment = ATC (MW) Needed * (KCPL to SPS %Response) / (AMRN to SPS %Response)

Table 4 - Generation Shift Factors for Redispatch

Limiting Facility: TERRA NITROGEN TAP - VERDIGRIS 138KV
 Line Outage: NORTHEAST STATION - OWASSO SOUTH 138KV
 Date Redispatch Needed: 6/1/04-10/1/04
 Relief Amount: 0.3 MW

Source	Sink	GSF
WELEETKA	System Swing	-0.00810
NORTHEASTERN STATION #1	System Swing	0.19491
NORTHEASTERN STATION #2	System Swing	0.19491
RIVERSIDE STATION #1	System Swing	-0.01770
RIVERSIDE STATION #2	System Swing	-0.01770
SOUTHWESTERN STATION #3	System Swing	-0.00298
COMANCHE #1	System Swing	-0.00297
TULSA POWER STATION # 3	System Swing	-0.01805
TULSA POWER STATION # 1	System Swing	-0.01805
COGENTRIX # 1	System Swing	-0.01386
ONETA #1	System Swing	-0.01575
KIOWA	System Swing	-0.00521

Example relief pairs with redispatch amounts required to relieve facility by 0.3 MW

Source	Sink	Factor	Redispatch Amount (MW)
RIVERSIDE STATION #1	NORTHEASTERN STATION #1	-0.21261	1
RIVERSIDE STATION #2	NORTHEASTERN STATION #1	-0.21261	1
RIVERSIDE STATION #1	NORTHEASTERN STATION #2	-0.21261	1
SOUTHWESTERN STATION #3	NORTHEASTERN STATION #2	-0.19789	2
TULSA POWER STATION # 3	NORTHEASTERN STATION #1	-0.21296	1
COMANCHE #1	NORTHEASTERN STATION #1	-0.19788	2
COGENTRIX # 1	NORTHEASTERN STATION #1	-0.20877	1

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

Study Year	From Area	To Area	Monitored Branch Over 100% Rate B	Rate B	KCPL to SPS BC % Loading	KCPL to SPS TC % Loading	AMRN to SPS BC % Loading	AMRN to SPS TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
03WP	WERE	WERE	57372 PHILIP3 115 to 57374 SPHILPJ3 115 CKT 1	160	100.3	102.0	100.3	101.7	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	Rebuild 0.88 miles and reconductor with 1192.5 ACSR.	\$ 417,200
03WP	WERE	WERE	57374 SPHILPJ3 115 to 57438 WMCPLHER3 115 CKT 1	68	108.2	110.1	108.2	109.7	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	Tear down double circuit, build single circuit with 1192.5 ACSR.	\$ 7,800,000
04G	WERE	WERE	57321 ANZIO 3 115 to 57328 FT JCT 3 115 CKT 1	92	104.2	104.9	104.2	104.8	57342 WJCCCTY 3 115 to 57343 WJCCCTYE3 115 CKT 1	0	Westar Operating Directive 1217, Outage of Fort Junction - West Junction City 115kV Line	
04G	WERE	WERE	57631 CC4VERN2 69 to 57623 ATHENS 2 69 CKT 1	45	101.6	102.0	101.6	101.7	56791 BENTON 7 345 to 56797 WOLFCKR7 345 CKT 1	0	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	57631 CC4VERN2 69 to 57623 ATHENS 2 69 CKT 1	45	101.1	101.5	101.1	101.1	56794 ROSEHIL7 345 to 56797 WOLFCKR7 345 CKT 1	0	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	57636 GREEN 2 69 to 57631 CC4VERN2 69 CKT 1	45	102.9	103.4	102.9	103.0	56791 BENTON 7 345 to 56797 WOLFCKR7 345 CKT 1	0	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	57636 GREEN 2 69 to 57631 CC4VERN2 69 CKT 1	45	102.4	102.8	102.4	102.4	56794 ROSEHIL7 345 to 56797 WOLFCKR7 345 CKT 1	0	Westar Operating Directive 1304, Overload of the Athens - Wolf Creek 69kV Line	
04G	WERE	WERE	57328 FT JCT 3 115 to 57343 WJCCCTYE3 115 CKT 1	68	115.0	116.0	115.0	115.8	57328 FT JCT 3 115 to 57343 WJCCCTYE3 115 CKT 1	0	Invalid Contingency	
04G	WERE	WERE	57216 KERFORD3 115 to 57259 NW LEAV3 115 CKT 1	68	105.0	105.1	105.0	105.1	57211 ARNOLD 3 115 to 57268 STRANGR3 115 CKT 1	0	Westar Operating Directive 1200, Outage of Arnold to Stranger Creek 115kV	
04G	WERE	WERE	57374 SPHILPJ3 115 to 57438 WMCPLHER3 115 CKT 1	68	105.0	106.9	105.0	106.5	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	See Previous Upgrade Specified for Facility	
04SP	WERE	WERE	57151 AUBURN 3 115 to 57167 KEENE 3 115 CKT 1	68	103.3	104.0	103.3	103.8	56852 JEC 6 230 to 56861 EMANHAT6 230 CKT 1	0	Westar Operating Directive 633, Outage of East Manhattan - Jeffery Energy Center 230kV Line	
04SP	AEPW	AEPW	54023 OKMULGE4 138 to 54049 EC.HEN-4 138 CKT 1	105	102.3	103.3	102.3	103.1	54017 HENRYET4 138 to 54057 KELCO 4 138 CKT 1	0	Replace Okmulgee Wavetrap	\$ 40,000
04SP	AEPW	AEPW	54023 OKMULGE4 138 to 54049 EC.HEN-4 138 CKT 1	105	109.6	110.6	109.6	110.4	54023 OKMULGE4 138 to 54057 KELCO 4 138 CKT 1	0	See Previous Upgrade Specified for Facility	
04SP	AEPW	AEPW	54049 EC.HEN-4 138 to 54028 WELETK4 138 CKT 1	105	105.4	106.3	105.4	106.1	54023 OKMULGE4 138 to 54057 KELCO 4 138 CKT 1	0	Replace Weleatka Wavetrap	\$ 40,000
04SP	WERE	WERE	57309 WEMPOR3 115 to 57301 EAST ST3 115 CKT 1	92	102.6	103.1	102.6	103.1	57305 MORRIS 3 115 to 57309 WEMPOR3 115 CKT 1	0	Westar Operating Directive 1209, Outage of Morris County - West Emporia 115kV Line	
04SP	OKGE	OKGE	54852 SLVRLAK4 138 to 54854 PANTHER4 138 CKT 1	287	101.5	101.7	101.5	101.7	54873 LONEOKA4 138 to 54879 NORTWST4 138 CKT 1	50	Upgrade completed by OKGE. Rate A/B = 478/478MVA	
04SP	WERE	WERE	57604 WEAVER 2 69 to 57837 RH JCT 2 69 CKT 1	43	101.6	102.7	101.6	102.3	57039 ELPASO 4 138 to 57042 FARBER 4 138 CKT 1	0	Move Rose Hill Jct. 69 kV load to Rose Hill 345/138 kV substation. Requires new transformer bay and a new 25 MVA 138-12 kV transformer.	\$ 1,400,000
04SP	AEPW	AEPW	53869 VERDIGS4 115 to 53849 TERNITP4 138 CKT 1	151	103.7	103.9	103.7	103.8	53857 OWASSO54 138 to 53945 N.E.S.-4 138 CKT 1	0	Solution Undetermined	
04FA	WERE	WERE	57321 ANZIO 3 115 to 57328 FT JCT 3 115 CKT 1	92	110.4	111.2	110.4	111.1	57342 WJCCCTY 3 115 to 57343 WJCCCTYE3 115 CKT 1	0	Westar Operating Directive 1217, Outage of Fort Junction - West Junction City 115kV Line	
04FA	WERE	WERE	57151 AUBURN 3 115 to 57167 KEENE 3 115 CKT 1	68	108.9	109.6	108.9	109.4	56852 JEC 6 230 to 56861 EMANHAT6 230 CKT 1	0	Westar Operating Directive 633, Outage of East Manhattan - Jeffery Energy Center 230kV Line	
04FA	AEPW	AEPW	53802 CATOOSA4 138 to 53783 LLAN ET4 138 CKT 1	235	99.8	100.3	99.8	100.2	53781 BA101-N4 138 to 53818 ONETA-4 138 CKT 1	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	AEPW	AEPW	53802 CATOOSA4 138 to 53783 LLAN ET4 138 CKT 1	235	102.3	102.8	102.3	102.7	53767 WEKIWA-7 345 to 53769 WEKIWA-4 138 CKT 1	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	AEPW	AEPW	53802 CATOOSA4 138 to 53783 LLAN ET4 138 CKT 1	235	102.3	102.8	102.3	102.7	53767 WEKIWA-7 345 to 53866 T.NO.-7 345 CKT 1	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	AEPW	AEPW	53802 CATOOSA4 138 to 53783 LLAN ET4 138 CKT 1	235	102.5	103.2	102.5	103.1	53819 ONETA--7 345 to 53955 N.E.S.-7 345 CKT 1	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04FA	WERE	WERE	57165 HTI JCT3 115 to 57152 CIRCLVL3 115 CKT 1	97	101.1	101.3	101.1	100.8	56765 HOYT 7 345 to 56772 STRANGR7 345 CKT 1	0	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04FA	WERE	WERE	57301 EAST ST3 115 to 57309 WEMPOR3 115 CKT 1	92	103.1	103.6	103.1	103.5	57305 MORRIS 3 115 to 57309 WEMPOR3 115 CKT 1	0	Westar Operating Directive 1209, Outage of Morris County - West Emporia 115kV Line	
04FA	WERE	WERE	57368 EXIDE J3 115 to 57372 PHILIP3 115 CKT 1	196	103.1	103.9	103.1	103.7	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	Rebuild and reconductor 0.34 miles with 1192 ACSR.	\$ 95,200
04FA	WERE	WERE	57368 EXIDE J3 115 to 57381 SUMMIT 3 115 CKT 1	196	100.2	100.4	100.2	100.4	57371 NORTHWV3 115 to 57381 SUMMIT 3 115 CKT 1	0	Rebuild and reconductor 4.94 miles with 1192 ACSR.	\$ 1,100,000
04FA	WERE	WERE	57368 EXIDE J3 115 to 57381 SUMMIT 3 115 CKT 1	196	108.9	109.7	108.9	109.6	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	57335 MCDOWEL3 115 to 57328 FT JCT 3 115 CKT 1	68	103.7	104.4	103.7	104.3	56766 JEC N 7 345 to 56773 SUMMIT 7 345 CKT 1	0	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04FA	WERE	WERE	57335 MCDOWEL3 115 to 57328 FT JCT 3 115 CKT 1	68	100.1	100.7	100.1	100.6	57328 FT JCT 3 115 to 57335 MCDOWEL3 115 CKT 2	0	Invalid Contingency	
04FA	WERE	WERE	57328 FT JCT 3 115 to 57343 WJCCCTYE3 115 CKT 1	68	110.4	111.4	110.4	111.2	56766 JEC N 7 345 to 56773 SUMMIT 7 345 CKT 1	0	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04FA	WERE	WERE	57328 FT JCT 3 115 to 57343 WJCCCTYE3 115 CKT 1	68	123.8	124.8	123.8	124.7	57328 FT JCT 3 115 to 57343 WJCCCTYE3 115 CKT 2	0	Invalid Contingency	
04FA	WERE	WERE	57167 KEENE 3 115 to 57339 S ALMA 3 115 CKT 1	68	103.3	104.0	103.3	103.9	56852 JEC 6 230 to 56861 EMANHAT6 230 CKT 1	0	Westar Operating Directive 633, Outage of East Manhattan - Jeffery Energy Center 230kV Line	
04FA	WERE	WERE	57372 PHILIP3 115 to 57374 SPHILPJ3 115 CKT 1	160	118.1	119.8	118.1	119.5	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	57374 SPHILPJ3 115 to 57438 WMCPLHER3 115 CKT 1	68	127.5	129.3	111.2	112.5	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	57374 SPHILPJ3 115 to 57438 WMCPLHER3 115 CKT 2	92	111.2	112.8	111.2	112.5	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	See Previous Upgrade Specified for Facility	
04FA	WERE	WERE	57343 WJCCCTYE3 115 to 57342 WJCCCTY 3 115 CKT 1	141	116.3	117.3	116.3	117.1	56766 JEC N 7 345 to 56773 SUMMIT 7 345 CKT 1	0	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04FA	WERE	WERE	57342 WJCCCTY 3 115 to 57344 WJCCCTY3 115 CKT 1	141	99.5	100.6	99.5	100.4	56766 JEC N 7 345 to 56773 SUMMIT 7 345 CKT 1	1	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04WP	AEPW	AEPW	53802 CATOOSA4 138 to 53783 LLAN ET4 138 CKT 1	235	99.7	100.3	99.7	100.2	53767 WEKIWA-7 345 to 53769 WEKIWA-4 138 CKT 1	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04WP	AEPW	AEPW	53802 CATOOSA4 138 to 53783 LLAN ET4 138 CKT 1	235	99.7	100.3	99.7	100.2	53767 WEKIWA-7 345 to 53866 T.NO.-7 345 CKT 1	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04WP	AEPW	AEPW	53802 CATOOSA4 138 to 53783 LLAN ET4 138 CKT 1	235	99.8	100.5	99.8	100.3	53819 ONETA--7 345 to 53955 N.E.S.-7 345 CKT 1	50	Incorrect rating in the non-summer cases. Rate A/B = 237/265MVA	
04WP	WERE	WERE	57165 HTI JCT3 115 to 57152 CIRCLVL3 115 CKT 1	97	102.5	102.6	102.5	102.2	56765 HOYT 7 345 to 56772 STRANGR7 345 CKT 1	0	Westar Operating Directive 803, Outage of Hoyt to Stranger Creek 345kV	
04WP	WERE	WERE	57328 FT JCT 3 115 to 57343 WJCCCTYE3 115 CKT 1	68	103.3	104.3	103.3	104.1	57328 FT JCT 3 115 to 57343 WJCCCTYE3 115 CKT 2	0	Invalid Contingency	
04WP	WERE	WERE	57372 PHILIP3 115 to 57374 SPHILPJ3 115 CKT 1	160	103.8	105.5	103.8	105.2	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	See Previous Upgrade Specified for Facility	
04WP	WERE	WERE	57374 SPHILPJ3 115 to 57438 WMCPLHER3 115 CKT 1	68	112.1	113.9	112.1	113.6	56872 EMCPLHER6 230 to 56873 SUMMIT 6 230 CKT 1	0	See Previous Upgrade Specified for Facility	
04WP	WERE	WERE	57343 WJCCCTYE3 115 to 57342 WJCCCTY 3 115 CKT 1	141	99.8	100.8	99.8	100.6	56766 JEC N 7 345 to 56773 SUMMIT 7 345 CKT 1	1	Westar Operating Directive 402, Outage of Jeffery Energy Center - Summit 345kV	
											Total Estimated Cost (Without Curtailment of Service)	\$ 10,892,400