



SPP *Southwest Power Pool*

*System Impact Study
SPP-2003-287-1
For Transmission Service
Requested By
Xcel Energy Marketing*

From SPS To EDDY

*For a Reserved Amount Of 200 MW
From 6/1/2008 To 6/1/2028*

SPP Engineering, Tariff Studies

Table of Contents

1. EXECUTIVE SUMMARY	3
2. INTRODUCTION	4
3. STUDY METHODOLOGY.....	5
A. DESCRIPTION	5
B. MODEL UPDATES	5
C. TRANSFER ANALYSIS	6
D. UPGRADE ANALYSIS	6
4. EXPANSION OF DC TIE AT EDDY.....	7
5. STUDY RESULTS	8
A. STUDY ANALYSIS RESULTS.....	8
5. CONCLUSION	9
APPENDIX A	10

ATTACHMENT: *SPP-2003-287-1 Tables*

1. Executive Summary

Xcel Energy Marketing has requested a system impact study for long-term Firm Point-to-Point transmission service from SPS to EDDY for 200 MW. The period of the service requested is from 6/1/2008 to 6/1/2028. The OASIS reservation numbers are 628572, 628573, 628574, and 628575.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 200 MW request while maintaining system reliability. The requested service was studied using two System Scenarios with SPS exporting and importing, respectively. The two scenarios were studied to capture worst case system limitations dependent on the bias of the transmission system.

The ATC and upgrades required may vary from these results due to the status of two higher priority requests. The higher priority requests include a SECI to SPS 150 MW request and a SECI to SPS 300 MW request. The study was performed with the higher priority requests and assigned upgrades included in the models.

Tables 1.1 and 1.2 list the SPP facility overloads caused or impacted by the transfer modeled for Scenario 1 and 2, respectively. Tables 2.1 and 2.2 lists the SPP voltage violations caused or impacted by the transfer modeled for Scenario 1 and 2, respectively. Tables 3.1 and 3.2 list the Non-SPP facility overloads caused or impacted by the transfer modeled, using Scenarios 1 and 2, respectively. Tables 4.1 and 4.2 list the Non-SPP voltage violations caused or impacted by the transfer modeled, using Scenarios 1 and 2, respectively. Selected solutions with known engineering and construction costs are provided for the SPP facility overloads and voltage violations found in the Tables.

The ATC for the SPS to EDDY request was assumed to be 0 MW. Per the customer, any remaining transmission capacity to EDDY not reserved during the 6/1/2008 to 6/1/2028 service period was assumed to be reserved with a POR of SPS, based on the requested service being a request to expand the EDDY DC Tie capacity by 200 MW. Preliminary estimates for two options are provided for increasing the DC Tie Capacity at EDDY. The first option is to install a parallel Variable Frequency Transformer with a \$55,363,405 preliminary estimate for engineering and construction. The second option is to install a parallel HVDC Tie with a \$50,363,405 preliminary estimate for engineering and construction. The estimated in-service date of the expansion is 1/1/2009. In addition to the expansion of the DC Tie Capacity at EDDY, the service requires AC transmission additions with a \$53,618,528 preliminary estimate for engineering and construction. This estimate includes a new 120 mile 345 kV line, a new 345 kV substation, two 345/230 kV transformers, and 78.8 MVAR of capacitor banks. The selected solutions proposed provide the voltage support needed to reliably facilitate the requested service. The preliminary engineering and construction estimates quoted are subject to change based on further engineering. The service also requires redispatch during the months of April through September over the entire reservation period. Generation shift factors and applicable redispatch relief pairs are documented in Tables 5 and 6, respectively. The redispatch requirements would be called upon prior to implementing NERC TLR Level 5a. A facility study may now be conducted to summarize the operating limits and to determine the financial characteristics associated with the requested service.

2. Introduction

Xcel Energy Marketing has requested a system impact study for long-term Firm Point-to-Point transmission service from SPS to EDDY for 200 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 request on transmission line and transformer loadings, and bus voltages for outages of single transmission lines, transformers, and generating units, and selected multiple transmission lines and transformers on the SPP system and first tier Non - SPP systems.

The requested service was studied using two System Scenarios with SPS exporting and importing, respectively. The two scenarios were studied to capture worst case system limitations dependent on the bias of the transmission system.

3. Study Methodology

A. Description

The system impact analysis was conducted to determine the steady-state impact of the requested service on the SPP and first tier Non - SPP control area 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. Normal operating ratings and emergency operating ratings monitored are Rate A and B in the SPP MDWG models, respectively. The upper bound and lower bound of the normal voltage range monitored is 105% and 95%. The upper bound and lower bound of the emergency voltage range monitored is 110% and 90%. The SPS Tuco 230 kV bus voltage is monitored at 92.5% due to pre-determined system stability limitations.

The contingency set includes AEPW, OKGE, SPS, SUNC, WEPL, and WFEW control area branches and ties 69kV and above, any defined contingencies for these control areas, and generation unit outages for the control areas with SPP reserve share program redispatch. The monitor elements include all SPP control area branches, ties, and buses 69 kV and above, and all first tier Non – SPP control area branches and ties 69 kV and above. Voltage monitoring was performed for SPP control area buses 69 kV and above.

A 3 % transfer distribution factor (TDF) cutoff was applied to all SPP control area facilities. For first tier Non – SPP control area facilities, a 3 % TDF cutoff was applied to AECI, AMRN, and ENTR and a 2 % TDF cutoff was applied to MEC, NPPD, and OPPD. For voltage monitoring, a 0.02 per unit change in voltage must occur due to the transfer or modeling upgrades to be considered a valid limit to the transfer.

B. Model Updates

SPP used eight seasonal models to study the SPS to EDDY 200 MW transfer for the requested service period. The SPP MDWG 2004 Series Cases Update 4 2005 April Minimum (05AP), 2005 Spring Peak (05G), 2005 Summer Shoulder (05SH), 2005 Fall Peak (05FA), 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 the requested service on the transmission system during the requested service period of 6/1/2008 to 6/1/2028. 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. From the eight seasonal models, two system scenarios were developed. Scenario 1 includes SWPP OASIS transmission requests not already included in the SPP 2004 Series Cases flowing in a West to East direction with ERCOT exporting and the SPS Control Area exporting to outside control areas and exporting to the planned Lamar HVDC Tie. Scenario 2 includes transmission requests not already included in the SPP 2004 Series Cases flowing in an East to West direction with ERCOT net importing and SPS importing from an outside control area and

importing from the planned Lamar HVDC Tie. The system scenarios were developed to minimize counter flows to the transfers studied. Both scenarios include higher priority service from SECI to SPS, totaling 450 MW, and assigned upgrades for that service.

Other modeling assumptions include modeling the expanded portion of the EDDY DC tie with a unity power factor. And, in order to have seasonal cases that serve as a good proxy for future seasonal models not available from the SPP MDWG 2004 Series Cases, the 2005 and 2007 cases were modified to include significant planned upgrades with in service dates prior to the start date of the requested service. The 2010 cases were not modified by adding any additional planned upgrades.

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

Using the cases both with and without the assigned upgrades modeled and with and without the 200 MW transfer modeled, the PSS/E Activity ACCC was run on the cases and compared to determine the facility overloads caused or impacted by the assigned upgrades. The transfer distribution cutoffs and voltage threshold were applied to determine the impacted facilities. The PSS/E options chosen to conduct the analysis can be found in Appendix A.

4. Expansion of DC Tie at EDDY

Per the customer, any remaining transmission capacity to EDDY not reserved during the 6/1/2008 to 6/1/2028 service period was assumed to be reserved with a POR of SPS, based on the requested service being a request to expand the EDDY DC Tie capacity by 200 MW. Preliminary estimates for two options are provided for increasing the DC Tie Capacity at EDDY. The first option is to install a parallel Variable Frequency Transformer with a \$55,363,405 preliminary estimate for engineering and construction. The second option is to install a parallel HVDC Tie with a \$50,363,405 preliminary estimate for engineering and construction. The estimated in-service date of the expansion is 1/1/2009. The preliminary engineering and construction estimates quoted are subject to change based on further engineering.

5. Study Results

A. Study Analysis Results

Tables 1 through 4 contain the initial steady-state analysis results of the System Impact Study. The Tables are in the attached workbook *SPP-2003-287-1 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 or voltage with and without the transfer, the percent transfer distribution factor (TDF) if applicable, 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.

Tables 1.1 and 1.2 list the SPP facility overloads caused or impacted by the transfer modeled for Scenario 1 and 2, respectively. Tables 2.1 and 2.2 lists the SPP voltage violations caused or impacted by the transfer modeled for Scenario 1 and 2, respectively. Tables 3.1 and 3.2 list the Non-SPP facility overloads caused or impacted by the transfer modeled, using Scenarios 1 and 2, respectively. Tables 4.1 and 4.2 list the Non-SPP voltage violations caused or impacted by the transfer modeled, using Scenarios 1 and 2, respectively. Selected solutions with known engineering and construction costs are provided for the SPP facility overloads and voltage violations found in the Tables.

From the results in the Tables, a number of solutions for contingencies analyzed did not converge with the 200 MW added at the EDDY DC Tie. The non-convergence was caused by voltage collapse. The selected solutions proposed provide the voltage support needed to reliably facilitate the requested service.

Table 5 lists SPS Generation Shift Factors for the CANYON WEST - DAWN 115KV line for the outage of BUSHLAND INTERCHANGE - DEAF SMITH INTERCHANGE 230KV CKT 1. These factors are provided for SPS redispatch to relieve the facility loading by 3.5 MW for the months of April and May and 3.4 MW for the months June through September. The redispatch is required for these months over the entire reservation period. Table 6 lists applicable relief pairs with redispatch amounts required to relieve facility by 3.5 MW and 3.4 MW, respectively.

No SPP or Non-SPP thermal overloads or voltage violation were caused or impacted by the modeling the selected upgrades.

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

5. Conclusion

The ATC for the SPS to EDDY request was assumed to be 0 MW. Per the customer, any remaining transmission capacity to EDDY not reserved during the 6/1/2008 to 6/1/2028 service period was assumed to be reserved with a POR of SPS, based on the requested service being a request to expand the EDDY DC Tie capacity by 200 MW. Preliminary estimates for two options are provided for increasing the DC Tie Capacity at EDDY. The first option is to install a parallel Variable Frequency Transformer with a \$55,363,405 preliminary estimate for engineering and construction. The second option is to install a parallel HVDC Tie with a \$50,363,405 preliminary estimate for engineering and construction. The estimated in-service date of the expansion is 1/1/2009. In addition to the expansion of the DC Tie Capacity at EDDY, the service requires AC transmission additions with a \$53,618,528 preliminary estimate for engineering and construction. This estimate includes a new 120 mile 345 kV line, a new 345 kV substation, two 345/230 kV transformers, and 78.8 MVAR of capacitor banks. The selected solutions proposed provide the voltage support needed to reliably facilitate the requested service. The preliminary engineering and construction estimates quoted are subject to change based on further engineering. The service also requires redispatch during the months of April through September over the entire reservation period. Generation shift factors and applicable redispatch relief pairs are documented in Tables 5 and 6, respectively. The redispatch requirements would be called upon prior to implementing NERC TLR Level 5a. A facility study may now be conducted to summarize the operating limits and to determine the financial characteristics associated with the requested service.

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 Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05AP			NONE IDENTIFIED						200		
05G			NONE IDENTIFIED						200		
05SH			NONE IDENTIFIED						200		
05FA			NONE IDENTIFIED						200		
07SP			NONE IDENTIFIED						200		
07WP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	Build a new 120 mile 345 kV line from Chaves County Interchange to a New Substation, on the Tolk to EDDY 345 kV line, to Yoakum County Interchange which requires four 345 kV terminals and two 345/230 kV transformers, add 50 MVAR capacitor bank at Chaves County Interchange 230 kV bus, and add 28.8 MVAR capacitor bank at Potash Junction Interchange 115 kV bus. Contingency Solution Converged with Selected Upgrades, No Limitations Identified	\$53,618,528
07WP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10SP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10SP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
10WP			NONE IDENTIFIED						200		
Total Estimated Engineering and Construction Cost											\$53,618,528

Study Case	AREA	Monitored Bus with Violation	BC Voltage (PU)	TC Voltage (PU)	Outaged Branch Causing Voltage Violation	ATC (MW)	Solution	Estimated Cost
05AP		NONE IDENTIFIED				200		
05G		NONE IDENTIFIED				200		
05SH		NONE IDENTIFIED				200		
05FA		NONE IDENTIFIED				200		
07SP	SPS	52073	52073 CHAVES6 230	0.9637	0.8629	OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	200	Not a Load Serving Bus
07SP	SPS	52073	52073 CHAVES6 230	0.9649	0.8658	OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	200	Not a Load Serving Bus
07WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
07WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
10SP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10SP		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
10WP		NONE IDENTIFIED				200		
Total Estimated Engineering and Construction Cost								\$0

Table 3.1 - Non-SPP Facility Overloads
Caused or Impacted by Transfer Using Scenario 1

Study Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	Comments
05AP			NONE IDENTIFIED						
05G			NONE IDENTIFIED						
05SH			NONE IDENTIFIED						
05FA			NONE IDENTIFIED						
07SP			NONE IDENTIFIED						
07WP			NONE IDENTIFIED						
10SP			NONE IDENTIFIED						
10WP			NONE IDENTIFIED						

Study Case	AREA	Monitored Bus with Violation	BC Voltage (PU)	TC Voltage (PU)	Outaged Branch Causing Voltage Violation	Comments
05AP		NONE IDENTIFIED				
05G		NONE IDENTIFIED				
05SH		NONE IDENTIFIED				
05FA		NONE IDENTIFIED				
07SP		NONE IDENTIFIED				
07WP		NONE IDENTIFIED				
10SP		NONE IDENTIFIED				
10WP		NONE IDENTIFIED				

SPP-2003-287-1
 Table 1.2 - SPP Facility Overloads
 Caused or Impacted by Transfer Using Scenario 2

Southwest Power Pool
 System Impact Study

Study Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05AP	SPS	SPS	PLANT X INTERCHANGE - TOLK INTERCHANGE 230KV	497	84.7	105.1	50.6	TOLK INTERCHANGE - TOLK INTERCHANGE 230KV	200	Invalid Contingency	
05AP			Contingency Solution Not Convergec					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05AP			Contingency Solution Not Convergec					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
05AP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51441 TOLK1 124.000] DISPATCH	N/A	Contingency Solution Not Converged with Selected Upgrades, SPS System Dispatch was revised due to unit outage for maintenance, Contingency Solution Converged and No Limitations Identified	
05FA			Contingency Solution Not Converged					TOLK INTERCHANGE 345/230KV TRANSFORMER	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05FA			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	"	
05FA			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
05G	SPS	SPS	CANYON WEST - DAWN 115KV	99	127.5	133.5	3.0	BUSHLAND INTERCHANGE - DEAF SMITH INTERCHANGE 230KV	0	Relieved by SPS Redispatch documented in Table 6	
05G			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05G			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
05G			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51441 TOLK1 124.000] DISPATCH	N/A	Contingency Solution Not Converged with Selected Upgrades, SPS System Dispatch was revised due to unit outage for maintenance, Contingency Solution Converged and No Limitations Identified	
05SH	SPS	SPS	CANYON WEST - DAWN 115KV	99	98.0	105.7	3.8	BUSHLAND INTERCHANGE - DEAF SMITH INTERCHANGE 230KV	52	Relieved by SPS Redispatch documented in Table 6	
05SH	SPS	SPS	DENVER CITY INTERCHANGE N - MUSTANG STATION 115KV	300	96.2	100.3	6.1	DENVER CITY INTERCHANGE S - MUSTANG STATION 115KV	200	Incorrect Rating, Emergency Rating is 316 MVA	
05SH			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05SH			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
07SP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
07SP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
07SP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51441 TOLK1 124.000] DISPATCH	N/A	"	
07SP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51442 TOLK2 124.000] DISPATCH	N/A	"	
07WP			Contingency Solution Not Converged					CHAVES COUNTY INTERCHANGE - OASIS INTERCHANGE 230KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
07WP			Contingency Solution Not Converged					TOLK INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
07WP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	"	
07WP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
10SP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10SP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
10WP			Contingency Solution Not Converged					CHAVES COUNTY INTERCHANGE - OASIS INTERCHANGE 230KV	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10WP			Contingency Solution Not Converged					TOLK INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
10WP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE - TOLK INTERCHANGE 345KV	N/A	"	
10WP			Contingency Solution Not Converged					EDDY COUNTY INTERCHANGE 345/230KV TRANSFORMER	N/A	"	
10WP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 52212 CUNN2 120.000] DISPATCH	N/A	"	
Total Estimated Engineering and Construction Cos											\$0

Study Case	AREA	Monitored Bus with Violation	BC Voltage (PU)	TC Voltage (PU)	Outaged Branch Causing Voltage Violation	ATC (MW)	Solution	Estimated Cost
05AP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05AP		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
05G		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05G		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
05SH		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05SH		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
05FA		Contingency Solution Not Converged			OPEN LINE FROM BUS 51439 [TOLKTP6 230.00] TO BUS 51440 [TOLK7 345.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05FA		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
05FA		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
07SP		Contingency Solution Not Converged			REMOVE UNIT 1 FROM BUS 51441 [TOLK1 124.000] DISPATCH	N/A	Contingency Converged with Selected Upgrades, No Limitations Identified	
07SP		Contingency Solution Not Converged			REMOVE UNIT 1 FROM BUS 51442 [TOLK2 124.000] DISPATCH	N/A	"	
07SP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
07SP		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
07WP	SPS	52073 CHAVES6 230	0.9699	0.8742	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	52185 EDDYCO 6 230	1.0000	0.8805	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	52186 EDDYCO7 345	0.9970	0.8849	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	52205 LEACO6 230	0.9989	0.8808	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	52209 CUNNINH6 230	1.0011	0.8783	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	52253 POTJCT6 230	0.9864	0.8665	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	52293 7RIVER6 230	0.9915	0.8685	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	52313 PECOS6 230	0.9931	0.8732	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP	SPS	59996 EPTNP-D6 230	0.9998	0.8800	REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	200	Not a Load Serving Bus	
07WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51195 [OASIS6 230.00] TO BUS 52073 [CHAVES6 230.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
07WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51439 [TOLKTP6 230.00] TO BUS 51440 [TOLK7 345.00] CKT 1	N/A	"	
07WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
07WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
10SP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10SP		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
10WP	SPS	51952 SNANDR3 115	0.9020	0.8760	OPEN LINE FROM BUS 51952 [SNANDR3 115.00] TO BUS 51962 [DNVRS3 115.00] CKT 1	154	Relieved or Impact Removed by Selected Upgrades	
10WP	SPS	51996 AMERADA3 115	0.9107	0.8850	OPEN LINE FROM BUS 51952 [SNANDR3 115.00] TO BUS 51962 [DNVRS3 115.00] CKT 1	156	Relieved or Impact Removed by Selected Upgrades	
10WP	SPS	52036 DOSS3 115	0.9031	0.8775	OPEN LINE FROM BUS 51952 [SNANDR3 115.00] TO BUS 51962 [DNVRS3 115.00] CKT 1	200	Not a Load Serving Bus	
10WP	SPS	52073 CHAVES6 230	0.9863	0.8997	OPEN LINE FROM BUS 51891 [YOAKUM6 230.00] TO BUS 52205 [LEACO6 230.00] CKT 1	200	Not a Load Serving Bus	
10WP	SPS	52205 LEACO6 230	0.9935	0.8982	OPEN LINE FROM BUS 51891 [YOAKUM6 230.00] TO BUS 52205 [LEACO6 230.00] CKT 1	200	Not a Load Serving Bus	
10WP		Contingency Solution Not Converged			REMOVE UNIT 1 FROM BUS 52212 [CUNN2 120.000] DISPATCH	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51195 [OASIS6 230.00] TO BUS 52073 [CHAVES6 230.00] CKT 1	N/A	"	
10WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51439 [TOLKTP6 230.00] TO BUS 51440 [TOLK7 345.00] CKT 1	N/A	"	
10WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 51440 [TOLK7 345.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
10WP		Contingency Solution Not Converged			OPEN LINE FROM BUS 52185 [EDDYCO 6230.00] TO BUS 52186 [EDDYCO7 345.00] CKT 1	N/A	"	
Total Estimated Engineering and Construction Cost								\$0

Table 3.2 - Non-SPP Facility Overloads
 Caused or Impacted by Transfer Using Scenario 2

Study Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	Comments
05AP			NONE IDENTIFIED						
05G			NONE IDENTIFIED						
05SH			NONE IDENTIFIED						
05FA			NONE IDENTIFIED						
07SP			NONE IDENTIFIED						
07WP			NONE IDENTIFIED						
10SP			NONE IDENTIFIED						
10WP			NONE IDENTIFIED						

Study Case	AREA	Monitored Bus with Violation	BC Voltage (PU)	TC Voltage (PU)	Outaged Branch Causing Voltage Violation	Comments
05AP		NONE IDENTIFIED				
05G		NONE IDENTIFIED				
05SH		NONE IDENTIFIED				
05FA		NONE IDENTIFIED				
07SP		NONE IDENTIFIED				
07WP		NONE IDENTIFIED				
10SP		NONE IDENTIFIED				
10WP		NONE IDENTIFIED				

Limiting Facility: CANYON WEST - DAWN 115KV
 Line Outage: BUSHLAND INTERCHANGE - DEAF SMITH INTERCHANGE 230KV CKT 1
 Date Redispatch Needed: 4/1-6/1
 Relief Amount: 3.5 MW
 Date Redispatch Needed: 6/1-10/1
 Relief Amount: 3.4 MW

Source	Sink	Generation Shift Factors for 4/1-6/1	Generation Shift Factors for 6/1-10/1
SPS_HARRNG1124.0	System Swing	0.05829	0.05822
SPS_HARRNG2124.0	System Swing	0.05829	0.05822
SPS_HARRNG3124.0	System Swing	0.05829	0.05822
SPS_NICHOL1113.8	System Swing	0.06938	0.06931
SPS_NICHOL2113.8	System Swing	0.06938	0.06931
SPS_NICHOL3122.0	System Swing	0.05843	0.05836
SPS_PLNTX1 113.8	System Swing	-0.10504	-0.10501
SPS_PLNTX2 113.8	System Swing	-0.10504	-0.10501
SPS_PLNTX3 113.8	System Swing	-0.10504	-0.10501
SPS_PLNTX4 120.0	System Swing	-0.10047	-0.10045
SPS_TOLK1 124.0	System Swing	-0.09727	-0.09724
SPS_TOLK2 124.0	System Swing	-0.09733	-0.09730
SPS_JONES1 122.0	System Swing	-0.05812	-0.05807
SPS_JONES2 121.0	System Swing	-0.05812	-0.05807
SPS_MUSTG1 113.8	System Swing	-0.08520	-0.08516
SPS_MUSTG2 113.8	System Swing	-0.08517	-0.08513
SPS_MUSTG3 122.0	System Swing	-0.08714	-0.08711
SPS_CUNN1 113.8	System Swing	-0.08753	-0.08749
SPS_CUNN2 120.0	System Swing	-0.08873	-0.08869
SPS_CUNN3 122.0	System Swing	-0.08753	-0.08749
SPS_CUNN4 122.0	System Swing	-0.08873	-0.08869
SPS_MADDX1 113.8	System Swing	-0.08729	-0.08725
SPS_MADDX2 113.8	System Swing	-0.08729	-0.08725

Relief Amount = ATC (MW) Needed * SPS to EDDY TDF - Relief Provided by Selected Upgrades
 Relief Provided by Selected Upgrades = 2.5 MW for 4/1-6/1 and 2.2 MW for 6/1-10/1

Table 6 - Applicable Relief Pairs
with Redispatch Amounts to Relieve Facility Impacts
to be implemented prior to NERC TLR Level 5a

Limiting Facility: CANYON WEST - DAWN 115KV

Line Outage: BUSHLAND INTERCHANGE - DEAF SMITH INTERCHANGE 230KV CKT 1

Date Redispatch Needed: 4/1-6/1

Relief Amount: 3.5 MW

Source	Sink	Factor	Redispatch Amount (MW)
SPS_JONES1 122.0	SPS_HARRINGTON 1, 2, or 3	-0.11641	30
SPS_JONES2 121.0	SPS_HARRINGTON 1, 2, or 3	-0.11641	30
SPS_MADDX1 113.8	SPS_HARRINGTON 1, 2, or 3	-0.14558	24
SPS_MADDX2 113.8	SPS_HARRINGTON 1, 2, or 3	-0.14558	24
SPS_CUNN1 113.8	SPS_HARRINGTON 1, 2, or 3	-0.14582	24
SPS_CUNN3 122.0	SPS_HARRINGTON 1, 2, or 3	-0.14582	24
SPS_CUNN4 122.0	SPS_HARRINGTON 1, 2, or 3	-0.14702	24
SPS_PLNTX1 113.8	SPS_HARRINGTON 1, 2, or 3	-0.16333	21
SPS_PLNTX2 113.8	SPS_HARRINGTON 1, 2, or 3	-0.16333	21
SPS_PLNTX3 113.8	SPS_HARRINGTON 1, 2, or 3	-0.16333	21
SPS_PLNTX4 120.0	SPS_HARRINGTON 1, 2, or 3	-0.15876	22

Date Redispatch Needed: 6/1-10/1

Relief Amount: 3.4 MW

Source	Sink	Factor	Redispatch Amount (MW)
SPS_JONES1 122.0	SPS_NICHOLS 1 or 2	-0.12738	27
SPS_MADDX1 113.8	SPS_NICHOLS 1 or 2	-0.15656	22
SPS_MADDX2 113.8	SPS_NICHOLS 1 or 2	-0.15656	22
SPS_CUNN1 113.8	SPS_NICHOLS 1 or 2	-0.1568	22
SPS_CUNN3 122.0	SPS_NICHOLS 1 or 2	-0.1568	22
SPS_CUNN4 122.0	SPS_NICHOLS 1 or 2	-0.158	22
SPS_PLNTX1 113.8	SPS_NICHOLS 1 or 2	-0.17432	20
SPS_PLNTX2 113.8	SPS_NICHOLS 1 or 2	-0.17432	20
SPS_PLNTX3 113.8	SPS_NICHOLS 1 or 2	-0.17432	20
SPS_PLNTX4 120.0	SPS_NICHOLS 1 or 2	-0.16976	20

Factor = Source GSF Referenced to System Swing - Sink GSF Referenced to System Swing

Redispatch Amount = Relief Amount / Factor

Study Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05AP			NONE IDENTIFIED						200		
05G			NONE IDENTIFIED						200		
05SH			NONE IDENTIFIED						200		
05FA			NONE IDENTIFIED						200		
07SP			NONE IDENTIFIED						200		
07WP			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	Build a new 120 mile 345 kV line from Chaves County Interchange to a New Substation, on the Tolk to EDDY 345 kV line, to Yoakum County Interchange which requires four 345 kV terminals and two 345/230 kV transformers, add 50 MVAR capacitor bank at Chaves County Interchange 230 kV bus, and add 28.8 MVAR capacitor bank at Potash Junction Interchange 115 kV bus. Contingency Solution Converged with Selected Upgrades, No Limitations Identified	\$53,618,528
07WP			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10SP			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	"	
10SP			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
10WP			NONE IDENTIFIED						200		

Table 1.2a - Modeling Representation for Table 1.2
Includes Bus Numbers and Bus Names

Southwest Power Pool
System Impact Study

Study Case	From Area	To Area	Monitored Branch Overload	Rate <MVA>	BC % Loading	TC % Loading	%TDF	Outaged Branch Causing Overload	ATC (MW)	Solution	Estimated Cost
05AP	SPS	SPS	51419 PLANTX6 230 to 51437 TOLKW6 230 CKT 1	497	84.7	105.1	50.6	51435 TOLKE6 230 to 51439 TOLKTP6 230 CKT 1	200	Invalid Contingency	
05AP			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05AP			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
05AP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51441 TOLK1 124.000] DISPATCH	N/A	Contingency Solution Not Converged with Selected Upgrades, SPS System Dispatch was revised due to unit outage for maintenance, Contingency Solution Converged and No Limitations Identified	
05FA			Contingency Solution Not Converged					51439 TOLKTP6 230 to 51440 TOLK7 345 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05FA			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	"	
05FA			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
05G	SPS	SPS	51078 CANYNW3 115 to 51102 DAWN 115 CKT 1	99	127.5	133.5	3.0	50993 BUSHLND6 230 to 51111 DFSMTH6 230 CKT 1	0	Relieved by SPS Redispatch documented in Table 6	
05G			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05G			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
05G			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51441 TOLK1 124.000] DISPATCH	N/A	Contingency Solution Not Converged with Selected Upgrades, SPS System Dispatch was revised due to unit outage for maintenance, Contingency Solution Converged and No Limitations Identified	
05SH	SPS	SPS	51078 CANYNW3 115 to 51102 DAWN 115 CKT 1	99	98.0	105.7	3.8	50993 BUSHLND6 230 to 51111 DFSMTH6 230 CKT 1	52	Relieved by SPS Redispatch documented in Table 6	
05SH	SPS	SPS	51960 DNVNR3 115 to 51966 MUSTGN3 115 CKT	300	96.2	100.3	6.1	51962 DNVRS3 115 to 51968 MUSTGS3 115 CKT 1	200	Incorrect Rating, Emergency Rating is 316 MVA	
05SH			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
05SH			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
07SP			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
07SP			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
07SP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51441 TOLK1 124.000] DISPATCH	N/A	"	
07SP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 51442 TOLK2 124.000] DISPATCH	N/A	"	
07WP			Contingency Solution Not Converged					51195 OASIS6 230 to 52073 CHAVES6 230 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
07WP			Contingency Solution Not Converged					51439 TOLKTP6 230 to 51440 TOLK7 345 CKT 1	N/A	"	
07WP			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	"	
07WP			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
10SP			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10SP			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
10WP			Contingency Solution Not Converged					51195 OASIS6 230 to 52073 CHAVES6 230 CKT 1	N/A	Contingency Solution Converged with Selected Upgrades, No Limitations Identified	
10WP			Contingency Solution Not Converged					51439 TOLKTP6 230 to 51440 TOLK7 345 CKT 1	N/A	"	
10WP			Contingency Solution Not Converged					51440 TOLK7 345 to 52186 EDDYCO7 345 CKT 1	N/A	"	
10WP			Contingency Solution Not Converged					52185 EDDYCO 6230 to 52186 EDDYCO7 345 CKT 1	N/A	"	
10WP			Contingency Solution Not Converged					REMOVE UNIT 1 FROM BUS 52212 CUNN2 120.000] DISPATCH	N/A	"	