



SPP *Southwest Power Pool*

***System Impact Study SPP-2001-026
For Transmission Service
Requested By
Southwestern Public Service
Company***

From SPS to OKGE

***For a Reserved Amount Of 14MW
From 6/1/01
To 1/1/03***

SPP Transmission Planning

Table Of Contents

1. EXECUTIVE SUMMARY	3
2. STUDY METHODOLOGY	4
A. DESCRIPTION.....	4
B. MODEL UPDATES.....	4
C. TRANSFER ANALYSIS.....	4
3. STUDY RESULTS	5
3. CONCLUSION.....	6
TABLE 1: FIRM SPS EXPORTS CONFIRMED DURING THE REQUESTED SERVICE PERIOD OF 6/01/01 TO 1/01/03.....	7
TABLE 2: SPS EXPORTS WITH THE RIGHT RENEW SERVICE DURING THE REQUESTED SERVICE PERIOD OF 1/01/02 TO 1/01/03.....	7
TABLE 3: SPS EXPORTS AND ATC SUMMARY DURING THE REQUESTED SERVICE PERIOD OF 6/01/01 TO 1/01/03.....	8
TABLE 4: OVERLOADS CAUSED BY RENEWABLE 136MW TRANSFER FROM SPS TO OKGE WITH ADDITIONAL LOADING BY REQUESTED 14MW TRANSFER FROM SPS TO OKGE	9
TABLE 5: VOLTAGES UNDER 0.9 PER UNIT CAUSED BY RENEWABLE 136MW TRANSFER FROM SPS TO OKGE WITH ADDITIONAL DECREASE IN PER UNIT VOLTAGE BY REQUESTED 14MW TRANSFER FROM SPS TO OKGE.....	9
APPENDIX A	10

1. Executive Summary

Southwestern Public Service Company has requested a Yearly Firm reservation for 14MW from SPS to OKGE. This is for OASIS Reservation 231393 for the time period from 6/1/01 to 1/1/03.

The previously calculated Total Transfer Capability from SPS to SPP was 315MW for the months of December 2001 thru March 2002. TTC had not been previously calculated for the months of April 2002 and beyond. The previously calculated TTC was based on the overloading of American Electric Power's Elk City 230/138kV autotransformer for the outage of the Tuco to Oklaunion 345kV line or the outage of the Oklaunion to Lawton Eastside 345kV line with the ERCOT North Tie Re-dispatched. The Transmission Reliability Margin, or TRM, is 34MW for SPS Exports.

Due the start of 300MW of long-term firm transmission service from SPS to Ameren and the possible renewal of 136MW of long-term firm transmission service from SPS to OKGE, starting January 1, 2002, the calculated TTC for 2002 must be greater or equal to 484MW to accept the requested 14MW transfer from SPS to OKGE.

The replacement of the Elk City 230/138kV autotransformer is already scheduled, and the upgraded transformer is required to be in service by January 1, 2002 for SPP OASIS transmission reservations 133602 and 133608. American Electric Power was contacted about the status of the transformer replacement and has verified the January 1, 2002 in service date. With the replacement of the Elk City transformer coupled with the new Potter to Holcomb 345kV line, scheduled to be in service by October 2001, the Total Transfer Capability can be increased up to the determination of new limiting constraints.

The renewable 136MW transfer from SPS to OKGE and the additional requested 14MW transfer from SPS to OKGE were studied to determine any new limiting facilities. Tables 4 and 5 document the identified Network Facility Limitations for the renewable 136MW transfer from SPS to OKGE. Table 4 lists the facilities overloaded by 136MW transfer and shows the additional loading caused by the requested 14MW transfer. Table 5 lists facilities with voltages below 0.9 per unit caused by the 136MW transfer and show the subsequent decrease in voltage caused by the requested 14MW transfer.

In addition to the identified thermal or voltage limitations, the Southwest Power Pool and SPS System Operations and Planning has determined that a stability study needs to be performed to determine any stability limitations before specifying a new TTC based solely on voltage and thermal limitations.

Due to the transfer limiting facilities identified in the steady-state analyses and the need for a Stability Study, SPP cannot accept the requested SPS to OKGE long-term firm 14MW transmission request from 6/1/01 to 1/1/03.

2. Study Methodology

A. Description

Two analyses were conducted to determine the impact of the 14MW transfer on the SPP system. An analysis was done to determine the ATC for SPS Exports available for the months of June 2001 thru March 2002, using calculated monthly TTC values. The second analysis was done to determine any new limiting facilities impacted or overloaded by the 14MW transfer.

The second analysis was done using two steps. The first step was to study the steady-state analysis impact on SPP and Non-SPP facilities of the renewable SPS to OKGE 136MW transfer that starts January 1, 2002 and ends January 1, 2003. The second step was to study the steady-state analysis impact on SPP and Non-SPP facilities of the additional requested SPS to OKGE 14MW transfer that starts June 1, 2001 and ends January 1, 2003.

The steady-state analyses were done to ensure current SPP Criteria and NERC Planning Standards requirements are fulfilled. The Southwest Power Pool (SPP) conforms to the NERC Planning Standards, which provide the strictest requirements, related to thermal overloads and voltages with a contingency. It requires that all facilities be within emergency ratings and voltages remain within plus or minus ten percent of nominal after a contingency.

B. Model Updates

SPP used four seasonal models to study the 14MW request. The SPP 2001 Series Cases 2001 Summer Peak, 2001/02 Winter Peak, 2002 Summer Peak, 2002/03 Winter Peak were used to study the impact of the 14MW transfer on the SPP system during the transaction period of 6/1/01 to 1/1/03.

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 request period that were not already included in the January 2001 base case series models.

C. Transfer Analysis

Using the created models and the ACCC function of PSS/E, single and select double contingency outages were analyzed. Then full AC solution was used to obtain the most accurate results possible. Any facility overloaded, using MVA ratings, in the transfer case and not overloaded in the base case was flagged. The PSS/E options chosen to conduct the Impact Study analysis can be found in Appendix A.

3. Study Results

Tables 1, 2, and 3 document the higher priority requests and ATC over the SPS to SPP interface. Table 1 lists all confirmed long-term firm reservations during the request period. Table 2 lists all long-term firm reservations with the right to renew service during the request period. Table 3 summarizes the higher priority requests and the ATC during the request period, using the previously calculated monthly TTC values. For June 2001 thru December 2001, ATC exists on the SPS to SPP interface to accept the requested 14MW transfer. For January 2002 thru March 2002, no ATC exists for the 14MW SPS to OKGE transfer, using the previously calculated TTC value of 315MW.

The replacement of the Elk City 230/138kV transformer January 1, 2002 increases the SPS export capability above the previously calculated 315MW TTC. To insure no other limiting facilities exist, two steady-state analyses were conducted in this study to determine the impact of the 14MW transfer on the SPP system. The first analysis was conducted to determine the overloads and voltages violations caused by the renewable 136MW transfer from SPS to OKGE from January 1, 2002 to January 1, 2003. Table 4 lists the overloads caused by the 136MW transfer from SPS to OKGE and the additional loading of those facilities by the requested 14MW transfer from SPS to OKGE. Table 5 lists the under-voltages caused by the 136MW transfer from SPS to OKGE and shows the subsequent decrease in voltage by the requested 14MW transfer from SPS to OKGE. Second, the requested 14MW transfer from SPS to OKGE was studied with the 136MW transfer included. No other new overloads were identified for the additional 14MW transfer from SPS to OKGE.

3. Conclusion

1. The upgraded Elk City 230/138kV autotransformer must be in service by January 1, 2002 to provide the capacity necessary to accept any additional transmission service requests over the SPS to SPP interface. Without the upgraded Elk City autotransformer, the ATC is zero for January 2002 thru March 2002 (Table 3).
2. If the upgraded Elk City 230/138kV autotransformer is in service by January 1, 2002, the 2002 TTC can be increased up to the determination of new limiting constraints.
3. The renewal of transmission service reservations 221370, 221371, and 232388 from 1/1/02 to 1/1/03, totaling 136MW from SPS to OKGE, were first studied to determine any limiting facilities. Limiting facilities were identified for the renewal of the 136MW transfer from SPS to OKGE in 2002. These facilities limitations must be relieved before accepting any additional requests in 2002.
4. The Southwest Power Pool and SPS System Operations and Planning has determined that a stability study is needed to determine if any stability limits exist for SPS Exports above the already confirmed 300MW in 2002.
5. Based on the results of the study, the requested 14MW of long-term firm transmission service from SPS to OKGE with a reservation period of 6/1/01 to 1/1/03 will be refused.

Table 1: Firm SPS Exports Confirmed During The Requested Service Period of 6/01/01 to 1/01/03

Request	From	To	POR	POD	Amnt	Customer	Type	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	
221370	1/1/2001	1/1/2002	SPS	OKGE	50	SPSM	Yearly						50	50	50	50	50	50	50	50
221371	1/1/2001	1/1/2002	SPS	OKGE	50	SPSM	Yearly						50	50	50	50	50	50	50	50
221372	1/1/2001	1/1/2002	SPS	CSWS	50	SPSM	Yearly	Redirected By 228448												
232388	1/10/2001	1/1/2002	SPS	OKGE	36	SPSM	Yearly						36	36	36	36	36	36	36	36
228448	1/18/2001	1/1/2002	SPS	OKGE	50	SPSM	Monthly						50	50	50	50	50	50	50	50
Total Confirmed Firm Service													186	186	186	186	186	186	186	186
Request	From	To	POR	POD	Amnt	Customer	Type	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	
234943	1/1/2002	1/1/2011	SPS	AMRN	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
234945	1/1/2002	1/1/2011	SPS	AMRN	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
234946	1/1/2002	1/1/2011	SPS	AMRN	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
234947	1/1/2002	1/1/2011	SPS	AMRN	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
133602	1/1/2002	1/1/2005	SPS	AMRN	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
133608	1/1/2002	1/1/2005	SPS	AMRN	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
Total Confirmed Firm Service								300	300	300	300	300	300	300	300	300	300	300	300	300

Table 2: SPS Exports With The Right Renew Service During The Requested Service Period of 1/01/02 to 1/01/03

Request	From	To	POR	POD	Amnt	Customer	Type	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	
221370	1/1/2001	1/1/2002	SPS	OKGE	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
221371	1/1/2001	1/1/2002	SPS	OKGE	50	SPSM	Yearly	50	50	50	50	50	50	50	50	50	50	50	50	50
232388	1/1/2001	1/1/2002	SPS	OKGE	36	SPSM	Yearly	36	36	36	36	36	36	36	36	36	36	36	36	36
Total ROFR								136	136	136	136	136	136	136	136	136	136	136	136	136

Table 3: SPS Exports And ATC Summary During The Requested Service Period of 6/01/01 to 1/01/03

Reservation Status	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	
Confirmed						186	186	186	186	186	186	186	
TRM						34	34	34	34	34	34	34	
						275	275	275	275	360	360	315	Calculated TTC
						55	55	55	55	140	140	95	ATC
Reservation Status	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	
Confirmed	300	300	300	300	300	300	300	300	300	300	300	300	
Possible Renewal	136	136	136	136	136	136	136	136	136	136	136	136	
TRM	34	34	34	34	34	34	34	34	34	34	34	34	
	315	315	315										Calculated TTC (1)
	0	0	0										ATC (1)

Note: (1) The Calculated TTC of 315MW and ATC of 0MW For January 2002 thru March 2002 applies to SPS Exports without the scheduled replacement of the Elk City 230/138kV Autotransformer.

Table 4: Overloads Caused By Renewable 136MW Transfer From SPS to OKGE with additional Loading By Requested 14MW Transfer From SPS to OKGE

Study Year	From-To Area(s)	Branch Over 100% Rate B	RATEB <MVA>	No Transfer %Loading	136MW Transfer Case %Loading	14MW Transfer Case %Loading	Outaged Branch That Caused Overload
02SP	SPS-SPS	KINGSMILL INTERCHNG 115/69KV TRANSFORMER 50808 KNGSML3 115 to 50807 KNGSML2 69.0 CKT 1	75	99.0	101.3	101.8	NICHOLS TO GRAPEVINE, 230KV 50915 NICHOL6 230 to 50827 GRAPEVN6 230 CKT1
02SP	WFEC-WFEC	MOREWOOD SW 138/69KV TRANSFORMER 56001 MORWODS4 138 to 56000 MORWODS269.0 CKT 1	33	99.7	101.1	101.3	ELK CITY 138/69KV TRANSFORMER 54121 ELKCTY-4 138 to 54122 ELKCTY-269.0 CKT1

Table 5: Voltages Under 0.9 Per Unit Caused By Renewable 136MW Transfer From SPS to OKGE with additional Decrease in Per Unit Voltage By Requested 14MW Transfer From SPS to OKGE

Study Year	From-To Area(s)	Buses With Voltage Under 0.9 per unit	No Transfer Per Unit Voltage	136MW Transfer Case Per Unit Voltage	14MW Transfer Case Per Unit Voltage	Outaged Branch That Caused Voltage Violation
02SP	SPS	CANADIAN, 69KV 50763 CANADIA269.0	0.903	0.874	0.869	NICHOLS TO GRAPEVINE, 230KV 50915 NICHOL6 230 to 50827 GRAPEVN6 230 CKT1

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 –1.0
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