



***System Impact Study SPP-2001-198  
For Transmission Service  
Requested By  
Southwestern Public Service  
Company***

***From Southwestern Public Service to  
Oklahoma Gas & Electric***

***For a Reserved Amount Of 100MW  
From 1/1/02  
To 1/1/03***

***SPP Transmission Planning***

# Table of Contents

<b>1. EXECUTIVE SUMMARY .....</b>	<b>3</b>
<b>2. INTRODUCTION .....</b>	<b>4</b>
<b>3. STUDY METHODOLOGY .....</b>	<b>5</b>
<b>A. DESCRIPTION.....</b>	<b>5</b>
<b>B. MODEL UPDATES.....</b>	<b>5</b>
<b>C. TRANSFER ANALYSIS .....</b>	<b>5</b>
<b>4. STUDY RESULTS.....</b>	<b>6</b>
<b>A. STUDY ANALYSIS RESULTS .....</b>	<b>6</b>
<b>TABLE 1 – SPP FACILITY OVERLOADS CAUSED BY THE SPS TO OKGE 100MW TRANSFER .....</b>	<b>7</b>
<b>TABLE 2 – NON - SPP FACILITY OVERLOADS CAUSED BY THE SPS TO OKGE 100MW TRANSFER.....</b>	<b>7</b>
<b>TABLE 3 – PREVIOUSLY ASSIGNED AND IDENTIFIED SPP FACILITIES IMPACTED BY THE SPS TO OKGE 100MW TRANSFER. ....</b>	<b>7</b>
<b>TABLE 4 – FIRM SPS EXPORTS CONFIRMED DURING THE REQUESTED SERVICE PERIOD OF 1/1/02 TO 1/1/03.....</b>	<b>8</b>
<b>TABLE 5 – SPS TO SPP TRANSFER SUMMARY DURING THE REQUESTED SERVICE PERIOD OF 1/1/02 TO 1/1/03.....</b>	<b>8</b>
<b>5. CONCLUSION .....</b>	<b>9</b>
<b>APPENDIX A .....</b>	<b>10</b>

## **1. Executive Summary**

Southwestern Public Service Company has requested a system impact study for long-term Firm Point-to-Point transmission service from SPS to OKGE. The period of the transaction is from 1/1/02 to 1/1/03. The request is for OASIS reservations 256922 and 256925 for a total of 100MW.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 100MW transfer while maintaining system reliability.

The previously calculated Total Transfer Capability from SPS to SPP was 315MW for the months of December 2001 through March 2002. This calculation 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 37MW for SPS Exports.

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. 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.

## **2. Introduction**

Southwestern Public Service Company has requested an impact study for transmission service from SPS to OKGE.

The principal objective of this study is to identify the restraints on the SPP Regional Tariff System that may limit the transfer to less than 100MW. This study includes steady-state contingency analyses (PSS/E function ACCC) and Available Transfer Capability (ATC) analyses.

The steady-state analysis considers the impact of the 100MW transfer on transmission line loading and transmission bus voltages for outages of single and selected multiple transmission lines and transformers on the SPP system.

### **3. Study Methodology**

#### **A. Description**

Two analyses were conducted to determine the impact of the 100MW transfer on the system. The first analysis was conducted to identify any new overloads caused by the 100MW transfer. The second analysis was done to ensure that available capacity exists on previously identified circuits.

The first analysis was to study the steady-state analysis impact of the 100MW transfer on the SPP system. The second step was to study Available Transfer Capability (ATC) of the facilities identified in the steady-state analysis impact. The steady-state analysis was 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 with a contingency. It requires that all facilities be within emergency ratings after a contingency.

The second analysis was done to determine the impact of the transfer on previously assigned and identified facilities.

#### **B. Model Updates**

SPP used three seasonal models to study the 100MW request. The SPP 2001 Series Cases 2001/2002 Winter Peak, 2002 Summer Peak, and 2002/03 Winter Peak were used to study the impact of the 100MW transfer on the SPP system during the transaction period of 1/1/02 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.

## **4. Study Results**

### **A. Study Analysis Results**

Tables 1, 2, and 3 contain the analysis results of the System Impact Study. The tables identify the seasonal case in which the event occurred; the emergency rating of the overloaded circuit (Rate B), the contingent loading percentage of the circuit with and without the studied transfer, the estimated ATC value using interpolation if calculated, any SPP identification or assignment of the event, and any solutions received from the transmission owners.

Table 1 shows the new facility overloads on the SPP Regional Tariff participants' transmission system caused by the 100MW transfer. Upgrades associated with these new overloads can be directly assigned to the SPS to OKGE 100MW transfer.

Table 2 documents overloads on Non SPP Regional Tariff participants' transmission systems caused by the 100MW transfer.

Table 3 documents the 100MW transfer impact on previously assigned and identified facilities. Available estimated in-service dates for the completion of the previously assigned upgrades are given in the table.

Tables 4 and 5 document the higher priority requests and requested service over the SPS to SPP interface. Table 4 lists all confirmed long-term firm reservations during the request period. Table 5 summarizes the total service from SPS to SPP during the request period.

**Table 1** – SPP Facility Overloads caused by the SPS to OKGE 100MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch That Caused Overload	ATC (MW)
01WP		NONE				NONE	100
02SP	WFEC-WFEC	MOREWOOD 138/69KV TRANSFORMER 56001 MORWODS4 138 to 56000 MORWODS269.0 CKT 1	33	99.2	100.2	ELK CITY 138/69KV TRANSFORMER 54121 ELKCTY-4 138 to 54122 ELKCTY-269.0 CKT1	76
02WP		NONE				NONE	100

**Table 2** – Non - SPP Facility Overloads caused by the SPS to OKGE 100MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch That Caused Overload	ATC (MW)	Assignment
01WP		NONE				NONE	100	
02SP	SUNC-SUNC	PIONEER 115/69KV TR 56391 PIONEER3 115 to 56390 PIONEER269.0 CKT 1	50	99.7	100.3	NORTH CIMARRON TO SEWARD, 115KV 56455 NCIMARN3 115 to 56467 SEWARD-3 115 CKT1	53	Mitigation Plan
02WP	SUNC-SUNC	PLYMELL TO PIONEER TAP, 115KV 56393 PLYMELL3 115 to 56392 PIONTAP3 115 CKT 1	143	99.9	100.7	FLETCHER TO HOLCOMB, 115KV 56420 FLETCHR3 115 to 56448 HOLCOMB3 115 CKT1	14	Mitigation Plan

**Table 3** – Previously Assigned and Identified SPP Facilities Impacted by the SPS to OKGE 100MW Transfer.

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch That Caused Overload
01WP		NONE				NONE
02SP		NONE				NONE
02WP		NONE				NONE

**Table 4** – Firm SPS Exports Confirmed During the Requested Service Period of 1/1/02 to 1/1/03.

Request	From	To	POR	POD	Amount	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	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	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	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	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	50
Total Confirmed Firm Service								300	300	300	300	300	300	300	300	300	300	300	300	300	

**Table 5** – SPS to SPP Transfer Summary During the Requested Service Period of 1/1/02 to 1/1/03.

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
256922	50	50	50	50	50	50	50	50	50	50	50	50
256925	50	50	50	50	50	50	50	50	50	50	50	50
TRM	37	37	37	37	37	37	37	37	37	37	37	37
<b>Total MW</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>	<b>437</b>



## **5. Conclusion**

The approval of the SPS to OKGE renewals is dependent on the following conditions:

- 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.
- The Morewood 138/69kV autotransformer must be upgraded by the 2002 Summer to allow for the full amount of service requested.

Facility restrictions exist in SPP that limit the requested SPS to OKGE 100MW reservation; therefore, a Facility Study is required to determine details and cost of upgrade.

## 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 automatically
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