



***System Impact Study SPP-2000-145
For Transmission Service
Requested By
ONEOK Power Marketing***

***From Oklahoma Gas & Electric To
Southwestern Public Service Co.***

***For a Reserved Amount Of 75MW
From 6/1/01
To 6/1/02***

SPP Transmission Planning

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1. Executive Summary

ONEOK Power Marketing has requested a system impact study for long-term Firm Point-to-Point transmission service from Oklahoma Gas & Electric to SPS with a sink of Blackwater WSCC DC Tie. The period of the transaction is from 6/1/01 to 6/1/02. The request is for OASIS reservation 227799, totaling 75MW.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 75MW transfer while maintaining system reliability.

New overloads caused by the 75MW transfer were identified along with determining the impact of the transfer on any previously assigned and identified facilities.

The OKGE to SPS transfer overloads new facilities as well as impacts facilities that have been identified as limiting constraints for previously studied transfers. Tables 1 and 2 list the new overloads caused by the 75MW transfer. Table 3 lists the previously assigned and identified facilities impacted by the 75MW transfer.

In addition to the thermal limitations identified, the SPP to SPS interface has Voltage Stability Limitations. The ATC determination and the higher priority transmission requests over the SPP to SPS interface are documented in Table 4. The ATC was determined by using calculated Total Transfer Capability for SPS Imports and the Transmission Reliability Margin for SPS Imports of 540MW.

The SPP and effected member companies shall use due diligence to coordinate the addition of necessary facilities or transmission system upgrades to provide the requested transmission service. ONEOK Power Marketing is to compensate SPP for such costs pursuant to the terms of section 27 of the SPP Open Access Transmission Tariff.

Expedited procedures for new facilities and upgrades are available to ONEOK Power Marketing per section 19.8 of the SPP Open Access Transmission Service Tariff.

Engineering and construction of any new facilities or modifications will not start until after a transmission service agreement and/or construction agreement is in place and effected member companies receive the appropriate authorization to proceed from the SPP after receiving authorization from the transmission customer.

2. Introduction

ONEOK Power Marketing has requested an impact study for transmission service from OKGE control area with a point-of-delivery to SPS.

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 75MW. 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 75MW transfer on transmission line loading and transmission bus voltages for outages of single and selected multiple transmission lines and transformers on the SPP system.

ATC analyses shows the amount of First Contingency Incremental Transfer Capabilities (FCITC) between the given study systems and what the limitations are, if any, for transferring up to 75MW.

3. Study Methodology

A. Description

Two analyses were conducted to determine the impact of the 75MW transfer on the system. The first analysis was conducted to identify any new overloads caused by the 75MW 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 75MW 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 75MW request. The SPP 2001 Series Cases 2001 Summer Peak, 2001/02 Winter Peak, and 2002 Summer Peak were used to study the impact of the 75MW transfer on the SPP system during the transaction period of 6/1/01 to 6/1/02.

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. Table four provides information from a previous study regarding the import capability of the SPS system. 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 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 caused by the 75MW transfer. Upgrades associated with these new overloads can be directly assigned to the OKGE to SPS transfer.

Table 2 documents overloads on Non SPP Regional Tariff participants' transmission systems caused by the 75MW transfer.

Table 3 documents the 75MW 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.

Table 4 documents the ATC results for SPS imports due to voltage stability limitations.

Table 1 – SPP Facility Overloads caused by the OKGE to SPS 75MW Transfer

Study Year	From Area - To Area	Branch Over 100% RateB	RATEB	BC %Loading	TC %Loading	Outaged Branch That Caused Overload	ATC (MW)	Solution
01SP	SPS-SPS	SWISHER CO 230/115KV TRANSFORMER 51321 SWISHER6 230 to 51320 SWISHER3 115 CKT 1	150	99.9	101.0	HALE CO TO PLANT X, 115KV 51402 HALECO3 115 to 51418 PLANTX3 115 CKT1	7	
01SP	SPS-SPS	DEAF SMITH 230/115KV TRANSFORMER 51111 DFSMTH6 230 to 51110 DFSMTH3 115 CKT 1	150	99.7	102.0	HARRINGTON STATION TO EAST PLANT, 230KV 50907 HARRNG6 230 to 50957 EASTPL6 230 CKT1	9	
01SP	SPS-SPS	POTASH JUNCTION 230/115KV TRANSFORMER 52253 POTJCT6 230 to 52252 POTJCT3 115 CKT 1	150	99.7	100.5	CUNNINGHAM STATION TO PCA, 115KV 52208 CUNNINH3 115 to 52240 PCA3 115 CKT1	24	
01SP	WFEC-WFEC	ACME TO WEST NORMAN, 69KV 55802 ACME 269.0 to 56095 WNORMAN269.0 CKT 1	38	99.0	100.5	CANADIAN SW TO GOLDSBY, 69KV 55841 CANADNS269.0 to 55924 GOLDSBY269.0 CKT1	50	
01SP	SPS-SPS	PIERCT3 TO EAST PLANT, 115KV 50964 PIERCT3 115 to 50956 EASTPL3 115 CKT 1	146	98.8	100.3	HARRINGTON STATION TO RANDALL CO, 230KV 50907 HARRNG6 230 to 51021 RANDALL6 230 CKT1	61	
01SP	SPS-SPS	PIERCT3 TO EAST PLANT, 115KV 50964 PIERCT3 115 to 50956 EASTPL3 115 CKT 1	146	98.8	100.3	RANDALL CO 230/115KV TRANSFORMER 51020 RANDALL3 115 to 51021 RANDALL6 230 CKT1	61	
01SP	SPS-SPS	RANDALL CO 230/115KV TRANSFORMER 51021 RANDALL6 230 to 51020 RANDALL3 115 CKT 1	225	98.9	100.2	DEAF SMITH 230/115KV TRANSFORMER 51110 DFSMTH3 115 to 51111 DFSMTH6 230 CKT1	63	
01WP	SWPA-WFEC	BROWN TO RUSSETT, 138KV 52802 S BROWN4 138 to 56044 RUSSETT4 138 CKT 1	96	99.9	100.1	BROWN TAP TO EXPLORER TAP, 138KV 55152 BROWNT4 138 to 55153 EXPLRTP4 138 CKT1	32	
02SP	SPS-SPS	BC-EARTH TO PLANT X,115KV 51250 BC-EART3 115 to 51418 PLANTX3 115 CKT 1	146	99.9	101.3	DEAF SMITH 230/115KV TRANSFORMER 51110 DFSMTH3 115 to 51111 DFSMTH6 230 CKT1	7	
02SP	SPS-SPS	OSAGE SWITCHING STATION TO CANYON EAST, 115KV 51014 OSAGE--3 115 to 51080 CANYNE3 115 CKT 1	90	99.0	105.5	POTTER CO TO BUSHLAND, 230KV 50887 POTTRC6 230 to 50993 BUSHLND6 230 CKT1	11	
02SP	WFEC-OKGE	FRANKLIN SW TO MIDWEST TAP, 138KV 55917 FRNKLNS4 138 to 54946 MIDWEST4 138 CKT 1	215	99.6	101.0	CROMWELL TO WETUMKA4, 138KV 55869 CROMWEL4 138 to 56084 WETUMKA4 138 CKT1	20	Replace WFEC CTs Franklin Switch
02SP	SPS-SPS	DEAF SMITH 230/115KV TRANSFORMER 51111 DFSMTH6 230 to 51110 DFSMTH3 115 CKT 1	150	98.4	103.2	DEAF SMITH TO PLANT X, 230KV 51111 DFSMTH6 230 to 51419 PLANTX6 230 CKT1	24	
02SP	OKGE-OKGE	RUSSETT TO GLASSES, 138KV 55120 RUSSETT4 138 to 55147 GLASSES4 138 CKT 1	96	99.8	100.4	EXPLORER TAP TO BROWN, 138KV 55153 EXPLRTP4 138 to 55157 BROWN 4 138 CKT1	25	Replace Wavetrap
02SP	WFEC-OKGE	FRANKLIN SW TO MIDWEST TAP, 138KV 55917 FRNKLNS4 138 to 54946 MIDWEST4 138 CKT 1	215	99.5	100.9	PHAROAH TO WETUMKA4, 138KV 56026 PHAROAH4 138 to 56084 WETUMKA4 138 CKT1	26	Replace Wavetrap
02SP	SPS-SPS	CANYON EAST TO CANYON WEST, 115KV 51080 CANYNE3 115 to 51078 CANYNW3 115 CKT 1	90	96.5	105.2	BUSHLAND TO DEAF SMITH INTERCHANCE, 230KV 50993 BUSHLND6 230 to 51111 DFSMTH6 230 CKT1	30	

Table 1 continued – SPP Facility Overloads caused by the OKGE to SPS 75MW Transfer

Study Year	From Area - To Area	Branch Over 100% RateB	RATEB	BC %Loading	TC %Loading	Outaged Branch That Caused Overload	ATC (MW)	Solution
02SP	SPS-SPS	OSAGE SWITCHING STATION TO CANYON EAST, 115KV 51014 OSAGE--3 115 to 51080 CANYNE3 115 CKT 1	90	96.8	102.2	NICHOLS STATION TO SWISHERS CO, 230KV 50915 NICHOL6 230 to 51321 SWISHER6 230 CKT1	44	
02SP	SPS-SPS	RANDALL CO 230/115KV TRANSFORMER 51021 RANDALL6 230 to 51020 RANDALL3 115 CKT 1	225	99.4	100.1	EAST PLANT TO PIERCT3, 115KV 50956 EASTPL3 115 to 50964 PIERCT3 115 CKT1	60	
02SP	SPS-SPS	POTASH JUNCTION TO CARLSBAD PLANT, 115KV 52252 POTJCT3 115 to 52310 CARLSBD3 115 CKT 1	90	97.2	100.4	EDDY CO TO CUNNINGHAM STATION, 230KV 52185 EDDYCO6 230 to 52209 CUNNINH6 230 CKT1	65	

Table 2 – Non - SPP Facility Overloads caused by the OKGE to SPS 75MW Transfer

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

Table 3 – Previously Assigned or Identified SPP Facilities Impacted by the OKGE to SPS 75MW Transfer

Study Year	From Area - To Area	Branch Over 100% RateB	RATEB	BC %Loading	TC %Loading	Outaged Branch That Caused Overload	ATC (MW)	Assignment
01SP	OKGE-OKGE	DRAPER LAKE 345/138KV TRANSFORMER 1 54934 DRAPER 7 345 to 54933 DRAPER 4 138 CKT 1	493	101.6	101.8	DRAPER LAKE 345/138KV TRANSFORMER 2 54933 DRAPER 4 138 to 54934 DRAPER 7 345 CKT2	0	None
01SP	OKGE-OKGE	DRAPER LAKE 345/138KV TRANSFORMER 2 54934 DRAPER 7 345 to 54933 DRAPER 4 138 CKT 2	493	101.6	101.8	DRAPER LAKE 345/138KV TRANSFORMER 1 54934 DRAPER 7 345 to 54933 DRAPER 4 138 CKT1	0	None
01SP	SPS-SPS	ROOSEVELT CO TO TOLK, 230KV CKT 2 51203 ROOSEVL6 230 to 51435 TOLKE6 230 CKT 2	451	104.4	121.7	ROOSEVELT CO TO TOLK, 230KV CKT 1 51203 ROOSEVL6 230 to 51437 TOLKW6 230 CKT1	0	None
01SP	SPS-SPS	ROOSEVELT CO TO TOLK, 230KV CKT 1 51203 ROOSEVL6 230 to 51437 TOLKW6 230 CKT 1	451	104.5	121.7	ROOSEVELT CO TO TOLK, 230KV CKT 2 51203 ROOSEVL6 230 to 51435 TOLKE6 230 CKT2	0	None
01WP	WERE-WERE	EXIDE JCT TO SUMMIT, 115KV 57368 EXIDE J3 115 to 57381 SUMMIT 3 115 CKT 1	181	105.4	106.5	SUMMIT TO EAST MCPHERSON, 230KV 56873 SUMMIT 6 230 to 56872 EMCIPHER6 230 CKT1	0	SPP-2000-017 136724, 136718, 136717, 136714 Est. In Service Date 12/1/2003
01WP	WERE-WERE	PHILIPS TO SOUTH PHILIPS JCT, 115KV 57372 PHILIPS3 115 to 57374 SPHILPJ3 115 CKT 1	160	110.7	112.8	SUMMIT TO EAST MCPHERSON, 230KV 56873 SUMMIT 6 230 to 56872 EMCIPHER6 230 CKT1	0	None
01WP	SWPA-WFEC	TUPELO TO TUPELO TAP, 138KV 52800 TUPELO 4 138 to 56071 TUPLOTP4 138 CKT 1	96	116.2	116.6	PITTSBURG TO VALIANT, 345KV 54033 PITTSB-7 345 to 54037 VALIANT7 345 CKT1	0	None
02SP	SPS-SPS	ROOSEVELT CO TO TOLK, 230KV CKT 2 51203 ROOSEVL6 230 to 51435 TOLKE6 230 CKT 2	451	107.2	124.9	ROOSEVELT CO TO TOLK, 230KV CKT 1 51203 ROOSEVL6 230 to 51437 TOLKW6 230 CKT1	0	None
02SP	SPS-SPS	ROOSEVELT CO TO TOLK, 230KV CKT 1 51203 ROOSEVL6 230 to 51437 TOLKW6 230 CKT 1	451	107.1	124.9	ROOSEVELT CO TO TOLK, 230KV CKT 1 51203 ROOSEVL6 230 to 51435 TOLKE6 230 CKT2	0	None

Table 4 – Available Transfer Capability During the Reservation Period for SPS Imports Due Voltage Stability Limitations

Request	From	To	POR	POD	Amnt	Customer	Status	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02		
136714	1/1/2002	1/1/2007	AMRN	SPS	50	SPSM	Confirmed								50	50	50	50	50	50	50	
136717	1/1/2002	1/1/2007	AMRN	SPS	50	SPSM	Confirmed								50	50	50	50	50	50	50	
136718	1/1/2002	1/1/2007	AMRN	SPS	50	SPSM	Confirmed								50	50	50	50	50	50	50	
136724	1/1/2002	1/1/2007	AMRN	SPS	36	SPSM	Confirmed								50	50	50	50	50	50	50	
Total Transfer Capability (TTC)								599	599	599	559	*	*	*	*	*	*	*	*	*	*	
Transmission Reliability Margin (TRM)								540	540	540	540	540	540	540	540	540	540	540	540	540	540	540
Total Amount Requested								75	75	75	75	75	75	75	75	75	75	75	75	75	75	75
Available Transfer Capability (ATC)								59	59	59	59	59	491	253	253	253	253	253	245	245	245	159

5. Conclusion

The voltage stability limitations into SPS are limited to 59 MW until the new Potter to Holcomb 345 kV transmission line comes into service. The current in-service date for this facility is November 1, 2001. After that the system is capable of providing the requested transmission service per Table 4 results.

The results of the study show that before the 75 MW transfer can take place system improvements are required because of thermal overloads. The facility upgrades required due to increased loading from the transfer, assigned or identified to previous customers will be required before the 670 MW transmission service request can take place.

Existing service across the Blackwater DC tie is currently equal to its maximum capability. Expansion of the DC tie or existing customers not renewing service is required before service can be provided.

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