



*System Impact Study SPP-2001-253
For Transmission Service
Requested By
Southwestern Public Service Co.*

From AEPW to SPS

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

SPP Transmission Planning

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1. Executive Summary

Southwestern Public Service Co. has requested a system impact study for long-term Firm Point-to-Point transmission service from AEPW to SPS. The period of the transaction is from 1/1/02 to 1/1/03. The request is for OASIS reservations 283102, 283104, 283105, and 283106 for a total amount 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.

New overloads caused by the 100MW transfer were identified along with determining the impact of the transfer on any previously assigned and identified facilities.

The 100MW transfer causes an increase in loading on La Cygne to Stilwell, La Cygne to West Gardner 345kV flowgate. Due to the impact on this flowgate, the ATC is zero for the CSWS to SPS request.

2. Introduction

Southwestern Public Service Co. has requested an impact study for transmission service from AEPW 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 100MW. 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 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.

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 100MW.

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 five seasonal models to study the 100MW request. The SPP 2001 Series Cases 2001/02 Winter Peak, 2002 Spring, 2002 Summer Peak, 2002 Fall, 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 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 100MW transfer. Upgrades associated with these new overloads can be directly assigned to the AEPW to SPS 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.

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

Study Year	From Area - To Area	Branch Over 100% of Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch that Caused Overload	ATC	Assignment
01WP	SWPA-WFEC	TUPELO TO TUPELO TAP, 138KV 52800 TUPELO 4 138 to 56071 TUPLOTP4 138 CKT 1	96	99.9	105	RIVERSIDE STATION TO ARCADIA, 345KV 53794 R.S.S.-7 345 to 54908 ARCADIA7 345 CKT1	2	Unassigned
01WP	OKGE-WFEC	RUSSETT TO RUSSETT, 138KV 55120 RUSSETT4 138 to 56044 RUSSETT4 138 CKT 1	96	98.9	102.4	BROWN TO BROWN, 138KV 52802 S BROWN4 138 to 55157 BROWN 4 138 CKT1	31	Unassigned
01WP	SWPA-AECI	CARTHAGE TO REEDS, 69KV 52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	43	99.8	100.1	CARTHAGE TO JASPER, 69KV 52690 CARTHG 269.0 to 96649 2JASPER 69.0 CKT1	67	Assigned to SPP-2000-108
02G	AEPW-AEPW	OKMULGEE 138/69KV TRANSFORMER 54023 OKMULGE4 138 to 54025 OKMULGE269.0 CKT 1	55	99.7	100.8	OKMULGEE TO EAST CENTRAL HENRYETTA, 138KV 54023 OKMULGE4 138 to 54049 EC.HEN-4 138 CKT1	27	Unassigned
02SP	OKGE-OKGE	BEELINE TO EXPLORER GLEENPOOL, 138KV 55247 BEELINE4 138 to 55248 EXPLGLN4 138 CKT 1	287	100	101.9	PECAN CREEK 345/161KV TRANSFORMER 55234 PECANCK5 161 to 55235 PECANCK7 345 CKT1	0	Unassigned
02SP	SPS-SPS	RANDALL COUNTY 230/115KV TRANSFORMER 51021 RANDALL6 230 to 51020 RANDALL3 115 CKT 1	225	100	100.8	HUTCHINSON CO. INT. TO NICHOLS STATION, 230KV 50751 HUTCH6 230 to 50915 NICHOL6 230 CKT1	0	Unassigned
02SP	GRRD-GRRD	COLLINSVILLE 161/69KV TRANSFORMER 54427 COLINS 5 161 to 54476 COLNSGR269.0 CKT 1	50	100	100.1	LYNN LANE WEST TAP TO LYNN LANE TAP, 138KV 53782 LLAN WT4 138 to 53816 LLANETP4 138 CKT1	0	Unassigned
02SP	AEPW-AEPW	WELEETKA 138/69KV TRANSFORMER 54028 WELETK4 138 to 54029 WELEETK269.0 CKT 2	36	99.9	102.2	OKMULGEE 138/69KV TRANSFORMER 54023 OKMULGE4 138 to 54025 OKMULGE269.0 CKT1	4	Unassigned
02SP	OKGE-AEPW	ARCADIA TO RIVERSIDE STATION, 345KV 54908 ARCADIA7 345 to 53794 R.S.S.-7 345 CKT 1	717	99.8	102.6	DELWARE TO NORTHEASTERN STATION, 345KV 53929 DELWARE7 345 to 53955 N.E.S.-7 345 CKT1	7	Unassigned
02SP	OKGE-AEPW	EXPLORER GLEENPOOL TO RIVERSIDE STATION, 138KV 55248 EXPLGLN4 138 to 53795 R.S.S.-4 138 CKT 1	287	99.8	101.8	PECAN CREEK 161/138KV TRANSFORMER 55233 PECANCK4 138 to 55234 PECANCK5 161 CKT1	10	Unassigned
02SP	OKGE-OKGE	BLUEBELL TO BRISTOW, 138KV 55242 BLUEBEL4 138 to 55035 BRISTOW4 138 CKT 1	143	99	102.6	PECAN CREEK 345/161KV TRANSFORMER 55234 PECANCK5 161 to 55235 PECANCK7 345 CKT1	28	Unassigned
02SP	SWPA-WFEC	TUPELO TO TUPELO TAP, 138KV 52800 TUPELO 4 138 to 56071 TUPLOTP4 138 CKT 1	96	97.3	102.9	PITTSBURG TO VALLIANT, 345KV 54033 PITTSB-7 345 to 54037 VALIANT7 345 CKT1	48	Unassigned
02SP	AEPW-AEPW	SAND SPRINGS TO OAKS WEST TAP, 138KV 53827 S.S.--4 138 to 53862 OAKSWTP4 138 CKT 1	143	98.4	101.2	RIVERSIDE STATION TO EXPLORER GLEENPOOL, 138KV 53795 R.S.S.-4 138 to 55248 EXPLGLN4 138 CKT1	57	Unassigned
02SP	SPS-SPS	OSAGE SWITCHING STATION TO CANYON EAST, 115KV 51014 OSAGE--3 115 to 51080 CANYNE3 115 CKT 1	90	97.6	101.6	POTTER COUNTY INT. TO BUSHLAND INT., 230KV 50887 POTTRC6 230 to 50993 BUSHLND6 230 CKT1	60	Unassigned
02SP	WFEC-SWPA	PHAROAH TO WELEETKA, 138KV 56026 PHAROAH4 138 to 52792 WELEETK4 138 CKT 1	191	97	101.9	BRISTOW TO SILVER CITY, 138KV 96137 4BRISTOW 138 to 96140 4SILVCTY 138 CKT1	61	Assigned to SPP-2000-108, Est In-Service Date 6/1/2005
02SP	WERE-WERE	WEST EMPORIA TO EAST STREET, 115KV 57309 WEMPORI3 115 to 57301 EAST ST3 115 CKT 1	92	99.3	100.3	MORRIS COUNTY TO WEST EMPORIA, 115KV 57305 MORRIS 3 115 to 57309 WEMPORI3 115 CKT1	70	Unassigned

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Table 1 – Continued - SPP Facility Overloads caused by the AEPW to SPS 100MW Transfer

Study Year	From Area - To Area	Branch Over 100% of Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch that Caused Overload	ATC	Assignment
02SP	AEPW-AEPW	SOUTHWEST STAT. TO FORT COBB NATURAL GAS, 138KV 54140 S.W.S.-4 138 to 54117 FTCOBNG4 138 CKT 1	151	92.4	101	OKLAUNION TO LAWTON EASTSIDE, 345KV 54119 O.K.U.-7 345 to 54131 L.E.S.-7 345 CKT1	88	Unassigned
02SP	WFEC-AEPW	ESQUANDALE JCT TO WALTERS JCT, 69KV 55905 ESQNDLJ269.0 to 54097 WALTRS-269.0 CKT 1	48	98.5	100.2	ANADARKO TO PARADISE, 138KV 55814 ANADARK4 138 to 56024 PARADSE4 138 CKT1	88	Unassigned
02SP	GRRD-GRRD	AFTON 161/69KV TRANSFORMER 54432 AFTON 5 161 to 54433 AFTON 269.0 CKT 1	50	99.3	100.1	MIAMI TO AFTON, 161KV 54431 MIAMI 5 161 to 54432 AFTON 5 161 CKT1	88	Unassigned
02SP	AEPW-AEPW	CARNEGIE TO HOBART JUNCTION, 138KV 54108 CARNEG-4 138 to 54126 HOB-JCT4 138 CKT 1	143	91.7	100.7	OKLAUNION TO LAWTON EASTSIDE, 345KV 54119 O.K.U.-7 345 to 54131 L.E.S.-7 345 CKT1	92	Unassigned
02FA	WERE-WERE	MCDOWELL CREEK S.S. TO FORT JUNCTION S.S., 115KV 57335 MCDOWEL3 115 to 57328 FT JCT 3 115 CKT 1	68	99.5	100.5	MCDOWELL CREEK S.S. TO FORT JUNCTION S.S., 115KV 57335 MCDOWEL3 115 to 57328 FT JCT 3 115 CKT 2	50	Unassigned
02FA	SWPA-WFEC	BROWN TO RUSSETT, 138KV 52802 S BROWN4 138 to 56044 RUSSETT4 138 CKT 1	96	97.4	102	BROWN TO BROWN, 138KV 52802 S BROWN4 138 to 55157 BROWN 4 138 CKT1	57	Unassigned
02FA	WFEC-WFEC	LITTLE AXE TO NOBLE, 69KV 55976 LIL AXE269.0 to 56011 NOBLE 269.0 CKT 1	26	99.5	100.2	PAOLI 138/69KV TRANSFORMER 56022 PAOLI 269.0 to 56023 PAOLI 4 138 CKT1	71	Unassigned
02WP	OKGE-OKGE	BLUEBELL TO BRISTOW, 138KV 55242 BLUEBEL4 138 to 55035 BRISTOW4 138 CKT 1	143	99.6	103	DELWARE TO NORTHEASTERN STATION, 345KV 53929 DELWARE7 345 to 53955 N.E.S.-7 345 CKT1	12	Unassigned
02WP	OKGE-OKGE	BLUEBELL TO KRMG TAP, 138KV 55241 BLUEBEL269.0 to 55038 KRMG TP269.0 CKT 1	66	99.6	102.6	BLUEBELL TO BRISTOW, 138KV 55242 BLUEBEL4 138 to 55035 BRISTOW4 138 CKT 1	13	Unassigned
02WP	WFEC-OKGE	RUSSETT TO RUSSETT, 138KV 56044 RUSSETT4 138 to 55120 RUSSETT4 138 CKT 1	96	98.8	102.3	EXPLORER TAP TO BROWN, 138KV 55153 EXPLRTP4 138 to 55157 BROWN 4 138 CKT1	34	Unassigned
02WP	SWPA-WFEC	BROWN TO RUSSETT, 138KV 52802 S BROWN4 138 to 56044 RUSSETT4 138 CKT 1	96	98.2	101.7	BROWN TAP TO EXPLORER TAP, 138KV 55152 BROWNTP4 138 to 55153 EXPLRTP4 138 CKT1	51	Unassigned
02WP	OKGE-OKGE	KRMG TAP TO PRINCEVILLE, 69KV 55038 KRMG TP269.0 to 55030 PRINCEV269.0 CKT 1	66	98.3	101.4	BLUEBELL TO BRISTOW, 138KV 55242 BLUEBEL4 138 to 55035 BRISTOW4 138 CKT 1	55	Unassigned
02WP	SWPA-WFEC	TUPELO TO TUPELO TAP, 138KV 52800 TUPELO 4 138 to 56071 TUPLOTP4 138 CKT 1	96	96.3	101	CANEY CREEK TO TEXOMA JCT, 138KV 55150 CANEYCK4 138 to 56067 TEXOMAJ4 138 CKT1	79	Unassigned
02WP	OKGE-AEPW	EXPLORER GLEENPOOL TO RIVERSIDE STATION, 138KV 55248 EXPLGLN4 138 to 53795 R.S.S.-4 138 CKT 1	287	98	100.1	PRATTVILLE TO SAND SPRINGS, 138KV 53770 PRATTV-4 138 to 53827 S.S.---4 138 CKT1	95	Unassigned

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

Study Year	From Area - To Area	Branch Over 100% of Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch that Caused Overload	ATC (MW)
01WP	EES-EES	99167 3RINGLD 115 to 99168 3SAILES 115 CKT 1	115	99.4	100.2	99166 3HODGE 115 to 99188 3JNSBRO 115 CKT1	93
02G		NONE				NONE	100
02SP		NONE				NONE	100
02FA		NONE				NONE	100
02WP	AECI-AECI	96067 5CHAMOI 161 to 96626 2CHAMOI 69.0 CKT 1	50	99.9	100.2	30677 GUTHRIE 161 to 31231 MONTGMRY 161 CKT1	40

Table 3 – Previously Assigned and Identified SPP Facilities Impacted by the AEPW to SPS 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	WERE-WERE	EXIDE JUNCTION TO SUMMIT, 115KV 57368 EXIDE J3 115 to 57381 SUMMIT 3 115 CKT 1	181	103.8	105.4	EAST MCPHERSON TO SUMMIT, 230KV 56872 EMCIPHER6 230 to 56873 SUMMIT 6 230 CKT1	0	Assigned to SPP-1999-017, Est In-Service Date 12/1/2003
02SP	OKGE-AEPW	BLUEBELL TO PRATTVILLE, 138KV 55242 BLUEBEL4 138 to 53770 PRATTV-4 138 CKT 1	235	104.6	106.8	BEELINE TO EXPLORER GLEENPOOL, 138KV 55247 BEELINE4 138 to 55248 EXPLGLN4 138 CKT1	0	Previously Identified
02SP	WFEC-WFEC	FRANKLIN SW TO ACME, 69KV 55916 FRNKLNS269.0 to 55802 ACME 269.0 CKT 1	34	132.5	134.1	GOLDSBY TO OKLAHOMA UNIVERSITY SW, 69KV 55924 GOLDSBY269.0 to 56018 OU SW 269.0 CKT1	0	Assigned to SPP-1999-017, Est In-Service Date 12/1/2005
02SP	KACP-KACP	STILWELL TO LACYGNE, 345KV 57968 STILWEL7 345 to 57981 LACYGNE7 345 CKT 1	1251	101.6	102.1	WEST GARDNER TO LACYGNE, 345KV 57965 W.GRDNR7 345 to 57981 LACYGNE7 345 CKT1	0	SPP Flowgate
02FA	WFEC-WFEC	FRANKLIN SW TO ACME, 69KV 55916 FRNKLNS269.0 to 55802 ACME 269.0 CKT 1	34	106.1	107.7	GOLDSBY TO OKLAHOMA UNIVERSITY SW, 69KV 55924 GOLDSBY269.0 to 56018 OU SW 269.0 CKT1	0	Assigned to SPP-1999-017, Est In-Service Date 12/1/2005
02FA	WERE-WERE	EXIDE JUNCTION TO SUMMIT, 115KV 57368 EXIDE J3 115 to 57381 SUMMIT 3 115 CKT 1	181	100.8	102.3	EAST MCPHERSON TO SUMMIT, 230KV 56872 EMCIPHER6 230 to 56873 SUMMIT 6 230 CKT1	0	Assigned to SPP-1999-017, Est In-Service Date 12/1/2003
02WP	WFEC-WFEC	FRANKLIN SW TO ACME, 69KV 55916 FRNKLNS269.0 to 55802 ACME 269.0 CKT 1	34	120.3	121.9	GOLDSBY TO OKLAHOMA UNIVERSITY SW, 69KV 55924 GOLDSBY269.0 to 56018 OU SW 269.0 CKT1	0	Assigned to SPP-1999-017, Est In-Service Date 12/1/2005

5. Conclusion

The AEPW to SPS 100MW transfer causes several new overloads on SPP facilities as well as increasing the loading on previously identified facilities. The ATC is zero for the AEPW to SPS request due to the following:

- 2001/2002 Winter Peak (12/1/01 – 4/1/02) – The ATC is zero due to the loading of the Exide Junction to Summit 115kV line. The estimated in-service date for this upgrade is 12/1/2003.
- 2002 Summer Peak (6/1/02 – 10/1/02) – The ATC is zero due to the loading of the La Cygne to Stilwell, La Cygne to West Gardner 345kV flowgate. The ATC is also zero due to the loading of the Franklin SW to Acme 69kV line. The estimated in-service date for this upgrade is 12/1/2005.
- 2002 Fall (10/1/02 – 12/1/02) - The ATC is zero due to the loading of the Exide Junction to Summit 115kV line. The estimated in-service date for this upgrade is 12/1/2003. The ATC is also zero due to the loading of the Franklin SW to Acme 69kV line. The estimated in-service date for this upgrade is 12/1/2005.
- 2002/2003 Winter Peak (12/1/02 – 4/1/03) – The ATC is zero due to the loading of the Franklin SW to Acme 69kV line. The estimated in-service date for this upgrade is 12/1/2005.

Facility restrictions exist in SPP that limit the requested AEPW to SPS 100MW reservation to an ATC of zero. The ATC of the existing transmission system cannot be increased as required to provide continuous service over the reservation period. Therefore, the requested reservation will be refused.

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 –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