



SPP *Southwest Power Pool*

***System Impact Study SPP-2001-177
For Transmission Service
Requested By
NRG Power Marketing***

***From Oklahoma Gas & Electric To
Ameren***

***For a Reserved Amount Of 200MW
From 7/1/01
To 7/1/02***

SPP Transmission Planning

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1. Executive Summary

NRG Power Marketing has requested a system impact study for long-term Firm Point-to-Point transmission service from Oklahoma Gas & Electric to Ameren. The period of the transaction is from 7/1/01 to 7/1/02. The request is for OASIS reservations 252500, 252502, 252503, and 252505, totaling 200MW.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 200MW transfer while maintaining system reliability.

The 200MW transfer was studied independently of the previous NRG Power Marketing requests for 200MW from OKGE to Entergy, 150MW from OKGE to MEC, 250MW from OKGE to AECI, and 200MW from OKGE to CLEC. The previous requests were assumed refused per the results of System Impact Studies SPP-2001-173, 174, 175, and 176, respectively.

New overloads caused by the 200MW transfer were identified along with determining the impact of the transfer on any previously assigned and identified facilities.

The OKGE to AMRN transfer impacts several facilities that have been identified as limiting constraints for previously studied transfers. Due to the inability to upgrade these limiting constraints within the reservation period using normal construction practices, the ATC is zero for the requested OKGE to AMRN 200MW transfer.

In addition to the SPP transmission limitations identified, the SPP to AMRN interface is firm contract path limited to 1,287MW. Currently, SPP has reserved long-term firm transmission service equal to the firm contract capacity limit of 1,287MW during the requested transmission service period. The transmission upgrades or additions required to increase the firm contract path capacity between SPP and AMRN was not determined in this study.

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. NRG 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 NRG 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

NRG Power Marketing has requested an impact study for transmission service from OKGE control area with a sink of AMRN.

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 200 MW. This study includes steady-state contingency analyses (PSS/E function ACCC), Available Transfer Capability (ATC) analyses, and the determination of available capacity over the SPP to AMRN interface.

The steady-state analyses consider the impact of the 200 MW 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 200 MW.

3. Study Methodology

A. Description

Three analyses were conducted to determine the impact of the 200MW transfer on the system. The first analysis was conducted to identify any new overloads caused by the 200MW 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 200MW 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.

For the third analysis, all confirmed and non-confirmed long-term SPP transmission requests with a POD of AMRN were included in finding the available capacity over the SPP to AMRN interface. The transactions included are confirmed long-term requests, long-term requests with right of renewal, and all long-term requests currently being studied. All of these long-term requests have a higher priority to the available capacity over the interface. Capacity is reserved for possible renewal of exiting firm service reservations per section 2.2 of the SPP Open Access Transmission Tariff.

B. Model Updates

SPP used three seasonal models to study the 200MW 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 200MW transfer on the SPP system during the transaction period of 7/01/01 to 7/1/02.

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. 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 200MW transfer.

Table 2 documents overloads on Non SPP Regional Tariff participants' transmission systems caused by the 200MW transfer.

Table 3 documents the 200MW 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.

B. SPP to AMRN Interface

The SPP to AMRN interface is contract path limited to 1,287 MW. SPP currently has 1,287 MW of higher priority yearly firm reservations over the AMRN interface for the reservation period (Table 6).

The confirmed yearly reservations over the interface total 1,058 MW for January 2002 (Table 4). The additional higher priority reservations on the interface are the reservations with the right to renew service (Table 5). Currently, no long-term reservations are being studied for the requested period.

Table 6 contains a summation of all higher priority SPP reservations with a POD of AMRN for the NRG request period. The current available capacity over the interface for the request period is 0MW.

Table 1 – SPP Facility Overloads caused by the OKGE to AMRN 200MW Transfer

Study Year	From Area - To Area	Branch Over 100% RateB	RATEB	BC % I Loading	TC % I Loading	Outaged Branch That Caused Overload	ATC (MW)
01SP	AEPW-AEPW	BANN to ALUMAX TAP, 138KV 53250 BANN 4 138 to 53245 ALUMXT 4 138 CKT 1	261	99.8	100.7	NW TEXARKANA-BANN T to NW TEXARKANA, 138KV 53299 NWT-BNT4 138 to 53300 NWTXARK4 138 CKT1	51
01SP	GRRD-GRRD	CLAREMORE 161/69KV TRANSFORMER 54451 CLARMR 5 161 to 54479 CLARMR 269.0 CKT 2	84	99.8	100.3	CLAREMORE 161/69KV TRANSFORMER 54451 CLARMR 5 161 to 54479 CLARMR 269.0 CKT1	72
01WP	WERE-WERE	KING HILL N.M. COOP to KELLY, 115KV 57331 KING HL3 115 to 57217 KELLY 3 115 CKT 1	92	99.6	101.3	HOYT to STRANGER CREEK, 345KV 56765 HOYT 7 345 to 56772 STRANGR7 345 CKT1	45
01WP	WFEC-WFEC	GOLDSBY TO OKLAHOMA UNIVERSITY SW, 69KV 55924 GOLDSBY269.0 to 56018 OU SW 269.0 CKT 1	34	98.2	100.4	FRANKLIN SW 138/69KV TRANSFORMER 55916 FRNKLNS269.0 to 55917 FRNKLNS4 138 CKT1	167
02SP	WERE-WERE	166TH TO JAGGARD JUNCTION, 115 KV 57233 166TH 3 115 to 57243 JAGGARD3 115 CKT 1	119	99.9	100.5	CAPTAIN JUNCTION TO 95TH & WAVERLY, 115 KV 57235 CAPTAIN3 115 to 57278 WAVERLY3 115 CKT1	23
02SP	EMDE-EMDE	MONETT TO AURORA H.T., 161KV 59480 MON383 5 161 to 59468 AUR124 5 161 CKT 1	157	99.7	101.5	DADEVILLE EAST TO MORGAN, 161KV 59478 DAD368 5 161 to 96101 5MORGAN 161 CKT1	32
02SP	WERE-WERE	WAKARUSA JCT TO FARMER'S CO-OP, 115KV 57277 WAKARUS3 115 to 57236 COOP 3 115 CKT 1	92	99.7	100.4	SW LAWRENCE TO WAKARUSA JCT, 115KV 57271 SWLWRNC3 115 to 57277 WAKARUS3 115 CKT1	78

Table 2 – Non - SPP Facility Overloads caused by the OKGE to AMRN 200MW Transfer

Study Year	From Area - To Area	Branch Over 100% RateB	RATEB	BC % I Loading	TC % I Loading	Outaged Branch That Caused Overload
01SP	EES-EES	99305 3MERIDN# 115 to 99286 3CROS-S* 115 CKT 1	68	99.9	100.6	99146 3STERL 115 to 99232 3CROS-N 115 CKT1
01WP	AECI-AECI	96099 5MONTCT 161 to 96575 2MONTGY 69.0 CKT 1	56	99.4	100.2	96061 5BOONE 161 to 96493 2BOONE 69.0 CKT1
01WP	EES-EES	98866 3SE-VKS 115 to 98938 3B.WLSN 115 CKT 1	161	99.7	100.1	98941 3VKSBRG 115 to 98942 3VKSBRG-W 115 CKT1
01WP	EES-EES	99167 3RINGLD 115 to 99168 3SAILES 115 CKT 1	115	99.7	100.3	50045 DOLHILL7 345 to 53454 SW SHV 7 345 CKT1
01WP	SWPA-AECI	52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	43	98.1	100.3	59479 LAR382 5 161 to 59480 MON383 5 161 CKT1
02SP	EES-EES	99146 3STERL 115 to 99232 3CROS-N 115 CKT 1	80	99.7	100.2	99305 3MERIDN# 115 to 99286 3CROS-S* 115 CKT 1
02SP	EES-EES	99556 3LR-WAL 115 to 99548 3LR-PIN 115 CKT 1	159	99.7	100.1	99570 3MAUMEL* 115 to 99581 3NLR-LV 115 CKT1
02SP	EES-SWPA	99825 5MIDWAY# 161 to 52660 BULL SH5 161 CKT 1	162	99.2	100.8	99798 5BATEVL 161 to 99808 5CUSHMN 161 CKT1
02SP	MIPU-AECI	59217 WINDSR 5 161 to 96071 5CLINTN 161 CKT 1	123	99.1	101.7	58062 SALSBR5 161 to 58064 NORTON-5 161 CKT1
02SP	SWPA-AECI	52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	36	99.3	102.5	56793 NEOSHO 7 345 to 96045 7MORGAN 345 CKT1

Table 3 – Previously Assigned and Identified SPP Facilities Impacted by the OKGE to AMRN 200MW Transfer.

Study Year	From Area - To Area	Branch Over 100% RateB	RATEB	BC % I Loading	TC % I Loading	Outaged Branch That Caused Overload	ATC (MW)	Assignment
01SP	AEPW-AEPW	EAST CENTERTON TO GENTRY REC, 161KV 53133 ECNTRTN5 161 to 53187 GENTRYR5 161 CKT 1	335	104.6	105.3	FLINT CREEK TO ELM SPRINGS REC, 161KV 53139 FLINTCR5 161 to 53194 ELMSPRR5 161 CKT1	0	Upgrade Assigned to SPP-2000-086 150680 Est. In-Service Date 4/1/2002
01SP	AEPW-AEPW	CHEROKEE REC TO KNOX LEE, 138KV 53522 CHEROKE4 138 53557 KNOXLEE4 138 CKT 1	209	99.4	100.5	Multiple Outage Contingency SOUTHWEST SHREVEPORT to LONGWOOD, 345KV 53454 SW SHV 7 345 to 53424 LONGWD 7 345 CKT 1 SOUTHWEST SHREVEPORT to DIANA, 345KV 53454 SW SHV 7 345 to 53528 DIANA 7 345 CKT 1	109	Upgrade Assigned to SPP-2000-086 150680 Est. In-Service Date 4/1/2002
01WP	AEPW-AEPW	EAST ROGERS TO DYESS, 161KV 53135 EROGERS5 161 to 53131 DYESS 5 161 CKT 1	245	101.9	104.1	FLINT CREEK TO GENTRY, 161KV 53139 FLINTCR5 161 to 53187 GENTRYR5 161 CKT1	0	Upgrade Assigned to SPP-2000-004 163951 Est. In-Service Date 6/1/2002
02SP	KACP-KACP	STILLWELL TO LA CYGNE, 345KV 57968 STILWEL7 345 to 57981 LACYGNE7 345 CKT 1	1202	103.4	105.6	WEST GARDNER TO LA CYGNE, 345KV 57965 W.GRDNR7 345 to 57981 LACYGNE7 345 CKT1	0	SPP Flowgate
02SP	SWPA-SWPA	ROBERT S. KERR TO VAN BUREN 52782 RS KERR5 161 to 52722 VAN BUR5 161 CKT 1	167	101.3	103.6	BONANZA TAP TO AES, 161KV 55261 BONANZT5 161 to 55262 AES 5 161 CKT1	0	Previously Identified
02SP	AEPW-AEPW	CHEROKEE REC TO TATUM, 138KV 53522 CHEROKE4 138 53611 TATUM 4 138 1	209	100.0	101.1	Multiple Outage Contingency SOUTHWEST SHREVEPORT to LONGWOOD, 345KV 53454 SW SHV 7 345 to 53424 LONGWD 7 345 CKT 1 SOUTHWEST SHREVEPORT to DIANA, 345KV 53454 SW SHV 7 345 to 53528 DIANA 7 345 CKT 1	0	Upgrade Assigned to SPP-2000-086 150680 Est. In-Service Date 2/1/2003
02SP	EMDE-EMDE	TIPTON FORD TO MONETT, 161KV 59472 TIP292 5 161 to 59480 MON383 5 161 CKT 1	157	98.2	100.5	LARUSSEL TO MONETT, 161KV 59479 LAR382 5 161 to 59480 MON383 5 161 CKT1	160	Upgrade Assigned to SPP-2000-086 150680 Est. In-Service Date 5/1/2003
02SP	AEPW-AEPW	CHEROKEE REC TO KNOX LEE, 138KV 53522 CHEROKE4 138 53557 KNOXLEE4 138 CKT 1	209	105.6	106.7	Multiple Outage Contingency SOUTHWEST SHREVEPORT to LONGWOOD, 345KV 53454 SW SHV 7 345 to 53424 LONGWD 7 345 CKT 1 SOUTHWEST SHREVEPORT to DIANA, 345KV 53454 SW SHV 7 345 to 53528 DIANA 7 345 CKT 1	200	Upgrade Assigned to SPP-2000-086 150680 Est. In-Service Date 4/1/2002

Table 4 – SPP Confirmed Long-term Reservations with POD of AMRN for 7/1/01-7/1/02

Study	Request	Status	From	To	POR	POD	Amnt	Customer	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02
	171	CONFIRMED	5/1/1983	1/1/2014	KACY	AMRN	20	KCPL	20	20	20	20	20	20	20	20	20	20	20	20
	109012	CONFIRMED	6/1/1999	6/1/2002	SPA	AMRN	11	SPA	11	11	11	11	11	11	11	11	11	11	11	
	109080	CONFIRMED	6/1/1999	6/1/2003	SPA	AMRN	125	SPA	125	125	125	125	125	125	125	125	125	125	125	125
	109431	CONFIRMED	4/1/1999	4/1/2004	KCPL	AMRN	200	KCPS	200	200	200	200	200	200	200	200	200	200	200	200
1999-010	234943	CONFIRMED	1/1/2002	1/1/2012	SPS	AMRN	50	SPSM							50	50	50	50	50	50
1999-010	234945	CONFIRMED	1/1/2002	1/1/2012	SPS	AMRN	50	SPSM							50	50	50	50	50	50
1999-010	234956	CONFIRMED	1/1/2002	1/1/2012	SPS	AMRN	50	SPSM							50	50	50	50	50	50
1999-010	234957	CONFIRMED	1/1/2002	1/1/2012	SPS	AMRN	50	SPSM							50	50	50	50	50	50
1999-016	133602	CONFIRMED	1/1/2002	1/1/2005	SPS	AMRN	50	SPSM							50	50	50	50	50	50
1999-016	133608	CONFIRMED	1/1/2002	1/1/2005	SPS	AMRN	50	SPSM							50	50	50	50	50	50
2001-007	230098	CONFIRMED	1/1/2002	1/1/2003	CSWS	AMRN	400	PECO							400	400	400	400	400	400
	220619	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS	50	50	50	50	50	50						
	220620	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS	50	50	50	50	50	50						
2000-010	168969	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS	50	50	50	50	50	50						
2000-010	168970	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS	50	50	50	50	50	50						
	185958	CONFIRMED	9/1/2000	6/1/2002	SPA	AMRN	2	SPA	2	2	2	2	2	2	2	2	2	2	2	2
2000-033	188155	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS	29	29	29	29	29	29						
Total Confirmed									587	587	587	587	587	587	1058	1058	1058	1058	1058	1045

Table 5 – SPP Long-term Reservations with the right to renew service for 7/1/01-7/1/02 per section 2.2 of Tariff

Study	Request	Status	From	To	POR	POD	Amnt	Customer	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03
	109012	CONFIRMED	6/1/1999	6/1/2002	SPA	AMRN	11	SPA												11
	220619	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS							50	50	50	50	50	50
	220620	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS							50	50	50	50	50	50
2000-010	168969	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS							50	50	50	50	50	50
2000-010	168970	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS							50	50	50	50	50	50
	185958	CONFIRMED	9/1/2000	6/1/2002	SPA	AMRN	2	SPA												2
2000-033	188155	CONFIRMED	1/1/2001	1/1/2002	WR	AMRN	50	WRGS							29	29	29	29	29	29
Total Right to Renew															229	229	229	229	229	242

Table 6 – Summation of Long-term Reservations with POD of AMRN for 7/1/01-7/1/02 and available interface capacity

Reservation Status	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	
Confirmed	587	587	587	587	587	587	1058	1058	1058	1058	1058	1045	
Possible Renewal							229	229	229	229	229	242	
	1287	1287	1287	1287	1287	1287	1287	1287	1287	1287	1287	1287	Contract Path Limit
	700	700	700	700	700	700	0	0	0	0	0	0	Total Available as of 6/1/2001

5. Conclusion

The previously assigned and identified facilities limit the ATC to zero due to the inability to upgrade the constraints as required. Those facilities that have an ATC of zero are given below.

- For the 2001 Summer (6/1/01-10/1/01), the ATC is zero due to the loading of the East Centerton to Gentry 161kV line. The estimated in service date of the upgrade is 4/1/2002.
- For the 2001/2002 Winter (12/1/01-4/1/01), the ATC is zero due to the loading of the Dyess to East Rogers 161kV line. The estimated in service date of the upgrade is 6/1/2002.
- For the 2002 Summer (6/1/02-10/1/02), the ATC is zero due the loading of the Cherokee to Tatum 138kV line, the La Cygne to Stillwell 345kV line, and the R.S. Kerr to Van Buren 161kV line. The estimated in service date of the Cherokee to Tatum 138kV line upgrade is 2/1/2003. No upgrades have been assigned for the La Cygne to Stillwell and R.S. Kerr to Van Buren overloads.

Given the estimated in service dates of these Upgrades, the ATC of the existing transmission system cannot be increased as required to provide continuous service over the reservation period.

In addition to the identified facility limitations, currently no ATC exists on the SPP to Ameren interface for the months of January 2002 thru June 2002.

Due to these limitations, the requested reservations 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