



***System Impact Study SPP-2001-178  
For Transmission Service  
Requested By  
NRG Power Marketing***

***From Oklahoma Gas & Electric To  
Western Resources***

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

***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 OKGE TO WR 200MW TRANSFER .....</b>	<b>7</b>
<b>TABLE 2 – NON - SPP FACILITY OVERLOADS CAUSED BY THE OKGE TO WR 200MW TRANSFER.....</b>	<b>7</b>
<b>TABLE 3 – PREVIOUSLY ASSIGNED AND IDENTIFIED SPP FACILITIES IMPACTED BY THE OKGE TO WR 200MW TRANSFER.....</b>	<b>8</b>
<b>5. CONCLUSION.....</b>	<b>9</b>
<b>APPENDIX A .....</b>	<b>10</b>

## **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 Western Resources. The period of the transaction is from 7/1/01 to 7/1/02. The request is for OASIS reservations 252508 - 252511, 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, 200MW from OKGE to CLEC, and 200MW from OKGE to AMRN. The previous requests were assumed refused per the results of System Impact Studies SPP-2001-173, 174, 175, 176 and 177, respectively. The System Impact Study for the 200MW transfer will need to be revised if the assumed statuses of these previous requests change.

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 WR transfer impacts 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 WR 200MW transfer.

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 WR.

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) and Available Transfer Capability (ATC) analyses.

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**

Two 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.

#### **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. Upgrades associated with these new overloads can be directly assigned to the OKGE to WR 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.

**Table 1** – SPP Facility Overloads caused by the OKGE to WR 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	WERE-WERE	<b>WEST EMPORIA TO EAST STREET, 115KV</b> 57309 WEMPORI3 115 to 57301 EAST ST3 115 CKT 1	92	98.9	102.6	<b>MORRIS COUNTY 230/115KV TRANSFORMER</b> 56863 MORRIS 6 230 to 57305 MORRIS 3 115 CKT1	59
01SP	GRRD-GRRD	<b>CLAREMORE 161/69KV TRANSFORMER</b> 54451 CLARMR 5 161 to 54479 CLARMR 269.0 CKT 2	84	99.8	100.3	<b>CLAREMORE 161/69KV TRANSFORMER</b> 54451 CLARMR 5 161 to 54479 CLARMR 269.0 CKT1	87
01SP	OKGE-OKGE	<b>CHIKASKIA TAP TO BRAMAN, 69KV</b> 54751 CHIKSTP269.0 to 54750 BRAMAN 269.0 CKT 1	38	93.4	101.9	<b>KILDARE4 TO WHITE EAGLE, 138KV</b> 54760 KILDARE4 138 to 54761 WHEAGLE4 138 CKT1	156
01SP	AECI-GRRD	<b>VIAN TO GORE, 69KV</b> 96879 2VIAN 69.0 to 54444 GORE GR269.0 CKT 1	47	99.5	100.1	<b>SALLISAW TO SALLISAW, 69KV</b> 52750 SALLISAW5 161 to 54452 SALLSWGR269.0 CKT1	172
01SP	WERE-WERE	<b>TIMBERLANE TO CRAIG JUNCTION, 115KV</b> 57273 TIMBRLN3 115 to 57237 CRAIG J3 115 CKT 1	92	97.8	100.4	<b>SPRING HILL 161/115KV TRANSFORMER</b> 57267 SPRINGH3 115 to 58042 SPRGHL 5 161 CKT1	172
01SP	WERE-WERE	<b>CRAIG JUNCTION TO PENTAGON, 115KV</b> 57237 CRAIG J3 115 to 57261 PENTAGN3 115 CKT 1	92	97.8	100.3	<b>SPRING HILL 161/115KV TRANSFORMER</b> 57267 SPRINGH3 115 to 58042 SPRGHL 5 161 CKT1	173
01WP	OKGE-OKGE	<b>OSAGE TO CONTINENTAL BLACKS, 69KV</b> 54742 OSAGE 269.0 to 54763 CONBLKS269.0 CKT 1	72	95.7	102.8	<b>KILDARE4 TO WHITE EAGLE, 138KV</b> 54760 KILDARE4 138 to 54761 WHEAGLE4 138 CKT1	120
01WP	WFEC-WFEC	<b>GOLDSBY TO OKLAHOMA UNIVERSITY SW, 69KV</b> 55924 GOLDSBY269.0 to 56018 OU SW 269.0 CKT 1	34	98.4	100.6	<b>FRANKLIN SW 138/69KV TRANSFORMER</b> 55916 FRNKLNS269.0 to 55917 FRNKLNS4 138 CKT1	146
02SP	SUNC-SUNC	<b>PLYMELL TO PIONEER TAP, 115KV</b> 56393 PLYMELL3 115 to 56392 PIONTAP3 115 CKT 1	143	99.9	100.4	<b>PK_GOAB3 TO FLETCHER, 115KV</b> 56400 PK_GOAB3 115 to 56420 FLETCHR3 115 CKT1	53
02SP	OKGE-OKGE	<b>CHIKASKIA TAP TO BRAMAN, 69KV</b> 54751 CHIKSTP269.0 to 54750 BRAMAN 269.0 CKT 1	38	95.5	103.5	<b>KILDARE4 TO WHITE EAGLE, 138KV</b> 54760 KILDARE4 138 to 54761 WHEAGLE4 138 CKT1	113

**Table 2** – Non - SPP Facility Overloads caused by the OKGE to WR 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	98747 3GR-MID 115 to 98750 3GRNVIL 115 CKT 1	120	99.9	100.1	98746 3GRNV-E 115 to 98750 3GRNVIL 115 CKT1
01WP	CELE-EES	50024 CARROLL4 138 to 99167 3RINGLD 115 CKT 1	125	99.4	100.8	99294 7ELDEHV 345 to 99295 8ELDEHV 500 CKT1
02SP	EES-EES	99146 3STERL 115 to 99232 3CROS-N 115 CKT 1	80	99.8	100.2	99286 3CROS-S* 115 to 99305 3MERIDN# 115 CKT1
02SP	SWPA-AECI	52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	36	99.5	100.7	59537 AUR124 269.0 to 59578 AUR355 269.0 CKT1

**Table 3** – Previously Assigned and Identified SPP Facilities Impacted by the OKGE to WR 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	<b>EAST CENTERTON TO GENTRY REC, 161KV</b> 53133 ECNTRTN5 161 to 53187 GENTRYR5 161 CKT 1	335	103.9	104.2	<b>FLINT CREEK TO ELM SPRINGS, 161KV</b> 53139 FLINTCR5 161 to 53194 ELMSPRR5 161 CKT1	0	Upgrade Assigned to SPP-2000-086 150680 Est. In-Service Date 4/1/2002
01WP	AEPW-AEPW	<b>EAST ROGERS TO DYESS, 161KV</b> 53135 EROGERS5 161 to 53131 DYESS 5 161 CKT 1	245	100.9	102.5	<b>FLINT CREEK TO GENTRY, 161KV</b> 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	<b>STILLWELL TO LA CYGNE, 345KV</b> 57968 STILWEL7 345 to 57981 LACYGNE7 345 CKT 1	1202	103.0	104.9	<b>WEST GARDNER TO LA CYGNE, 345KV</b> 57965 W.GRDNR7 345 to 57981 LACYGNE7 345 CKT1	0	SPP Flowgate
02SP	AEPW-AEPW	<b>CHEROKEE REC TO KNOX LEE, 138KV</b> 53522 CHEROKE4 138 to 53557 KNOXLEE4 138 CKT 1	209	103.9	104.6	<b>Multiple Outage Contingency</b> <b>SOUTHWEST SHREVEPORT TO LONGWOOD, 345KV</b> 53454 SW SHV 7 345 to 53424 LONGWD 7 345 CKT 1 <b>SOUTHWEST SHREVEPORT TO DIANA, 345KV</b> 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



## **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 La Cygne to Stillwell 345kV line. No upgrade has been assigned for the La Cygne to Stillwell overload.

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