



# **SPP** *Southwest Power Pool*

***System Impact Study SPP-2001-174  
For Transmission Service  
Requested By  
NRG Power Marketing***

***From Oklahoma Gas & Electric To  
Mid-American Energy***

***For a Reserved Amount Of 150MW  
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 Mid-American Energy. The period of the transaction is from 7/1/01 to 7/1/02. The request is for OASIS reservations 252485, 252487, and 252488, totaling 150MW.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 150MW transfer while maintaining system reliability.

The 150MW transfer was studied independently of the previous NRG Power Marketing request for 200MW from OKGE to Entergy. The previous request was assumed refused per the results of System Impact Study SPP-2001-173. The System Impact Study for 150MW transfer will need to be revised if the assumed status of the previous request changes.

New overloads caused by the 150MW transfer were identified along with determining the impact of the transfer on any previously assigned and identified facilities.

The OKGE to MEC 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 MEC 150MW transfer.

In addition to the SPP transmission limitations identified, the SPP to MEC interface is firm contract path limited to 71MW. Currently, SPP has not reserved any firm transmission service with a POD of MEC for the requested reservation period of 7/1/01 to 7/1/02. The transmission upgrades or additions required to increase the firm contract path capacity between SPP and MEC 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 MEC.

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 150 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 150 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 150 MW.

### **3. Study Methodology**

#### **A. Description**

Two analyses were conducted to determine the impact of the 150MW transfer on the system. The first analysis was conducted to identify any new overloads caused by the 150MW 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 150MW 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 150MW 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 150MW 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 150MW transfer. Upgrades associated with these new overloads with an ATC less than 71MW can be directly assigned to the OKGE to MEC transfer.

Table 2 documents overloads on Non SPP Regional Tariff participants' transmission systems caused by the 150MW transfer.

Table 3 documents the 150MW 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 MEC 150MW 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	<b>BANN to ALUMAX TAP, 138KV</b> 53250 BANN 4 138 to 53245 ALUMXT 4 138 CKT 1	261	99.8	100.4	<b>NW TEXARKANA-BANN T to NW TEXARKANA, 138KV</b> 53299 NWT-BNT4 138 to 53300 NWTXARK4 138 CKT1	58
01SP	GRRD-GRRD	<b>CLAREMORE 161/69KV TRANSFORMER</b> 54451 CLARMR 5 161 to 54479 CLARMR 269.0 CKT 2	84	99.8	100.2	<b>CLAREMORE 161/69KV TRANSFORMER</b> 54451 CLARMR 5 161 to 54479 CLARMR 269.0 CKT1	72
01SP	WERE-WERE	<b>HOYT to HOYT HTI SWITCHING JUNCTION, 115KV</b> 57163 HOYT 3 115 to 57165 HTI JCT3 115 CKT 1	92	98.1	101.2	<b>CONCORDIA 230/115KV TRANSFORMER</b> 58757 CONCORD3 115 to 58758 CONCORD6 230 CKT1	90
02SP	EMDE-EMDE	<b>MONETT TO AURORA H.T., 161KV</b> 59480 MON383 5 161 to 59468 AUR124 5 161 CKT 1	157	99.7	100.6	<b>DADEVILLE EAST TO MORGAN, 161KV</b> 59478 DAD368 5 161 to 96101 5MORGAN 161 CKT1	49

**Table 2** – Non - SPP Facility Overloads caused by the OKGE to MEC 150MW 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	EES-EES	99305 3MERIDN# 115 to 99286 3CROS-S* 115 CKT 1	68	99.9	100.3	99146 3STERL 115 to 99232 3CROS-N 115 CKT1	22
01SP	NPPD-NPPD	64181 MAXWELL7 115 to 64039 CALAWAY7 115 CKT 1	105	99.8	100.1	56449 HOLCOMB7 345 to 56469 SPERVIL7 345 CKT1	90
01WP	EES-EES	99167 3RINGLD 115 to 99168 3SAILES 115 CKT 1	115	99.7	100.1	50045 DOLHILL7 345 to 53454 SW SHV 7 345 CKT1	126
01WP	SJLP-SJLP	69703 ST JOE 5 161 to 69701 MIDWAY 5 161 CKT 1	164	97.9	100.4	96039 7FAIRPT 345 to 96076 5FAIRPT 161 CKT3	128
02SP	SWPA-AECI	52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	36	99.3	101.0	56793 NEOSHO 7 345 to 96045 7MORGAN 345 CKT1	61
02SP	MIPU-AECI	59217 WINDSR 5 161 to 96071 5CLINTN 161 CKT 1	123	99.1	100.2	58062 SALSBRY5 161 to 58064 NORTON-5 161 CKT1	122

**Table 3** – Previously Assigned and Identified SPP Facilities Impacted by the OKGE to MEC 150MW 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)	Assigned
01SP	AEPW-AEPW	<b>EAST CENTERTON TO GENTRY REC, 161KV</b> 53133 ECNTRTN5 161 to 53187 GENTRYR5 161 CKT 1	335	104.6	105.1	<b>FLINT CREEK TO ELM SPRINGS REC, 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
01SP	AEPW-AEPW	<b>CHEROKEE REC to KNOX LEE, 138KV</b> 53522 CHEROKE4 138 to 53557 KNOXLEE4 138 CKT 1	209	99.4	100.1	<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	133	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	101.9	103.3	<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	103.4	105.7	<b>WEST GARDNER TO LA CYGNE, 345KV</b> 57965 W.GRDNR7 345 to 57981 LACYGNE7 345 CKT1	0	SPP Flowgate
02SP	SWPA-SWPA	<b>ROBERT S. KERR TO VAN BUREN</b> 52782 RS KERR5 161 to 52722 VAN BUR5 161 CKT 1	167	101.3	102.7	<b>BONANZA TAP TO AES, 161KV</b> 55261 BONANZT5 161 to 55262 AES 5 161 CKT1	0	Previously Identified
02SP	AEPW-AEPW	<b>CHEROKEE REC to TATUM, 138KV</b> 53611 TATUM 4 138 to 53522 CHEROKE4 138 CKT 1	209	100.0	100.7	<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	0	Upgrade Assigned to SPP-2000-086 150680 Est. In-Service Date 2/1/2003
02SP	AEPW-AEPW	<b>CHEROKEE REC to KNOX LEE, 138KV</b> 53522 CHEROKE4 138 to 53557 KNOXLEE4 138 CKT 1	209	105.6	106.3	<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	150	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 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. 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