SPP Southwest Power Pool

# *System Impact Study SPP-2001-375*
# *For Transmission Service*
# *Requested By*
# *Reliant Energy Services, Inc.*

# *From ERCOTE To*
# *MPS*

# *For a Reserved Amount Of 100MW*
# *From 5/1/02*
# *To 1/1/06*

***SPP Transmission Planning***

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## 1. Executive Summary

Reliant Energy Services, Inc. has requested a system impact study for long-term Firm Point-to-Point transmission service from ERCOTE to MPS. The period of the transaction is from 5/1/02 to 1/1/06. The request is for OASIS reservations 321748 and 321749 for a total of 100MW. This is a redirect of the previously confirmed Oasis Reservations 260873 and 260874 for long-term firm service from ERCOTE to EES.

This study was performed to determine if service is available from the start date of 5/1/2002 through a period ending 5/1/2003. For the remaining period of the transaction from 5/1/2003 to 1/1/2006, higher priority requests exist and are currently being evaluated. Analysis for the remaining period is also provided without the higher priority requests included.

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 ERCOTE to MPS 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 ERCOTE to MPS 100MW transfer.

## 2. Introduction

Reliant Energy Services, Inc. has requested an impact study for transmission service from ERCOTE to MPS.

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 ten seasonal models to study the 100MW request. The SPP 2002 Series Cases 2002 Summer Peak, 2002 Fall, 2002/03 Winter Peak, 2003 Spring, 2003 Summer Peak, 2003 Fall, 2003/2004 Winter Peak, 2004 Spring, 2005 Summer Peak, and 2005/2006 Winter Peak were used to study the impact of the 100MW transfer on the SPP system during the transaction period of 5/1/02 to 1/1/06.

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 2002 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.

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. 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 ERCOTE to MPS 100MW Transfer

| Study Year | From Area - To Area | Branch Over 100% Rate B | Rate B | BC % Loading | TC % Loading | Outaged Branch Causing Overload | ATC (MW) |
|---|---|---|---|---|---|---|---|
| 02SP | | NONE | | | | NONE | |
| 02FA | | NONE | | | | NONE | |
| 02WP | | NONE | | | | NONE | |
| 03G | | NONE | | | | NONE | |
| | | **CHIKASKIA TAP TO BRAMAN, 69KV** | | | | **KILDARE TO WHITE EAGLE, 138KV** | |
| 03SP | OKGE-OKGE | 54751 CHIKSTP269.0 to 54750 BRAMAN 269.0 CKT 1 | 38 | 98.8 | 100.1 | 54760 KILDARE4 138 to 54761 WHEAGLE4 138 CKT1 | 90 |
| | | **CRESWELL TO PARIS, 69KV** | | | | **CRESWELL TO OAK, 69KV** | |
| 03SP | WERE-WERE | 57543 CRESWLN269.0 to 57548 PARIS 269.0 CKT 1 | 80 | 99.8 | 100.1 | 57543 CRESWLN269.0 to 57547 OAK 269.0 CKT1 | 82 |
| 03FA | | NONE | | | | NONE | |
| 03WP | | NONE | | | | NONE | |
| 04G | | NONE | | | | NONE | |
| 05SP | | NONE | | | | NONE | |
| 05WP | | NONE | | | | NONE | |

**Table 2** – Non - SPP Facility Overloads caused by the ERCOTE to MPS 100MW Transfer

| Study Year | From Area - To Area | Branch Over 100% Rate B | Rate B | BC % Loading | TC % Loading | Outaged Branch Causing Overload |
|---|---|---|---|---|---|---|
| 02SP | SWPA-AECI | 52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1 | 36 | 99.9 | 100.7 | 52690 CARTHG 269.0 to 96649 2JASPER 69.0 CKT1 |
| 02SP | SWPA-AECI | 52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1 | 36 | 99.4 | 100.1 | 59468 AUR124 5 161 to 59480 MON383 5 161 CKT1 |
| 02SP | EES-EES | 98949 3BOVINA 115 to 98938 3B.WLSN 115 CKT 99 | 161 | 99.8 | 100.2 | 98941 3VKSBRG 115 to 98945 3VKSB-N 115 CKT99 |
| 02FA | AMRN-AMRN | 31221 MOBERLY 161 to 31222 MOBERLY 69.0 CKT 2 | 75 | 100.0 | 100.2 | 30001 ADAIR 161 to 96106 5NOVELY 161 CKT1 |
| 02FA | EMDE-AECI | 59471 NEO184 5 161 to 96748 2NEOSAC 69.0 CKT 1 | 56 | 100.0 | 100.1 | 54430 MIAMI 269.0 to 54436 MIAENEO269.0 CKT1 |
| 02WP | EES-EES | 98930 8R.BRAS 500 to 98931 6R.BRAS 230 CKT 1 | 560 | 99.9 | 100.1 | 98935 8LAKEOV 500 to 98936 3LAKEOV 115 CKT1 |
| 03G | EES-EES | 99764 5NEWPO 161 to 99817 5ISES 1 161 CKT 2 | 372 | 99.6 | 100.1 | 99764 5NEWPO 161 to 99817 5ISES 1 161 CKT1 |
| 03SP | CELE-EES | 50024 CARROLL4 138 to 99167 3RINGLD 115 CKT 1 | 125 | 97.8 | 101.9 | 99294 7ELDEHV 345 to 99295 8ELDEHV 500 CKT1 |
| 03SP | CELE-EES | 50024 CARROLL4 138 to 99167 3RINGLD 115 CKT 1 | 125 | 97.7 | 101.8 | 53424 LONGWD 7 345 to 99294 7ELDEHV 345 CKT1 |
| 03SP | MEC-MEC | 63822 ATLANTC5 161 to 64601 ATLN MD869.0 CKT 1 | 56 | 99.8 | 100.3 | 64054 WGRAND5 161 to 64061 BOONVIL5 161 CKT1 |
| 03SP | EES-EES | 98489 3BOGLSA 115 to 99066 3DEXTER* 115 CKT 1 | 80 | 99.9 | 100.2 | 98235 8MCKNT 500 to 99027 8FRKLIN 500 CKT1 |
| 03FA | CELE-CELE | 50031 COCODR 6 230 to 50039 COUGH 4 138 CKT 1 | 386 | 99.8 | 100.7 | 50031 COCODR 6 230 to 50203 VILPLT 6 230 CKT1 |
| 03FA | EES-EES | 97454 4WALDEN 138 to 97469 4APRIL 138 CKT 1 | 206 | 98.1 | 100.2 | 97487 4MT.ZION 138 to 97514 4GRIMES 138 CKT1 |
| 03FA | EES-EES | 97487 4MT.ZION 138 to 97480 L558T485 138 CKT 1 | 206 | 99.5 | 101.9 | 97454 4WALDEN 138 to 97514 4GRIMES 138 CKT1 |
| 03FA | EES-EES | 97487 4MT.ZION 138 to 97480 L558T485 138 CKT 1 | 206 | 98.0 | 100.3 | 97454 4WALDEN 138 to 97469 4APRIL 138 CKT1 |
| 03FA | EES-EES | 97514 4GRIMES 138 to 97454 4WALDEN 138 CKT 1 | 206 | 99.6 | 101.6 | 97480 L558T485 138 to 97484 4HUNTSVL 138 CKT1 |
| 03FA | EES-EES | 97686 4LEACH 138 to 97618 4NEWTONB 138 CKT 1 | 144.6 | 99.2 | 100.7 | 53526 CROCKET7 345 to 53637 TENRUSK7 345 CKT1 |
| 03FA | EES-EES | 97708 4TOLEDO 138 to 97686 4LEACH 138 CKT 1 | 144.6 | 100.0 | 101.4 | 53526 CROCKET7 345 to 53637 TENRUSK7 345 CKT1 |
| 03WP | CELE-CELE | 50039 COUGH 4 138 to 50031 COCODR 6 230 CKT 1 | 386 | 99.8 | 100.6 | 50031 COCODR 6 230 to 50203 VILPLT 6 230 CKT1 |
| 03WP | NPPD-NPPD | 64895 MCCOOK 869.0 to 64894 MCCOOK 7 115 CKT 2 | 28 | 99.9 | 100.1 | 64894 MCCOOK 7 115 to 64895 MCCOOK 869.0 CKT1 |
| 04G | OPPD-OPPD | 65627 W BROCK869.0 to 65390 S1263T1T 161 CKT 1 | 53 | 99.5 | 100.3 | 64863 HUMBOLT5 161 to 65391 S975T4 T 161 CKT1 |
| 04G | OPPD-OPPD | 65627 W BROCK869.0 to 65390 S1263T1T 161 CKT 1 | 53 | 99.5 | 100.3 | 65391 S975T4 T 161 to 65575 S975 869.0 CKT1 |
| 04G | EES-EES | 97454 4WALDEN 138 to 97469 4APRIL 138 CKT 1 | 206 | 99.3 | 101.4 | 97480 L558T485 138 to 97487 4MT.ZION 138 CKT1 |
| 04G | EES-EES | 97454 4WALDEN 138 to 97469 4APRIL 138 CKT 1 | 206 | 98.1 | 100.2 | 97480 L558T485 138 to 97484 4HUNTSVL 138 CKT1 |
| 04G | EES-EES | 97469 4APRIL 138 to 97470 4LFOREST 138 CKT 1 | 206 | 98.2 | 100.3 | 97487 4MT.ZION 138 to 97514 4GRIMES 138 CKT1 |
| 04G | EES-EES | 97480 L558T485 138 to 97484 4HUNTSVL 138 CKT 1 | 206 | 98.5 | 100.9 | 97454 4WALDEN 138 to 97514 4GRIMES 138 CKT1 |
| 04G | EES-EES | 97487 4MT.ZION 138 to 97480 L558T485 138 CKT 1 | 206 | 99.6 | 102.0 | 97469 4APRIL 138 to 97470 4LFOREST 138 CKT1 |
| 04G | EES-EES | 97513 7GRIMES 345 to 97514 4GRIMES 138 CKT 1 | 525 | 99.3 | 101.3 | 97513 7GRIMES 345 to 97514 4GRIMES 138 CKT2 |
| 04G | EES-EES | 97513 7GRIMES 345 to 97514 4GRIMES 138 CKT 1 | 525 | 99.2 | 100.8 | 97513 7GRIMES 345 to 97514 4GRIMES 138 CKT2 |
| 04G | EES-EES | 97513 7GRIMES 345 to 97514 4GRIMES 138 CKT 2 | 525 | 99.3 | 101.3 | 97513 7GRIMES 345 to 97514 4GRIMES 138 CKT1 |
| 04G | EES-EES | 97514 4GRIMES 138 to 97454 4WALDEN 138 CKT 1 | 206 | 99.6 | 101.3 | 97514 4GRIMES 138 to 97526 4MAG AND 138 CKT1 |
| 04G | EES-EES | 97514 4GRIMES 138 to 97454 4WALDEN 138 CKT 1 | 206 | 99.4 | 101.1 | 97510 4SOTA 1 138 to 97526 4MAG AND 138 CKT1 |
| 04G | EES-EES | 97514 4GRIMES 138 to 97487 4MT.ZION 138 CKT 1 | 206 | 99.7 | 102.1 | 97459 4CONROE 138 to 97539 4WDHAVN 138 CKT1 |
| 04G | EES-EES | 97708 4TOLEDO 138 to 97686 4LEACH 138 CKT 1 | 144.6 | 98.9 | 100.2 | 53526 CROCKET7 345 to 53637 TENRUSK7 345 CKT1 |
| 05SP | SWPA-AECI | 52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1 | 36 | 99.9 | 100.5 | 55224 MUSKOGE7 345 to 55302 FTSMITH7 345 CKT1 |
| 05SP | SWPA-AECI | 52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1 | 36 | 99.9 | 100.4 | 59604 BHJ415 269.0 to 96673 2JAMESV 69.0 CKT1 |
| 05SP | SWPA-AECI | 52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1 | 36 | 99.7 | 100.1 | 96071 5CLINTN 161 to 96108 5OSCEOL 161 CKT1 |
| 05SP | MEC-MEC | 63822 ATLANTC5 161 to 64601 ATLN MD869.0 CKT 1 | 56 | 99.9 | 100.3 | 64054 WGRAND5 161 to 64061 BOONVIL5 161 CKT1 |
| 05SP | MEC-MEC | 63822 ATLANTC5 161 to 64601 ATLN MD869.0 CKT 1 | 56 | 99.6 | 100.1 | 63823 AVOCA 5 161 to 64603 AVOCMID869.0 CKT1 |
| 05SP | MEC-MEC | 64601 ATLN MD869.0 to 63822 ATLANTC5 161 CKT 1 | 56 | 99.7 | 100.1 | 63878 NEAL 4 5 161 to 63894 MONONA 5 161 CKT1 |
| 05SP | EES-CELE | 98578 6FAIRVW 230 to 50106 MADISON6 230 CKT 1 | 454 | 100.0 | 100.4 | 98235 8MCKNT 500 to 99027 8FRKLIN 500 CKT1 |
| 05SP | EES-EES | 99167 3RINGLD 115 to 99168 3SAILES 115 CKT 1 | 115 | 99.0 | 103.6 | 99294 7ELDEHV 345 to 99295 8ELDEHV 500 CKT1 |
| 05SP | EES-EES | 99167 3RINGLD 115 to 99168 3SAILES 115 CKT 1 | 115 | 98.9 | 103.5 | 53424 LONGWD 7 345 to 99294 7ELDEHV 345 CKT1 |
| 05SP | EES-EES | 99167 3RINGLD 115 to 99168 3SAILES 115 CKT 1 | 115 | 97.1 | 101.4 | 99294 7ELDEHV 345 to 99295 8ELDEHV 500 CKT1 |

**Table 3** – Previously Assigned and Identified SPP Facilities Impacted by the ERCOTE to MPS 100MW Transfer.

| Study Year | From Area - To Area | Branch Over 100% Rate B | Rate B | BC % Loading | TC % Loading | Outaged Branch Causing Overload | ATC (MW) | Assignment |
|---|---|---|---|---|---|---|---|---|
| 02SP | KACP-KACP | **STILWELL TO LA CYGNE, 345KV**<br>57968 STILWEL7 345 to 57981 LACYGNE7 345 CKT 1 | 1251 | 103.0 | 104.0 | **WEST GARDNER TO LA CYGNE, 345KV**<br>57965 W.GRDNR7 345 to 57981 LACYGNE7 345 CKT1 | 0 | SPP Flowgate, Upgrade Assigned to SPP-2000-108, Date Required 6/1/2005: Build Parallel La Cygne to Stilwell 345kV line, Construction Lead-time 36 Months |
| 02FA | | NONE | | | | NONE | 100 | |
| 02WP | | NONE | | | | NONE | 100 | |
| 03G | | NONE | | | | NONE | 100 | |
| 03SP | KACP-KACP | **STILWELL TO LA CYGNE, 345KV**<br>57968 STILWEL7 345 to 57981 LACYGNE7 345 CKT 1 | 1251 | 105.5 | 106.5 | **WEST GARDNER TO LA CYGNE, 345KV**<br>57965 W.GRDNR7 345 to 57981 LACYGNE7 345 CKT1 | 0 | SPP Flowgate, Upgrade Assigned to SPP-2000-108, Date Required 6/1/2005: Build Parallel La Cygne to Stilwell 345kV line, Construction Lead-time 36 Months |
| 03FA | | NONE | | | | NONE | 100 | |
| 03WP | | NONE | | | | NONE | 100 | |
| 04G | | NONE | | | | NONE | 100 | |
| 05SP | KACP-KACP | **STILWELL TO LA CYGNE, 345KV**<br>57968 STILWEL7 345 to 57981 LACYGNE7 345 CKT 1 | 1251 | 104.3 | 105.3 | **WEST GARDNER TO LA CYGNE, 345KV**<br>57965 W.GRDNR7 345 to 57981 LACYGNE7 345 CKT1 | 0 | SPP Flowgate, Upgrade Assigned to SPP-2000-108, Date Required 6/1/2005: Build Parallel La Cygne to Stilwell 345kV line, Construction Lead-time 36 Months |
| 05SP | AEPW-AEPW | **CHEROKEE TO KNOX LEE, 138KV**<br>53522 CHEROKE4 138 to 53557 KNOXLEE4 138 CKT 1 | 235 | 99.6 | 101.5 | **Multiple Outage Contingency**<br>**SOUTHWEST SHREVEPORT TO LONGWOOD, 345KV**<br>53454 SW SHV 7 345 to 53424 LONGWD 7 345 CKT 1<br>**SOUTHWEST SHREVEPORT TO DIANA, 345KV**<br>53454 SW SHV 7 345 to 53528 DIANA 7 345 CKT 1 | 20 | Upgrade Assigned to SPP-2000-108, Date Required 6/1/2005: Reconductor 3.25 miles of 666 ACSR with 1272 ACSR, Construction Lead-time 12 Months |
| 05WP | | NONE | | | | NONE | | |

## 5. Conclusion

The results of the study show that before the 100 MW transfer from ERCOTE to MPS can take place system improvements will be needed.

The previously assigned and identified facilities limit the ATC to zero due to the inability to upgrade the constraints as required. For the 2002 Summer (6/1/2002 to 10/1/2002), 2003 Summer (6/1/2003 to 10/1/2003) and 2005 Summer (6/1/2005 to 10/1/2005), the ATC is zero due to the loading of the La Cygne to Stilwell, La Cygne to West Gardner Flowgate. The estimated lead-time of the Flowgate upgrade is 36 months, putting the estimated in service date at 1/1/2005. Therefore service would need to be deferred until such time.

If the customer elects to take deferred service, additional system impact analysis will be required in addition to a Facility Study.

# 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 - X 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. Excld 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 - X Phase shift adjustment
   _ Flat start
   _ Lock DC taps
   _ Lock switched shunts