



# **SPP** *Southwest Power Pool*

***System Impact Study SPP-2002-128  
For Transmission Service  
Requested By  
Western Resources Generation  
Services***

***From WR To EES***

***For a Reserved Amount Of 100 MW  
From 11/1/02  
To 11/1/07***

***SPP Coordinated Planning***

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## **1. Executive Summary**

Western Resources Generation Services (WRGS) has requested a system impact study for long-term Firm Point-to-Point transmission service from WR to EES. The period of the transaction is from 11/1/02 to 11/1/07. The request is for OASIS reservations 374668 and 374669 totaling 100 MW. OASIS reservation 374668 and 374669 are the renewals of OASIS reservation 260470 and 260471 respectively.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 100 MW transfer while maintaining system reliability.

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

Limiting facilities were identified for the WR to EES 100MW transfer. SPP has determined that provision of the requested service for the requested renewal term will result in violation of applicable NERC and SPP reliability criteria. Violation of reliability criteria will result in curtailment of transmission service as per the SPP Tariff.

Given the original Oasis requests, 194741 and 194744, were granted with no specified limitations placed on the customer's right to renew service in the executed long-term service agreement, the request will be accepted, pursuant to the decision of the FERC in Dkt. No. ER02-86.

## **2. Introduction**

Western Resources Generation Services (WRGS) has requested an impact study for transmission service from WR to EES.

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 100 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 100 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.

### **3. Study Methodology**

#### **A. Description**

Two analyses were conducted to determine the impact of the 100 MW transfer on the system. The first analysis was conducted to identify any new overloads caused by the 100 MW 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 100 MW 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 WR to EES 100 MW transfer for the requested service period. The SPP 2002 Series Cases 2002 Fall, 2002/03 Winter Peak, 2003 April Minimum, 2003 Spring Peak, 2003 Summer Peak, 2003 Fall Peak, 2003/04 Winter Peak, 2004 Spring Peak, 2005 Summer Peak, and 2005/2006 Winter Peak were used to study the impact of the 100 MW transfer on the SPP system during the requested service period of 11/1/02 to 11/1/07.

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 requested service 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 SPP facility overloads caused by the 100 MW transfer. Available solutions are given in the table.

Table 2 documents overloads on Non SPP Regional Tariff participants' transmission systems caused by the 100 MW transfer.

Table 3 documents the 100 MW transfer impact on previously assigned and identified SPP facilities. Available solutions are given in the table.

Tables 1a and 3a of Appendix B documents the modeling representation of the events identified in Tables 1 and 3 respectively to include bus numbers and bus names.

**Table 1** – SPP Facility Overloads caused by the WR to EES 100 MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATM (MW)	Comment
02FA	AEPW-SWPA	NONE				NONE	100	
02WP	WERE-WERE	Circleville - King Hill N.M. Coop 115KV	92	99.8	101.0	Hoyt - Stranger Creek, 345kV	100	Transmission Operating Directive 803
03AP		NONE				NONE	100	
03SP	WERE-WERE	Gill Energy Center East - Oatville 69KV	72	79.0	110.9	Gill Energy Center East - Macarthur 69KV	66	Replace disconnect switches at Gill 69kV (use 800A.), Replace line switch at Oatville 69kV (use 800 A.)
03SP	WERE-WERE	166th Street - Jarbalo Junction Switching Station, 115kV	97	99.7	100.1	Midland Junction to Pentagon, 115kV	100	Transmission Operating Directive 1202
03SP	WERE-WERE	Gill Energy Center East - Macarthur 69KV	68	73.9	102.6	Gill Energy Center East - Oatville 69KV	91	Replace sub bus and jumpers at MacArthur 69kV
03SP	WERE-WERE	Gill Energy Center East - Oatville 69KV	72	73.8	100.9	Gill Energy Center West - Haysville Junction, 69KV	97	Replace disconnect switches at Gill 69kV (use 800A.), Replace line switch at Oatville 69kV (use 800 A.)
03FA		NONE				NONE	100	
03WP		NONE				NONE	100	
04G		NONE				NONE	100	
05SP	WERE-WERE	Gill Energy Center East - Oatville 69KV	72	94.6	113.6	Gill Energy Center East - Macarthur 69KV	28	Replace disconnect switches at Gill 69kV (use 800A.), Replace line switch at Oatville 69kV (use 800 A.)
05SP	WERE-WERE	Gill Energy Center East - Macarthur 69KV	68	88.0	105.2	Gill Energy Center East - Oatville 69KV	70	"
05SP	WERE-WERE	Gill Energy Center East - Oatville 69KV	72	87.6	103.8	Gill Energy Center West - Haysville Junction, 69KV	77	"
05SP	SWPA-SPRM	Brookline - Springfield, 161kV	323	99.4	100.1	Battlefield - Southwest Disposal, 161kV	85	Solution Undetermined
05SP	WERE-WERE	Hoyt HTI Switching JCT - Circleville 115KV	97	99.1	100.1	Hoyt - Stranger Creek, 345kV	89	Transmission Operating Directive 803
05WP		NONE				NONE	100	

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

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload
03SP	AECI-AECI	96654 2MILO 69.0 to 96802 2CLARK 69.0 CKT 1	36	99.8	100.1	52690 CARTHG 269.0 to 96649 2JASPER 69.0 CKT1
03FA	EES-EES	97686 4LEACH 138 to 97618 4NEWTONB 138 CKT 1	144.6	99.4	100.6	50037 COOPER 4 138 to 50098 LEESV 4 138 CKT1
05SP	MIPU-AECI	59217 WINDSR 5 161 to 96071 5CLINTN 161 CKT 1	123	100.0	100.7	58062 SALSBRY5 161 to 58064 NORTON-5 161 CKT1
02WP	AMRN-AMRN	31239 MOREAU 161 to 31240 MOREAU 69.0 CKT 1	84	99.5	100.1	30532 ELDON 161 to 31400 OSAGE 138 CKT1
02WP	AECI-AECI	96090 5KINGDM 161 to 96517 2KINGDM 69.0 CKT 3	29	100.0	100.2	96090 5KINGDM 161 to 96517 2KINGDM 69.0 CKT2
04G	AMRN-AMRN	31221 MOBERLY 161 to 31222 MOBERLY 69.0 CKT 1	75	100.0	100.2	58062 SALSBRY5 161 to 96120 5THMHIL 161 CKT1



**Table 3** – Previously Assigned and Identified SPP Facilities Impacted by the WR to EES 100 MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Comment
02FA	WERE-WERE	Coffey County No. 4 Vernon - Green, 69kV	45	102.2	105.8	La Cygne to Wolf Creek, 345kV	100	Westar Transmission Operating Directive 1304
02FA	WERE-WERE	Athens Switching Station - Coffey County No. 4 Vernon , 69kV	45	100.9	104.4	La Cygne to Wolf Creek, 345kV	100	"
02WP		NONE				NONE	100	
03G	WERE-WERE	Coffey County No. 4 Vernon - Green, 69kV	45	99.7	101.0	Rose Hill to Wolf Creek, 345kV	100	Westar Transmission Operating Directive 1304
03G	WERE-WERE	Coffey County No. 4 Vernon - Green, 69kV	45	99.1	101.9	La Cygne to Wolf Creek, 345kV	100	"
03G	WERE-WERE	Coffey County No. 4 Vernon - Green, 69kV	45	99.6	100.7	Benton to Wolf Creek, 345kV	100	"
03G	WERE-WERE	Athens Switching Station - Coffey County No. 4 Vernon , 69kV	45	97.7	100.5	La Cygne to Wolf Creek, 345kV	100	"
03AP		NONE				NONE	100	
03SP	AEPW-AEPW	Cherokee REC to Knox Lee, 138kV	209	100.3	100.8	Multiple Outage Contingency Southwest Shreveport to Longwood, 345kV Southwest Shreveport to Diana, 345kV	0	Reconductor 3.25 miles of 666 ACSR with 1272 ACSR
03FA		NONE				NONE	100	
03WP		NONE				NONE	100	
04G		NONE				NONE	100	
05SP		NONE				NONE	100	
05WP		NONE				NONE	100	

## **5. Conclusion**

Limiting facilities were identified for the WR to EES 100MW transfer. SPP has determined that provision of the requested service for the requested renewal term will result in violation of applicable NERC and SPP reliability criteria. Violation of reliability criteria will result in curtailment of transmission service as per the SPP Tariff.

Given the original Oasis requests, 194741 and 194744, were granted with no specified limitations placed on the customer's right to renew service in the executed long-term service agreement, the request will be accepted, pursuant to the decision of the FERC in Dkt. No. ER02-86.

## 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 immediately
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 – 0.5
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

## Appendix B

**Table 1a** – Model Data for SPP Facility Overloads caused by the WR to EES 100 MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATM (MW)	Comment
02WP	WERE-WERE	57152 CIRCLVL3 115 to 57331 KING HL3 115 CKT 1	92	99.8	101.0	56765 HOYT 7 345 to 56772 STRANGR7 345 CKT1	100	Transmission Operating Directive 803
03AP		NONE				NONE	100	
03SP	WERE-WERE	57795 GILL E 269.0 to 57825 OATVILL269.0 CKT 1	72	79.0	110.9	57795 GILL E 269.0 to 57813 MACARTH269.0 CKT1	66	Replace disconnect switches at Gill 69kV (use 800A.), Replace line switch at Oatville 69kV (use 800 A.)
03SP	WERE-WERE	57244 JARBALO3 115 to 57233 166TH 3 115 CKT 1	97	99.7	100.1	57252 MIDLAND3 115 to 57261 PENTAGN3 115 CKT1	100	Transmission Operating Directive 1202
03SP	WERE-WERE	57795 GILL E 269.0 to 57813 MACARTH269.0 CKT 1	68	73.9	102.6	57795 GILL E 269.0 to 57825 OATVILL269.0 CKT1	91	Replace sub bus and jumpers at MacArthur 69kV
03SP	WERE-WERE	57795 GILL E 269.0 to 57825 OATVILL269.0 CKT 1	72	73.8	100.9	57796 GILL W 269.0 to 57804 HAYSVLJ269.0 CKT1	97	Replace disconnect switches at Gill 69kV (use 800A.), Replace line switch at Oatville 69kV (use 800 A.)
03FA		NONE				NONE	100	
03WP		NONE				NONE	100	
04G		NONE				NONE	100	
05SP	WERE-WERE	57795 GILL E 269.0 to 57825 OATVILL269.0 CKT 1	72	94.6	113.6	57795 GILL E 269.0 to 57813 MACARTH269.0 CKT1	28	Replace disconnect switches at Gill 69kV (use 800A.), Replace line switch at Oatville 69kV (use 800 A.)
05SP	WERE-WERE	57795 GILL E 269.0 to 57813 MACARTH269.0 CKT 1	68	88.0	105.2	57795 GILL E 269.0 to 57825 OATVILL269.0 CKT1	70	"
05SP	WERE-WERE	57795 GILL E 269.0 to 57825 OATVILL269.0 CKT 1	72	87.6	103.8	57796 GILL W 269.0 to 57804 HAYSVLJ269.0 CKT1	77	"
05SP	SWPA-SPRM	52692 SPRGFLD5 161 to 59969 BRKLINE 5 161 CKT 1	323	99.4	100.1	59959 BATFLD 5 161 to 59960 SWDISP 5 161 CKT1	85	Solution Undetermined
05SP	WERE-WERE	57165 HTI JCT3 115 to 57152 CIRCLVL3 115 CKT 1	97	99.1	100.1	56765 HOYT 7 345 to 56772 STRANGR7 345 CKT1	89	Replace 82 Structures
05WP		NONE				NONE	100	

**Table 3a** – Model Data for SPP Facility Overloads caused by the WR to EES 100 MW Transfer

Study Year	From Area - To Area	Branch Over 100% Rate B	Rate B	BC % Loading	TC % Loading	Outaged Branch Causing Overload	ATC (MW)	Comment
02FA	WERE-WERE	57636 GREEN 269.0 to 57631 CC4VERN269.0 CKT 1	45	102.2	105.8	56797 WOLFCRK7 345 to 57981 LACYGNE7 345 CKT1	100	Westar Transmission Operating Directive 1304
02FA	WERE-WERE	57631 CC4VERN269.0 to 57623 ATHENS 269.0 CKT 1	45	100.9	104.4	56797 WOLFCRK7 345 to 57981 LACYGNE7 345 CKT1	100	"
02WP		NONE				NONE	100	
03G	WERE-WERE	57636 GREEN 269.0 to 57631 CC4VERN269.0 CKT 1	45	99.7	101.0	56794 ROSEHIL7 345 to 56797 WOLFCRK7 345 CKT1	100	Westar Transmission Operating Directive 1304
03G	WERE-WERE	57636 GREEN 269.0 to 57631 CC4VERN269.0 CKT 1	45	99.1	101.9	56797 WOLFCRK7 345 to 57981 LACYGNE7 345 CKT1	100	"
03G	WERE-WERE	57636 GREEN 269.0 to 57631 CC4VERN269.0 CKT 1	45	99.6	100.7	56791 BENTON 7 345 to 56797 WOLFCRK7 345 CKT1	100	"
03G	WERE-WERE	57631 CC4VERN269.0 to 57623 ATHENS 269.0 CKT 1	45	97.7	100.5	56797 WOLFCRK7 345 to 57981 LACYGNE7 345 CKT1	100	"
03AP		NONE				NONE	100	
03SP	AEPW-AEPW	53522 CHEROKE4 138 to 53557 KNOXLEE4 138 CKT 1	209	100.3	100.8	Multiple Outage Contingency 53454 SW SHV 7 345 to 53424 LONGWD 7 345 CKT1 53454 SW SHV 7 345 to 53528 DIANA 7 345 CKT 1	0	Reconductor 3.25 miles of 666 ACSR with 1272 ACSR
03FA		NONE				NONE	100	
03WP		NONE				NONE	100	
04G		NONE				NONE	100	
05SP		NONE				NONE	100	
05WP		NONE				NONE	100	