



***System Impact Study SPP-2001-137  
For Transmission Service  
Requested By  
Calpine Power Services Company***

***From AEPW To WR***

***For a Reserved Amount Of 185 MW  
From 1/1/03  
To 1/1/04***

***SPP Coordinated Planning***

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## **1. Executive Summary**

Calpine Power Services Company (CALP) has requested a system impact study for long-term Firm Point-to-Point transmission service from AEPW to WR. The period of the transaction is from 1/1/03 to 1/1/04. The request is for OASIS reservation 247371, totaling 185 MW.

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 185 MW transfer while maintaining system reliability.

New overloads caused by the 185 MW transfer were identified along with determining the impact of the transfer on any previously assigned and identified facilities.

The AEPW to WR transfer impacts facilities that have been identified as limiting constraints for previously studied transfers. Table 3 lists the previously assigned and identified facilities impacted by the 185 MW transfer. Facilities found in Table 3 limit the ATC to zero. The La Cygne to Stillwell, La Cygne to West Gardner Flowgate limits the ATC to zero in the 2003 Summer (6/1/03 to 10/1/03). The Flowgate cannot be relieved through system upgrades until 4/1/05.

## **2. Introduction**

Calpine Power Services Company (CALP) has requested an impact study for transmission service from AEPW to Westar Energy (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 185 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 185 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 185 MW transfer on the system. The first analysis was conducted to identify any new overloads caused by the 185 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 185 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 SPP facilities.

#### **B. Model Updates**

SPP used six seasonal models to study the AEPW to WR 185 MW transfer. The SPP 2002 Series Cases: 2002/03 Winter Peak, 2003 April Minimum, 2003 Spring Peak, 2003 Summer Peak, 2003 Fall Peak, and 2003/04 Winter Peak were used to study the impact of the 185 MW transfer on the SPP system during the transaction period of 1/1/03 to 1/1/04.

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 SPP facility overloads caused by the 185 MW transfer. Available solutions are given in the table.

Table 2 documents overloads on Non SPP Regional Tariff participants' transmission systems caused by the 185 MW transfer.

Table 3 documents the 185 MW transfer impact on previously assigned and identified SPP facilities. Available solutions are given in the table.

**Table 1** – SPP Facility Overloads caused by the AEPW to WR 185 MW Transfer

Study Year	From Area To Area	Branch Over 100% Rate B	Rate B	BC %Loading	TC %Loading	Outaged Branch That Caused Overload	ATC	Solution
02WP		No Branches Identified					185	
03AP		No Branches Identified					185	
03G		No Branches Identified					185	
03SP	AEPW-AEPW	EAST CENTERTON TO GENTRY REC, 161 KV 53133 ECNTRTN5 161 to 53187 GENTRYR5 161 CKT 1	368	99.8	100.3	FLINT CREEK TO ELM SPRINGS REC, 161 KV 53139 FLINTCR5 161 to 53194 ELMSPRR5 161 CKT 1	78	Undetermined
03FA	OKGE-OKGE	CHIKASKIA TAP TO BRAMAN, 69 KV 54751 CHIKSTP269.0 to 54750 BRAMAN 269.0 CKT 1	38	97.8	103.6	KILDARE4 TO WHITE EAGLE, 138 KV 54760 KILDARE4 138 to 54761 WHEAGLE4 138 CKT1	71	Undetermined
03FA	WERE-WERE	ANZIO TO FORT JUNCTION SWITCHING STATION, 115 KV 57321 ANZIO 3 115 to 57328 FT JCT 3 115 CKT 1	92	93.2	102.8	WEST JCT CITY JCT EAST TO WEST JUNCTION CITY, 115 KV 57343 WJCCTYE3 115 to 57342 WJCCTY 3 115 CKT 1	131	Undetermined
03WP		No Branches Identified					185	

**Table 2** – Non - SPP Facility Overloads caused by the AEPW to WR 185 MW Transfer

Study Year	From Area To Area	Branch Over 100% Rate B	Rate B	BC %Loading	TC %Loading	Outaged Branch That Caused Overload
02WP	EMDE-AECI	59471 NEO184 5 161 to 96748 2NEOSAC 69.0 CKT 1	56	99.6	100.1	54430 MIAMI 269.0 to 54436 MIAENEO269.0 CKT1
02WP	AECI-AECI	96089 5JAMESV 161 to 96673 2JAMESV 69.0 CKT 1	64	99.9	100.2	96089 5JAMESV 161 to 96673 2JAMESV 69.0 CKT2
03AP		No Branches Identified				
03G	EES-EES	99764 5NEWPO 161 to 99817 5ISES 1 161 CKT 2	372	100.0	100.3	99764 5NEWPO 161 to 99817 5ISES 1 161 CKT1
03SP	SWPA-EES	52660 BULL SH5 161 to 99825 5MIDWAY# 161 CKT 1	162	106.7	107.3	52660 BULL SH5 161 to 52661 BUFRDTP5 161 CKT1
03SP	SWPA-AECI	52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	36	99.8	101.4	59578 AUR355 269.0 to 59606 MTV420 269.0 CKT1
03SP	SWPA-AECI	52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	36	99.7	101.4	59468 AUR124 5 161 to 59499 CPK446 5 161 CKT1
03SP	SWPA-AECI	52690 CARTHG 269.0 to 96751 2REEDS 69.0 CKT 1	36	99.3	100.7	52692 SPRGFLD5 161 to 59479 LAR382 5 161 CKT1
03SP	SUNC-SUNC	56393 PLYMELL3 115 to 56392 PIONTAP3 115 CKT 1	143	99.9	100.6	56420 FLETCHR3 115 to 56448 HOLCOMB3 115 CKT1
03FA		No Branches Identified				
03WP	NPPD-NPPD	64895 MCCOOK 869.0 to 64894 MCCOOK 7 115 CKT 1	28	99.7	100.1	64894 MCCOOK 7 115 to 64895 MCCOOK 869.0 CKT2
03WP	AECI-AMRN	96096 5MARIES 161 to 31024 MARIES 138 CKT 1	100	99.5	100.5	30233 CALIF 161 to 31409 OVERTON 161 CKT1



**Table 3** – Previously Assigned and Identified SPP Facilities Impacted by the AEPW to WR 185 MW Transfer

Study Year	From Area To Area	Branch Over 100% Rate B	Rate B	BC %Loading	TC %Loading	Outaged Branch That Caused Overload	ATC	Assignment	Estimated Cost
02WP		No Branches Identified					185		
03AP		No Branches Identified					185		
03G		No Branches Identified					185		
03SP	KACP-KACP	LACYGNE TO STILWELL, 345 KV 57981 LACYGNE7 345 to 57968 STILWEL7 345 CKT 1	1251	105.5	106.2	LACYGNE TO WEST GARDNER, 345 KV 57981 LACYGNE7 345 to 57965 W.GRDNR7 345 CKT1	0	SPP Flowgate, Upgrade Assigned to SPP-2000-108, Date Required 6/1/05: Build Parallel LaCygne to Stilwell 345 kV line Construction Lead-time 36 Months	17,000,000
03SP	SWPA-EES	BULL SHOALS TO MIDWAY, 161 KV 52660 BULL SH5 161 to 99825 5MIDWAY# 161 CKT 1	167	103.5	104.1	BULL SHOALS TO BUFFORD TAP, 161 KV 52660 BULL SH5 161 to 52661 BUFRDTP5 161 CKT1	0	Entergy Owned Tie Line, SWPA Limitation at Bull Shoals, Upgrade Assigned to SPP-2000-108, Date Required 6/1/05: Replace 600 Amp disconnect switches, metering CTs and wave trap	150,000
03SP	AEPW-WERE	COFFEYVILLE TAP TO DEARING, 138 KV 53972 COFFEYT4 138 to 57002 DEARING4 138 CKT 1	210	99.8	108.3	DELAWARE TO NEOSHO, 345 KV 53929 DELWARE7 345 to 56793 NEOSHO 7 345 CKT1	5	Upgrade Assigned to SPP-2000-108, Date Required 6/1/05: Replace wave trap @ Dearing New Summer Emer. Rating 232 MVA 10.5% Increase	20,000
03SP	AEPW-AEPW	DYESS TO EAST ROGERS, 161 KV 53131 DYESS 5 161 to 53135 EROGERS5 161 CKT 1	244	98.5	100.4	FLINT CREEK TO GENTRY REC, 161 KV 53139 FLINTCR5 161 to 53187 GENTRYR5 161 CKT1	150	SPP Flowgate, Solution Undetermined	
03FA	WERE-WERE	EXIDE JUNCTION TO SUMMIT, 115 KV 57368 EXIDE J3 115 to 57381 SUMMIT 3 115 CKT 1	181	100.0	108.3	NORTHVIEW TO SUMMIT, 115 KV 57371 NORTHVW3 115 to 57381 SUMMIT 3 115 CKT1	0	Upgrade Assigned to SPP-1999-017, Date Required 12/1/03: Remove sag limitation	300,000
03FA	WERE-WERE	EXIDE JUNCTION TO SUMMIT, 115 KV 57368 EXIDE J3 115 to 57381 SUMMIT 3 115 CKT 1	181	93.2	108.4	EAST MCPHERSON TO SUMMIT, 230 KV 56872 EMCIPHER6 230 to 56873 SUMMIT 6 230 CKT1	83	"	"
03WP	AEPW-WERE	COFFEYVILLE TAP TO DEARING, 138 KV 53972 COFFEYT4 138 to 57002 DEARING4 138 CKT 1	210	92.5	101.0	DELAWARE TO NEOSHO, 345 KV 53929 DELWARE7 345 to 56793 NEOSHO 7 345 CKT1	162	Upgrade Assigned to SPP-2000-108, Date Required 6/1/05: Replace wave trap @ Dearing New Winter Emer. Rating 270 MVA 28.6% Increase	See Previous

## **5. Conclusion**

The La Cygne to Stilwell Flowgate limits the ATC to zero due to the inability to upgrade the constraint as required. For the 2003 Summer (6/1/03-10/1/03), the ATC is zero due 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 4/1/05.

The AEPW to WR 185 MW reservation is limited to zero ATC on one or more facilities, and the time frame of the limitation is such that facilities cannot be upgraded; therefore, the request must 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 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