



# **SPP** *Southwest Power Pool*

*System Impact Study  
SPP-2003-191-1  
For Network Service  
Requested By  
Grand River Dam Authority*

*From GRDA To WFECA*

*For a Reserved Amount Of  
10 to 15 MW From 1/1/2004 To  
1/1/2014*

*SPP Engineering, Tariff Studies*

## **System Impact Study**

Grand River Dam Authority has requested a system impact study for Network Service from GRDA to WFEC for 10 to 15 MW. The period of the service requested is from 1/1/2004 to 1/1/2014. The OASIS reservation number is 546513. The principal objective of this study is to identify system constraints on the SPP Regional Tariff System and potential system facility upgrades that may be necessary to provide the requested service.

The GRDA to WFEC request was studied to determine the facility upgrades required based on the actual queue position of the request. Only the higher priority requests in Facility Study mode were considered in developing the study models. The results of the transfer analysis are documented in Table 1. The results given in Table 1 include upgrades that may be assigned to higher priority requests. The results of this study gives the customer an estimated cost of the facility upgrades that may be required in order to accommodate the GRDA to WFEC request.

Eight seasonal models were used to study the GRDA to WFEC request for the requested service period. The SPP 2003 Series Cases 2003/04 Winter Peak (03WP), 2004 April Min (04AP), 2004 Spring Peak (04G), 2004 Summer Peak (04SP), 2004 Fall Peak (04FA), 2004/05 Winter Peak (04WP), 2009 Summer Peak (09SP), and 2009/10 Winter Peak (09WP) were used to study the impact of the request on the SPP system during a the requested service period of 1/1/2004 to 1/1/2014. The chosen base case models were modified to reflect the most current modeling information. The cases were modified to reflect firm transfers during the requested service period that were not already included in the January 2003 base case series models.

PTI's MUST First Contingency Incremental Transfer Capability (FCITC) DC analysis was used to study the request. The MUST option to convert MVA branch ratings to estimated MW ratings was used to partially compensate for reactive loading.

The study results of the GRDA to WFEC transfer show that limiting constraints exist. Due to the limiting constraints identified, the Transmission Service Request cannot be granted. Any solutions, upgrades, and costs provided in the System Impact Study are planning estimates only. The final ATC and upgrades required may vary from these results due to the status of higher priority requests, unknown facility upgrades and proposed transmission plans that will be identified during the facility study process, and the final results of the full AC analysis. Execution of a Facility Study Agreement is now required to maintain queue position. The final upgrade solutions and cost assignments will be determined upon the completion of the facility study.

**Table 1** – SPP facility overloads identified for the GRDA to WFEC transfer

Study Case	From Area - To Area	Branch Overload	Rating <MW>	Pre Transfer Loading	%TDF	Outaged Branch Causing Overload	ATC <MW>	Solution	Estimated Cost
03WP	WFEC-WFEC	55802 ACME 2 69 55916 FRNKLNS2 69 1	34	45	0.3	55841 CANADNS2 69 55842 CANADNS4 138 1	0	Acme Jct to Acme Sub: Upgrade From 3/0 To 795MCM Current work plan - Complete by 2004 Summer	
03WP	WFEC-WFEC	55802 ACME 2 69 56095 WNORMAN2 69 1	38	39	0.3	55841 CANADNS2 69 55842 CANADNS4 138 1	0	Acme Sub > West Norman: Upgrade from 3/0 to 795 ACSR Current work plan - Complete by 2004 Winter	
03WP	WFEC-WFEC	55976 LIL AXE2 69 56011 NOBLE 2 69 1	26	27	0.2	56022 PAOLI 2 69 56023 PAOLI 4 138 1	0	Solution Undetermined	
04AP	WFEC-WFEC	55802 ACME 2 69 55916 FRNKLNS2 69 1	34	39	0.3	55841 CANADNS2 69 55842 CANADNS4 138 1	0	Acme Jct to Acme Sub: Upgrade From 3/0 To 795MCM Current work plan - Complete by 2004 Summer	
04FA	SWPA-ENTR	52660 BULL SH5 161 99825 5MIDWAY# 161 1	162	163	2.9	Multiple Outage Contingency: 52660 BULL SH5 161 52661 BUFRDTP5 161 1 52648 NORFORK5 161 52661 BUFRDTP5 161 1	0	See Previous Upgrade Specified for Facility	
04FA	SWPA-EMDE	52688 CARTHAG5 161 59466 ATL109 5 161 1	167	167	4.7	59472 TIP292 5 161 59483 JOP389 5 161 1	0	Replace 600 Amp disconnect switches	\$ 60,000
04G	SWPA-ENTR	52660 BULL SH5 161 99825 5MIDWAY# 161 1	162	163	2.9	Multiple Outage Contingency: 52660 BULL SH5 161 52661 BUFRDTP5 161 1 52648 NORFORK5 161 52661 BUFRDTP5 161 1	0	Replace disconnect switches, metering CTs and wave trap at Bull Shoals.	\$ 150,000
04G	WFEC-WFEC	55802 ACME 2 69 55916 FRNKLNS2 69 1	34	36	0.3	55841 CANADNS2 69 55842 CANADNS4 138 1	0	Acme Jct to Acme Sub: Upgrade From 3/0 To 795MCM Current work plan - Complete by 2004 Summer	
04SP	SWPA-ENTR	52660 BULL SH5 161 99825 5MIDWAY# 161 1	161	170	1.2	99817 5ISES 1 161 99826 5MORFLD 161 1	0	See Previous Upgrade Specified for Facility	
04SP	AEPW-AEPW	53133 ECNTRTN5 161 53187 GENTRYR5 161 1	353	379	1.9	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	Rebuild 19.16 miles of 2-397.5 ACSR with 2156 ACSR. Replace East Centerton Wavetrap & jumpers	\$ 8,000,000
04SP	AEPW-AEPW	53139 FLINTCR5 161 53170 TONTITN5 161 1	311	414	3.2	53139 FLINTCR5 161 53187 GENTRYR5 161 1	0	Rebuild 16.3 miles of 2-297 ACSR with 2156 ACSR. Replace Flint Creek wavetrap & jumpers. Replace Flint Creek switch # 1K75	\$ 8,200,000
04SP	AEPW-AEPW	53139 FLINTCR5 161 53187 GENTRYR5 161 1	353	396	1.9	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	Rebuild 1.09 miles of 2-397.5 ACSR with 2156 ACSR. Replace Flint Creek wavetrap & jumpers	\$ 450,000
04SP	AEPW-AEPW	53245 ALUMXT 4 138 53300 NWTXARK4 138 1	260	274	1.5	53299 NWT-BNT4 138 53300 NWTXARK4 138 1	0	Rebuild 1.68 miles of 1024 ACAR with 2156 ACSR, Replace wavetrap jumpers with 2156 ACSR	\$ 840,000
04SP	AEPW-AEPW	53249 BANN 2 69 53269 KINGHWY2 69 1	72	77	0.5	53249 BANN 2 69 53312 REDLICK2 69 1	0	Replace switch 8965 @ Kings Highway	\$ 60,000
04SP	OKGE-WFEC	54946 MIDWEST4 138 55917 FRNKLNS4 138 1	186	187	1.0	56026 PHAROAH4 138 56084 WETUMKA4 138 1	0	Replace 800 amp wavetrap with 2000 amp wavetrap at Franklin Switch and 795ACSR jumpers with 1590ACSR, connectors	\$ 24,000
04SP	OKGE-OKGE	55177 PARKLN 2 69 55187 AHLOSTP2 69 1	72	78	1.8	55177 PARKLN 2 69 55182 VALLYVU2 69 1	0	Solution Undetermined	
04SP	OKGE-OKGE	55237 TIBBENS2 69 55246 BEELINE2 69 1	66	66	0.4	55241 BLUEBEL2 69 55242 BLUEBEL4 138 1	0	Construct new Tibbens Road 138/12.5kV Substation by OKGE in 2008	
04SP	WFEC-WFEC	55802 ACME 2 69 56095 WNORMAN2 69 1	38	45	0.3	55841 CANADNS2 69 55842 CANADNS4 138 1	0	Acme Sub > West Norman: Upgrade from 3/0 to 795 ACSR Current work plan - Complete by 2004 Winter	
04SP	EMDE-EMDE	59467 ORO110 5 161 59494 OAK432 5 161 1	214	215	4.0	59472 TIP292 5 161 59483 JOP389 5 161 1	0	Reconstruct and replace 1.4 miles of 556 ACSR with Bundled 556 ACSR.	\$ 800,000
04WP	AEPW-AEPW	53139 FLINTCR5 161 53170 TONTITN5 161 1	334	345	3.2	53139 FLINTCR5 161 53187 GENTRYR5 161 1	0	See Previous Upgrade Specified for Facility	
04WP	WFEC-WFEC	55976 LIL AXE2 69 56011 NOBLE 2 69 1	26	26	0.2	56022 PAOLI 2 69 56023 PAOLI 4 138 1	0	Solution Undetermined	
09SP	SWPA-ENTR	52660 BULL SH5 161 99825 5MIDWAY# 161 1	161	182	1.2	99817 5ISES 1 161 99826 5MORFLD 161 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-AEPW	53133 ECNTRTN5 161 53187 GENTRYR5 161 1	353	438	1.9	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-ENTR	53136 EUREKA 5 161 99832 SOSAGE # 161 1	244	245	1.9	52660 BULL SH5 161 99802 5BULLSH 161 1	0	Rebuild 5.34 miles of 666 ACSR with 1590 ACSR. Replace wavetrap jumpers @ Eureka Springs	\$ 2,400,000

**Table 1 - continued** – SPP facility overloads identified for the GRDA to WFEC transfer

Study Case	From Area - To Area	Branch Overload	Rating <MW>	Pre Transfer Loading	%TDF	Outaged Branch Causing Overload	ATC <MW>	Solution	Estimated Cost
09SP	AEPW-AEPW	53139 FLINTCR5 161 53170 TONTITN5 161 1	305	479	3.2	53139 FLINTCR5 161 53187 GENTRYR5 161 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-AEPW	53139 FLINTCR5 161 53187 GENTRYR5 161 1	350	463	1.9	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-AEPW	53245 ALUMXT 4 138 53250 BANN 4 138 1	260	286	1.5	53299 NWT-BNT4 138 53300 NWTXARK4 138 1	0	Replace six (6) 138 kV switches, five at Bann & one at Alumax Tap. Rebuild 0.67 miles of 1024 ACAR with 2156 ACSR. Replace wavetrap jumpers @ Bann. Replace breaker 3300 @ Bann.	\$ 630,000
09SP	AEPW-AEPW	53245 ALUMXT 4 138 53300 NWTXARK4 138 1	260	301	1.5	53299 NWT-BNT4 138 53300 NWTXARK4 138 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-AEPW	53249 BANN 2 69 53269 KINGHWY2 69 1	72	83	0.5	53249 BANN 2 69 53312 REDLICK2 69 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-AEPW	53319 SETEXAR2 69 53329 TEXARK 2 69 1	90	96	0.7	53300 NWTXARK4 138 53323 SUGARHL4 138 1	0	Solution Undetermined	
09SP	GRRD-GRRD	54427 COLINS 5 161 54476 COLNSGR2 69 1	50	52	1.1	54427 COLINS 5 161 54476 COLNSGR2 69 2	0	Solution Undetermined	
09SP	OKGE-WFEC	54946 MIDWEST4 138 55917 FRNKLNS4 138 1	184	208	1.0	56026 PHAROAH4 138 56084 WETUMKA4 138 1	0	See Previous Upgrade Specified for Facility	
09SP	OKGE-OKGE	55177 PARKLN 2 69 55187 AHLOSTP2 69 1	72	88	1.8	55177 PARKLN 2 69 55182 VALLYVU2 69 1	0	Solution Undetermined	
09SP	WFEC-WFEC	55810 ANADARK2 69 55870 CYRIL 2 69 1	61	62	0.5	55814 ANADARK4 138 55923 GEORGIA4 138 1	0	Reconductor 13 miles of 336MCM ACSR with 795MCM.	\$ 2,626,000
09SP	GRRD-GRRD	54428 PENZA 2 69 54465 GRAY TP2 69 1	47	45	13.0	54514 KANSATP5 161 54516 KANSAS 5 161 1	9	Rebuild 4/0 to 795MCM.	\$ 730,000
09WP	SWPA-ENTR	52660 BULL SH5 161 99825 5MIDWAY# 161 1	161	164	1.2	99817 5ISES 1 161 99826 5MORFLD 161 1	0	See Previous Upgrade Specified for Facility	
09WP	AEPW-AEPW	53133 ECNTRTN5 161 53187 GENTRYR5 161 1	367	388	1.9	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	See Previous Upgrade Specified for Facility	
09WP	AEPW-AEPW	53139 FLINTCR5 161 53170 TONTITN5 161 1	330	408	3.2	53139 FLINTCR5 161 53187 GENTRYR5 161 1	0	See Previous Upgrade Specified for Facility	
09WP	AEPW-AEPW	53139 FLINTCR5 161 53187 GENTRYR5 161 1	360	406	1.9	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	See Previous Upgrade Specified for Facility	
09WP	EMDE-EMDE	59500 RNM393 5 161 B150 REINMILL 1 1	75	75	0.6	59472 TIP292 5 161 59483 JOP389 5 161 1	0	Replace 161/69 KV Transformer with a 150 MVA Transformer.	\$ 1,565,000
Total Estimated Cost									\$ 26,535,000

## **Appendix A**

### MUST CHOICES IN RUNNING FCITC DC ANALYSIS

#### CONSTRAINTS/CONTINGENCY INPUT OPTIONS

1. AC Mismatch Tolerance – 2 MW
2. Base Case Rating – Rate A
3. Base Case % of Rating – 100%
4. Contingency Case Rating – Rate B
5. Contingency Case % of Rating – 100%
6. Base Case Load Flow – PSS/E
7. Convert branch ratings to estimated MW ratings – Yes
8. Contingency ID Reporting – Labels
9. Maximum number of contingencies to process - 50000

#### MUST CALCULATION OPTIONS

1. Phase Shifters Model for DC Linear Analysis – Constant flow for Base Case and Contingencies
2. Report Base Case Violations with FCITC – Yes
3. Maximum number of violations to report in FCITC table - 50000
4. Distribution Factor (OTDF and PTDF) Cutoff – 0.0
5. Maximum times to report the same elements - 10
6. Apply Distribution Factor to Contingency Analysis – Yes
7. Apply Distribution Factor to FCITC Reports – Yes
8. Minimum Contingency Case flow change – 1 MW
9. Minimum Contingency Case Distribution Factor change – 0.0
10. Minimum Distribution Factor for Transfer Sensitivity Analysis – 0.0