



SPP *Southwest Power Pool*

*System Impact Study
SPP-2003-177-1
For Transmission Service
Requested By
Tenaska Power Services Company*

From MCLN To ERCOTN

*For a Reserved Amount Of 150 MW
From 8/10/2003 To 8/10/2005*

SPP Engineering, Tariff Studies

System Impact Study

Tenaska Power Services Company has requested a system impact study for long-term Firm Point-to-Point transmission service from MCLN to ERCOTN for 150 MW. The period of the service requested is from 8/10/2003 to 8/10/2005. The OASIS reservation numbers are 539379, 539380, and 539381. 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 MCLN to ERCOTN 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 MCLN to ERCOTN request.

Six seasonal models were used to study the MCLN to ERCOTN request for the requested service period. The SPP 2003 Series Cases 2004 April Min (04AP), 2004 Spring Peak (04G), 2004 Summer Peak (04SP), 2004 Fall Peak (04FA), 2004/05 Winter Peak (04WP), and 2009 Summer Peak (09SP) were used to study the impact of the request on the SPP system during a the requested service period of 8/10/2003 to 8/10/2005. 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 MCLN to ERCOTN 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. Evaluation of the right to renew service for future years was not performed. Renewal rights will be evaluated as part of the facility study. 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 MCLN to ERCOTN transfer

Study Case	From Area - To Area	Branch Overload	Rating <MW>	Pre Transfer Loading	%TDF	Outaged Branch Causing Overload	ATC <MW>	Solution	Estimated Cost
04AP	WFEC-WFEC	55802 ACME 2 69 55916 FRNKLNS2 69 1	34	41	1.3	55841 CANADNS2 69 55842 CANADNS4 138 1	0	Acme Jct to Acme Sub: Upgrade From 3/0 To 795MCM.	\$ 857,820
04AP	WFEC-WFEC	55802 ACME 2 69 56095 WNORMAN2 69 1	38	38	1.3	55841 CANADNS2 69 55842 CANADNS4 138 1	22	Acme Sub > West Norman: Upgrade from 3/0 to 795 ACSR	\$ 525,000
04G	WFEC-WFEC	55802 ACME 2 69 55916 FRNKLNS2 69 1	34	38	1.3	55841 CANADNS2 69 55842 CANADNS4 138 1	0	See Previous Upgrade Specified for Facility	
04G	WERE-WERE	57321 ANZIO 3 115 57328 FT JCT 3 115 1	92	94	0.3	57342 WJCCTY 3 115 57343 WJCCTYE3 115 1	0	May be relieved due to WERE Operating Guide 1217 - Outage of Fort Junction - West Junction City 115kV Line	
04G	WERE-WERE	57151 AUBURN 3 115 57167 KEENE 3 115 1	68	73	0.1	56852 JEC 6 230 56861 EMANHAT6 230 1	0	May be relieved due to WERE Operating Guide 900 - Outage of East Manhattan - Jeffrey Energy Center 230kV Line	
04G	WERE-WERE	57786 CHISHLM2 69 57832 RIPLEYM2 69 1	128	133	0.1	57040 EVANS N4 138 57041 EVANS S4 138 1	0	Solution Undetermined	
04G	WERE-WERE	57039 ELPASO 4 138 57046 GILL S 4 138 1	210	274	0.5	57040 EVANS N4 138 57041 EVANS S4 138 1	0	Solution Undetermined	
04G	WERE-WERE	57328 FT JCT 3 115 57343 WJCCTYE3 115 1	68	70	0.2	56873 SUMMIT 6 230 *B168 SUMMIT1X 1 1	0	May be relieved due to WERE Operating Guide 613 - Outage of Summit 230/115kV Transformer	
04G	WERE-WERE	57167 KEENE 3 115 57339 S ALMA 3 115 1	68	68	0.1	56852 JEC 6 230 56861 EMANHAT6 230 1	0	May be relieved due to WERE Operating Guide 900 - Outage of East Manhattan - Jeffrey Energy Center 230kV Line	
04G	WERE-WERE	57342 WJCCTY 3 115 57343 WJCCTYE3 115 1	141	152	0.5	56873 SUMMIT 6 230 *B168 SUMMIT1X 1 1	0	May be relieved due to WERE Operating Guide 613 - Outage of Summit 230/115kV Transformer	
04G	WERE-WERE	57374 SPHILPJ3 115 57438 WMCIPHER3 115 1	67	67	0.4	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	12	Tear down double circuit, build single circuit with 1192.5 ACSR.	\$ 7,800,000
04SP	WERE-WERE	57182 TECHILE3 115 57187 27CROCO3 115 1	67	75	0.1	57151 AUBURN 3 115 *B016 AUBRN77X 1 1	0	May be relieved due to WERE Operating Guide 618 - Outage of Auburn Road 230/115kV Xfr	
04SP	WERE-WERE	57412 ARKVALJ3 115 57435 3 VANBU3 115 1	68	75	0.1	57413 CIRCLE 3 115 57419 HEC 3 115 1	0	May be relieved due to WERE Operating Guide 1204 - Outage of Circle - Hutchinson Energy Center 115kV Line	
04SP	WFEC-WFEC	55802 ACME 2 69 56095 WNORMAN2 69 1	38	48	1.4	55841 CANADNS2 69 55842 CANADNS4 138 1	0	See Previous Upgrade Specified for Facility	
04SP	OKGE-OKGE	55177 PARKLN 2 69 55187 AHLOSTP2 69 1	72	77	0.4	55177 PARKLN 2 69 55182 VALLYVU2 69 1	0	Solution Undetermined	
04SP	WERE-WERE	57151 AUBURN 3 115 57167 KEENE 3 115 1	68	71	0.2	56852 JEC 6 230 56861 EMANHAT6 230 1	0	May be relieved due to WERE Operating Guide 900 - Outage of East Manhattan - Jeffrey Energy Center 230kV Line	
04SP	WERE-WERE	56851 AUBURN 6 230 *B016 AUBRN77X 1 1	304	306	0.1	57163 HOYT 3 115 *B089 HOYT 44X 1 1	0	May be relieved due to WERE Operating Guide 803 - Outage of Hoyt 345/115kV Transformer	
04SP	AEPW-AEPW	53154 CHAMSPR5 161 53170 TONTITN5 161 1	247	285	0.2	53154 CHAMSPR5 161 53195 FARMGTN5 161 1	0	Rebuild 12 miles with 2156MCM ACSR. Replace Chamber Springs wavetrp & reset relays.	\$ 7,200,000
04SP	WERE-WERE	57412 ARKVALJ3 115 57413 CIRCLE 3 115 1	68	80	0.1	57413 CIRCLE 3 115 57419 HEC 3 115 1	0	May be relieved due to WERE Operating Guide 1204 - Outage of Circle - Hutchinson Energy Center 115kV Line	
04SP	AEPW-AEPW	53133 ECNTRTN5 161 53187 GENTRYR5 161 1	353	360	0.1	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	Rebuild 19.16 miles of 2-397.5 ACSR with 2156 ACSR. Replace East Centerton Wavetrp & jumpers	\$ 8,000,000
04SP	WERE-WERE	57301 EAST ST3 115 57309 WEMPORJ3 115 1	91	94	0.3	57305 MORRIS 3 115 57309 WEMPORJ3 115 1	0	May be relieved due to WERE Operating Guide 1209 - Outage of Morris - West Emporia 115kV Line	
04SP	AEPW-AEPW	53139 FLINTCR5 161 53187 GENTRYR5 161 1	354	376	0.1	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	Rebuild 1.09 miles of 2-397.5 ACSR with 2156 ACSR. Replace Flint Creek wavetrp & jumpers	\$ 450,000
04SP	AEPW-AEPW	53139 FLINTCR5 161 53170 TONTITN5 161 1	311	352	0.1	53154 CHAMSPR5 161 53170 TONTITN5 161 1	0	Rebuild 16.3 miles of 2-297 ACSR with 2156 ACSR. Replace Flint Creek wavetrp & jumpers. Replace Flint Creek switch # 1K75	\$ 8,200,000

Table 1 - continued – SPP facility overloads identified for the MCLN to ERCOTN transfer

Study Case	From Area - To Area	Branch Overload	Rating <MW>	Pre Transfer Loading	%TDF	Outaged Branch Causing Overload	ATC <MW>	Solution	Estimated Cost
04SP	OKGE-WFEC	54946 MIDWEST4 138 55917 FRNKLS4 138 1	186	204	5.0	56026 PHAROAH4 138 56084 WETUMKA4 138 1	0	Replace 800 amp wavetrapp with 2000 amp wavetrapp at Franklin Switch and 795ACSR jumpers with 1590ACSR, connectors	\$ 24,000
04SP	WFEC-WFEC	56022 PAOLI 2 69 56023 PAOLI 4 138 1	42	42	0.2	55841 CANADNS2 69 56011 NOBLE 2 69 1	0	WFEC Planned Upgrade 2004WP	
04SP	SWPS-SWPS	51014 OSAGE--3 115 51080 CANYNE3 115 1	99	97	1.7	50993 BUSHLND6 230 51111 DFSMTH6 230 1	84	Rebuild 13 miles of 115 kV circuit with 397 ACSR on T-0-102 structures.	\$ 1,910,000
04FA	WERE-WERE	57321 ANZIO 3 115 57328 FT JCT 3 115 1	92	100	0.3	57342 WJCCTY 3 115 57343 WJCCTYE3 115 1	0	May be relieved due to WERE Operating Guide 1217 - Outage of Fort Junction - West Junction City 115kV Line	
04FA	WERE-WERE	57151 AUBURN 3 115 57167 KEENE 3 115 1	68	76	0.1	56852 JEC 6 230 56861 EMANHAT6 230 1	0	May be relieved due to WERE Operating Guide 900 - Outage of East Manhattan - Jeffrey Energy Center 230kV Line	
04FA	WERE-WERE	57786 CHISHLM2 69 57832 RIPLEYM2 69 1	128	133	0.1	57040 EVANS N4 138 57041 EVANS S4 138 1	0	Solution Undetermined	
04FA	WERE-WERE	57152 CIRCLVL3 115 57165 HTI JCT3 115 1	95	97	0.1	56765 HOYT 7 345 56772 STRANGR7 345 1	0	May be relieved due to WERE Operating Guide 803 - Outage of Hoyt - Stranger 345kV Line	
04FA	WERE-WERE	57301 EAST ST3 115 57309 WEMPOR3 115 1	92	97	0.1	57305 MORRIS 3 115 57309 WEMPOR3 115 1	0	May be relieved due to WERE Operating Guide 1209 - Outage of Morris - West Emporia 115kV Line	
04FA	WERE-WERE	57039 ELPASO 4 138 57046 GILL S 4 138 1	210	271	0.5	57040 EVANS N4 138 57041 EVANS S4 138 1	0	Solution Undetermined	
04FA	WERE-WERE	57368 EXIDE J3 115 57372 PHILIPS3 115 1	196	198	0.5	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	0	Rebuild and reconductor 0.34 miles with 1192 ACSR.	\$ 95,200
04FA	WERE-WERE	57368 EXIDE J3 115 57381 SUMMIT 3 115 1	196	209	0.5	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	0	Rebuild and reconductor 4.94 miles with 1192 ACSR.	\$ 1,100,000
04FA	WERE-WERE	57328 FT JCT 3 115 57335 MCDOWEL3 115 1	68	70	0.2	56766 JEC N 7 345 56773 SUMMIT 7 345 1	0	May be relieved due to WERE Operating Guide 402 - Outage of Jeffery Energy Center - Summit 345kV Line	
04FA	WERE-WERE	57328 FT JCT 3 115 57343 WJCCTYE3 115 1	68	75	0.2	56873 SUMMIT 6 230 *B168 SUMMIT1X 1 1	0	May be relieved due to WERE Operating Guide 613 - Outage of Summit 230/115kV Transformer	
04FA	WERE-WERE	57167 KEENE 3 115 57339 S ALMA 3 115 1	68	72	0.1	56852 JEC 6 230 56861 EMANHAT6 230 1	0	May be relieved due to WERE Operating Guide 900 - Outage of East Manhattan - Jeffrey Energy Center 230kV Line	
04FA	WERE-WERE	57372 PHILIPS3 115 57374 SPHILPJ3 115 1	156	180	0.9	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	0	Rebuild 0.88 miles and reconductor with 1192.5 ACSR.	\$ 417,200
04FA	WERE-WERE	57374 SPHILPJ3 115 57438 WMCIPHER3 115 1	66	83	0.4	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	0	See Previous Upgrade Specified for Facility	
04FA	WERE-WERE	57374 SPHILPJ3 115 57438 WMCIPHER3 115 2	90	97	0.5	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	0	See Previous Upgrade Specified for Facility	
04FA	WERE-WERE	57342 WJCCTY 3 115 57343 WJCCTYE3 115 1	141	163	0.5	56873 SUMMIT 6 230 *B168 SUMMIT1X 1 1	0	May be relieved due to WERE Operating Guide 613 - Outage of Summit 230/115kV Transformer	
04WP	WERE-WERE	57152 CIRCLVL3 115 57165 HTI JCT3 115 1	95	98	0.1	56765 HOYT 7 345 56772 STRANGR7 345 1	0	May be relieved due to WERE Operating Guide 803 - Outage of Hoyt - Stranger 345kV Line	
04WP	WERE-WERE	57039 ELPASO 4 138 57046 GILL S 4 138 1	210	248	0.5	57040 EVANS N4 138 57041 EVANS S4 138 1	0	Solution Undetermined	
04WP	WFEC-WFEC	55976 LIL AXE2 69 56011 NOBLE 2 69 1	26	28	0.9	56022 PAOLI 2 69 56023 PAOLI 4 138 1	0	Solution Undetermined	
04WP	WERE-WERE	57372 PHILIPS3 115 57374 SPHILPJ3 115 1	156	160	0.9	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	0	See Previous Upgrade Specified for Facility	
04WP	WERE-WERE	57374 SPHILPJ3 115 57438 WMCIPHER3 115 1	66	74	0.4	56872 EMCIPHER6 230 56873 SUMMIT 6 230 1	0	See Previous Upgrade Specified for Facility	
04WP	WFEC-WFEC	56022 PAOLI 2 69 56023 PAOLI 4 138 1	42	42	0.2	55841 CANADNS2 69 56011 NOBLE 2 69 1	0	WFEC Planned Upgrade 2004WP	
04WP	WERE-WERE	57342 WJCCTY 3 115 57343 WJCCTYE3 115 1	141	144	0.5	56873 SUMMIT 6 230 *B167 SUMMIT1X 1 1	0	May be relieved due to WERE Operating Guide 613 - Outage of Summit 230/115kV Transformer	
09SP	WERE-WERE	57182 TECHILE3 115 57187 27CROCO3 115 1	67	77	0.1	57182 TECHILE3 115 57187 27CROCO3 115 2	0	Solution Undetermined	
09SP	OKGE-OKGE	55177 PARKLN 2 69 55187 AHLOSTP2 69 1	72	81	0.4	55177 PARKLN 2 69 55182 VALLYVU2 69 1	0	Solution Undetermined	
09SP	WFEC-WFEC	55810 ANADARK2 69 55838 CADDO 2 69 1	61	65	0.4	55814 ANADARK4 138 56089 WASHITA4 138 1	0	Solution Undetermined	
09SP	AECI-AECI	96137 4BRISTOW 138 96889 2BRISTOW 69 1	54	57	0.1	96137 4BRISTOW 138 96889 2BRISTOW 69 2	0	Replace 50 MVA Transformer with 84 MVA unit.	\$ 890,000

Table 1 - continued – SPP facility overloads identified for the MCLN to ERCOTN 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	SWPA-SPRM	52692 SPRGFLD5 161 59969 BRKLINE 5 161 1	307	322	0.1	59955 JUNCTN 5 161 59969 BRKLINE 5 161 1	0	Replace disconnect switches at Springfield.	\$ 60,000
09SP	SWPS-SWPS	51014 OSAGE--3 115 51080 CANYNE3 115 1	99	106	1.7	50993 BUSHLND6 230 51111 DFSMTH6 230 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-AEPW	53154 CHAMSPR5 161 53195 FARMGTN5 161 1	335	355	0.1	53154 CHAMSPR5 161 53170 TONTITN5 161 1	0	Replace Farmington switch 8839	\$ 60,000
09SP	AEPW-AEPW	53139 FLINTCR5 161 53154 CHAMSPR5 161 1	333	338	0.1	53155 CHAMSPR7 345 53756 CLARKSV7 345 1	0	Replace Terminal Equipment	\$ 60,000
09SP	AEPW-AEPW	53154 CHAMSPR5 161 53170 TONTITN5 161 1	243	346	0.2	53154 CHAMSPR5 161 53195 FARMGTN5 161 1	0	See Previous Upgrade Specified for Facility	
09SP	WFEC-WFEC	55863 COMANCH2 69 56086 WALTERS2 69 1	38	40	0.1	54099 COMANC-2 69 54187 L-DISTP2 69 1	0	Comanche> Walters: Upgrade 4/0 to 556 ACSR	\$ 3,500,000
09SP	AEPW-AEPW	53133 ECNTRTN5 161 53187 GENTRYR5 161 1	353	421	0.1	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	See Previous Upgrade Specified for Facility	
09SP	AEPW-AEPW	53139 FLINTCR5 161 53187 GENTRYR5 161 1	350	444	0.1	53139 FLINTCR5 161 53170 TONTITN5 161 1	0	See Previous Upgrade Specified for Facility	
09SP	OKGE-WFEC	54946 MIDWEST4 138 55917 FRNKLNS4 138 1	185	229	5.0	56026 PHAROAH4 138 56084 WETUMKA4 138 1	0	See Previous Upgrade Specified for Facility	
09SP	WFEC-WFEC	55979 LNDSYSW2 69 56087 WALVILL2 69 1	26	28	0.3	55911 FLETCHR2 69 55990 MARLOWJ2 69 1	0	Lindsay>Wallvile: 4.9 miles, 1/0 to 336	\$ 1,000,000
09SP	SWPS-SWPS	50520 LP-HOLL2 69 50521 LP-HOLL6 230 1	90	93	0.1	50524 LP-HCLI2 69 50527 LP-WADS6 230 1	0	Solution Undetermined	
09SP	SWPS-SWPS	51020 RANDALL3 115 51082 PALODU 3 115 1	98	99	2.5	51041 AMARLS6 230 51321 SWISHER6 230 1	0	Rebuild 9 miles of 115 kV circuit with 397 ACSR on T-0-102 structures.	\$ 1,170,000
09SP	MIDW-WEPL	56565 SEWARD 2 69 58792 SEWARD 3 115 1	44	45	0.1	56601 HEIZER 3 115 58779 MULGREN6 230 1	0	Solution Undetermined	
09SP	AEPW-AEPW	54125 TIP&HED2 69 54138 SNYDER-2 69 1	53	58	0.1	54126 HOB-JCT4 138 54158 TAMARTP4 138 1	0	Replace Snyder wavetrap	\$ 40,000
09SP	WERE-WERE	57438 WMCIPHER3 115 57439 WHEATLD3 115 1	70	71	0.2	57413 CIRCLE 3 115 57432 RICE 3 115 1	0	Solution Undetermined	
09SP	SWPS-SWPS	51082 PALODU 3 115 51302 HAPPY3 115 1	98	94	2.5	51041 AMARLS6 230 51321 SWISHER6 230 1	145	Rebuild 24 miles of 115 kV circuit with 397 ACSR on T-0-102 structures.	\$ 3,130,000
Total Estimated Cost									\$ 46,489,220

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