



SPP

*Southwest
Power Pool*

*System Impact Study for
Transmission Service Requests from
Grand River Dam Authority to
Western Resources Co.
&
Kansas City Power & Light Co.*

SPP Transmission Planning

Table of Contents

1. Executive Summary	1
2. Introduction	2
3. Study Methodology	3
A. Description	3
B. Model Updates	3
C. Transfer Analysis	4
4. Study Results	
A. PSSE	
1. Table No. 1- ACCC Run Results (24 MW)	5
2. Table No. 2- ACCC Run Results (15 MW)	9
B. MUST - Available Transfer Capability	12
5. Conclusion	12

1. Executive Summary

Kansas Municipal Energy Agency has requested a system impact study for long-term Firm Point-to-Point transmission service from Grand River Dam Authority to Western Resources Co. and Kansas City Power & Light Co. The period of the transactions is from 5/1/00 to 5/1/10. The Grand River Dam Authority to Western Resources Co. transaction is for 24 MW (Reservation#163951). The Grand River Dam Authority to Kansas City Power & Light Co. transaction is for 15 MW (Reservation#163958).

The principal objective of this study is to identify system problems and potential system modifications necessary to facilitate the additional 24 and 15 MW transfers while maintaining system reliability. The analysis in this document shows that to accommodate an additional 24 and 15 MW transfers, upgrades will be required on the SPP transmission systems. A summary of the overloads and suggested upgrades can be found in Table No. 1 for the 24MW transfer and Table No. 2 for the 15 MW transfer.

The SPP and effected member companies shall use due diligence to coordinate the addition of necessary facilities or transmission system upgrades to provide the requested transmission service. Kansas Municipal Energy Agency is to compensate SPP for such costs pursuant to the terms of section 27 of the SPP Open Access Transmission Tariff. Expedited procedures for new facilities are available to Kansas Municipal Energy Agency per section 19.8 of the SPP Open Access Transmission Service Tariff.

Engineering and construction of any new facilities or modifications will not start until after a transmission service agreement and/or construction agreement is in place and effected member companies receives the appropriate authorization to proceed from the SPP after they receive authorization from the transmission customer.

2. Introduction

Kansas Municipal Energy Agency has requested an impact study for transmission service from GRDA control area with sinks of WR and KCPL.

The principal objective of this study is to identify the restraints on the SPP Regional Tariff System that may limit the transfers to less than 24 and 15 MW. This study includes steady-state contingency analysis (PSS/E function ACCC) and Available Transfer Capability (ATC Linear) analysis.

The steady-state analysis considers the impact of the 24 and 15 MW transfers on transmission line loading and transmission bus voltages for outages of single and selected multiple transmission lines and autotransformers 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 24 and 15 MW.

3. Study Methodology

A. Description

This study was done in two different parts. The first part was to study the steady-state analysis impacts caused on the SPP system from the 24 and 15 MW transfers identified and the second part was to study Available Transfer Capability (ATC). The SPP base case models were modified to reflect the most current modeling information.

The steady-state analysis part was done to ensure current SPP Criteria and NERC Planning Standards requirements are fulfilled.

The Southwest Power Pool (SPP) meets the NERC Planning Standards, Table No. 1, which provides the strictest requirements related to thermal overloads with a contingency. It requires that all facilities be within emergency ratings after a contingency.

The ATC study portion was done using the requirements specified in the current SPP Criteria related to determination of ATC. The linear analysis was first performed using PTI's MUST FCITC activity. The results were AC verified and validated.

When facilities were identified as being overloaded the facility owners were asked to review and confirm the validity of the limit. During this review the transmission providers would use available mitigation plans.

B. Model Updates

SPP built fourteen models for each season representative of the system with and without the requested transfers. The higher priority, based on queue time, 24 MW transfer to WR was added to the seasonal models and studied first. The 15 MW transfer was then added to the already studied 24MW models and again studied.

Additional modeling data was received from Kansas City Power & Light Co. and Western Resources was added to the study cases. The additional load flow data modeled KCPL's 34.5 kV system and updated Western Resources system. Cases for year 2000 Spring Peak, 2000 Summer Peak, 2000 Fall Peak, 2000/01 Winter Peak, 2001 April, 2001 Spring Peak, 2001 Summer Peak, 2001 Fall Peak, and 2001/02 Winter Peak, 2004 Summer Peak, 2004/05 Winter Peak, 2006 Summer Peak, 2006/07 Winter Peak, and 2010 Summer Peak were included. These cases were modified to reflect future firm transfers not already included in the January 2000 base case series.

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, which overloaded using MVA ratings in the transfer case and was not overloaded in the base case, was flagged.

Shown in Table No. 1 and Table No. 2 is the outages that caused overloads and has not been previously identified with a mitigation plan. The upgrades needed to solve the overloading problems in the appropriate year cases are provided.

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 - 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. Exclcd 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

4. Study Results

A. PSSE ACCC

1. Table No. 1: GRRD TO WERE Transmission Service Study – 24 MW

Study Year	Load flow case description (opened branch(es))	Overloaded lines	FROM TO	RATE B % load	Available ATC MW	Solutions
01 SR	All Studied Contingencies	NONE		-----		
00 SP	CRESWELL TO PARIS 69 KV 57143 [CRESWEL2] TO 57148 [PARIS 2] CKT 1	CRESWELL TO OAK 69 KV 57143 CRESWEL2 TO 57147 OAK 2	WERE WERE	72MVA 101.7%	17	Replacement of jumpers and disconnect switches
00 FA	All Studied Contingencies	NONE		-----		
00 WP	KANSAS TAP TO KANSAS 161 KV 54514 [KANSATP5] TO 54516 [KANSAS 5] CKT 1	PENSACOLA TO GRAY TAP 69 KV 54428 PENSA 2 TO 54465 GRAY TP2	GRRD GRRD	41MVA 100.1%	14	NEW OVERLOAD GRDA plans an 138interconnection With PSO Grove and 138/69 tie To Grove GRDA. Will alleviate this overload.
00 WP	KANSAS TRANSFORMER 161/69 KV 54515 [KANSAS 2] TO 54516 [KANSAS 5] CKT 1	PENSACOLA TO GRAY TAP 69 KV 54428 PENSA 2 TO 54465 GRAY TP2	GRRD GRRD	41MVA 100.2%	13	NEW OVERLOAD GRDA plans an 138interconnection With PSO Grove and 138/69 tie To Grove GRDA. Will alleviate this overload.
01 AP	All Studied Contingencies	NONE		-----		
01 SR	All Studied Contingencies	NONE		-----		

Table No. 1 continued: GRRD TO WERE Transmission Service Study – 24 MW

Study Year	Load flow case description (opened branch(es))	Overloaded lines	FROM TO	RATE B % load	Available ATC MW	Solutions
01 SP	EAST CENTERTON TO GENTRYR5 161 KV 53133 [ECNTRTN5] TO 53187 [GENTRYR5] CKT 1	DYESS TO EAST ROGERS 161 KV 53131 DYESS 5 TO 53135 EROGERS5	CESW CESW	245MVA 100.2%	9	SPP-1999-012/013
01 SP	GRDA1 TO WAGONER 161 KV 54456 [GRDA1 5] TO 54500 [WAGNOR 5] CKT 1	MAID TO TAHLEQUAH 161 KV 54448 MAID 5 TO 54455 TAHLQH 5	GRRD GRRD	148MVA 100.5%	16	NEW OVERLOAD GRDA has agreement with AECI to reduce Chouteau Gen output to eliminate loads like this one
01 SP	MUSKOGEE TO ROSS LAKE 161 KV 55222 [MSKGE5] TO 55252 [ROSS 5] CKT 1	MAID TO TAHLEQUAH 161 KV 54448 MAID 5 TO 54455 TAHLQH 5	GRRD GRRD	148MVA 100.5%	8	NEW OVERLOAD GRDA has agreement with AECI to reduce Chouteau Gen output to eliminate loads like this one
01 FA	All Studied Contingencies	NONE		-----		
01 WP	All Studied Contingencies	NONE		-----		
04 SP	KERR TO KANSAS TAP 161 KV 54435 [KERR GR5] TO 54514 [KANSATP5] CKT 1	ZENA TAP TO JAY 69 KV 54467 ZENA TP2 TO 54520 JAY GR 2	GRRD GRRD	41MVA 100.1%	23	NEW OVERLOAD GRDA plans an 138interconnection With PSO Grove and 138/69 tie To Grove GRDA. Will alleviate this overload.
04 SP	NAVAJO3 TO NAVAJO4 115 KV 52162 [NAVAJ3 3] TO 52166 [NAVAJ4 3] CKT1	CV-ART TO ART W 69 KV 52171 CV-ARTE TO 52173 ART W	SPS SPS	54MVA 100.2%	23	NEW OVERLOAD
04 WP	All Studied Contingencies	NONE		-----		

Table No. 1 continued: GRRD TO WERE Transmission Service Study – 24 MW

Study Year	Load flow case description (opened branch(es))	Overloaded lines	FROM TO	RATE B % load	Available ATC MW	Solutions
06 SP	CHAMSPR7 TO CLARKSVILLE 345KV 53155 [CHAMSPR7] TO 53756 [CLARKSV7] CKT 1	AURORA TO MONETT 161 KV 59468 AUR124 5 TO 59480 MON383 5	EMDE EMDE	157MVA 100.1%	19	(05SP) SPP-1999-015 Mitigation Plan in effect
06 SP	CHAMSPR 345/161KV 53154 [CHAMSPR5] TO 53155 [CHAMSPR7] CKT 1	AURORA TO MONETT 161 KV 59468 AUR124 5 TO 59480 MON383 5	EMDE EMDE	157MVA 100.1%	19	(05SP) SPP-1999-015 Mitigation Plan in effect
06 SP	WEAVER TO ROSE HILL JUNCTION 69 KV 57187 [WEAVER 2] TO 57384 [RH JCT 2] CKT 1	CRESWELL TO OAK 69 KV 57143 CRESWEL2 TO 57147 OAK 2	WERE WERE	72MVA 100.9%	20	NEW OVERLOAD
06 WP	All Studied Contingencies	NONE		-----		

Table No. 1 continued: GRRD TO WERE Transmission Service Study – 24 MW

Study Year	Load flow case description (opened branch(es))	Overloaded lines	FROM TO	RATE B % load	Available ATC MW	Solutions
10 SP	DYESS TO NORTH FAYETTEVILLE 69 KV 53130 [DYESS 2] TO 53146 [NFAYTVL2] CKT 1	FLINT CREEK TO GENTRYR 161 KV 53139 FLINTCR5 TO 53187 GENTRYR5	CESW CESW	335MVA 100.1%	13	REPLACE SWITCH
10 SP	MUSKOGEE TO PECAN CREEK 345 KV 55224 [MSKGE7] TO 55235 [PECAN7] CKT 1	MAID TO TAHLEQUAH 161 KV 54448 MAID 5 TO 54455 TAHLQH 5	GRRD GRRD	148MVA 100.7%	7	NEW OVERLOAD GRDA has agreement with AECI to reduce Chouteau Gen output to eliminate loads like this one
10 SP	PECAN CREEK 345/161 KV TRANSFORMER 55234 [PECAN5] TO 55235 [PECAN7] CKT 1	MAID TO TAHLEQUAH 161 KV 54448 MAID 5 TO 54455 TAHLQH 5	GRRD GRRD	148MVA 100.7%	7	NEW OVERLOAD GRDA has agreement with AECI to reduce Chouteau Gen output to eliminate loads like this one
10 SP	JAY TO COLCOTP 69 KV 54520 [JAY GR 2] TO 54629 [COLCOTP2] CKT 1	ZENA TAP TO JAY 54467 ZENA TP2 TO 54520 JAY GR 2	GRRD GRRD	41MVA 100.1%	23	NEW OVERLOAD GRDA plans an 138interconnection With PSO Grove and 138/69 tie To Grove GRDA. Will alleviate this overload.
10 SP	WEAVER 138/69 KV 56824 [WEAVER 4] TO 57187 [WEAVER 2] CKT 1	KEN MAR TO NORTHEAST 69 KV 57359 KENMAR 2 TO 57372 NORTHEA2	WERE WERE	63MVA 100.1%	8	NEW OVERLOAD
10 SP	EL PASO 138/69 KV 56859 [ELPASO 4] TO 57345 [ELPASO 2] CKT 1	MACARTH TO OATVILLE 69 KV 57364 MACARTH2 TO 57374 OATVILL2	WERE WERE	72MVA 100.1%	10	NEW OVERLOAD
10 SP	CRESWELL TO OAK 69 KV 57143 [CRESWEL2] TO 57147 [OAK 2] CKT 1	WEAVER TO ROSE HILL JUNCTION 69 KV 57187 WEAVER 2 TO 57384 RH JCT 2	WERE WERE	43MVA 103.2%	10	NEW OVERLOAD
10 SP	TWIN VALLEY NO.1 MOUND VALLEY TO NEOSHO 138 KV 56838 [TVLMNDV4] TO BUS 56846 [NEOSHO 4] CKT 1	NORTHEAST PARSONS TO NEOSHO 138 KV 56835 NEPARSN4 TO 56846 NEOSHO 4	WERE WERE	159MVA 100.5%	15	NEW OVERLOAD
10 SP	CIRCLEVILLE TO RICE COUNTY 115 KV 57043 [CIRCLE 3] TO 57061 [RICE 3] CKT 1	LYONS TO WHEATLAND 115 KV 57055 LYONS 3 TO 57067 WHEATLD3	WERE WERE	70MVA 103.1%	0	NEW OVERLOAD
10 SP	ARKANSAS CITY TO PARIS 69 KV 57142 [ARKCITY2] TO 57148 [PARIS 2] CKT 1	CRESWELL TO OAK 69 KV 57143 CRESWEL2 TO 57147 OAK 2	WERE WERE	72MVA 105.8%	2	NEW OVERLOAD
10 SP	RICHLAND TO ROSE HILL JUNCTION 69 KV 57150 [RICHLAN2] TO 57384 [RH JCT 2] CKT 1	CRESWELL TO OAK 69 KV 57143 CRESWEL2 TO 57147 OAK 2	WERE WERE	72MVA 104.8%	6	NEW OVERLOAD
10 SP	KILDARE TAP TO WHITE EAGLE 138 KV 54760 [KILDR4] TO 54761 [WHEGL4] CKT 1	CHILOCCO TAP TO CONTINENTAL TAP 69KV 54744 CHLOC2 TO 54745 CONTT2	WERE WERE	111MVA 100.8%	11	NEW OVERLOAD

Table No. 1 continued: GRRD TO WERE Transmission Service Study – 24 MW

Study Year	Load flow case description (opened branch(es))	Overloaded lines	FROM TO	RATE B % load	Available ATC MW	Solutions
10 SP	TIPTON FORD-292 TO MONETT-383 161 KV 59472 [TIP292 5] TO 59480 [MON383 5] CKT 1	CARTHAGE TO JASPER 69KV 52690 CARTHG 2 TO 96649 2JASPER	SWPA AECI	36MVA 100.2%	16	NEW OVERLOAD
10 SP	TIPTON FORD-292 TO MONETT-383 161 KV 59472 [TIP292 5] TO 59480 [MON383 5] CKT 1	CARTHAGE TO REEDS 69 KV 52690 CARTHG 2 TO 96751 2REEDS	SWPA AECI	36MVA 100.1%	19	NEW OVERLOAD
10 SP	MON383 7 TO BROOKLINE 345 KV 59481 [MON383 7] TO 59984 [BRKLINE 7] CKT 1 FLINT CREEK TO MON383 7 345 KV 53140 [FLINTCR7] TO 59481 [MON383 7] CKT 1	CARTHAGE TO REEDS 69 KV 52690 CARTHG 2 TO 96751 2REEDS	SWPA AECI	36MVA 100.1%	17	NEW OVERLOAD

2. Table No. 2: GRRD TO KCPL Transmission Service Study – 15 MW

Study Year	Load flow case description (opened branch(es))	Overloaded lines	FROM TO	RATE B % load	Available ATC MW	Solutions
00 SR	All Studied Contingencies	NONE		-----		
00 SP	All Studied Contingencies	NONE		-----		
00 FA	All Studied Contingencies	NONE		-----		
00 WP	All Studied Contingencies	NONE		-----		
01 AP	All Studied Contingencies	NONE		-----		
01 SR	All Studied Contingencies	NONE		-----		
01 SP	WATOVA TO NOWATA 138 KV 53933 [WATOVA 4] TO 53946 [NOWATA-4] CKT 1	RICE CK TO BARTLESVILLE SOUTHEAST 138 KV 53934 RICE CK4 TO 53940 BV-SE--4	CESW CESW	210MVA 100.3%	2	REPLACE WAVE TRAP AND JUMPERS
01 SP	KERR TO KANSAS TAP 161 KV 54435 [KERR GR5] TO 54514 [KANSATP5] CKT 1	ZENA TAP TO JAY 69 KV 54467 ZENA TP2 TO 54520 JAY GR 2	GRRD GRRD	41MVA 100.4%	11	NEW OVERLOAD GRDA plans an 138interconnection With PSO Grove and 138/69 tie To Grove GRDA. Will alleviate this overload.
01 SP	BEAVER TO EUREKA SPRINGS 161 KV 52680 [BEAVER 5] TO 53136 [EUREKA 5] CKT 1	CARTHAGE TO REEDS 69 KV 52690 CARTHG 2 TO 96751 2REEDS	SWPA AECI	36MVA 100.5%	2	NEW OVERLOAD
01 SP	NEVADA TO BUTLER 161 KV 59208 [NEVADA 5] TO 59216 [BUTLER_5] CKT 1	CARTHAGE TO JASPER 69KV 52690 CARTHG 2 TO 96649 2JASPER	SWPA AECI	36MVA 100.2%	9	NEW OVERLOAD
01 FA	All Studied Contingencies	NONE		-----		

Table No. 2 continued: GRRD TO KCPL Transmission Service Study – 15 MW

Study Year	Load flow case description (opened branch(es))	Overloaded lines	FROM TO	RATE B % load	Available ATC MW	Solutions
01 WP	All Studied Contingencies	NONE		-----		
04 SP	DYESS TO EAST ROGERS 161 KV 53131 [DYESS 5] TO 53135 [EROGERS5] CKT 1	FLINT CREEK TO GENTRYR 161 KV 53139 FLINTCR5 TO 53187 GENTRYR5	CESW CESW	335MVA 100.2%	4	REPLACE SWITCH
04 SP	CAPTAIN JUNCTION TO 95TH & WAVERLY 115 KV 56932 [CAPTAIN3] TO 56968 [WAVERLY3] CKT 1	CRAIG JUNCTION TO PENTAGON 115 KV 56934 CRAIG J3 TO 56954 PENTAGN3	WERE WERE	92MVA 100.1%	13	NEW OVERLOAD
04 SP	CRESWELL TO OAK 69 KV 57143 [CRESWEL2] TO 57147 [OAK 2] CKT 1	CRESWELL TO PARIS 69 KV 57143 CRESWEL2 TO 57148 PARIS 2	WERE WERE	80MVA 100.1%	13	NEW OVERLOAD
04 WP	DYESS TO EAST ROGERS 161 KV 53131 [DYESS 5] TO 53135 [EROGERS5] CKT 1	FLINT CREEK TO GENTRYR 161 KV 53139 FLINTCR5 TO 53187 GENTRYR5	CESW CESW	335MVA 100.2%	5	REPLACE SWITCH
06 SP	PENSACOLA TO GRAY TAP 69 KV 54428 [PENSA 2] TO 54465 [GRAY TP2] CKT 1	JAY TO COLCOTP 69 KV 54520 JAY GR 2 TO 54629 COLCOTP2	GRRD GRRD	41MVA 100.1%	11	NEW OVERLOAD GRDA plans an 138interconnection With PSO Grove and 138/69 tie To Grove GRDA. Will alleviate this overload.
06 WP	All Studied Contingencies	NONE		-----		
10 SP	FLINT CREEK TO MON383 7 345 KV 53140 [FLINTCR7] TO 59481 [MON383 7] CKT 1	CARTHAGE TO REEDS 69 KV 52690 CARTHG 2 TO 96751 2REEDS	SWPA AECI	36MVA 100.3%	7	NEW OVERLOAD
10 SP	FLINT CREEK TO MON383 7 345 KV 53140 [FLINTCR7] TO 59481 [MON383 7] CKT 1	CARTHAGE TO JASPER 69KV 52690 CARTHG 2 TO 96649 2JASPER	SWPA AECI	36MVA 100.3%	9	NEW OVERLOAD

B. MUST - Available Transfer Capability

ATC studies were run. The purpose of these studies was to ensure that the desired power transfers (24 and 15 MW) could be accomplished while maintaining system reliability.

The results for the studies do not identify facilities which have been previously identified in the ACCC analysis in Section 4.A.

5. Conclusion

Before the 24 MW transfer from GRRD to WERE can take place system improvements to correct problems caused by the transfer (listed in Table No. 1) need to be completed. Likewise, before the 15 MW transfer from GRRD to KCPL begins system improvements to correct problems caused by the transfer (listed in Table No. 2) need to be completed.