



SPP *Southwest Power Pool*

*System Impact Study
For Network Service
Requested By
City Utilities of Springfield*

*From 6/1/01
To 6/1/13*

SPP Transmission Planning

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1. Executive Summary

City Utilities of Springfield has requested a system impact study for Network Integration Transmission Service. The period of the Network Service is from 6/1/01 to 6/1/13. The request is for reservation 224310.

The principal objective of this study is to identify system constraints and potential system modifications necessary to provide the applied for Network Service while maintaining system reliability. The analysis in this document shows that no Network Facility upgrades were identified as being required to accommodate the City Utilities of Springfield Network Service. Tables 1 and 2 document Network Facilities within City Utilities of Springfield identified as having voltage and thermal violations. Table 3 summarizes the Network Facility Limits identified in the Generation Sensitivity Analysis. All identified facilities were mitigated either by an operating procedure, updating the model representation, or the addition of future transmission expansion.

2. Introduction

City Utilities of Springfield has requested an impact study for Network Integration Transmission Service. The transmission service runs from 6/1/01 to 6/1/13.

The principal objective of the study is to identify the restraints on the SPP Regional Tariff System, which includes the City Utilities of Springfield Transmission System that limit the Network Integration Transmission Service. This study includes a steady-state contingency analysis (PSS/E function ACCC) and PTI's MUST Generation Sensitivity Analysis.

The steady-state analysis considers transmission line loading and transmission bus voltages for outages of transmission lines and transformers on the City Utilities of Springfield system.

The Generation Sensitivity analysis shows the amount of First Contingency Incremental Transfer Capabilities (FCITC) between the specified designated Network Resources and Network Loads and what the limitations are, if any, for a given generation dispatch to serve load.

3. Study Methodology

A. Description

The system impact study consists of two analyses. PSS/E's ACCC steady-state contingency analysis was used to identify any system criteria violations on the City Utilities of Springfield Transmission System. Power Technologies Inc.'s MUST software Generation Sensitivity function was used to identify any SPP system overloads caused by the worst dispatch of the Designated Network Resources to serve the designated Network Load.

The steady-state analysis and generation sensitivity was done to ensure current SPP Criteria and NERC Planning Standards requirements are fulfilled as well as City Utilities' Criteria. The Southwest Power Pool (SPP) conforms to the NERC Planning Standards, which provide the strictest requirements, related to voltage violations and thermal overloads during normal conditions and during a contingency. It requires that all facilities be within normal operating ratings for normal system conditions and within emergency ratings after a contingency.

B. Model Updates

SPP used fourteen seasonal models to study the City Utilities of Springfield Network Integration Transmission Service. The SPP 2001 Series Cases used are as follows. The 2001 Summer Peak, 2001 Fall, 2001/02 Winter Peak, 2002 April (Spring Minimum), 2002 Spring Peak, 2002 Summer Peak, 2002 Fall Peak, 2002/03 Winter Peak, 2003 Spring Peak, 2004 Summer Peak, 2004/05 Winter Peak, 2006 Summer Peak, 2006/07 Winter Peak, and 2010 Summer Peak were used to study the impact of the Network Service on the SPP system during the transmission request period of 6/1/01 to 6/1/13.

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 2001 base case series models. These modified models were then used in the steady-state contingency analysis. For the Generation Sensitivity analysis, the models were further adjusted to model the designated Network Resource of 51MW at KCPL's Montrose Generation Facility as a City Utilities of Springfield Generator and to scale down all City Utilities' designated Network Resources and Network Loads to model a 100MW transfer from the Network Resources to the Network Load.

C. Steady-state Contingency Analysis and Generation Sensitivity Analysis

Using the first set of created models and the ACCC function of PSS/E, single and select double contingency outages were analyzed to determine City Utilities' facility thermal and voltage violations during a contingency. The PSS/E options chosen to conduct the Impact Study analysis can be found in Appendix A.

The MUST Generation Sensitivity Analysis was used to determine any thermal constraints due to specific generation dispatches of the designated Network Resources. The analysis requires the modeling of a transfer, in this case the transfer from Network Resources to Network Load. To overcome this limitation, the power flow model was modified to provide room for a 100MW transfer as mentioned above in the model update section. The GSA function of MUST finds

dispatches that minimize the FCITC of a study transfer. The study transfer in this case is from the Designated Network Resources to the Designated Network Load.

4. Study Results

A. Study Analysis Results

Tables 1 and 2 contain the analysis results of the steady-state contingency analysis. The tables identify the seasonal case in which the event occurred; the emergency rating of the overloaded circuit (Rate B) if applicable, the contingent loading percentage of the circuit or per unit voltage, and any solutions received from the transmission owners.

Table 1 contains the voltage violations found above and below plus or minus five percent of the nominal voltages respectively for normal and contingency conditions. SPP criterion states that transmission system voltages must be maintained within plus or minus 10% of nominal voltage on load serving buses for contingency conditions. With respect to the SPP criteria, the voltages violations identified are within tolerance. In addition, the over and under voltages were seen by City Utilities as not being a problem.

Table 2 contains the City Utilities' Network Facilities overloaded above 100% of their emergency ratings. The majority of the Network Facility limits identified can be removed due to updated transmission line ratings. The other identified Network Facilities without updated ratings have adequate mitigation plans to alleviate the overloads. The Kickapoo to Sunset 69kV line and James River to Twin Oaks 69kV line are scheduled to be reconducted by 2008 with new summer emergency ratings of 138MVA, which will cover the loading seen in the 2010 Summer Peak Model. The planned load transfer to the new Mentor substation in 2005 relieves the slight loading on the Mill 161/69kV transformers, the Norton 161/69kV transformer and the Main to Grand 69kV transmission line.

The remaining tables that follow Tables 1 and 2 contain the results of the Generation Sensitivity Analysis. Limits were only found in Summer Peak Cases. Table 3 contains the Network Facilities that limit the studied 100MW transfer from Network Resources to Network Load for all five of the summer peak cases studied. For each numbered constraint found in Table 3, a generation adjustment table documents the dispatches that cause these reduced FCITCs. The limitation of the MUST Generation Sensitivity is that it requires a transfer. To overcome this limitation, the models were adjusted appropriately to allow room for a 100MW transfer from the Network Resources to the Network Load.

For an explanation of the columns found in Table 3 the following descriptions are included. The Worst Dispatch FCITC column contains the FCITC that results from the dispatch found in the Limiting Constraints Generator adjustments page. The Base FCITC is the FCITC that results from a dispatch using fixed generator participation factors, which are easily calculated from a generator's Pgen or Porig and Pmax and the total generation available for dispatch. The Study Flow column is the flow on the line when the Worst Dispatch FCITC number is used with fixed generator participation factors, which has a flow less than the limit. In addition, the fix generator participation factor dispatch has the specified OTDF shown in Table 3.

The majority of the limits identified in the Generation Sensitivity Analysis were also identified in the steady-state contingency analysis. In addition, all of the identified facilities have been removed as limits with the exception of the James River to Sunset 69kV line for the outage of the James River to Twin Oaks 69kV line in the 2004 and 2010 Summer Peak Cases. Even with an updated summer emergency rating of 80MVA, the worst case FCITC for the James River to Sunset 69kV line is 72MW for the 2004 Summer Peak Model and 91MW for the 2010 Summer Peak. These numbers can be calculated from the information found in Table 3. Examining the generation dispatch responsible for the lower FCITC, the generation adjustment tables show that the line is sensitive to ramping of the James River Power Station Unit 4 and 5. Cities Utilities of Springfield should be aware of this constraint and avoid generation dispatches as documented. The SPA Springfield 161/69kV transformer #2 was identified as a limit to the 100MW transfer in every seasonal case. SPA was contacted about the transformer limit and notified SPP that only transformers 1 and 3 exist at the SPA Springfield Sub and in the case of the outage of transformer 1 that transformer 3 would be taken off-line if overloaded.

Table 1 – City Utilities of Springfield Network Facilities with Voltages above or below plus or minus 5% of Nominal (Voltages are within plus or minus 10% and meet SPP Criteria)

STUDY CASE	BUS WITH VOLTAGE VIOLATION	PU VOLTAGE	OUTAGED BRANCH
01SP	MILL 59962 MILL 5, 161KV	0.9372	MILL TO CLAY, 161KV 59962 MILL 5 TO 59970 CLAY 5 CKT 1
01SP	McCARTNEY 59968 MAC 5, 161KV	0.9439	"
01SP	NORTON 59967 NORTON 5, 161KV	0.9244	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
01FA	NORTON 59967 NORTON 5, 161KV	0.9488	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
01WP	NORTON 59967 NORTON 5, 161KV	0.9386	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
02AP	JAMES RIVER 59904 JRPS 2, 69KV	1.0531	BASE CASE BASE CASE, NO OUTAGE
02AP	SOUTH HIGHWAY 65 59908 S HY65 2, 69KV	1.0519	"
02AP	HIGHWAY M 59909 HY M 2, 69KV	1.0558	"
02AP	GALLOWAY 59915 GALLOWY2, 69KV	1.0559	"
02AP	BLACKMAN 59916 BLACKMN2, 69KV	1.061	"
02AP	INGRAM 59917 INGRAM 2, 69KV	1.0656	"
02AP	MILL 59918 MILL 2, 69KV	1.0716	"
02AP	CHAD 59919 CHAD 2, 69KV	1.0669	"
02AP	HARGISS 59920 HARGISS2, 69KV	1.0656	"
02AP	MAIN 59921 MAIN 2, 69KV	1.0658	"
02AP	GRAND 59922 GRAND 2, 69KV	1.0611	"
02AP	MONROE 59923 MONROE 2, 69KV	1.0575	"
02AP	NICHOLS 59925 NICHOLS2, 69KV	1.0547	"
02AP	FRISCO 59926 FRISCO 2, 69KV	1.0566	"
02AP	NORTH HIGHWAY 13 59927 N HY13 2, 69KV	1.0637	"
02AP	NORTON 59928 NORTON 2, 69KV	1.0687	"
02AP	WASHINGTON 59929 WASHNTN2, 69KV	1.067	"
02AP	NEERGARE 59930 NEERGRD2, 69KV	1.0678	"
02AP	LECOMPTE 59931 LECOMPT2, 69KV	1.0681	"

Table 1 continued – City Utilities of Springfield Network Facilities with Voltages above or below plus or minus 5% of Nominal (Voltages are within plus or minus 10% and meet SPP Criteria)

STUDY CASE	BUS WITH VOLTAGE VIOLATION	PU VOLTAGE	OUTAGED BRANCH
02AP	PACKER 59932 PACKER 2, 69KV	1.0692	"
02AP	BROOKLINE 59984 BRKLINE 7, 345KV	1.0565	"
02AP	LAUREL 59924 LAUREL 2, 69KV	1.0738	GOLDEN WEST TO LAUREL, 69KV 59911 GOLDNW 2 TO 59924 LAUREL 2 CKT 1
02AP	DAYTON 59913 DAYTON 2, 69KV	1.0545	GOLDEN EAST TO DAYTON, 69KV 59912 GOLDNE 2 TO 59913 DAYTON 2 CKT 1
02AP	NICHOLS 59925 NICHOLS2, 69KV	1.0754	LAUREL TO NICHOLS, 69KV 59924 LAUREL 2 TO 59925 NICHOLS2 CKT 1
02AP	COX 59910 COX 2, 69KV	1.0608	SPRINGFIELD (SWPA) TO GOLDEN WEST, 69KV 52694 SPRGFLD2 TO 59911 GOLDNW 2 CKT 1
02AP	GOLDEN WEST 59911GOLDNW 2, 69KV	1.0633	"
02AP	LAUREL 59924 LAUREL 2, 69KV	1.0663	"
02AP	GOLDEN EAST 59912 GOLDNE 2, 69KV	1.0535	SPRINGFIELD (SWPA) TO GOLDEN EAST, 69KV 52694 SPRGFLD2 TO 59911 GOLDNE 2 CKT 1
02AP	DAYTON 59913 DAYTON 2, 69KV	1.0536	"
02G	NONE		
02SP	NORTON 59967 NORTON 5, 161KV	0.9274	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
02FA	NONE		
02WP	NORTON 59967 NORTON 5, 161KV	0.9426	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
03G	NORTON 59967 NORTON 5, 161KV	0.9462	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
04SP	NORTON 59967 NORTON 5, 161KV	0.9356	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
04WP	NONE		
06SP	NORTON 59967 NORTON 5, 161KV	0.9352	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
06WP	NORTON 59967 NORTON 5, 161KV	0.9471	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1
10SP	McCARTNEY 59968 MAC 5, 161KV	1.0655	BASE CASE BASE CASE, NO OUTAGE
10SP	NORTON 59967 NORTON 5, 161KV	0.9233	SUMMIT TO NORTON, 161KV 59966 SUMMIT 5 TO 59967 NORTON 5 CKT 1

Table 2 - City Utilities of Springfield Network Facilities with Thermal Loading above 100% Rate B

STUDY YEAR	OVERLOADED BRANCH	Rate B <MVA>	% Loading	OUTAGED BRANCH	MITIGATION PLAN, SOLUTION
01SP	NONE				
01FA	"				
01WP	"				
02AP	"				
02G	"				
02SP	"				
02FA	"				
02WP	"				
03G	"				
04SP	JAMES RIVER TO SUNSET, 69KV 59904 JRPS 2 TO 59907 SUNSET 2 CKT 1	73	101.8	JAMES RIVER TO TWIN OAKS, 69KV 59904 JRPS 2 TO 59933 TWINOAK2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 80MVA 8.8% Increase
04SP	JAMES RIVER TO TWIN OAK, 69KV 59904 JRPS 2 TO 59933 TWINOAK2 CKT 1	99	101.5	SOUTHWEST PS #1 TO SOUTHWEST 161 59890 SWPS#1 1 TO BUS 59954 SWPS 5 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 9.1% Increase
06SP	KICKAPOO TO SUNSET, 69KV 59906 KICKAPO2 TO 59907 SUNSET 2 CKT 1	98	107.0	JAMES RIVER TO TWIN OAKS, 69KV 59904 JRPS 2 TO 59933 TWINOAK2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 10.2% Increase
06SP	JAMES RIVER TO TWIN OAKS, 69KV 59904 JRPS 2 TO 59933 TWINOAK2 CKT 1	99	104.1	KICKAPOO TO SUNSET, 69KV 59906 KICKAPO2 TO 59907 SUNSET 2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 9.1% Increase
06SP	GOLDEN EAST TO DAYTON, 69KV 59912 GOLDNE 2 TO 59913* DAYTON 2 CKT1	60	103.6	MAIN TO GRAND, 69KV 59921 MAIN 2 TO 59922 GRAND 2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 80% Increase
10SP	KICKAPOO TO SUNSET, 69KV 59906 KICKAPO2 TO 59907 SUNSET 2 CKT 1	98	128.3	JAMES RIVER TO TWIN OAKS, 69KV 59904 JRPS 2 TO 59933 TWINOAK2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 10.2% Increase
10SP	JAMES RIVER TO TWIN OAKS, 69KV 59904 JRPS 2 TO 59933 TWINOAK2 CKT 1	99	124.9	KICKAPOO TO SUNSET 59906 KICKAPO2 TO 59907 SUNSET 2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 9.1% Increase

Table 2 continued – City Utilities of Springfield Network Facilities with Thermal Loading above 100% Rate B

STUDY YEAR	OVERLOADED BRANCH	Rate B <MVA>	% Loading	OUTAGED BRANCH	MITIGATION PLAN, SOLUTION
10SP	"	99	100.8	MAIN TO GRAND, 69KV 59921 MAIN 2 TO 59922 GRAND 2 CKT 1	"
10SP	GOLDEN EAST TO DAYTON, 69KV 59912 GOLDNE 2 TO 59913* DAYTON 2 CKT1	60	124.3	MAIN TO GRAND, 69KV 59921 MAIN 2 TO 59922 GRAND 2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 80% Increase
10SP	"	60	108.3	JAMES RIVER 161/69KV XFMR 59904 JRPS 2 TO 59961 JRPS 5 CKT 1	"
10SP	"	60	106.1	JAMES RIVER TO TWIN OAKS, 69KV 59904 JRPS 2 TO 59933 TWINOAK2 CKT 1	"
10SP	"	60	107.1	COX TO GOLDED WEST, 69KV 59910 COX 2 TO 59911 GOLDNW 2 CKT 1	"
10SP	"	60	106.7	SPRINGFIELD(SWPA) TO GOLDEN WEST, 69KV 52694 SPRGFLD2 TO 59911 GOLDNW 2 CKT 1	"
10SP	"	60	103.0	GRAND TO MONROE, 69KV 59922 GRAND 2 TO 59923 MONROE 2 CKT 1	"
10SP	MAIN TO GRAND, 69KV 59921 MAIN 2 TO 59922 GRAND 2 CKT 1	98	110.7	JAMES RIVER 161/69KV XFMR 59904 JRPS 2 TO 59961 JRPS 5 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 10.2% Increase
10SP	"	99	101.2	SPRINGFIELD(SWPA) TO GOLDEN EAST, 69KV 52694 SPRGFLD2 TO 59911 GOLDNE 2 CKT 1	"
10SP	DAYTON TO FORT, 69KV 59913 DAYTON 2 TO 59914 *FORT CKT 2	60	115.1	MAIN TO GRAND, 69KV 59921 MAIN 2 TO 59922 GRAND 2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 80% Increase
10SP	MILL TO PACKER, 69KV 59918 MILL 2 TO 59932 *PACKER 2 CKT1	65	110.2	NORTON TO NEERGARD, 69KV 59928 NORTON 2 TO 59930 NEERGRD2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 108MVA 66.2% Increase
10SP	NORTON 161/69KV XFMR 59928 NORTON 2 TO 59967 *NORTON 5 CKT1, XFMR	134	100.3	MILL TO McCARTNEY, 161KV 59962 MILL 5 TO 59968 MAC 5 CKT 1	Relieved By 20MW Load Shift To Mentor Substation
10SP	MILL 161/69KV XFMR #2 59918 MILL 2 TO 59962 MILL 5 CKT 2	134	101.3	MILL 161/69KV XFMR #1 59918 MILL 2 TO 59962 MILL 5 CKT 1	Relieved By 20MW Load Shift To Mentor Substation
10SP	MILL 161/69KV XFMR #1 59918 MILL 2 TO 59962 MILL 5 CKT 1	134	101.3	MILL 161/69KV XFMR #2 59918 MILL 2 TO 59962 MILL 5 CKT 2	Relieved By 20MW Load Shift To Mentor Substation
10SP	INGRAM TO MILL, 69KV 59917 INGRAM 2 59918 MILL 2 CKT 1	64	101.0	BLACKMAN TO MILL, 69KV 59916 BLACKMN269 TO 59918 MILL 2 CKT 1	Incorrect Rating in Case New Summer Emergency Rating is 80MVA 25% Increase

Table 3 – City Utilities of Springfield Network Facilities identified as limits in the MUST Generation Sensitivity Analysis

MUST Generation Sensitivity Analysis														
Study Case	Limiting Constraint	Worst Dispatch FCITC	Base FCITC	Limiting Facility	Initial Flow	Limit	Study Flow	OTDF	LODF	Outaged Facility	Mitigation Plan, Solutions	Owner		
01SP	1	76	141	59904 JRPS 269.0 59907 SUNSET 269.0 1	63.5	73	68.6	0.0674	0.3560	59904 JRPS 269.0 59933 TWINOAK269.0 1	New Limit 80MVA New Worst Dispatch FCITC is 132MW	SPRM		
02SP	2	84	196	59904 JRPS 269.0 59907 SUNSET 269.0 1	56.5	73	63.5	0.0840	0.3560	59904 JRPS 269.0 59933 TWINOAK269.0 1	New Limit 80MVA New Worst Dispatch FCITC is 120MW	SPRM		
02SP	3	98	186	52692 SPRGFLD5 161 52694 SPRGFLD269.0 2	32.6	38	35.4	0.0291	0.1571	52692 SPRGFLD5 161 52694 SPRGFLD269.0 1	Not Valid	SPA		
04SP	4	36	120	59904 JRPS 269.0 59907 SUNSET 269.0 1	65.9	73	68	0.0591	0.3560	59904 JRPS 269.0 59933 TWINOAK269.0 1	New Limit 80MVA New Worst Dispatch FCITC is 72	SPRM		
06SP	5	1	2	52692 SPRGFLD5 161 52694 SPRGFLD269.0 2	37.9	38	38	0.0300	0.1569	52692 SPRGFLD5 161 52694 SPRGFLD269.0 1	Not Valid	SPA		
06SP	6	64	64	59906 KICKAPO269.0 59907 SUNSET 269.0 1	-92.5	-98	-98	-0.0849	-1.0000	59904 JRPS 269.0 59933 TWINOAK269.0 1	New Limit 108MVA New Worst Dispatch FCITC is 183MW	SPRM		
06SP	7	69	167	59904 JRPS 269.0 59907 SUNSET 269.0 1	59.5	73	65	0.0810	0.3560	59904 JRPS 269.0 59933 TWINOAK269.0 1	New Limit 80MVA New Worst Dispatch FCITC is 104MW	SPRM		
06SP	8	72	144	52692 SPRGFLD5 161 52694 SPRGFLD269.0 2	34.4	38	36.2	0.0250	-0.1347	59924 LAUREL 269.0 59925 NICHOLS269.0 1	Not Valid	SPA		

Table 3 continued – City Utilities of Springfield Network Facilities identified as limits in the MUST Generation Sensitivity Analysis

MUST Generation Sensitivity Analysis													
Study Case	Limiting Constraint	Worst Dispatch FCITC	Base FCITC	Limiting Facility	Initial Flow	Limit	Study Flow	OTDF	LODF	Outaged Facility	Mitigation Plan, Solutions	Owner	
06SP	9	76	76	59904 JRPS 269.0 59933 TWINOAK269.0 1	92.5	99	99	0.0849	-1.0000	59906 KICKAPO269.0 59907 SUNSET 269.0 1	New Limit 108MVA New Worst Dispatch FCITC is 181MW	SPRM	
06SP	10	87	286	59913 DAYTON 269.0 59914 FORT 269.0 1	51.1	60	53.8	0.0310	0.3272	59921 MAIN 269.0 59922 GRAND 269.0 1	New Limit 108MVA New Worst Dispatch FCITC is 554MW	SPRM	
10SP	11	10	19	52692 SPRGFLD5 161 52694 SPRGFLD269.0 2	37.5	38	37.8	0.0264	0.0878	59904 JRPS 269.0 59905 PLAINVI269.0 1	Not Valid	SPA	
10SP	12	56	103	59904 JRPS 269.0 59907 SUNSET 269.0 1	62.1	73	68	0.1063	0.3560	59904 JRPS 269.0 59933 TWINOAK269.0 1	New Limit 80MVA New Worst Dispatch FCITC is 91MW	SPRM	
10SP	13	59	97	59904 JRPS 269.0 59933 TWINOAK269.0 1	86	99	93.9	0.1346	0.3408	59904 JRPS 269.0 59907 SUNSET 269.0 1	New Limit 108MVA New Worst Dispatch FCITC is 100MW	SPRM	

Generation Adjustment Tables For Limits Found In Generation Sensitivity Analysis

2001 Summer Peak Generator Adjustments For Limiting Constraint Number 1 James River PS to Sunset, 69KV						
Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	--	0	178	148.1		--
59891 SWPSGT 112.5	--	0	104	45.8		--
59892 MCCARTN113.0	N/A	N/A	N/A	N/A	N/A	
59897 JRPS#3 113.8	6.9	0	41	34.1		41
59898 JRPS#4 113.8	10.2	0	56	45.8		56
59899 JRPS#5 113.8	20.9	0	97	76.1		97
59900 JRGT1 113.8	23.4	0	75	51.6		75
59901 JRGT2 113.8	14.7	0	80	51.6		66.3
57000 MONTSPRM22.0	--	0	51	42.4		--

2002 Summer Peak Generator Adjustments For Limiting Constraint Number 2 James River PS to Sunset, 69KV						
Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	--	0	178	149.2		--
59891 SWPSGT 112.5	--	0	104	46.1		--
59892 MCCARTN113.0	--	0	104	67.1		--
59897 JRPS#3 113.8	5.8	0	41	34.4		40.1
59898 JRPS#4 113.8	9.9	0	56	46.1		56
59899 JRPS#5 113.8	67.9	0	97	29.1		97
59900 JRGT1 113.8	--	0	75	52		--
59901 JRGT2 113.8	--	0	80	52		--
57000 MONTSPRM22.0	--	0	51	42.8		--

2002 Summer Peak Generator Adjustments For Limiting Constraint Number 3 Springfield 161/69KV XFMR 2						
Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	28.8	0	178	149.2		178
59891 SWPSGT 112.5	57.9	0	104	46.1		104
59892 MCCARTN113.0	--	0	104	67.1		--
59897 JRPS#3 113.8	--	0	41	34.4		--
59898 JRPS#4 113.8	--	0	56	46.1		--
59899 JRPS#5 113.8	--	0	97	29.1		--
59900 JRGT1 113.8	3.2	0	75	52		55.2
59901 JRGT2 113.8	--	0	80	52		--
57000 MONTSPRM22.0	8.2	0	51	42.8		51

2004 Summer Peak Generator Adjustments For Limiting Constraint Number 4 James River PS to Sunset, 69KV						
Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	--	0	178	150.8		--
59891 SWPSGT 112.5	--	0	104	12.7		--
59892 MCCARTN113.0	--	0	104	67.8		--
59897 JRPS#3 113.8	--	0	41	34.7		--
59898 JRPS#4 113.8	9.4	0	56	46.6		56
59899 JRPS#5 113.8	26.6	0	97	69.5		96
59900 JRGT1 113.8	--	0	75	63.5		--
59901 JRGT2 113.8	--	0	80	63.5		--
57000 MONTSPRM22.0	--	0	51	43.2		--

2006 Summer Peak Generator Adjustments For Limiting Constraint Number 5 Springfield 161/69KV XFMR 2						
Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	1.1	0	178	152.7		153.8
59891 SWPSGT 112.5	--	0	104	47.2		--
59892 MCCARTN113.0	--	0	104	68.6		--
59893 MCCARTN213.0	--	0	104	68.6		--
59897 JRPS#3 113.8	--	0	41	35.2		--
59898 JRPS#4 113.8	--	0	56	47.2		--
59899 JRPS#5 113.8	--	0	97	22.1		--
59900 JRGT1 113.8	--	0	75	64.3		--
59901 JRGT2 113.8	--	0	80	53.2		--
57000 MONTSPRM22.0	--	0	51	43.7		--

2006 Summer Peak Generator Adjustments For Limiting Constraint Number 6 Kickapoo to Sunset, 69KV						
Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	25.3	0	178	152.7		178
59891 SWPSGT 112.5	39.1	0	104	47.2		86.2
59892 MCCARTN113.0	--	0	104	68.6		--
59893 MCCARTN213.0	--	0	104	68.6		--
59897 JRPS#3 113.8	--	0	41	35.2		--
59898 JRPS#4 113.8	--	0	56	47.2		--
59899 JRPS#5 113.8	--	0	97	22.1		--
59900 JRGT1 113.8	--	0	75	64.3		--
59901 JRGT2 113.8	--	0	80	53.2		--
57000 MONTSPRM22.0	--	0	51	43.7		--

Generation Adjustment Tables For Limits Found In Generation Sensitivity Analysis

2006 Summer Peak Generator Adjustments For Limiting Constraint Number 7 James River to Sunset, 69KV Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	--	0	178	152.7	--	
59891 SWPSGT 112.5	--	0	104	47.2	--	
59892 MCCARTN113.0	--	0	104	68.6	--	
59893 MCCARTN213.0	--	0	104	68.6	--	
59897 JRPS#3 113.8	5.8	0	41	35.2	41	
59898 JRPS#4 113.8	8.8	0	56	47.2	56	
59899 JRPS#5 113.8	54.1	0	97	22.1	76.2	
59900 JRGT1 113.8	--	0	75	64.3	--	
59901 JRGT2 113.8	--	0	80	53.2	--	
57000 MONTSPRM22.0	--	0	51	43.7	--	

2006 Summer Peak Generator Adjustments For Limiting Constraint Number 8 Springfield 161/69KV XFMR 2 Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	25.3	0	178	152.7	178	
59891 SWPSGT 112.5	46.9	0	104	47.2	94.1	
59892 MCCARTN113.0	--	0	104	68.6	--	
59893 MCCARTN213.0	--	0	104	68.6	--	
59897 JRPS#3 113.8	--	0	41	35.2	--	
59898 JRPS#4 113.8	--	0	56	47.2	--	
59899 JRPS#5 113.8	--	0	97	22.1	--	
59900 JRGT1 113.8	--	0	75	64.3	--	
59901 JRGT2 113.8	--	0	80	53.2	--	
57000 MONTSPRM22.0	--	0	51	43.7	--	

2006 Summer Peak Generator Adjustments For Limiting Constraint Number 9 James River to Twin Oaks, 69KV Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	25.3	0	178	152.7	178	
59891 SWPSGT 112.5	--	0	104	47.2	--	
59892 MCCARTN113.0	35.4	0	104	68.6	104	
59893 MCCARTN213.0	6.6	0	104	68.6	75.2	
59897 JRPS#3 113.8	--	0	41	35.2	--	
59898 JRPS#4 113.8	8.8	0	56	47.2	56	
59899 JRPS#5 113.8	--	0	97	22.1	--	
59900 JRGT1 113.8	--	0	75	64.3	--	
59901 JRGT2 113.8	--	0	80	53.2	--	
57000 MONTSPRM22.0	--	0	51	43.7	--	

2006 Summer Peak Generator Adjustments For Limiting Constraint Number 10 Dayton to Fort, 69KV Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	25.3	0	178	152.7	178	
59891 SWPSGT 112.5	54	0	104	47.2	101.2	
59892 MCCARTN113.0	--	0	104	68.6	--	
59893 MCCARTN213.0	--	0	104	68.6	--	
59897 JRPS#3 113.8	--	0	41	35.2	--	
59898 JRPS#4 113.8	--	0	56	47.2	--	
59899 JRPS#5 113.8	--	0	97	22.1	--	
59900 JRGT1 113.8	--	0	75	64.3	--	
59901 JRGT2 113.8	--	0	80	53.2	--	
57000 MONTSPRM22.0	7.3	0	51	43.7	51	

2010 Summer Peak Generator Adjustments For Limiting Constraint Number 11 Springfield 161/69KV XFMR 2 Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	10.2	0	178	157.4	167.7	
59891 SWPSGT 112.5	--	0	104	70.7	--	
59892 MCCARTN113.0	--	0	104	92	--	
59893 MCCARTN213.0	--	0	184	162.7	--	
59897 JRPS#3 113.8	--	0	41	36.3	--	
59898 JRPS#4 113.8	--	0	56	48.6	--	
59899 JRPS#5 113.8	--	0	97	14.4	--	
59900 JRGT1 113.8	--	0	75	66.3	--	
59901 JRGT2 113.8	--	0	80	70.7	--	
57000 MONTSPRM22.0	--	0	51	45.1	--	

2010 Summer Peak Generator Adjustments For Limiting Constraint Number 12 James River to Sunset, 69KV Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	--	0	178	157.4	--	
59891 SWPSGT 112.5	--	0	104	70.7	--	
59892 MCCARTN113.0	--	0	104	92	--	
59893 MCCARTN213.0	--	0	184	162.7	--	
59897 JRPS#3 113.8	--	0	41	36.3	--	
59898 JRPS#4 113.8	7.3	0	56	48.6	56	
59899 JRPS#5 113.8	48.2	0	97	14.4	61.6	
59900 JRGT1 113.8	--	0	75	66.3	--	
59901 JRGT2 113.8	--	0	80	70.7	--	
57000 MONTSPRM22.0	--	0	51	45.1	--	

Generation Adjustment Tables For Limits Found In Generation Sensitivity Analysis

2010 Summer Peak Generator Adjustments For Limiting Constraint Number 13 James River to Twin Oaks, 69KV Worst						
Generator bus	Dispatch	Pmin	Pmax	Porig	Pnew	
59890 SWPS#1 120.0	--	0	178	157.4	--	
59891 SWPSGT 112.5	--	0	104	70.7	--	
59892 MCCARTN113.0	--	0	104	92	--	
59893 MCCARTN213.0	--	0	184	162.7	--	
59897 JRPS#3 113.8	--	0	41	36.3	--	
59898 JRPS#4 113.8	7.3	0	56	48.6	56	
59899 JRPS#5 113.8	51.3	0	97	14.4	64.8	
59900 JRGT1 113.8	--	0	75	66.3	--	
59901 JRGT2 113.8	--	0	80	70.7	--	
57000 MONTSPRM22.0	--	0	51	45.1	--	

5. Conclusion

The results of the study show that the applied for Network Integration Transmission Service by City Utilities of Springfield from 6/01/01 to 6/01/13 can be accepted without any assigned Network Facility Upgrades. The facilities identified in the System Impact Study were addressed and mitigated by SPA and City Utilities of Springfield.

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 –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. 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