

FEASIBILITY STUDY

640 MW Plant in KCPL Control Area

(SPP Study #GEN-2001-001)

(Modified by SPP for confidentiality of Customer)



Executive Summary

Customer requested a Feasibility Study to evaluate a proposal to add 620MW to 640MW of generation in the KCPL control area. The power plant is to be constructed adjacent to an existing KCPL substation and interconnected with the 345kV transmission system at that location. The service date for the new facilities is expected to be summer 2003.

Customer has filed two generation interconnection requests for the same facility. The requests were filed for different plant configurations. A proposal to add 620MW combined-cycle generation or an alternate proposal consisting of 640MW combustion turbine generation is being considered. This study addresses the proposal to add 640MW at the facility.

The study includes analysis of the 2004 summer peak load flow and contingency events. Single contingency outages were applied to the system model without the facilities, and the resultant transmission system overloads were identified as pre-existing. Further studies with the addition of the facilities provided a comparison to determine the impact of the new generation on the transmission system. The analysis indicates that the generation addition in the area increases overloading of circuits on the 345kV and 161kV system. Reinforcing the transmission system through new line construction and upgrades of existing 161kV circuits provide relief for the overloading conditions.

The interconnection facilities required for the project involve the expansion of an existing KCPL station and construction of a 345kV transmission line to the site. The cost for the interconnection facilities is estimated to be \$2,839,000 less CIAC adders. Projected in-service date for the interconnection is June 1, 2003.

System improvements are needed to alleviate overloading of transmission facilities due to the proposed generation addition and include the construction of a new 161kV transmission line, a second transformer at the W. Gardner substation, and several circuit reconductor projects. The total cost is estimated to be \$13,800,000 less CIAC adders.

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Appendix A 2004 Summer Peak Load Flow Diagrams and Contingency Data

1. Introduction

1.1 Project Description

This Feasibility Study was conducted at the request of Customer to evaluate the installation of 620MW to 640MW of power generation in KCPL control area.

Customer is currently planning the construction of generation facilities in the KCPL control area to serve load in the SPP region. The plant is to be constructed in one of two configurations: 620MW combined cycle or 640MW gas combustion turbine operation. The market for the new generation is not specified. However, for the purpose of this study the sink is expected to be within the Southwest Power Pool (SPP) operating region.

1.2 Study Methodology

This feasibility study consists of a system load flow analysis of the 2004 summer peak model to examine the power flow resulting from the addition of new generation in the area. The study model includes any transmission system upgrades that are planned for summer 2004 and all generation facilities that are proposed for that time. The analysis performed for this request is based on the information supplied by Customer. In the case of incomplete data, reasonable assumptions have been made to complete the analysis

Two configurations were submitted by the requestor for evaluation: a 620MW combined cycle plant consisting of two GE model 7FA combustion turbine and one GE steam turbine and a 640MW combustion turbine plant consisting of eight GE model 7EA units. Since the scope of this feasibility study is limited to load flow and contingency analysis, only the 640MW plant configuration is considered. Examination of the specific plant configuration will be necessary only if a more detailed impact study is requested.

No specific market was identified in the study request and assumptions were made to identify the sink area. The plant is to be located in the Kansas City Power & Light (KCPL) control area and generation re-dispatch is performed on specific units within the KCPL system in the model data. The case study includes transfers to other control areas with corresponding generation reductions made by scaling the area generation totals. Table 1 lists the transfers from the KCPL control area that are based on the assumed sink area.

The initial load flow solution establishes the normal operating conditions for the study with all transmission facilities in service. Full AC contingency analysis is used to investigate the limiting constraints of the transmission system with the added generation. Comparisons are made between the cases with and without the CUSTOMER facilities in service in order to identify the severity and cause of the overloading conditions. Overloading caused or increased by the proposed generation is

discussed in this report and further analysis is conducted to determine the best remedy to alleviate the contingency overloads. All branches in the KCPL and surrounding control areas above 100kV and all ties with KCPL are monitored for overloads exceeding 100% of normal rating. Buses are monitored for voltage deviations exceeding +/- 5% of nominal.

Table 1 –Share of new generation by control areas for 2004 summer peak study case

Transfers of Customer generation to area sink	
	Generation Share /Transfer
AEPW (520)	125
OKGE (524)	75
WERE (536)	150
KACP (541)	125
MIPU (540)	75
KACY (542)	50
INDN (545)	40
Total	640

1.3 Plant Details and Modeling

Although two different configuration plans have been submitted for study to the SPP, this feasibility study looks at the arrangement having the most significant impact on power flows in the region. The gross generation output is expected to be 640MW net during peak loading conditions with 9.3MW of auxiliary load. Prevailing market conditions will determine the actual output of the plant, but the peak output is used in the study to assess the impact of the generation on the transmission system.

Changes to the 2004 summer peak base case have been included in this analysis for improvements in progress or planned for service by summer 2004. The projects include circuit reconductoring and equipment upgrades that increase the capability of the transmission system, and a list of these improvements is included below.

- ?? Stilwell-Antioch 161kV line rebuild 2003
- ?? Antioch-Oxford 161kV line rebuild 2003
- ?? Paola-S. Ottawa 161kV line improvements 2004

2. Analysis

2004 Summer Peak

The sink area for the Customer generation facilities includes seven control areas. For the combined market, the load forecast for the summer 2004 peak period is 29,707MW. The base case analysis includes generation and normal transfers without the Customer generation facilities. The study case includes 640MW additional generation from the Customer plant. Generation adjustments and additional inter-area transfers are included for the control areas that comprise the market for the Customer generation. Table 2 lists the specific generation dispatch in the KCPL control area and the transfers to the control areas supplied by the new plant.

Table 2 – Generation Dispatch and Area Interchange Schedule					
Comparison of base case and proposed Customer plant addition for 2004 summer peak					
GENERATION DISPATCH (for KCPL control area)			INTERCHANGE		
Plant/Unit	Base	Study	Area	Base	Study
	w/o CUSTOMER plant	w/ CUSTOMER plant			
Hawthorn 5	560	560	AECI	-150	-150
Hawthorn 6	105	50	SWPA	-5	-5
Hawthorn 7	0	0	AEPW	0	125
Hawthorn 8	0	0	GRRD	-15	-15
Hawthorn 9	100	45	OKGE	0	75
Montrose #1	170	170	MIDW	0	0
Montrose #2	164	164	WERE	141	291
Montrose #3	171	166	MIPU	121	196
LaCygne#1	688	688	KACY	35	85
LaCygne#2	674	605	EMDE	80	80
Iatan#1	670	670	INDN	111	151
Northeast N.	0	0	SPRM	51	51
Northeast S.	0	0	STJO	121	121
Grand Ave	0	0			
Gardner	2	2			
Higginsville	34	34			
Paola Proposed #1	240	240			
Proposed #2	552	552			
Customer	0	640			

Load flow analysis with the CUSTOMER generation online and all lines in service reveals no base case overload conditions due to the added generation. The contingency analysis indicates overloading of facilities in the KCPL and surrounding areas during contingency situations. Several overloads occur in the initial case prior to the addition of new generation. The most critical 345kV system constraints are summarized in Table 3.

The W. Gardner-Craig 345kV circuit reaches 103% of capability during an outage of the Hoyt-JEC 345kV line. An outage of the W. Gardner-Craig 345kV line results in overloads of the Springhill 161/115kv transformer (103%), Stilwell #11 345/161kV transformer (102%), Stilwell-Pleasant Hill 345kV line (101%), Stilwell-Redel 161kV line (113%), Southtown-Martin City 161kV line (104%), and the Martin City-Redel 161kV line (101%). Loss of the Stilwell #22 345/161kV transformer causes loading of the Stilwell #11 transformer to reach 111% while loss of the Stilwell #11 345/161kV transformer causes loading of the Stilwell #22 transformer to reach 114%.

Table 3 - 2004 summer peak - Significant 345kV overloaded facilities
 Normal and contingency flows with and without the proposed CUSTOMER generation

Monitored line----normal -----contingency	Base Case W/o CUSTOMER	Analysis Base Case w/ CUSTOMER
LaCygne-Stilwell(normal) – rating:1099MVA	1068	1018
Stilwell-W.Gardner out	-	1158
W. Gardner-Craig (normal) – rating:1099MVA	741	917
Hoyt-Jeffrey EC out	-	1136
Stilwell transformer #11 (normal) – rating: 550MVA	381	421
W. Gardner-Craig out	-	559
Stilwell-Pleasant Hill (normal) – rating:717MVA	419	527
W. Gardner-Craig out	-	725
Craig transformer #33 (normal) – rating:400MVA	271	299
Craig transformer #11 out	-	414
Craig transformer #22 out	-	412
W. Gardner-Stilwell(normal) – rating: 753MVA	na	300
LaCygne-Stilwell out	na	948

An outage of the LaCygne-Stilwell 345kV circuit increases the Stilwell-W. Gardner 345kV circuit loading to 126%. An outage of the Stilwell-Pleasant Hill 345kV circuit causes the Stilwell-Redel 161kV loading to reach 124%, the Craig-Lenexa 161kV loading to reach 104%, and the Martin City-Redel loading to reach 113%. Loss of the Stilwell-Hickman circuit causes overloads of the Stilwell-Redel 161kV circuit (114%), the Southtown-Martin City 161kV circuit (101%) and the Martin City-Redel circuit (102%). An outage of the Stilwell-Antioch line causes the loading of the Stilwell-Redel 161kV circuit to reach 108%.

Loss of either of the Craig 345/161kV transformers causes the second Craig transformer loading to reach 103% of capability. With the Craig-Pflumm 161kV circuit out of service, the Craig-Lenexa N. 161kV line loading reaches 115% and the Greenwood-Lenexa 161kV line reaches 110%. With the Pflumm-Overland Park circuit out of service, the Craig-Lenexa N. 161kV circuit loading reaches 114% and the Greenwood-Lenexa 161kV circuit loading reaches 108%. An outage of the Iatan-St. Joe 345kV line causes the Stilwell-Redel 161kV circuit to reach 101%, the Craig-Lenexa N.161kV line to reach 107% and the Greenwood-Lenexa line to reach 101% of capability. With the Stranger Creek 345/115kV transformer out of service, the Springhill 161/115kV transformer is loaded to 102% of capability and the Craig-Lenexa N.161kV line is loaded to 101% of capability. Loss of Hawthorn Unit #5 causes the loading of the Stilwell-Redel 161kV line and the Craig-Lenexa N. 161kV line to reach 101% of the circuit capabilities.

An outage of the Hoyt-Stranger Creek 345kV circuit causes loading of the W. Gardner-Craig 345kV circuit to reach 101% of capability. The Stilwell-Lacygne 345kV circuit becomes loaded to 105% of capability with the loss of the W. Gardner-Stilwell 345kV circuit. With the Craig-Lenexa S. 161kV line out of service, the Craig-Lenexa N. 161kV line is loaded to 101% of its rating. Loss of the Craig-Lenexa N. 161kV line results in loading of the Merriam-Overland Park 161kV line to 101%. An outage of the Craig-Cedar Creek 161kV circuit results in loading of the Craig-Lenexa N. 161kV line to 115% and the Greenwood-Lenexa N. 161kV line to 109%. An outage of the Southtown-Hickman 161kV line results in loading of the Stilwell Redel 161kV circuit to 109%. The Merriam-Roe Park 161kV loading reaches 106% for an outage of the Southtown-Forest 161kV circuit, and the Craig-Lenexa N 161kV line is overloaded at 101% for an outage of the Merriam-Overland Park 161kV circuit. Loss of the Greenwood-Cedar Creek 161kV line causes loading of the Craig-Lenexa N. 161kV line to 112% and the Greenwood-Lenexa N. 161kV line to 106% of capability. The loading of the Stilwell-Redel 161kV line reaches 102% for loss of the Oxford-Olathe 161kV line, 106% for the loss of the Antioch-Oxford 161kV line, 102% for loss of the Pleasant Hill-Sibley 345kV circuit and 101% for loss of the Pleasant Hill 345/161kV transformer.

In the Western Resources control area the Midland 230/115kV transformer loading exceeds capability (115%) for loss of the Lawrence Hill 230/115kV transformer. With the Midland 230/115kV transformer out of service, the Lawrence Hill 230/115kV transformer is overloaded (129%).

In the Missouri Public Service area the loss of the Salisbury-Norton 161kV line causes overloading of the Windsor-Clinton 161kV line (103%). Loss of the Nevada #2 161/69kV transformer results in overloading of the Nevada #1 transformer (102%). The loading of the Martin City 161/69kV transformer (103%) and the Warrensburg 161/69kV transformer (105%) exceed capability for loss of the Pleasant Hill 161/69kV transformer. With the Longview-KC South 161kV circuit out of service, the Prairie Lee-Blue Springs 161kV line is overloaded (101%).

Proposed Improvements

The addition of a new 161kV circuit from W. Gardner to Craig provides a path for power from the proposed generation to the load centers in the area. This relieves loading on the Stilwell transformers and the Southtown-Martin City-Redel-Stilwell 161kV circuits during contingency events. The Craig transformer #33 and W. Gardner transformer #11 overloading problems are eliminated with the new 161kV circuit. Addition of a second transformer at W. Gardner relieves overloads on the existing transformer, and circuit reconductoring on the W. Gardner-Moonlight 161kV circuit is necessary to eliminate the overloads that occur on the line during contingency events. The Craig-Lenexa and Lenexa-Greenwood 161kV circuits remain overloaded under contingency situations due to the new generation, and the loading of the Merriam-Roe Park and Merriam-Overland Park 161kV lines exceed the circuit capabilities. Reconductoring of the existing lines is needed to increase the capacity of the circuits and eliminate the overloads. Reconductor or the

The addition of a new W. Gardner-Craig 161kV line has little impact on constraints imposed by other system generation changes. New circuit construction or generation re-dispatch at Hawthorn is necessary to eliminate the constraints caused by contingency overloading in the central Kansas City area that exists prior to the addition of generation at the CUSTOMER facilities. Further system improvements are presently under study to eliminate other 345kV and 161kV transmission circuit overloads. Outside the KCPL control area, pre-existing overloads are not significantly affected by the proposed generation additions.

Table 4 below summarizes the system improvements that are recommended to help alleviate the contingency overloading due to the added generation. A general cost estimate is included in the table.

Table 4 – Recommended System Improvements for the CUSTOMER generation	
<i>* Costs do not include any adders for CIAC</i>	
Description	Cost
New W. Gardner-Craig 161kV line (16.0 mi.)	\$4,800,000
Second transformer at W. Gardner	\$3,000,000
Reconductor W. Gardner-Moonlight 161kV line (5.8 mi.)	\$1,740,000
Reconductor Craig-Lenexa 161kV line (3.0 mi.)	\$900,000
Reconductor Lenexa-Greenwood 161kV line (3.9 mi.)	\$1,170,000
Reconductor Merriam-Roe Park 161kV line (4.2 mi.)	\$1,260,000
Reconductor Merriam-Overland Park 161kV line (3.1 mi.)	\$930,000
Total System Improvements Cost	\$13,800,000

3. Interconnection Facilities

The CUSTOMER plant will be interconnected with the 345kV transmission system at an existing KCPL station. The proposed site is approximately one mile east of the station, and a new 345kV transmission circuit will be constructed to provide the connection to the plant. The transmission circuit will consist of bundled 795kcmil ACSR conductor to handle the capacity of the CUSTOMER plant.

At the existing station, the expansion of the existing 345kV ring bus is necessary to accommodate the new 345kV line terminal for the new CUSTOMER facility. Further bus expansion is required for the 345kV tie to an additional 345kV line requested in the interconnection request, and construction of approximately .5 mi. of new line between the existing circuit and the existing station is necessary. The preliminary cost estimates for the facilities are listed in Table 4 below. The amount does not include additional charges of approximately 25-30% resulting from contribution in aid to construction (CIAC) fees that are to be paid by the requestor for tax purposes. The construction of the interconnection facilities is expected to last 12 months once right-of-way and zoning permits have been obtained. The estimated project schedule is included in Table 5.

Table 5 – Summary of Estimated Project Component Costs
** Costs do not include any adders for CIAC*

Item	Description	Cost
1	Substation facilities and equipment	\$2,339,000
2	Transmission circuit construction	\$500,000
	Total Project Cost	\$2,839,000*

Table 6 – Project Schedule
Project timeline does not include right of way acquisition and zoning approvals

Task	Description of Work	Start	End
1	Evaluation and budgetary approvals	5/27/02	6/14/02
2	Initial engineering	6/17/02	7/26/02
3	Materials ordering & procurement	7/15/02	3/21/03
4	Final engineering & design	9/9/02	10/18/02
5	Foundation, structural work	10/21/02	12/13/02
6	Transmission line & terminal work	12/9/02	2/28/03
7	Equipment, relay, metering installation	12/16/02	5/2/03
8	Testing and inspection	5/5/03	5/30/03
	Total Project Completion	5/27/02	5/30/03

4. Summary

This feasibility study was requested by Customer to assess transmission capacity with the addition of 640MW of new generation. The analysis evaluates the impact of introducing the new generation on the power system during normal operation and contingency events.

The addition of 640MW generating capacity at the proposed CUSTOMER site results in the overloading of facilities during outages on the 345kV and 161kV system. The sparse 161kV transmission link between the site and the area load centers imposes constraints that require significant system improvements to transfer the supply of power to the areas of high growth. Moreover, the trend of shifting generation supply from the central Kansas City area to the southern part of the KCPL territory continues to create overloading problems with the circuits in the Hawthorn area. As generation capacity increases, a comprehensive system improvement plan best addresses the issues of overloading that exist throughout the system. Pre-existing contingency overloads on the transmission system may be worsened or improved by the shift in generation. This study attempts to identify those constraints that are specifically related to the CUSTOMER generation additions.

The CUSTOMER request to interconnect with the 345kV transmission system requires facility improvements at existing station and new line construction to the plant site. At existing station, the improvements require bus expansion and three 345kV circuit breaker installations for the additional line terminals. A new 345kV line of 1.0 mi. is required for the interconnection interface to the CUSTOMER plant facility. An additional .5 mi. of 345kV double-circuit transmission line is needed to tie the project into an additional 345kV line in the area. The cost for the interconnection facilities is estimated to be \$2,839,000 less CIAC adders. The project timeline is approximately 12 months provided any right-of-way and zoning issues are resolved. Construction of the interconnection facility would begin on May 27, 2002 with an anticipated service date of June 1, 2003.

System improvements are required to alleviate contingency overloads that result from the generation additions. New line construction from the W. Gardner substation to the Craig substation and a second transformer at W. Gardner station provide a new path for delivering power from the generation facilities to the 161kV system. Further improvements require circuit reconductoring to increase the load carrying capability of several lines on the 161kV system. The initial cost estimate for the related system improvements is \$13,800,000.

Branch Violations

Table D-1 Base case vs. CUSTOMER study w/ 640MW

*** MUST 4.00 *** TUE, FEB 27 2001 9:51 ***
 1-2001 SOUTHWEST POWER POOL POWER FLOW MODEL
 2004 SUMMER PEAK (04SP) BASE CASE;WITH MODS (SEE LONG TITLE)

start: 10:16:57 AM
 end: 10:34:44 AM
 elapsed: 0:17:47

Notes:

Base case w/o Customer Generation vs Customer Study w/ 640MW generation added and no fixes applied

*****Comparison of Base case flows to Contingency flows*****

Contingency	Monitored Element	Rating	Base Case		Study Case	
			Normal	Contingency Flow % of Rating	Normal	Contingency Flow % of Rating
56765 HOYT 7 345 56766 JEC N 7 345 1	57965 W.GRDNR7 345 58105 PROP#2 345 1 LN	1099.0	966.0	1103.3	100.4	889.0
	57965 W.GRDNR7 345 57977 CRAIG 7 345 1 LN	1099.0	741.0			917.0 1136.6 103.4
56769 LANG 7 345 56774 SWISVAL7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1105.4	100.6	1018.0
56769 LANG 7 345 56796 WICHITA7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1110.6	101.1	1018.0
56774 SWISVAL7 345 57968 STILWEL7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1105.4	100.6	1018.0
56791 BENTON 7 345 56797 WOLFCRK7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1157.7	105.3	1018.0
56793 NEOSHO 7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1148.9	104.5	1018.0 1113.2 101.3
56794 ROSEHIL7 345 56797 WOLFCRK7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1149.8	104.6	1018.0
56851 AUBURN 6 230 56852 JEC 6 230 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1100.7	100.2	1018.0
56853 LAWHILL6 230 56854 LEC U5 6 230 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1118.2	101.8	1018.0
56853 LAWHILL6 230 56855 MIDLAND6 230 1	56853 LAWHILL6 230 57250 LWRNCHL3 115 1 TR	280.0	236.0	354.5	126.6	239.0 359.7 128.5
57965 W.GRDNR7 345 57966 WGARDNR5 161 11	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1134.1	103.2	1018.0
57965 W.GRDNR7 345 57977 CRAIG 7 345 1	57965 W.GRDNR7 345 57966 WGARDNR5 161 11 TR	400.0	228.0	498.5	124.6	266.0 414.5 103.6
	57966 WGARDNR5 161 58044 MOONLT 5 161 1 LN	293.0	205.0	411.2	140.3	228.0 347.5 118.6
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1420.0	129.2	1018.0
	58037 OLATHEW5 161 58043 MURLEN 5 161 1 LN	293.0	107.0	315.3	107.6	127.0

					58043	MURLEN	5	161	58044	MOONLT	5	161	1	LN	293.0	164.0	373.1	127.3	185.0	309.1	105.5		
					58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	174.0	143.0	192.7	110.7	140.0					
					58042	SPRGHL	5	161	57267	SPRINGH3	115	1	TR	100.0	84.0			87.0		103.2	103.2		
					57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	381.0			421.0		559.0	101.6			
					57968	STILWEL7	345	59200	PHILL	7	345	1	LN	717.0	419.0			527.0		725.4	101.2		
					57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0			279.0		330.1	112.7		
					57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	150.0			157.0		233.7	104.3			
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	213.0			240.0		295.3	100.8		
57965	W.GRDNR7	345	58105	PROP#2	345	1			57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	381.0	552.5	100.5	421.0		
					57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1761.3	160.3	1018.0	1684.1		153.2			
					57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	294.3	100.4	279.0					
					57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	150.0	231.9	103.5	157.0						
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	293.0	146.0	344.0	117.4	144.0					
57966	WGARDNR5	161	58044	MOONLT	5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1120.5	102.0	1018.0		
57968	STILWEL7	345	57969	STILWEL5	161	11			57968	STILWEL7	345	57969	STILWEL5	161	22	TR	550.0	361.0	568.9	103.4	400.0	612.2	
57968	STILWEL7	345	57969	STILWEL5	161	22			57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	381.0	582.3	105.9	421.0	628.0	
57968	STILWEL7	345	57981	LACYGNE7	345	1			57965	W.GRDNR7	345	57977	CRAIG	7	345	1	LN	1099.0	741.0	1264.2	115.0	917.0	
					57965	W.GRDNR7	345	58105	PROP#2	345	1	LN	1099.0	966.0	1625.0	147.9	889.0	1609.0		146.4			
					57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	294.6	100.5	270.0					
					58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	174.0	143.0	227.9	131.0	140.0	180.5	103.7			
					57968	STILWEL7	345	58130	WGARD3	345	1	LN	753.0				300.0	947.8	125.9				
57968	STILWEL7	345	59200	PHILL	7	345	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	323.9	110.6	279.0	
					57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			270.0	304.1	103.8			
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	213.0			240.0	329.6	112.5			
57969	STILWEL5	161	57994	HICKMAN5	161	1			57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	304.7	104.0	279.0	
					57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	150.0			157.0	226.2	101.0				
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	213.0			240.0	299.7	102.3			
57969	STILWEL5	161	58050	ANTIOCH5	161	1			57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	294.2	100.4	279.0	
57969	STILWEL5	161	58057	BUCYRUS5	161	1			57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1105.5	100.6	1018.0		
69702	ST JOE	3	345	57972	HAWTH	7	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1099.2	100.0	1018.0		
57973	HAWTHRN5	161	57976	LEVEE	5	161	1		57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	332.3	113.4	212.0	314.5	
					57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	315.0	107.5	247.0	302.6	103.3				
					57985	NEAST	5	161	58011	CHOUTEU5	161	1	LN	293.0	200.0	311.2	106.2	189.0	293.5	100.2			
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	233.0	294.4	100.5	224.0						
57973	HAWTHRN5	161	58011	CHOUTEU5	161	1			57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	340.0	116.1	219.0	
					57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	310.6	106.0	247.0	298.6	101.9				

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					57976	LEVEE	5	161	57985	NEAST	5	161	1	LN	293.0	232.0	340.2	116.1	219.0	321.9	109.9			
57973	HAWTHRN5	161	58027	RANDLPH5	161	1			57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	323.4	110.4	219.0	307.7	105.0
					57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	309.0	105.5	212.0	294.3	100.4					
					57976	LEVEE	5	161	57985	NEAST	5	161	1	LN	293.0	232.0	323.6	110.4	219.0	307.8	105.1			
57976	LEVEE	5	161	57985	NEAST	5	161	1		57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	332.3	113.4	212.0	314.6	107.4
					57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	315.0	107.5	247.0	302.6	103.3					
					57985	NEAST	5	161	58011	CHOUTEU5	161	1	LN	293.0	200.0	311.2	106.2	189.0	293.6	100.2				
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	233.0	294.4	100.5	224.0							
57977	CRAIG	7	345	57978	CRAIG	5	161	11		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1111.8	101.2	1018.0		
					57977	CRAIG	7	345	57978	CRAIG	5	161	33	TR	400.0	271.0			299.0	413.8	103.4			
57977	CRAIG	7	345	57978	CRAIG	5	161	22		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1111.5	101.1	1018.0		
					57977	CRAIG	7	345	57978	CRAIG	5	161	33	TR	400.0	271.0			299.0	412.3	103.1			
57977	CRAIG	7	345	57978	CRAIG	5	161	33		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1103.3	100.4	1018.0		
57978	CRAIG	5	161	57979	PFLUMM	5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1100.3	100.1	1018.0		
					57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	296.8	101.3	270.0	338.6	115.6				
					58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0			251.0	321.9	109.9					
57979	PFLUMM	5	161	58047	OVERLPK5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1099.0	100.0	1018.0			
					57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			270.0	332.9	113.6				
					58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0			251.0	316.2	107.9					
57981	LACYGNE7	345	58105	PROP#2	345	1			57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1382.9	125.8	1018.0	1291.1	117.5	
69702	ST JOE	3	345	57982	IATAN	7	345	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1128.1	102.7	1018.0		
					57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0			279.0	294.3	100.5				
					57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			270.0	312.4	106.6				
					58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0			251.0	295.8	100.9					
57985	NEAST	5	161	58011	CHOUTEU5	161	1		57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	329.2	112.4	219.0	310.9	106.1
					57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	304.9	104.1	247.0							
					57976	LEVEE	5	161	57985	NEAST	5	161	1	LN	293.0	232.0	329.4	112.4	219.0	311.1	106.2			
58015	AVONDAL5	161	58027	RANDLPH5	161	1			57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	315.5	107.7	219.0	299.8	102.3
					57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	301.6	102.9	212.0							
					57976	LEVEE	5	161	57985	NEAST	5	161	1	LN	293.0	232.0	315.7	107.7	219.0	299.9	102.4			
58037	OLATHEW5	161	58043	MURLEN	5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1103.4	100.4	1018.0			
58043	MURLEN	5	161	58044	MOONLT	5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1113.8	101.3	1018.0		
58057	BUCYRUS5	161	58068	WAGSTAF5	161	1			57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1114.9	101.4	1018.0			

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58062	SALSBR5	161	58064	NORTON-5	161	1	59217	WINDSR	5	161	96071	5CLINTN	161	1	LN	123.0	94.0	125.7	102.2	96.0	126.8	103.1		
58066	S.OTTWA5	161	58069	PAOLA	5	161	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	174.0	143.0	191.2	109.9	140.0	180.7	103.8		
58067	CENTENL5	161	58068	WAGSTAF5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1116.8	101.6	1018.0					
58067	CENTENL5	161	58069	PAOLA	5	161	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1125.5	102.4	1018.0					
59224	LNGVW	5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	301.9	103.0	279.0	326.6	111.5
59225	PHILL	5	161	59243	LKWINGB5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	309.0	105.5	279.0	333.7	113.9	
																				240.0	298.8	102.0		
59243	LKWINGB5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	304.6	104.0	279.0	329.3	112.4	
																				240.0	294.6	100.5		
96045	7MORGAN	345	56793	NEOSHO	7	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1137.7	103.5	1018.0				
96071	5CLINTN	161	59242	CLINTON5	161	1	59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	69.5	139.0	44.0	69.3	138.6		
56772	STRANGR7	345	56811	STRANG7X1.00	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1099.1	100.0	1018.0					
							58042	SPRGHL	5	161	57267	SPRINGH3	115	1	TR	100.0	84.0			87.0	101.7	101.7		
							57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			270.0	294.8	100.6		
56853	LAWHILL6	230	57250	LWRNCHL3	115	1	56855	MIDLAND6	230	57252	MIDLAND3	115	1	TR	280.0	171.0	317.3	113.3	175.0	322.3	115.1			
56855	MIDLAND6	230	57252	MIDLAND3	115	1	56853	LAWHILL6	230	57250	LWRNCHL3	115	1	TR	280.0	236.0	354.6	126.6	239.0	359.8	128.5			
57951	HAW G5	122.0	57973	HAWTHRNS	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1153.5	105.0	1018.0	1103.7	100.4			
							57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0			279.0	296.5	101.2		
							57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			270.0	296.9	101.3		
57957	IAT G1	124.0	57982	IATAN	7	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1122.6	102.1	1018.0				
59151	SIBLEY#322.0	59202	SIBLEY	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1133.0	103.1	1018.0					
59162	ARIESSTG18.0	59225	PHILL	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1118.0	101.7	1018.0					
59163	ARIESCT118.0	59225	PHILL	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1109.5	101.0	1018.0					
59164	ARIESCT218.0	59225	PHILL	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1109.5	101.0	1018.0					
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	30.0	51.2	102.3	30.0	51.2	102.4	
59209	SEDALIA5	161	59271	SEDN	269.0	1	59209	SEDALIA5	161	59272	SEDS	269.0	1	TR	50.0	29.0	52.2	104.4	28.0	52.0	104.0			
							59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	52.4	104.9	44.0	52.2	104.5		
59209	SEDALIA5	161	59272	SEDS	269.0	1	59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	36.0	56.0	112.0	36.0	55.8	111.6			

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					59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	50.9	101.8	44.0	50.7	101.4				
59224	LNGVW	5	161	59282	LNGVW	269.0	1		59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0	58.0	116.0	39.0	59.5	119.0	
59225	PHILL	5	161	59280	PHILL	269.0	1		59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	52.7	105.5	44.0	52.7	105.4
									59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0			39.0	51.8	103.6	
59242	CLINTON5	161	59303	CLINTON	269.0	1			59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	36.0	56.0	112.0	36.0	55.9	111.8	
59242	CLINTON5	161	59303	CLINTON	269.0	2			59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	35.0	56.4	112.7	35.0	56.3	112.5	
56765	HOYT	7	345	56772	STRANGR	7	345	1	57965	W.GRDNR	7	345	57977	CRAIG	7	345	1	LN	1099.0	741.0		917.0	1106.1	100.6
56916	PENTAGN5	161	56917	PENTGNT	5	161	1		58042	SPRGHL	5	161	57267	SPRINGH	3	115	1	TR	100.0	84.0		87.0	100.3	100.3
57968	STILWEL	7	345	58130	WGARD	3	345	1	57968	STILWEL	7	345	57981	LACYGNE	7	345	1	LN	1099.0	1068.0		1018.0	1157.7	105.3
57978	CRAIG	5	161	58038	LENEXAS	5	161	1	57978	CRAIG	5	161	58039	LENEXAN	5	161	1	LN	293.0	228.0		270.0	295.8	101.0
57978	CRAIG	5	161	58039	LENEXAN	5	161	1	58032	MERRIAM	5	161	58047	OVERLPK	5	161	1	LN	187.0	83.0		108.0	189.7	101.4
57978	CRAIG	5	161	58049	CEDRCRK	5	161	1	57978	CRAIG	5	161	58039	LENEXAN	5	161	1	LN	293.0	228.0		270.0	336.1	114.7
									58031	GRNWOOD	5	161	58039	LENEXAN	5	161	1	LN	293.0	210.0		251.0	319.4	109.0
57993	STHTOWN	5	161	57994	HICKMAN	5	161	1	57969	STILWEL	5	161	58053	REDEL	5	161	1	LN	293.0	251.0		279.0	317.8	108.5
57993	STHTOWN	5	161	58001	FOREST	5	161	1	58032	MERRIAM	5	161	58040	ROEPARK	5	161	1	LN	187.0	70.0		90.0	198.9	106.4
58031	GRNWOOD	5	161	58049	CEDRCRK	5	161	1	57978	CRAIG	5	161	58039	LENEXAN	5	161	1	LN	293.0	228.0		270.0	329.0	112.3
									58031	GRNWOOD	5	161	58039	LENEXAN	5	161	1	LN	293.0	210.0		251.0	312.4	106.6
58032	MERRIAM	5	161	58047	OVERLPK	5	161	1	57978	CRAIG	5	161	58039	LENEXAN	5	161	1	LN	293.0	228.0		270.0	297.0	101.4
58036	OLATHEE	5	161	58046	OXFORD	5	161	1	57969	STILWEL	5	161	58053	REDEL	5	161	1	LN	293.0	251.0		279.0	297.8	101.6
58046	OXFORD	5	161	58050	ANTIOCH	5	161	1	57969	STILWEL	5	161	58053	REDEL	5	161	1	LN	293.0	251.0		279.0	309.5	105.6
59200	PHILL	7	345	59201	SIBLEY	7	345	1	57969	STILWEL	5	161	58053	REDEL	5	161	1	LN	293.0	251.0		279.0	297.3	101.5
									57978	CRAIG	5	161	58039	LENEXAN	5	161	1	LN	293.0	228.0		270.0	293.3	100.1
59200	PHILL	7	345	59225	PHILL	5	161	1	57969	STILWEL	5	161	58053	REDEL	5	161	1	LN	293.0	251.0		279.0	294.7	100.6
59224	LNGVW	5	161	59245	KCSOUTH	5	161	1	59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	140.0		151.0	224.5	100.7
56916	PENTAGN	5	161	57261	PENTAGN	3	115	1	58042	SPRGHL	5	161	57267	SPRINGH	3	115	1	TR	100.0	84.0		87.0	100.3	100.3

Branch Violations

Table D-2 Base case vs. CUSTOMER study w/ 640MW and system improvements applied

*** MUST 4.00 *** THU, MAR 15 2001 7:16 ***
 1-2001 SOUTHWEST POWER POOL POWER FLOW MODEL
 2004 SUMMER PEAK (04SP) BASE CASE;WITH MODS (SEE LONG TITLE)

start: 9:43:55 AM
 end: 9:58:10 AM
 elapsed: 0:14:15

Notes:

Base case w/o Customer Generation vs Customer Study w/ 640MW generation added and WG-Craig fixes applied

*****Comparison of Base case flows to Contingency flows*****

Contingency	Monitored Element	Rating	Base Case		Study Case	
			Normal	Contingency Flow	Normal	Contingency Flow
				% of Rating		% of Rating
56765 HOYT 7 345 56766 JEC N 7 345 1	57965 W.GRDNR7 345 58105 PROP#2 345 1 LN	1099.0	966.0	1103.3	100.4	901.0
56769 LANG 7 345 56774 SWISVAL7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1105.4	100.6	1012.0
56769 LANG 7 345 56796 WICHITA7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1110.6	101.1	1012.0
56774 SWISVAL7 345 57968 STILWEL7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1105.4	100.6	1012.0
56791 BENTON 7 345 56797 WOLFCRK7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1157.7	105.3	1012.0
56793 NEOSHO 7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1148.9	104.5	1012.0 1104.4 100.5
56794 ROSEHIL7 345 56797 WOLFCRK7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1149.8	104.6	1012.0
56851 AUBURN 6 230 56852 JEC 6 230 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1100.7	100.2	1012.0
56853 LAWHILL6 230 56854 LEC U5 6 230 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1118.2	101.8	1012.0
56853 LAWHILL6 230 56855 MIDLAND6 230 1	56853 LAWHILL6 230 57250 LWRNCHL3 115 1 TR	280.0	236.0	354.5	126.6	237.0 355.1 126.8
57965 W.GRDNR7 345 57966 WGARDNR5 161 11	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1134.1	103.2	1012.0
57965 W.GRDNR7 345 57977 CRAIG 7 345 1	57965 W.GRDNR7 345 57966 WGARDNR5 161 11 TR	400.0	228.0	498.5	124.6	211.0
	57966 WGARDNR5 161 58044 MOONLT 5 161 1 LN	293.0	205.0	411.2	140.3	233.0 316.5 108.0
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	1068.0	1420.0	129.2	1012.0
	58037 OLATHEW5 161 58043 MURLEN 5 161 1 LN	293.0	107.0	315.3	107.6	130.0
	58043 MURLEN 5 161 58044 MOONLT 5 161 1 LN	293.0	164.0	373.1	127.3	189.0
	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	174.0	143.0	192.7	110.7	142.0
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	251.0			275.0 312.3 106.6
57965 W.GRDNR7 345 58105 PROP#2 345 1	57968 STILWEL7 345 57969 STILWEL5 161 11 TR	550.0	381.0	552.5	100.5	406.0

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	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1761.3	160.3	1012.0	1686.2	153.4
	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	294.3	100.4	275.0	
	57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	150.0	231.9	103.5	150.0		
	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	293.0	146.0	344.0	117.4	127.0	
57966	WGARDNR5	161	58044	MOONLT	5	161	1								
	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1120.5	102.0	1012.0		
57968	STILWEL7	345	57969	STILWEL5	161	22	TR		550.0	361.0	568.9	103.4	385.0	587.7	106.9
57968	STILWEL7	345	57969	STILWEL5	161	22	TR		550.0	381.0	582.3	105.9	406.0	603.0	109.6
57968	STILWEL7	345	57981	LACYGNE7	345	1									
	57965	W.GRDNR7	345	57977	CRAIG	7	345	1	LN	1099.0	741.0	1264.2	115.0	826.0	
	57965	W.GRDNR7	345	58105	PROP#2	345	1	LN	1099.0	966.0	1625.0	147.9	901.0	1618.3	147.2
	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	294.6	100.5	284.0	
	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	174.0	143.0	227.9	131.0	142.0	183.0
	57968	STILWEL7	345	58130	WGARD3	345	1	LN	753.0				261.0	899.5	119.5
57968	STILWEL7	345	59200	PHILL	7	345	1								
	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	323.9	110.6	275.0	356.1
	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			284.0	318.2
	58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	213.0			236.0	321.8
	58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0			265.0	301.6	102.9
57969	STILWEL5	161	57994	HICKMAN5	161	1									
	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	304.7	104.0	275.0	328.5
	58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	213.0			236.0	293.8
57969	STILWEL5	161	58050	ANTIOCH5	161	1									
	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	294.2	100.4	275.0	307.4
57969	STILWEL5	161	58057	BUCYRUS5	161	1									
	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1105.5	100.6	1012.0		
69702	ST JOE	3	345	57972	HAWTH	7	345	1							
	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1099.2	100.0	1012.0		
57973	HAWTHRN5	161	57976	LEVEE	5	161	1								
	57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	332.3	113.4	208.0	309.5	105.6
	57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	315.0	107.5	246.0	299.9	102.3
	57985	NEAST	5	161	58011	CHOUTEU5	161	1	LN	293.0	200.0	311.2	106.2	186.0	
	58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	233.0	294.4	100.5	223.0		
57973	HAWTHRN5	161	58011	CHOUTEU5	161	1									
	57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	340.0	116.1	216.0	316.5
	57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	310.6	106.0	246.0	296.0	101.0
	57976	LEVEE	5	161	57985	NEAST	5	161	LN	293.0	232.0	340.2	116.1	216.0	316.7
57973	HAWTHRN5	161	58027	RANDLPH5	161	1									
	57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	323.4	110.4	216.0	303.5
	57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	309.0	105.5	208.0		
	57976	LEVEE	5	161	57985	NEAST	5	161	LN	293.0	232.0	323.6	110.4	216.0	303.6
57976	LEVEE	5	161	57985	NEAST	5	161	1							
	57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	332.3	113.4	208.0	309.5	105.6
	57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	315.0	107.5	246.0	299.9	102.4
	57985	NEAST	5	161	58011	CHOUTEU5	161	1	LN	293.0	200.0	311.2	106.2	186.0	
	58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	233.0	294.4	100.5	223.0		
57977	CRAIG	7	345	57978	CRAIG	5	161	11							
	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1111.8	101.2	1012.0		

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57977	CRAIG	7	345	57978	CRAIG	5	161	22	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1111.5	101.1	1012.0				
57977	CRAIG	7	345	57978	CRAIG	5	161	33	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1103.3	100.4	1012.0				
57978	CRAIG	5	161	57979	PFLUMM	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1100.3	100.1	1012.0				
									57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	296.8	101.3	284.0	353.6	120.7	
									58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0			265.0	336.9	115.0		
57979	PFLUMM	5	161	58047	OVERLPK5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1099.0	100.0	1012.0				
									57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			284.0	348.0	118.8	
									58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0			265.0	331.4	113.1		
57981	LACYGNE7	345	58105	PROP#2		345	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1382.9	125.8	1012.0	1293.2	117.7		
69702	ST JOE	3	345	57982	IATAN	7	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1128.1	102.7	1012.0				
									57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0			284.0	326.0	111.3	
									58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0			265.0	309.4	105.6		
57985	NEAST	5	161	58011	CHOUTEU5	161	1		57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	329.2	112.4	216.0	305.7	104.3	
									57973	HAWTHRN5	161	58027	RANDLPH5	161	1	LN	293.0	256.0	304.9	104.1	246.0				
									57976	LEVEE	5	161	57985	NEAST	5	161	1	LN	293.0	232.0	329.4	112.4	216.0	305.9	104.4
58015	AVONDAL5	161	58027	RANDLPH5	161	1			57973	HAWTHRN5	161	57976	LEVEE	5	161	1	LN	293.0	232.0	315.5	107.7	216.0	295.6	100.9	
									57973	HAWTHRN5	161	58011	CHOUTEU5	161	1	LN	293.0	223.0	301.6	102.9	208.0				
									57976	LEVEE	5	161	57985	NEAST	5	161	1	LN	293.0	232.0	315.7	107.7	216.0	295.8	100.9
58037	OLATHEW5	161	58043	MURLEN	5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1103.4	100.4	1012.0				
58043	MURLEN	5	161	58044	MOONLT	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1113.8	101.3	1012.0				
58057	BUCYRUS5	161	58068	WAGSTAF5	161	1			57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1114.9	101.4	1012.0				
58062	SALSBRY5	161	58064	NORTON-5	161	1			59217	WINDSR	5	161	96071	5CLINTN	161	1	LN	123.0	94.0	125.7	102.2	96.0	127.0	103.2	
58066	S.OTTWA5	161	58069	PAOLA	5	161	1		58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	174.0	143.0	191.2	109.9	142.0	180.0	103.4	
58067	CENTENL5	161	58068	WAGSTAF5	161	1			57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1116.8	101.6	1012.0				
58067	CENTENL5	161	58069	PAOLA	5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1125.5	102.4	1012.0				
59224	LNGVW	5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	301.9	103.0	275.0	321.9	109.9	
59225	PHILL	5	161	59243	LKWINGB5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	309.0	105.5	275.0	328.9	112.3	
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	213.0			236.0	294.1	100.4	
59243	LKWINGB5	161	59249	HOOKRD	5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	304.6	104.0	275.0	324.6	110.8	
96045	7MORGAN	345	56793	NEOSHO	7	345	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1137.7	103.5	1012.0				
96071	5CLINTN	161	59242	CLINTON5	161	1			59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	69.5	139.0	44.0	69.3	138.7	

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56651	JEC U1	26.0	56852	JEC	6	230	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1131.9	103.0	1012.0			
56652	JEC U2	26.0	56766	JEC N	7	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1128.3	102.7	1012.0			
56653	JEC U3	26.0	56766	JEC N	7	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1128.3	102.7	1012.0			
56663	LEC U5	24.0	56854	LEC U5	6	230	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1118.2	101.8	1012.0			
56772	STRANGR7	345	56811	STRANG7X1.00	1			57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1099.1	100.0	1012.0			
								58042	SPRGHL	5	161	57267	SPRINGH3	115	1	TR	100.0	84.0		87.0	100.8	100.8	
								57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0		284.0	308.5	105.3	
56853	LAWHILL6	230	57250	LWRNCHL3	115	1		56855	MIDLAND6	230	57252	MIDLAND3	115	1	TR	280.0	171.0	317.3	113.3	172.0	318.0	113.6	
56855	MIDLAND6	230	57252	MIDLAND3	115	1		56853	LAWHILL6	230	57250	LWRNCHL3	115	1	TR	280.0	236.0	354.6	126.6	237.0	355.2	126.9	
57951	HAW G5	122.0	57973	HAWTHRN5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1153.5	105.0	1012.0			
								57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0		284.0	311.7	106.4	
								58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0		265.0	294.9	100.6		
57952	MONTG1	122.0	57995	MONTROS5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1106.3	100.7	1012.0			
57953	MONTG2	122.0	57995	MONTROS5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1105.5	100.6	1012.0			
57954	MONTG3	118.0	57995	MONTROS5	161	1		57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1106.3	100.7	1012.0			
57957	IAT G1	124.0	57982	IATAN	7	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1122.6	102.1	1012.0			
59151	SIBLEY#322.0		59202	SIBLEY	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1133.0	103.1	1012.0			
59162	ARIESSTG18.0		59225	PHILL	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1118.0	101.7	1012.0			
59163	ARIESCT118.0		59225	PHILL	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1109.5	101.0	1012.0			
59164	ARIESCT218.0		59225	PHILL	5	161	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1109.5	101.0	1012.0			
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	30.0	51.2	102.3	30.0	51.2	102.3
59209	SEDALIA5	161	59271	SEDN	269.0	1		59209	SEDALIA5	161	59272	SEDS	269.0	1	TR	50.0	29.0	52.2	104.4	28.0	52.0	104.0	
								59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	52.4	104.9	44.0		
59209	SEDALIA5	161	59272	SEDS	269.0	1		59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	36.0	56.0	112.0	35.0	55.8	111.6	
								59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	50.9	101.8	44.0		
59224	LNGVW	5	161	59282	LNGVW	269.0	1	59210	MARTCTY5	161	59287	MARTCTY269.0	1	TR	50.0	38.0	58.0	116.0	40.0	59.8	119.5		
59225	PHILL	5	161	59280	PHILL	269.0	1	59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	44.0	52.7	105.5	44.0		
								59210	MARTCTY5	161	59287	MARTCTY269.0	1	TR	50.0	38.0			40.0	52.0	104.1		
59242	CLINTON5	161	59303	CLINTON269.0	1			59242	CLINTON5	161	59303	CLINTON269.0	2	TR	50.0	36.0	56.0	112.0	36.0	55.9	111.9		

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59242	CLINTON5	161	59303	CLINTON269.0	2	59242	CLINTON5	161	59303	CLINTON269.0	1	TR	50.0	35.0	56.4	112.7	35.0	56.3	112.6	
56772	STRANGR7	345	59231	STRANGR5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	296.7	101.3	
56915	MIDLAND5	161	56917	PENTGNT5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	296.8	101.3	
57965	W.GRDNR7	345	58130	WGARD3	345	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1012.0	1126.8	102.5		
						57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	302.6	103.3	
57968	STILWEL7	345	58130	WGARD3	345	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	1068.0	1012.0	1131.7	103.0		
						57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	293.9	100.3	
57969	STILWEL5	161	58042	SPRGHL	5	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	293.2	100.1	
57972	HAWTH	7	345	59201	SIBLEY	7	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	295.6	100.9
57978	CRAIG	5	161	58038	LENEXAS5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	310.0	105.8
						58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0	265.0	293.3	100.1		
57978	CRAIG	5	161	58039	LENEXAN5	161	58032	MERRIAM5	161	58047	OVERLPK5	161	1	LN	187.0	83.0	115.0	201.1	107.5	
57978	CRAIG	5	161	58048	COLLEGE5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	296.9	101.3
57978	CRAIG	5	161	58049	CEDRCRK5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	352.9	120.4
						58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0	265.0	336.2	114.8		
57993	STHTOWN5	161	57994	HICKMAN5	161	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	275.0	312.0	106.5	
57993	STHTOWN5	161	58001	FOREST	5	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	293.8	100.3	
						58032	MERRIAM5	161	58040	ROEPARK5	161	1	LN	187.0	70.0	99.0	204.9	109.6		
58031	GRNWOOD5	161	58039	LENEXAN5	161	58032	MERRIAM5	161	58047	OVERLPK5	161	1	LN	187.0	83.0	115.0	196.0	104.8		
58031	GRNWOOD5	161	58049	CEDRCRK5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	345.9	118.0	
						58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0	265.0	329.2	112.4		
58032	MERRIAM5	161	58047	OVERLPK5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	313.1	106.9	
						58031	GRNWOOD5	161	58039	LENEXAN5	161	1	LN	293.0	210.0	265.0	296.6	101.2		
58034	KNLWRTH5	161	58052	REEDER	5	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	300.4	102.5	
58036	OLATHEE5	161	58037	OLATHEW5	161	57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	205.0	233.0	307.8	105.1	
						57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	293.8	100.3	
58037	OLATHEW5	161	58045	SWITZER5	161	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	300.1	102.4	
58038	LENEXAS5	161	58052	REEDER	5	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	304.1	103.8	
58046	OXFORD	5	161	58050	ANTIOCH5	161	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	251.0	275.0	302.1	103.1

KCPL Transmission Planning

Feasibility Study

59200	PHILL	7	345	59201	SIBLEY	7	345	1	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	307.3	104.9	
59221	PLTCTY	5	161	59231	STRANGR5	161	1		57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	296.8	101.3	
59224	LNGVW	5	161	59245	KCSOUTH5	161	1		59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	140.0	150.0	223.3	100.1
56915	MIDLAND5	161		57252	MIDLAND3	115	1		57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	293.8	100.3	
57267	SPRINGH3	115		58042	SPRGHL	5	161	1	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	228.0	284.0	293.2	100.1	