

EXPEDITED SYSTEM IMPACT STUDY

550 MW Plant in KCPL Control Area

(SPP Study #GEN-2000-008)

(Modified by SPP for Confidentiality of Customer)



Executive Summary

Customer requested an Expedited System Impact Study to determine the feasibility of developing a 552MW power plant in the KCPL Control Area. The plant is expected to be in service in June 2003.

System conditions were studied using the summer 2004, winter 2004 and summer 2006 load flow cases under normal and contingency situations. For each case, load flow analysis was performed on the base case to determine system conditions without the proposed generation additions. Single contingency outages were applied to determine overloading of transmission facilities. With the Customer facilities added to the model, further load flow and contingency analysis was performed to assess the impact of the new generation. System improvement options were analyzed to determine the most effective solution to the overloading conditions.

Comparison of the contingency data indicates that significant overloading occurs on the 345kV and 161kV transmission system. The construction of a 345kV line out of LaCygne provides a delivery path for the additional generation at the Customer plant to alleviate overloading on the 345kV circuits. The additional 345kV transmission line from LaCygne to a new substation on the Stilwell-Pleasant Hill line at the Raymore site establishes another delivery point to the 161kV system. Overloading of the 161kV circuits can be alleviated by circuit re-conductoring and equipment upgrades in conjunction with generation re-dispatch.

Results from the short circuit analysis and transient stability analysis conclude that no additional equipment upgrades or replacements are necessary as a result of the proposed Customer generation.

A facility study is included to address the details of the transmission interconnection. The estimated cost of the interconnection facilities for the Customer plant is \$3,472,000. The recommended system improvements necessary to eliminate the contingency constraints are estimated to cost \$37,851,000.

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1. Introduction

1.1 Project Description

This Generation Impact Study is provided in response to a request by Customer for an Expedited System Impact Study to evaluate the potential development of a site in KCPL control area for generation facilities. The request was made to the Southwest Power Pool on September 22, 2000 with a signed agreement and payment for the requested services.

Customer is currently planning to install 552MW of generation at a location in the KCPL Control Area with an interconnection to the KCPL EHV transmission system in the summer of 2003. The plans include nine units utilizing combined cycle operation. According to Customer, the market for the generated power is expected to be the Kansas City, MO and Kansas City, KS area. The area to be served by the proposed generation is currently served by Kansas City Power & Light (KCPL), Board of Public Utilities-Kansas City, KS (KACP), Missouri Public Service (MIPU), and City Utilities-Independence, MO (INDN).

1.2 Study Methodology

The System Impact Study assesses the effect of adding generation on the system performance under normal and contingency conditions. The result is a comparison of base case, which considers the currently forecast system conditions, and a study case, which includes the proposed Customer generation facilities. The study models are based on the 2004 summer peak, 2004 winter peak, 2006 summer peak models provided by the Southwest Power Pool. Base case analysis includes existing and planned generation sources and transmission improvements. Additional generation is planned for the Paola site in KCPL control area with 240MW installed in 2003 and 260MW in 2004. The proposed generation facilities are included in these same models for the study case. These models are intended to provide a reasonable assessment of system performance during the period following the projected in-service date of the Customer facilities.

The output of the proposed power plant is adjusted for the three cases under the assumption that all generation would be utilized during periods of high demand with reduced output for seasonal variations. The 2004 summer peak case includes the maximum total output of 552MW. The 2004 winter peak case includes a scaled value of generation output proportional to the seasonal system totals. The value of 375MW is based on the 35% ratio of the winter total generation versus the summer total generation. The 2006 summer peak base again includes the maximum plant output of 552MW.

The sink area for the generation is broadly described as Kansas City, MO and Kansas City, KS. Thus, the new generation is offset through the re-dispatch of plants in the KCPL, BPU, MPS, and Independence control areas. Since the location of the new

plant is within the KCPL control area, the dispatch of generation is performed on specific units within the control area. In the adjacent control areas the generation is scaled by an amount proportional to the share of the area generation to that of the combined sink area. Table 1 shows the amount of the proposed generation that is offset by a reduction of generation in each of the impacted control areas for the three study cases.

Table 1 – Generation reduction (in MW)for control areas for each study case			
Total of control areas equals the plant output at the Customer plant			
	2004 summer	2004 winter	2006 summer
KACP	359	258	348
MIPU	121	75	132
KACY	50	34	50
INDN	22	8	22
Total	552	375	552

Load flow solutions establish the normal base case load flow anticipated for the seasonal loading conditions. AC Contingency analysis is used to determine the impact of the added generation on the system. The system constraints are compared between the pre- and post-generation situations. All branches in the KCPL and neighboring areas above 100kV and ties to KCPL are monitored for overloads above 100% of normal rating. Buses are monitored for voltage deviations exceeding +-5% of nominal.

1.3 Plant Details and Modeling

The Customer plant includes six LM6000 units, one 7EA unit and two steam generators. For the case studies, the system is modeled to provide explicit details of the bus and equipment arrangement.

The total maximum gross output of the facility is expected to be 552 MW with 18 MW of auxiliary load. The minimum generation output is expected to be 62 MW gross with 5 MW of auxiliary load. The actual dispatch of each unit varies depending on the particular generation requirements and seasonal load conditions. For the purpose of this analysis, the Customer facility is dispatched with maximum output for summer peak conditions and with a winter peak output scaled in proportion to the area load conditions.

For the KCPL control area, the dispatch of units is tabulated for each case, and in the adjacent control areas, the total area generation is scaled. Because the Customer plant is in the KCPL control area, additional exports are made to the adjacent areas to maintain the balance of generation supply.

System improvements that are in progress or planned for service during the study periods are included in the analysis models. These include line reconductoring and upgrades to equipment resulting in the increase in transmission line capability. Listed below are planned transmission projects and the forecasted in-service dates. Improvement options identified in this study that provide relief for contingency overloads are presented for each case with recommendations and cost estimates included in the summary.

?? Stilwell-Antioch 161kV line rebuild	2003
?? Antioch-Oxford 161kV line rebuild	2003
?? Paola S. Ottawa 161kV improvements	2004
?? Wagstaff-Centennial-Paola 161kV reconductor/upgrade	2005
?? W. Gardner-S. Ottawa 161kV equipment upgrade	2005

2. Analysis

2.1 2004 Summer Peak

The load forecast for the Kansas City and surrounding area for the 2004 summer peak is 5722MW with 3520MW in the KCPL control area. For the purpose of this study, the maximum generation output provided by the Customer plant is 552MW and is offset by generation in the four control areas in the Kansas City area. In the KCPL control area, 359MW of the generation is re-dispatched among several specified units. For the three remaining control areas, the balance of the Customer generation is transferred to the areas by a proportional amount and the area generation is scaled by the amount of the transfer. The area interchange is increased with 121MW transferred to MIPU, 50MW transferred to KACY, and 22MW transferred to INDN. The generation dispatch of KCPL area and scaling of generation in adjacent control areas including the area interchange are listed in Table 2.

The contingency analysis indicates overloading of several facilities in the KCPL and surrounding areas. Appendix A includes information on the specific facilities that exhibit overloading for specific contingencies.

Table 2 – Generation Dispatch and Area Interchange Schedule					
Comparison of base case with generation at Customer for 2004 Summer Peak					
GENERATION DISPATCH			INTERCHANGE		
Plant/Unit	Base	Study	Area	Base	Study
	w/o Customer	w/ Customer			
Hawthorn 5	544	544	SWPA	-5	-5
Hawthorn 6	141	141	MIDW	4	4
Hawthorn 7	77	0	WERE	141	141
Hawthorn 8	77	0	MIPU	7	128
Hawthorn 9	139	139	KACY	-18	32
Montrose #1	170	170	EMDE	80	80
Montrose #2	164	164	INDN	90	112
Montrose #3	164	165	SPRM	50	50
LaCygne#1	688	688	AECI	-150	-150
LaCygne#2	674	605	CWL	0	0
Iatan#1	670	670	AMRN	0	0
Northeast N.	110	0	NPPD	0	0
Northeast S.	0	0	LES	0	0
Grand Ave	0	0	WAPA	0	0
Gardner	5	5	STJO	121	121
Higginsville	34	34			
Paola	240	240			
Customer	0	552			

For an outage on the W. Gardner-LaCygne 345kV line, the LaCygne-Stilwell 345kV circuit becomes loaded to 112% of normal in the base case before generation is added

at the Customer site. An outage of the LaCygne-W. Gardner circuit forces the LaCygne-Stilwell circuit to exceed 142% of normal rating. The generation re-dispatch at LaCygne due to the added generation reduces the overloading of the LaCygne-Stilwell circuit during an outage of the LaCygne-W Gardner line. The Oxford-Olathe loading reaches 109% of capability for an outage of the LaCygne-W. Gardner line. The Southtown-Martin City circuit becomes loaded to 105% of normal rating for an outage of the LaCygne-W. Gardner circuit.

An outage of the LaCygne-Stilwell circuit does not cause any overloads to occur prior to the Customer generation addition. However, with the generation in service, this outage results in the W. Gardner-Craig line and the LaCygne-W. Gardner line reaching 101% and 132% respectively.

An outage of the W. Gardner-Craig line results in an overload of the W. Gardner 345/161kV transformer to 114% of normal rating and the LaCygne-Stilwell circuit to 114% of capability. The W. Gardner-Moonlight reaches 126% and Moonlight-Murlen reaches 114% of capability for this outage.

Contingency analysis of the base case shows pre-existing overloads on circuits in the central Kansas City area prior to the Customer generation additions. However, the severity of the contingency overloads of circuits near the Hawthorn plant increases as a result of new generation at the Customer site. In the Hawthorn vicinity, an outage of the Hawthorn-Chouteau circuit or the Northeast-Chouteau circuit increases overloading of the Hawthorn-Randolph, Levee-Northeast, Hawthorn-Levee and the Avondale-Randolph circuits by approximately 1 - 20%. An outage on the Hawthorn-Randolph or Avondale-Randolph circuit aggravates the overloading of the Levee-Northeast, Hawthorn-Levee, Hawthorn-Chouteau and Northeast-Chouteau circuits causing an increase of 2 - 14% in the overloads. With an outage on the Levee-Northeast circuit or Hawthorn Levee circuit, the Hawthorn-Chouteau, Hawthorn-Randolph, Northeast-Chouteau and Avondale-Randolph circuits experience substantial increases in overloads by 2 - 16%. Studies indicate that a new 161kV transmission circuit from the Blue Valley substation to Crosstown alleviates the overloads in the Hawthorn area. Re-dispatch of generation at Hawthorn provides relief from contingency overloads in the area without new circuit construction.

The addition of generation at the Customer site has limited impact on the pre-existing overload conditions in the Western Resources control area. With the proposed generation online, the Lawrence Hill 115/230kV transformer loading increases by 3% for an outage on the Lawrence Hill-Midland circuit or for a loss of the Midland 115/230kV transformer. Similarly the overloading of the Midland 115/230kV transformer is increased by 3% for a loss of the Lawrence Hill transformer.

In the Missouri Public Service Area, several facilities experience pre-existing overload conditions that are further exacerbated by the addition of generation at Customer. With the Customer generation in service, The Prairie Lee-Blue Springs circuit and the Blue SpringsE.-Blue SpringsS. circuit overloading increases by 2-5% for

an outage on the Frost Road-KCSouth line or the Longview-KC City South line. The additional generation causes loading of the Prairie Lee-Blue Springs line to reach 102% for an outage of the Pleasant Hill-Sibley 345kV circuit or the Raytown-Frost Rd 161kV circuit. Loss of either Nevada 169/161kV transformer results in further overload of the remaining equipment by 2-3% as a result of the new generation.

Proposed improvements

The contingency analysis reveals overloads of several facilities that exist prior to the Customer generation additions that are increased by the new generation. The Hawthorn overloading problems occur as the demand for power to the south of the area is redirected to areas west of the Hawthorn plant. With the installation of more generation in the southern part of the KCPL territory, this problem only increases in severity. A new line from the Blue Valley site to the Crosstown site will relieve loading on the existing circuits for contingencies in the Hawthorn area. This circuit provides a new path for flows from the Hawthorn generation to the load centers to the west.

Four area improvements have been investigated as possible remedies for the overloading that occurs on the 345kV transmission facilities in the southern part of the KCPL territory. During an outage of the LaCygne-Stilwell circuit, LaCygne-W Gardner circuit, the remaining lines are heavily loaded by the generation output of the LaCygne plant. The analysis results indicate that providing a new path for power flow from the LaCygne generating station will improve the contingency overloads on the existing circuits. The four improvement scenarios that can provide benefit are listed below:

1. Hart/Archie 345kV

New 345/161kV substation on Stilwell-Archie 161kV circuit, 345kV/161kV transformer, New LaCygne-Hart 345kV circuit.

2. Raymore 345kV

New 345/161kV substation on the Montrose-Loma Vista 161kV lines, 345/161kV transformer, New LaCygne-Raymore 345kV circuit.

3. LaCygne-Stilwell #2 345kV circuit

Parallel circuit from LaCygne to Stilwell

4. LaCygne-W. Gardner 345kV circuit

Parallel circuit from LaCygne to W. Gardner

Critical 345kV facility overloads are shown in Table 3. This information summarizes the normal flows and the contingency flows that occur for the specified outages. The table includes the results for the base case without Customer generation, the Customer study without any system upgrades and the four improvement proposals to correct for the overloading on the 345kV EHV system. Data is included for only those facilities that exhibit overloads in any of the cases.

The four plans offer some relief for the overload problems that occur during contingency events. Although the Hart/Archie proposal helps improve the situation with the 345kV overloading, the LaCygne-Stilwell 345kV circuit remains overloaded. A second 345kV/161kV transformer would be required at Hart to relieve the overloading on the proposed Hart transformer and to relieve contingency loading on the LaCygne-Stilwell circuit. Moreover, the plan requires reconductoring of the W. Gardner-Moonlight, Stilwell-Redel and Oxford-Olathe circuits. Additional upgrades of the Southtown-Martin City circuit equipment are needed to eliminate the contingency overloading that occurs on this circuit. A new 345kV transmission circuit of approximately 23.8 miles must be constructed from LaCygne to the proposed Hart site.

Table 3 - 2004 summer peak - Significant 345kV overloaded facilities
 Normal and contingency flows for four improvement proposals

Monitored line----normal -----contingency (Lines rated 1099MVA)	Base Case W/o Custmr.	Analysis Base Case w/Custmr.	Hart/ Archie	Raymore	LaCygne- Stilwell#2	LaCygne - W. Gardner
LaCygne-Stilwell(normal)	793	946	764	620	580	843
W. Gardner-LaCygne out	1230	na	na	na	na	na
W. Gardner - Craig out	-	1250	-	-	-	1235
W. Gardner-Craig (normal)	459	657	587	533	568	787
LaCygne-Stilwell out	-	1113	-	-	-	1239
LaCygne-W. Gardner(normal)	na	870	795	731	772	646
Lacygne-Stilwell out	na	1444	-	-	-	-
W.Gardner Transformer (normal)	179	216	197	191	194	251
W. Gardner-Craig out	-	455	-	-	-	484
Stilwell transformer #11 (normal)	332	353	296	336	404	324
Stilwell transformer #22 out	-	-	-	-	609	-

The Raymore proposal establishes a tie between the LaCygne generating plant and the Stilwell-Pleasant Hill 345kV circuit. The proposed transformer at the Raymore site would improve the utilization of the Montrose-Loma Vista 161kV circuits, delivering power to the areas of load concentration. This plan requires only one transformer at the Raymore site. However, transmission circuit mileage increases to 38.0 miles. Additional facility upgrades in the KCPL area are necessary to alleviate overloads on

the 161kV system. Reconductor of the Oxford-Olathe circuit and the W. Gardner-Moonlight circuit will eliminate the contingency loading of these lines.

The LaCygne-Stilwell #2 second circuit provides another tie between the LaCygne plant and the Stilwell station to carry half the power from the plant. However, the additional capacity of the transmission line causes the Stilwell transformer #11 to reach 100% of rating during an outage of the LaCygne-W. Gardner line. The Stilwell #11 and #22 transformers reach 111% and 108% of rating respectively, for an outage of the other parallel transformer. A third 345/161kV transformer would provide relief for the contingency overloads of the existing equipment. With the new line in service, 161kV facilities must be upgraded to eliminate the line overloading. Reconductoring is necessary for the Olathe-Oxford, W. Gardner-Moonlight, Stilwell-Redel, and Martin City-Redel circuits. Upgrades to equipment on the Southtown-Martin City line would increase the loading capability of this line. This plan could utilize existing right-of-way and would require a 30.8-mile transmission circuit.

The addition of a parallel LaCygne-W. Gardner circuit eliminates the overloading on the circuits delivering power from the LaCygne plant. Under normal conditions the new circuit reduces the loading of the LaCygne-W Gardner line by 45% and provides a stronger source into the W. Gardner site. However, with this stronger source, the W. Gardner-Craig 345 line becomes loaded to 113% of capability for an outage of the LaCygne-Stilwell circuit. For an outage on the W. Gardner-Craig line, the loading of the W. Gardner 345/161kV transformer #11 reaches 121% and the LaCygne-Stilwell 345kV circuit reaches 112% of capability. The W. Gardner-Moonlight, Murlen-Olathe and Moonlight-Murlen 161kV lines exceed loading capability for this outage. The Craig-Lenexa circuit is overloaded for an outage of the Craig-Pflumm circuit and the Merriam-Roe Park line becomes loaded beyond capability for loss of the Southtown-Forest line. Further overloading occurs in the Hawthorn area. Providing a tie at W. Gardner to the Stilwell-Swissvale 345kV circuit relieves the overloading on the W. Gardner transformer and the 161kV circuits in the W. Gardner/Craig area. However, with the 345kV tie, power flow on the Stilwell-W. Gardner line exceeds the capability of the circuit for an outage of the LaCygne-Stilwell circuit. Extensive reconductoring in conjunction with the tie line addition and construction of a new 40.5-mile circuit is necessary to avoid further contingency overloading.

2.2 2004 Winter Peak

The 2004 winter peak period load forecast for Kansas City and the surrounding areas is 3705MW with 2292MW in the KCPL control area. Since the particular unit dispatch at the plant is unknown, the generation at the Customer site was reduced from peak output by a percentage in proportion to the total generation. The total plant output at Customer for the study period is reduced to 374MW. The sink for the Customer generation is shared among the four control areas with 12MW transferred to MIPU, 42MW re-dispatched within the KCPL area, 6MW transferred to KACY and 2MW transferred to INDN. In the KCPL control area, the generation was re-dispatched using specific units. Generation in the surrounding control areas was scaled to reduce the

generation by the amount of the transfer. The generation dispatch and area interchange data for the KCPL control area are listed in Table 4.

The contingency analysis reveals overloading on the area transmission system. For an outage of the LaCygne-W. Gardner line, the LaCygne-Stilwell 345kV circuit is loaded to 105% of the circuit capability due to the generation at Customer.

In the Western Resources control area, pre-existing overloads on the Lawrence-Hill 230/115kV transformer resulting from an outage on the Lawrence Hill-Midland 230kV circuit or the Midland 230/115kV transformer increase by 1% due to the Customer generation additions.

Table 4 – Generation Dispatch and Area Interchange Schedule					
Comparison of base case with generation at Customer for 2004 Winter Peak					
GENERATION DISPATCH			INTERCHANGE		
Plant/Unit	Base	Study	Area	Base	Study
	w/o Customer	w/ Customer			
Hawthorn 5	544	544	SWPA	-5	-5
Hawthorn 6	141	141	MIDW	4	4
Hawthorn 7	77	0	WERE	137	137
Hawthorn 8	77	0	MIPU	5	80
Hawthorn 9	0	0	KACY	-18	16
Montrose #1	100	100	EMDE	80	80
Montrose #2	0	0	INDN	90	98
Montrose #3	121	93	SPRM	50	50
LaCygne#1	688	650	AECI	0	0
LaCygne#2	674	674	CWL	0	0
Iatan#1	670	670	AMRN	0	0
Northeast N.	0	0	NPPD	0	0
Northeast S.	0	0	LES	0	0
Grand Ave	0	0	WAPA	0	0
Gardner	0	0	STJO	121	121
Higginsville	0	0			
Paola	0	0			
Customer	0	374			

In the Missouri Public Service area, overloading occurs on the Harrisonville 161/69kV transformer, which reaches 108% of capability for an outage of the Pleasant Hill 161/69kV transformer. For an outage on the Clinton bus tie, the Warrensburg E. 161/69kV transformer is loaded to 104% of capability.

Proposed Improvements

Additional 345kV facilities are necessary to handle the increased flows resulting from generation additions at Customer. Analysis of the four proposals discussed above indicates that the overloading of EHV can be relieved by a new 345kV circuit out of

LaCygne generating station. This line would provide a new path for the flow of power from LaCygne to load areas in the KCPL territory. The significant 345kV contingency is included in table 5 with the analysis results of the four system improvement proposals.

The Hart plan does alleviate the overloads on the Lawrence Hill transformer and the Warrensburg transformer slightly, while the overloads of the Harrisonville transformer increase by 4%. The new transformer at Hart also reaches 113% of rated capacity for an outage of the LaCygne-Stilwell 345kV line. A second transformer would be necessary to remove this constraint.

The Raymore option eliminates the LaCygne-Stilwell overloads and reduces the existing contingency overloads of the Lawrence Hill transformer by 1%. It has little impact on the Harrisonville transformer and Warrensburg transformer overload conditions.

Table 5 - 2004 winter peak – Significant 345kV overloaded facilities

Normal and contingency flows for four improvement proposals

Monitored line----normal -----contingency	Base Case w/o Cusmr.	Analysis Base Case w/ Custmr.	Hart/ Archie	Raymore	LaCygne- Stilwell#2	LaCygne- W. Gardner
LaCygne-Stilwell(normal)	793	920	736	596	566	836
LaCygne-W. Gardner out	na	1381	-	-	-	-

The additional LaCygne-Stilwell #2 circuit removes the LaCygne-Stilwell constraint, but the overloads on the Lawrence Hill transformer increase by 2%. The effect of this new circuit on the Harrisonville and Warrensburg transformers is negligible.

A new LaCygne-W. Gardner line eliminates the contingency overloading of the LaCygne-Stilwell circuit. The contingency overloading of the Lawrence Hill transformer is reduced slightly and the overloads on the Harrisonville and the Warrensburg transformers does not change significantly.

2.3 2006 Summer Peak

During the 2006 summer peak period, the load forecast for the KCPL and surrounding control areas is forecast to be 5924MW of which 3623 is within the KCPL control area. The generation dispatch at Customer for the 2006 Summer Peak period is 552MW. Of this amount, 348MW will be retained internal to the KCPL control area offset by generation re-dispatch of KCPL facilities. The adjacent control areas offset the remainder of the generation through area transfers and include 132MW to the MIPU area, 50MW to the KACY control area, and 22MW to the INDN control area. These

amounts are added to the existing transfers that are planned for the study period. The generation dispatch and area interchange schedule is listed in Table 6.

Numerous constraints are identified in the contingency analysis in the KCPL and surrounding areas. Appendix C contains the detailed contingency data for the base case and study cases.

Table 6 – Generation Dispatch and Area Interchange Schedule

Comparison of base case with generation at Customer for 2006 Summer Peak

GENERATION DISPATCH			INTERCHANGE		
Plant/Unit	Base	Study	Area	Base	Study
	w/o Customer	w/ Customer			
Hawthorn 5	544	544	SWPA	-5	-5
Hawthorn 6	141	125	MIDW	4	4
Hawthorn 7	77	0	WERE	141	141
Hawthorn 8	50	0	MIPU	7	139
Hawthorn 9	139	122	KACY	-18	32
Montrose #1	170	170	EMDE	80	80
Montrose #2	164	0	INDN	90	112
Montrose #3	158	156	SPRM	50	50
LaCygne#1	688	688	AECI	-150	-150
LaCygne#2	674	674	CWL	0	0
Iatan#1	670	670	AMRN	0	0
Northeast N.	0	0	NPPD	0	0
Northeast S.	0	0	LES	0	0
Grand Ave	0	0	WAPA	0	0
Gardner	3	3	STJO	121	121
Higginsville	34	34			
Paola	500	500			
Customer	0	552			

An outage of the W. Gardner-Craig 345kV line causes overloading of the LaCygne-Stilwell 345kV circuit (116%) and the W. Gardner 345/161kV transformer (113%). Overloaded 161kV facilities include the W. Gardner-Moonlight (144%), Stilwell-Redel(107%), Murlen-Olathe(111%), and Moonlight-Murlen(128%) circuits. Loss of the LaCygne-W. Gardner line increases overloading of the LaCygne-Stilwell 345kV circuit to 143% and cause the Stilwell #11345/161kV transformer loading to reach 101% of capability. An outage of the LaCygne-W Gardner 345kV circuit causes the LaCygne-Stilwell line to reach 110% of capability. Loss of the LaCygne-Stilwell 345kV line results in overload of the W. Gardner-Craig 345kV (107%) and the LaCygne-W. Gardner 345kV (135%), W. Gardner-Moonlight (101%), Stilwell-Bucyrus (102%) and the Bucyrus-Wagstaff (105%) lines.

An outage of the Stilwell #22 transformer increases the overloading of the #11 transformer to 109% of its rating and outage of the Stilwell #11 transformer causes overload of the #22 transformer to 106% of capability. With a loss of the Stilwell-

Pleasant Hill 345kV line, the Stilwell-Redel circuit reaches 110% of capability and the Martin City-Redel circuit reaches 104% of capability.

The loss of the Stilwell-Hickman circuit causes loading of the Stilwell-Redel to reach 114%, the Southtown-Martin City line to reach 102% and the Martin City-Redel line to reach 108% of capability. Outage of the Antioch-Oxford line causes overloading on the Stilwell-Redel and the Martin City-Redel lines of 108% and 101% respectively. Loss of the S. Ottawa-Paola line increases overloads of the Stilwell-Bucyrus line to 106% and the Bucyrus-Wagstaff line to 111% of capability.

With the Stilwell-Antioch line out of service, the Stilwell-Redel and Martin City-Redel line overloads increase to 109% and 103% of capability respectively. Loss of the Southtown-Hickman line causes overloading of the Stilwell-Redel circuit (109%) and the Martin City circuit (102%). An outage of the Oxford-Olathe circuit causes loading of the Stilwell-Redel line to reach 103% of capability.

In the central Kansas City area, overloading conditions exist due to shifts in power flow from the Hawthorn plant to locations west of the plant. Significant re-dispatch of generation from Hawthorn to other generation sources relieves many of the overloads due to the Hawthorn-Chouteau, Hawthorn Randolph, Levee-Northeast, Northeast-Chouteau and Avondale-Randolph lines. For an outage of the Hawthorn-Levee circuit, the Hawthorn-Chouteau line overload increases by 13%, the Hawthorn-Randolph by 6%, and Northeast-Chouteau by 14%, and the Avondale-Randolph line becomes loaded to 103% of capability. For an outage of the Hawthorn-Chouteau circuit, the overload on the Hawthorn-Randolph line decreases by 6%, Levee-Northeast by 9%, and Avondale-Randolph by 6%, but the Hawthorn-Levee line becomes overloaded to 120% of capability. For loss of the Hawthorn-Randolph circuit, the Hawthorn-Chouteau overloaded is reduced by 7%, Levee-Northeast by 8%, and Northeast-Chouteau by 7%, but the Hawthorn-Levee circuit becomes overloaded to 114% of capability. For an outage of the Levee-Northeast circuit the Hawthorn-Chouteau line overload decrease by 8%, Hawthorn-Randolph by 6%, Northeast-Chouteau by 9% and Avondale Randolph by 6% of capability. The overload on the Hawthorn-Randolph line due to the Northeast-N. Kansas City outage is eliminated. For a loss of the Northeast-Chouteau line, the Hawthorn-Randolph line overload is reduced by 6%, Levee-Northeast by 9% and Avondale-Randolph by 6%, but the Hawthorn-Levee line becomes loaded to 119% of capability. For an outage of the Avondale-Randolph line, the Hawthorn-Chouteau overload is reduced by 7%, Levee-Northeast by 2% and Northeast-Chouteau by 7%. However, the Hawthorn-Levee line overloading reaches 119% of capability.

In the Western Resources control area pre-existing overloads are slightly affected by generation additions. The loss of the Hoyt-Stranger Creek 345 Line results in overloads of the Lawrence Hill 230/115kV transformer (102%) and the Midland 161/115kV transformer (109%). An outage of the Lawrence Hill-Midland line or the Midland 230/115kV transformer causes overloads of the Lawrence Hill 230/115kV transformer (131%). With an outage of the Lawrence Hill 230/115kV transformer, the Midland

transformer becomes overloaded (117%). Loss of the Stranger Creek 345/161kV transformer results in overloading of the Lawrence Hill 230/115kV transformer (102%).

In the Missouri Public Service control area, the new generation has limited impact on the overloaded facilities. The loss of the Longview-K.C. South circuit increases the overloading of the Prairie Lee-Blue Springs circuit (109%). Overloading increases slightly on the Martin City 161/69kV transformer for an outage on the Pleasant Hill 161/69kV or Longview 161/69kV transformer. With the Longview-Hook Rd, the Pleasant Hill-Lake Winnebago, or the Lake Winnebago-Hook Rd line open, the Stilwell-Redel circuit and the Martin City-Redel circuit experience overloading. Loss of the Pleasant Hill-Sibley 345kV circuit causes the loading of the Stilwell-Redel line to reach 103% of capability and the Pleasant Hill 345/161kV transformer to reach 102% of capability. An outage of the Pleasant Hill 345/161kV transformer in the Missouri Public Service area results in overloading of the Stilwell-Redel (111%) and Martin City-Redel (105%) lines. With the Frost Road-K.C. South line open, the Prairie Lee-Blue Springs circuit reaches 103% of capability.

Proposed Improvements

The contingency analysis reveals a number of constraints that exist prior to the addition of generation at Customer. Some of these overloads in the Hawthorn area are reduced in part by re-dispatch of generation from the Hawthorn plant to the Customer generation. However, for the generation dispatch discussed in the study, the facilities remain overloaded and several additional overloads result from the new generation. Further generation re-dispatch from Hawthorn is necessary to eliminate the overloading conditions in the Hawthorn area during contingency event. In lieu of generation re-dispatch, a proposed Blue Valley-Crosstown line will reduce the contingency overloads that exist in the Hawthorn area.

The four proposed system improvements offer relief for the 345kV system overloads that occur during contingency events. With the additional circuit from LaCygne, power flow is re-directed to this alternate path under EHV contingency situations. The 345kV contingencies are summarized in Table 7 below. The data is provided for the facilities that are overloaded for the study cases, which include the four proposed improvements.

The Hart/Archie plan provides a 345kV/161kV delivery point for power flow from LaCygne to the Stilwell-Archie 161kV circuit. However, two transformers are necessary at Hart to avoid overloading of the equipment and to relieve overloads on the LaCygne-Stilwell circuit for an outage of the LaCygne-W. Gardner line. Circuit reconductoring of the Stilwell-Redel-Martin City, W. Gardner-Moonlight-Murlen, the Bucyrus-Wagstaff, Oxford-Olathe, and Hart-Archie lines is necessary to eliminate the overloading for contingency events. Equipment upgrades are necessary to increase the capability of the Southtown-Martin City and Southtown-Hickman and Stilwell-Bucyrus lines.

Table 7 - 2006 summer peak - Significant 345kV overloaded facilities
 Normal and contingency flows for four improvement proposals

Monitored line----normal -----contingency	Base Case W/o CUSTMR.	No Changes	Hart/ Archie	Raymore	LaCygne- Stilwell#2	LaCygne- W. Gardner
LaCygne-Stilwell(normal)	749	940	731	643	576	831
W. Gardner-LaCygne out	1202	1272	na	na	na	na
W. Gardner -Craig out	-	1250	-	-	-	1258
LaCygne-W Gardner out	-	1204	-	-	-	-
W.Gardner-LaCygne(normal)	660	na	na	na	na	na
LaCygne-Stilwell out	1102	na	na	na	na	na
W. Gardner-Craig (normal)	515	720	641	582	635	859
LaCygne-Stilwell out	-	1179	-	-	-	1309
Craig transformer #33 (normal)	239	275	259	246	259	297
Craig transformer #11 out	-	-	-	-	-	414
Craig transformer #22 out	-	-	-	-	-	413
LaCygne-W. Gardner(normal)	na	907	804	755	813	671
Lacygne-Stilwell out	na	1483	1104	-	-	-
Stilwell transformer #11 (normal)	367	396	327	353	447	366
LaCygne-W. Gardner out	na	553	-	-	602	-
Stilwell transformer #22 out	-	602	-	-	674	554

The Raymore proposal provides a 345/161kV tie on the Montrose-Loma Vista 161kV lines via a single transformer and a tie from a new 345kV circuit from LaCygne to the Stilwell-Pleasant Hill 345kV circuit. This arrangement allows a portion the power generated at LaCygne and Customer to flow into the 161kV system, bypassing the Stilwell station and utilizing existing 161kV facilities. Reconductoring of the Stilwell-Redel, W. Gardner-Moonlight-Murlen, Olathe-Oxford and Bucyrus-Wagstaff lines is required to relieve the overloading of these facilities. Equipment upgrades are necessary on the Stilwell-Bucyrus, Bunker Ridge-Southtown and Raymore-Loma Vista circuits to eliminate the overloads.

The construction of a LaCygne-Stilwell #2 circuit provides a parallel path for power flow from LaCygne generation to the 161kV system at Stilwell. Because the stronger source causes contingency overloading on the Stilwell transformers, a third transformer

would be required to alleviate overloading of the existing equipment. Reconductoring would be required on the Stilwell-Redel-Martin City line, the Bucyrus-Wagstaff line, the W. Gardner-Moonlight-Murlen line and the Oxford-Olathe line. Equipment upgrades are necessary to relieve the contingency overloads on the Stilwell-Bucyrus, Southtown-Hickman and Southtown-Martin City circuits.

The addition of a LaCygne-W. Gardner circuit strengthens the source into the W. Gardner area. The effect of this new path for power flow causes contingency overloading of the W. Gardner 345/161kV transformer #11 at 120% of capability for loss of the W. Gardner-Craig circuit. An outage of the W. Gardner-Craig circuit causes overloading of the LaCygne-Stilwell 345kV circuit. Furthermore, contingency overloading occurs on the Stilwell-Redel, Murlen-Olathe, and Moonlight-Murlen 161kV circuits. Additional overloading occurs on the W. Gardner Craig 345kV circuit, the W. Gardner Moonlight, Craig-Lenexa, and the Bucyrus-Wagstaff 161kV lines for loss of the LaCygne-Stilwell 345kV line outage. The Craig transformer #33, the Craig-Lenexa line and the Merram-Roe Park circuits experience contingency overloads with the construction of the new line. In addition, the Stilwell-Redel and Martin City-Redel circuits are loaded beyond capability and require reconductoring to relieve the overloads on these lines.

2.4 Short Circuit Analysis

Short circuit analysis was performed to determine if bus fault currents exceed the interrupting ratings of circuit breakers on the system. The newly proposed Customer facilities were included in the study to determine the effects of the added generation on the system fault levels. The study revealed that the additional generation does not significantly impact the fault current levels, and no equipment upgrades or replacements are necessary as a result of the added generation and system improvements.

2.5 Transient Stability Analysis

A transient stability analysis was performed to determine if the proposed Customer Units in addition to the KCPL and nearby units remained stable during selected system disturbances. The study found that all generators in the area remained stable for the studied fault cases as specified in the present planning standards. The results of this study can be found in a separate report titled "Transient Stability Study for Kansas City Power & Light Service Territory."

3. Interconnection Facilities

3.1 Overview

The proposed Customer plant is to be interconnected with the 345kV transmission system. KCPL will construct a 345kV switchyard adjacent to the plant to provide the interface. The switching facility will consist of a three circuit breaker scheme in a ring bus configuration with line terminals and associated equipment. The switching facility will include metering, protection and SCADA systems. Customer will construct and own the generating plant and maintain the equipment including the 345kV high-side transformer disconnects at the ownership boundary. Customer will also provide the property and initial site preparation for the construction of the switching facility. KCPL will retain ownership and operating authority of the 345kV switchyard up to the high-side transformer disconnects.

The design and construction of the switching station will meet all KCPL specifications. Support structures and line terminal equipment will be designed to terminate the 2-954MCM ACSR conductors on the 345kV circuit. Bus work and disconnect switches will be designed to accommodate the loading requirements, and circuit breakers will be rated to ensure adequate load and fault interrupting capability. Metering equipment will be installed to monitor the plant output and will meet the required accuracy specifications.

Construction will be complete and facilities operational by January 2003. Customer will bear the costs of the design and construction of the switching station and will ensure that the interface equipment is constructed in accordance with design specifications provided to KCPL. The estimated cost of the interconnection facility is \$3,472,000.

3.2 Discussion

3.2.1 Project Components

- i) Property: The property for the switching station will be procured by Customer
- ii) Site: Customer will perform site evaluation and preparation.
- iii) Bus design: The bus consists of three 345kV circuit breakers in a ring bus configuration, two line terminals and three generator interface positions.
- iv) Control House: A control house will be installed to contain relay, metering and communications equipment and battery power supply.
- v) Yard: The 345kV switchyard will be enclosed by a chain-link perimeter fence with crushed stone surface.

- vi) Ground grid: A ground grid will be installed to provide adequate station equipment grounding.
- vii) Protection: Relaying will be provided for line and bus protection.
- viii) Metering: Bi-Directional metering equipment will be installed to monitor plant output and off-line auxiliary load.
- ix) GSU terminal switch: Customer will install three disconnect switches at the plant interface to the switchyard. KCPL will provide transmission connections to these three disconnect switches.

3.2.2 Project Cost Estimate

An itemized cost estimate is listed in Table 8 below and includes only work associated with the transmission interconnection at the plant site based on the information provided by the requestor. The estimated total cost for the project is \$3,472,000.

Table 8 – Summary of Estimated Project Component Costs

Item	Description	Cost
1	Site Preparation	\$347,432
2	Grounding	\$119,052
3	Manholes & Conduits	\$107,900
4	Cable Trough & Conduits	\$104,644
5	Control House & Equipment	\$168,883
6	Circuit Breakers	\$911,336
7	Disconnect Switches	\$566,605
8	Coupling Cap. Pot. Transformer	\$116,661
9	Line Traps	\$66,136
10	Deadends	\$55,628
11	Lightning Arrestors	\$47,278
12	Line Panels	\$186,870
13	Bus Supports	\$198,306
14	Lightning Mast	\$17,682
15	Bus work	\$257,544
16	Transmission Line Work	\$200,000
	Total Project Cost	\$3,471,957

3.2.3 Project Schedule

The construction of the interconnection facilities is estimated to be complete in 14 months with a service date of January 1, 2003. A general schedule of work is included in Table 9 with estimated dates for each phase of the project.

Table 9 – Project Schedule			
Task	Description of Work	Start	End
1	Evaluation and approvals	11/5/01	11/23/01
2	Initial engineering	11/26/01	1/18/01
3	Materials ordering & procurement	12/17/01	8/9/02
4	Final engineering & design	4/15/02	5/31/02
5	Foundation, structural work	6/10/02	7/26/02
6	Transmission line & terminal work	7/8/02	8/23/02
7	Equipment, relay, metering installation	7/15/02	12/06/02
8	Testing and inspection	12/9/02	12/31/03
	Total Project Completion	11/5/01	12/31/03

4. Summary

This study was requested by Customer to investigate the impact of adding 552MW generation to be located in KCPL Control Area. The analysis was performed to examine the effect of the added generation on single contingencies that result in overloading of facilities within Kansas City and the surrounding areas.

The analysis shows numerous loading problems in the Kansas City area for each of the three study years. Extensive 161kV facility upgrades in addition to new line construction are required to eliminate the overloading that occurs in the 2004 summer peak study. The additional generation causes overloading on several 345kV facilities including the LaCygne-Stilwell 345kV line, LaCygne-W.Gardner 345kV line, W. Gardner-Craig 345kV line and the W. Gardner 345/161kV transformer. Overloading on the 161kV system occurs on numerous facilities including the W. Gardner-Moonlight-Murlen, Southtown-Martin City and Oxford-Olathe circuits. Further contingency overloading occurs in 2006 on the Stilwell 345/161kV transformers, Stilwell-Redel 161kV, Stilwell-Bucyrus, Martin City-Redel and Bucyrus-Wagstaff circuits. Equipment upgrades and circuit reconductoring are necessary to eliminate the overloading.

The contingency overloads out of the Hawthorn plant can be eliminated by the construction of a new 161kV circuit in the area. Initial study suggests that a line from Hawthorn to Northeast substation or from Blue Valley to Crosstown substation can remove the constraints in that area. This pre-existing constraint is impacted by the generation re-dispatch at Hawthorn in response to any new generation added to the KCPL system.

With 552MW of Customer generation connected to the 345kV system, the circuit loading problems out of LaCygne and W. Gardner become severe during contingency events. For an outage event on the LaCygne-Stilwell, LaCygne-W.Gardner circuit, the large amount of power generated by the LaCygne and Customer plants is forced to flow on the remaining lines. The Wolf Creek-LaCygne and LaCygne-Neosho circuits participate very little in the redistribution of the contingency flows from LaCygne. The remaining LaCygne-WGardner line and the LaCygne-Stilwell line respond significantly to outages on the 345kV transmission system. The studies indicate that the construction of a 345kV circuit from the LaCygne generating station into the Kansas City area will alleviate the contingency overloads on the existing 345kV circuits.

While the construction of either a second LaCygne-Stilwell circuit or a LaCygne-W. Gardner line would provide another path for power flow from the LaCygne plant, the effect of adding these facilities tends to create contingency overloads at the Stilwell or W. Gardner delivery points. Similarly, the Hart/Archie option causes overloading of other facilities on the 161kV system and two 345/161kV transformers would be required at the Hart site to deliver power from the new circuit.

The addition of a 345kV line from LaCygne to the new 345/161kV Raymore substation on the Stilwell-Pleasant Hill 345kV circuit with ties to the Montrose-Loma Vista 161kV circuits provides the most effective solution to the contingency overloads.

Other circuit construction options proposed in this report may provide relief of the EHV problems but tend to worsen 161kV overloading or require additional transformer installations. The additional circuit from LaCygne enhances the reliability of the system and removes 345kV transmission constraints associated with the Customer and LaCygne generation. Further benefits of implementing the Raymore option include a new 345/161kV delivery point that would take advantage of presently under-utilized 161kV transmission facilities on the Montrose-Loma Vista circuits. This plan would significantly improve the power transfer to the load centers in the Kansas City area and reduce the contingency overloading of the 161kV transmission paths out of the Stilwell station.

Interconnection with the 345kV transmission system at the Customer plant requires the construction of 345kV switching facility at the plant site. The estimated cost of the facility is \$3,472,000. A summary of proposed system improvements necessary to implement the recommendations resulting from the Raymore plan is included in Table 10 below. General cost estimates are included for project components that are necessary in the years 2004 and 2006 to provide adequate transmission capacity and ensure system reliability. The estimated total cost of system improvements associated with the Raymore proposal is \$37,851,000.

Table 10 – System improvements necessary for the Raymore proposal		
Cost estimates for system improvements to be implemented in 2004 and 2006		
	2004	2006
Raymore 345kV Substation (incl. 345/161kV transformer)	\$ 9,592,000	-
LaCygne-Raymore 345kV Circuit (38.0 mi.)	\$ 19,000,000	-
LaCygne Substation 345kV Terminal	\$ 1,579,000	-
Oxford-Olathe circuit reconductor (4.4 mi.)	\$ 1,320,000	
W. Gardner-Moonlight 161kV circuit reconductor (5.8 mi.)	\$ 1,740,000	-
Moonlight-Murlen 161kV circuit reconductor (10.7 mi.)	-	\$ 3,210,000
Raymore-Loma Vista 161kV circuits equipment upgrade (wave trap/CT's)	-	\$ 75,000
Stilwell-Redel 161kV circuit reconductor (4.4 mi.)	-	\$ 1,320,000
Bunker Ridge-Southtown line equipment upgrade (wave trap)	-	\$ 15,000
Total	\$ 37,851,000	

Additional generation on the 345kV system places further constraints on the transmission capacity in the Kansas City area. The construction of new 345kV transmission facilities is necessary to eliminate these constraints and improve reliability.

The recommended improvements require a significant investment of capital but offer the most effective and economical means of achieving the performance required by the present operating standards.

Appendix A

Summer 2004

1. Contingency Analysis Data

Table A-1 Base case vs. Customer study w/o fixes

Table A-2 Base case vs. Customer study w/ fixes

Table A-3 Base case vs. Customer study w/Raymore

Table A-4 Base case vs. Customer study w/LaCygne-Stilwell #2

Table A-5 Base case vs. Customer study w/LaCygne-W. Gardner #2

Branch Violations

Table A-1 Base case vs Customer study w/o fixes

*** MUST 4.00 *** TUE, DEC 19 2000 12:14 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 3:49:14 PM
 end: 4:10:28 PM
 elapsed: 0:21:14

Notes:

Base case vs Initial Customer Study containing no system improvements

*****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
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	296.0	105.7	245.0	296.3	105.8
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	287.7	102.8	244.0	292.1	104.3
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	288.7	103.1	245.0	288.9	103.2
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	355.2	126.9	244.0	363.6	129.8
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	793.0	1230.2	111.9	946.0		
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	156.0	283.3	126.5	145.0		
57968 STILWEL7 345 57981 LACYGNE7 345 1	57965 W.GRDNR7 345 57981 LACYGNE7 345 1 LN	1099.0	634.0	1099.4	100.0			
	57965 W.GRDNR7 345 57977 CRAIG 7 345 1 LN	1099.0	459.0			657.0	1113.0	101.3
	57965 W.GRDNR7 345 58105 LACYGNE 345 1 LN	1099.0				870.0	1444.2	131.4
	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	174.0	112.0			124.0	198.0	113.8
57973 HAWTH N5 161 58011 CHOUTEU5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	309.5	105.6	261.0	317.3	108.3
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	328.2	112.0	240.0	351.3	119.9
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			240.0	351.0	119.8
	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0			237.0	296.8	101.3
57973 HAWTH N5 161 58027 RANDLPH5 161 1	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	297.8	101.6	227.0	314.9	107.5
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	318.7	108.8	240.0	335.3	114.4
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			240.0	335.1	114.4
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0			217.0	307.0	104.8
57976 LEVEE 5 161 57985 NEAST N5 161 1	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	317.5	108.3	227.0	340.6	116.2
	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	315.6	107.7	261.0	323.4	110.4
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0	309.7	105.7	217.0	332.7	113.5
	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0	295.3	100.8	237.0	302.9	103.4

57985	NEAST N5	161	58018	NKANCTY5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	259.0	300.1	102.4	261.0					
57986	NEAST S5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	259.0	307.4	104.9	261.0	315.2	107.6			
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	227.0	324.2	110.6	240.0	347.2	118.5		
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	71.0			240.0	347.0	118.4		
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	236.0			237.0	294.7	100.6			
58015	AVONDAL5	161	58027	RANDLPH5	161	1	57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	227.0	310.8	106.1	240.0	327.4	111.7		
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	71.0			240.0	327.2	111.7		
							57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	212.0			227.0	307.6	105.0			
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	203.0			217.0	299.7	102.3			
59220	FROSTRD5	161	59245	KCSOUTH5	161	1	59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	239.1	107.2	179.0	249.6	111.9	
							59205	BLSPE	5	161	59211	BLSPS	5	161	1	LN	223.0	151.0			157.0	228.7	102.5	
59224	LNGVW	5	161	59245	KCSOUTH5	161	1	59205	BLSPE	5	161	59211	BLSPS	5	161	1	LN	223.0	151.0	230.3	103.3	157.0	240.8	108.0
							59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	251.4	112.7	179.0	261.9	117.5	
56791	LAWHILL6	230	56945	LWRNCHL3	115	1	56793	MIDLAND6	230	56946	MIDLAND3	115	1	TR	280.0	169.0	316.1	112.9	174.0	324.0	115.7			
56793	MIDLAND6	230	56946	MIDLAND3	115	1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	239.0	355.3	126.9	244.0	363.6	129.9			
59208	NEVADA	5	161	59308	NEVADA	269.0	1	59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	30.0	57.2	114.3	30.0	58.3	116.6	
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	34.0	58.6	117.3	34.0	59.0	118.0	
59209	SEDALIA5	161	59272	SEDS	269.0	1	59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	33.0	51.5	103.0	33.0	51.8	103.6			
59225	PHILL	5	161	59280	PHILL	269.0	1	59239	HSNVL	5	161	59295	HSNVL	269.0	1	TR	50.0	38.0	55.4	110.7	39.0	57.5	115.1	
59242	CLINTON5	161	59303	CLINTON	269.0	1	59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	35.0	55.7	111.4	35.0	56.1	112.2			
59242	CLINTON5	161	59303	CLINTON	269.0	2	59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	36.0	56.3	112.7	36.0	56.7	113.4			
59242	CLINTON5	161	96071	5CLINTN	161	1	59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	45.0	71.0	142.0	44.0	71.0	142.0		
56752	HOYT	7	345	56758	STRANGR7	345	1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	239.0			244.0	282.6	100.9		
57965	W.GRDNR7	345	57977	CRAIG	7	345	1	57965	W.GRDNR7	345	57966	WGARDNR5	161	11	TR	400.0	179.0			216.0	455.3	113.8		
							57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	160.0			188.0	368.5	125.8		
							57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	793.0			946.0	1250.7	113.8			
							58043	MURLEN	5	161	58044	MOONLT	5	161	1	LN	293.0	123.0			151.0	333.5	113.8	
57965	W.GRDNR7	345	58105	LACYGNE	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	793.0			946.0	1558.2	141.8			
							57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	154.0			160.0	235.6	105.2			
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	156.0			145.0	320.7	143.2		

KCPL Transmission Planning

System Impact Study – Customer Power Co.

57969	STILWEL5	161	57994	HICKMAN5	161	1	57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	154.0	160.0	225.2	100.5	
57973	HAWTH N5	161	57976	LEVEE	5	161	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	212.0	227.0	340.5	116.2	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	259.0	261.0	323.4	110.4	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	203.0	217.0	332.6	113.5	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	236.0	237.0	302.8	103.4	
57981	LACYGNE7	345	58105	WGARDNER	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	793.0	946.0	1185.8	107.9	
59200	PHILL	7	59201	SIBLEY	7	345	59206	PRALEE	5	59211	BLSPS	5	161	1	LN	223.0	173.0	179.0	226.8	101.7
59219	RAYTOWN5	161	59220	FROSTRD5	161	1	59206	PRALEE	5	59211	BLSPS	5	161	1	LN	223.0	173.0	179.0	226.0	101.4

Branch Violations

Table A-2 Base case vs. Customer study w/ Hart/Archie 345kV addition

*** MUST 4.00 *** TUE, DEC 19 2000 12:14 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 3:49:18 PM
 end: 4:12:29 PM
 elapsed: 0:23:11

Notes:

Base case vs Customer study with 345kV system improvements applied. New Hart station with transformer on the Archie-Stilwell 161kV line and 345kV circuit to LaCygne.

*****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
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	296.0	105.7	245.0	296.0	105.7
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	287.7	102.8	241.0	289.3	103.3
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	288.7	103.1	245.0	289.0	103.2
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	355.2	126.9	241.0	359.4	128.3
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	793.0	1230.2	111.9	764.0		
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	156.0	283.3	126.5	173.0		
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	634.0	1099.4	100.0			
57968 STILWEL7 345 57981 LACYGNE7 345 1	58120 HART1 2 161 58121 HART3 345 1 TR	550.0				383.0	626.3	113.9
	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	259.0	309.5	105.6	264.0	321.3	109.6
57973 HAWTH N5 161 58011 CHOUTEU5 161 1	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	328.2	112.0	244.0	357.3	121.9
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			244.0	357.1	121.9
57973 HAWTH N5 161 58027 RANDLPH5 161 1	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0			240.0	300.7	102.6
	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	297.8	101.6	231.0	319.8	109.1
57973 HAWTH N5 161 58027 RANDLPH5 161 1	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	318.7	108.8	244.0	340.5	116.2
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			244.0	340.2	116.1
57973 HAWTH N5 161 58011 CHOUTEU5 161 1	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0			221.0	311.9	106.4
	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	317.5	108.3	231.0	346.4	118.2
57976 LEVEE 5 161 57985 NEAST N5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	315.6	107.7	264.0	327.5	111.8
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0	309.7	105.7	221.0	338.5	115.5
57986 NEAST S5 161 58011 CHOUTEU5 161 1	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0	295.3	100.8	240.0	307.0	104.8
	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	300.1	102.4	264.0	293.5	100.2
57985 NEAST N5 161 58018 NKANCY5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	307.4	104.9	264.0	319.1	108.9

					57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	227.0	324.2	110.6	244.0	353.3	120.6																
					57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	71.0			244.0	353.1	120.5																
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	236.0			240.0	298.6	101.9																	
58015	AVONDAL5	161	58027	RANDLPH5	161	1								57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	227.0	310.8	106.1	244.0	332.6	113.5							
					57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	71.0			244.0	332.4	113.4																
					57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	212.0			231.0	312.4	106.6																	
					57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	203.0			221.0	304.6	104.0																	
59220	FROSTRD5	161	59245	KCSOUTH5	161	1								59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	239.1	107.2	189.0	262.0	117.5						
					59205	BLSPE	5	161	59211	BLSPS	5	161	1	LN	223.0	151.0			167.0	241.1	108.1															
59224	LNGVW	5	161	59245	KCSOUTH5	161	1							59205	BLSPE	5	161	59211	BLSPS	5	161	1	LN	223.0	151.0	230.3	103.3	167.0	253.2	113.6						
					59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	251.4	112.7	189.0	274.2	123.0															
56791	LAWHILL6	230	56945	LWRNCHL3	115	1								56793	MIDLAND6	230	56946	MIDLAND3	115	1	TR	280.0	169.0	316.1	112.9	171.0	320.0	114.3								
56793	MIDLAND6	230	56946	MIDLAND3	115	1								56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	239.0	355.3	126.9	241.0	359.5	128.4								
59208	NEVADA	5	161	59308	NEVADA	269.0	1							59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	30.0	57.2	114.3	30.0	58.9	117.8							
59208	NEVADA	5	161	59308	NEVADA	269.0	2							59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	34.0	58.6	117.3	34.0	59.6	119.2							
59209	SEDALIA5	161	59272	SEDS	269.0	1								59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	33.0	51.5	103.0	33.0	51.7	103.4								
59225	PHILL	5	161	59280	PHILL	269.0	1							59239	HSNVL	5	161	59295	HSNVL	269.0	1	TR	50.0	38.0	55.4	110.7	43.0	61.4	122.9							
59242	CLINTON5	161	59303	CLINTON	269.0	1								59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	35.0	55.7	111.4	36.0	56.4	112.8								
59242	CLINTON5	161	59303	CLINTON	269.0	2								59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	36.0	56.3	112.7	36.0	57.0	114.0								
59242	CLINTON5	161	96071	5CLINTN	161	1								59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	45.0	71.0	142.0	43.0	70.3	140.6							
57965	W.GRDNR7	345	57977	CRAIG	7	345	1							57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	160.0			176.0	327.5	111.8							
					57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	154.0			176.0	224.9	100.4																	
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	156.0			173.0	233.6	104.3																
57965	W.GRDNR7	345	58105	LACYGNE	345	1								57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	793.0			764.0	1173.5	106.8								
					57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	154.0			176.0	246.9	110.2																	
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	156.0			173.0	338.1	150.9																
					58120	HART1	2	161	58121	HART3	345	1	TR	550.0			383.0	555.3	101.0																	
57966	WGARDNR5	161	58044	MOONLT	5	161	1							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	156.0			173.0	225.9	100.8							
57969	STILWEL5	161	57994	HICKMAN5	161	1								57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	154.0			176.0	243.6	108.7								
57973	HAWTH N5	161	57976	LEVEE	5	161	1							57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	212.0			231.0	346.3	118.2								

						57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	259.0		264.0	327.4	111.8	
						57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	203.0		221.0	338.4	115.5	
						58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	236.0		240.0	306.9	104.7	
58062	SALSBRYS	161	58064	NORTON-5	161	1											94.0	126.9	103.1	
						59217	WINDSR	5	161	96071	5CLINTN	161	1	LN	123.0	85.0				
59200	PHILL	7	345	59201	SIBLEY	7	345	1									189.0	236.7	106.2	
						59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0			
59207	ARCHIE	5	161	59240	ADRIAN	5	161	1									343.0	380.9	102.9	
						57995	MONTROS5	161	96071	5CLINTN	161	1	LN	370.0	315.0					
59208	NEVADA	5	161	59216	BUTLER_5	161	1										39.0	58.0	103.6	
						59216	BUTLER_5	161	96689	2BUTLER	69.0	1	TR	56.0	34.0					
59216	BUTLER_5	161	59240	ADRIAN	5	161	1										343.0	376.8	101.8	
						57995	MONTROS5	161	96071	5CLINTN	161	1	LN	370.0	315.0					
59219	RAYTOWN5	161	59220	FROSTRD5	161	1											189.0	238.0	106.7	
						59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0			
59225	PHILL	5	161	59243	LKWINGB5	161	1										227.0	295.7	100.9	
						57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	197.0				
						59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0			
59243	LKWINGB5	161	59249	HOKRD	5	161	1										189.0	224.3	100.6	
						59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0			
59151	SIBLEY#322.0	59202	SIBLEY	5	161	1											189.0	223.8	100.3	
						59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0			

Branch Violations

Table A-3 Base case vs. Customer study w/ Raymore 345kV addition

*** MUST 4.00 *** MON, DEC 18 2000 13:37 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 8:00:26 AM
 end: 8:05:13 AM
 elapsed: 0:04:47

Notes:

Base case vs Customer study with system improvements applied. Raymore Station Added to the Stilwell-Sibley circuit with 345kV line from LaCygne and 345/161kV transformer on the Montrose-Loma Vista 161kV circuit.

*****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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	296.0	105.7	245.0	295.8	105.7		
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	287.7	102.8	240.0	288.1	102.9		
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	288.7	103.1	245.0	288.7	103.1		
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	355.2	126.9	240.0	356.9	127.5		
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	793.0	1230.2	111.9	618.0				
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	156.0	283.3	126.5	161.0				
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	634.0	1099.4	100.0					
57973 HAWTH N5 161 58011 CHOUTEU5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	309.5	105.6	271.0	329.9	112.6		
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	328.2	112.0	254.0	370.0	126.3		
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			254.0	369.8	126.2		
	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0			248.0	309.4	105.6		
57973 HAWTH N5 161 58027 RANDLPH5 161 1	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	297.8	101.6	240.0	330.0	112.6		
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	318.7	108.8	254.0	351.5	119.9		
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			254.0	351.2	119.9		
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0			230.0	322.2	110.0		
57976 LEVEE 5 161 57985 NEAST N5 161 1	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	317.5	108.3	240.0	358.7	122.4		
	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	315.6	107.7	271.0	336.3	114.8		
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0	309.7	105.7	230.0	350.8	119.7		
	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0	295.3	100.8	248.0	315.9	107.8		
57985 NEAST N5 161 58018 NKANCTY5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	300.1	102.4	271.0	298.1	101.8		
57986 NEAST S5 161 58011 CHOUTEU5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	307.4	104.9	271.0	327.8	111.9		
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	324.2	110.6	254.0	366.0	124.9		

					57973 HAWTH N5 161	57976 LEVEE 5 161 1 LN	293.0	71.0			254.0	365.8	124.8	
					58015 AVONDAL5 161	58027 RANDLPH5 161 1 LN	293.0	236.0			248.0	307.3	104.9	
58015	AVONDAL5	161	58027	RANDLPH5	161 1	57976 LEVEE 5 161	57985 NEAST N5 161 1 LN	293.0	227.0	310.8	106.1	254.0	343.6	117.3
					57973 HAWTH N5 161	57976 LEVEE 5 161 1 LN	293.0	71.0			254.0	343.4	117.2	
					57973 HAWTH N5 161	58011 CHOUTEU5 161 1 LN	293.0	212.0			240.0	322.7	110.1	
					57986 NEAST S5 161	58011 CHOUTEU5 161 1 LN	293.0	203.0			230.0	314.9	107.5	
59220	FROSTRD5	161	59245	KCSOUTH5	161 1	59206 PRALEE 5 161	59211 BLSPS 5 161 1 LN	223.0	173.0	239.1	107.2	178.0	247.7	111.1
					59205 BLSPE 5 161	59211 BLSPS 5 161 1 LN	223.0	151.0			157.0	226.8	101.7	
59224	LNGVW	5 161	59245	KCSOUTH5	161 1	59205 BLSPE 5 161	59211 BLSPS 5 161 1 LN	223.0	151.0	230.3	103.3	157.0	238.9	107.1
					59206 PRALEE 5 161	59211 BLSPS 5 161 1 LN	223.0	173.0	251.4	112.7	178.0	260.0	116.6	
56791	LAWHILL6	230	56945	LWRNCHL3	115 1	56793 MIDLAND6 230	56946 MIDLAND3 115 1 TR	280.0	169.0	316.1	112.9	170.0	317.8	113.5
56793	MIDLAND6	230	56946	MIDLAND3	115 1	56791 LAWHILL6 230	56945 LWRNCHL3 115 1 TR	280.0	239.0	355.3	126.9	240.0	357.0	127.5
59208	NEVADA	5 161	59308	NEVADA	269.0 1	59208 NEVADA 5 161	59308 NEVADA 269.0 2 TR	50.0	30.0	57.2	114.3	29.0	56.9	113.8
59208	NEVADA	5 161	59308	NEVADA	269.0 2	59208 NEVADA 5 161	59308 NEVADA 269.0 1 TR	50.0	34.0	58.6	117.3	34.0	58.4	116.7
59209	SEDALIA5	161	59272	SEDS	269.0 1	59209 SEDALIA5 161	59271 SEDN 269.0 1 TR	50.0	33.0	51.5	103.0	33.0	51.7	103.4
59225	PHILL	5 161	59280	PHILL	269.0 1	59239 HSNVL 5 161	59295 HSNVL 269.0 1 TR	50.0	38.0	55.4	110.7	39.0	57.5	114.9
59242	CLINTON5	161	59303	CLINTON	269.0 1	59242 CLINTON5 161	59303 CLINTON269.0 2 TR	50.0	35.0	55.7	111.4	36.0	57.2	114.4
59242	CLINTON5	161	59303	CLINTON	269.0 2	59242 CLINTON5 161	59303 CLINTON269.0 1 TR	50.0	36.0	56.3	112.7	36.0	57.8	115.6
59242	CLINTON5	161	96071	5CLINTN	161 1	59228 WBURGE 5 161	59269 WBURGE 269.0 1 TR	50.0	45.0	71.0	142.0	44.0	71.1	142.3
57965	W.GRDNR7	345	57977	CRAIG	7 345 1	57966 WGARDNR5 161	58044 MOONLT 5 161 1 LN	293.0	160.0			168.0	300.1	102.4
57965	W.GRDNR7	345	58105	LACYGNE	345 1	58036 OLATHEE5 161	58046 OXFORD 5 161 1 LN	224.0	156.0			161.0	300.4	134.1
57973	HAWTH N5	161	57976	LEVEE	5 161 1	57973 HAWTH N5 161	58011 CHOUTEU5 161 1 LN	293.0	212.0			240.0	358.6	122.4
					57973 HAWTH N5 161	58027 RANDLPH5 161 1 LN	293.0	259.0			271.0	336.3	114.8	
					57986 NEAST S5 161	58011 CHOUTEU5 161 1 LN	293.0	203.0			230.0	350.7	119.7	
					58015 AVONDAL5 161	58027 RANDLPH5 161 1 LN	293.0	236.0			248.0	315.8	107.8	
58028	NASHUA-5	161	58029	SHOLCRK5	161 1	57973 HAWTH N5 161	58027 RANDLPH5 161 1 LN	293.0	259.0			271.0	296.6	101.2
58062	SALSBRYS	161	58064	NORTON-5	161 1	59217 WINDSR 5 161	96071 5CLINTN 161 1 LN	123.0	85.0			92.0	124.8	101.5
59200	PHILL	7 345	59201	SIBLEY	7 345 1	59206 PRALEE 5 161	59211 BLSPS 5 161 1 LN	223.0	173.0			178.0	225.7	101.2

59202	SIBLEY	5	161	59215	HLLMRK	5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	259.0	271.0	296.4	101.2
59207	ARCHIE	5	161	59240	ADRIAN	5	161	1	57995	MONTROS5	161	96071	5CLINTN	161	1	LN	370.0	315.0	348.0	380.0	102.7
59216	BUTLER_5	161	59240	ADRIAN	5	161	1	57995	MONTROS5	161	96071	5CLINTN	161	1	LN	370.0	315.0	348.0	375.8	101.6	
59219	RAYTOWN5	161	59220	FROSTRD5	161	1	59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	178.0	224.4	100.6

Branch Violations

Table A-4 Base case vs. Customer study w/ LaCygne-Stilwell #2 345kV circuit addition.

*** MUST 4.00 *** TUE, DEC 19 2000 8:29 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 10:14:01 AM
 end: 10:42:08 AM
 elapsed: 0:28:07

Notes:

Base case vs Customer study with 345kV system improvements applied. New LaCygne-Stilwell #2 345kV circuit.

*****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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	296.0	105.7	244.0	295.7	105.6		
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	287.7	102.8	245.0	294.0	105.0		
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	288.7	103.1	244.0	287.6	102.7		
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	355.2	126.9	245.0	365.7	130.6		
	57965 W.GRDNR7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	793.0	1230.2	111.9	580.0			
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	156.0	283.3	126.5	179.0				
	57968 STILWEL7 345 57981 LACYGNE7 345 1	57965 W.GRDNR7 345 57981 LACYGNE7 345 1 LN	1099.0	634.0	1099.4	100.0				
57973 HAWTH N5 161 58011 CHOUTEU5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	309.5	105.6	264.0	320.9	109.5		
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	328.2	112.0	244.0	357.0	121.8		
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			245.0	356.8	121.8		
	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0			240.0	300.4	102.5		
57973 HAWTH N5 161 58027 RANDLPH5 161 1	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	297.8	101.6	231.0	319.4	109.0		
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	318.7	108.8	244.0	340.1	116.1		
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			245.0	339.9	116.0		
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0			221.0	311.6	106.3		
57976 LEVEE 5 161 57985 NEAST N5 161 1	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	317.5	108.3	231.0	346.1	118.1		
	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	315.6	107.7	264.0	327.1	111.7		
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0	309.7	105.7	221.0	338.2	115.4		
	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0	295.3	100.8	240.0	306.7	104.7		
57985 NEAST N5 161 58018 NKANCTY5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	300.1	102.4	264.0	293.1	100.0		
57986 NEAST S5 161 58011 CHOUTEU5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	307.4	104.9	264.0	318.8	108.8		
	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	324.2	110.6	244.0	353.0	120.5		

					57973 HAWTH N5 161	57976 LEVEE 5 161 1 LN	293.0	71.0			245.0	352.7	120.4	
					58015 AVONDAL5 161	58027 RANDLPH5 161 1 LN	293.0	236.0			240.0	298.3	101.8	
58015	AVONDAL5	161	58027	RANDLPH5	161 1	57976 LEVEE 5 161	57985 NEAST N5 161 1 LN	293.0	227.0	310.8	106.1	244.0	332.3	113.4
					57973 HAWTH N5 161	57976 LEVEE 5 161 1 LN	293.0	71.0			245.0	332.1	113.3	
					57973 HAWTH N5 161	58011 CHOUTEU5 161 1 LN	293.0	212.0			231.0	312.1	106.5	
					57986 NEAST S5 161	58011 CHOUTEU5 161 1 LN	293.0	203.0			221.0	304.3	103.9	
59220	FROSTRD5	161	59245	KCSOUTH5	161 1	59206 PRALEE 5 161	59211 BLSPS 5 161 1 LN	223.0	173.0	239.1	107.2	186.0	257.5	115.5
					59205 BLSPE 5 161	59211 BLSPS 5 161 1 LN	223.0	151.0			164.0	236.6	106.1	
59224	LNGVW	5 161	59245	KCSOUTH5	161 1	59205 BLSPE 5 161	59211 BLSPS 5 161 1 LN	223.0	151.0	230.3	103.3	164.0	248.7	111.5
					59206 PRALEE 5 161	59211 BLSPS 5 161 1 LN	223.0	173.0	251.4	112.7	186.0	269.8	121.0	
56791	LAWHILL6	230	56945	LWRNCHL3	115 1	56793 MIDLAND6 230	56946 MIDLAND3 115 1 TR	280.0	169.0	316.1	112.9	175.0	326.3	116.5
56793	MIDLAND6	230	56946	MIDLAND3	115 1	56791 LAWHILL6 230	56945 LWRNCHL3 115 1 TR	280.0	239.0	355.3	126.9	245.0	365.8	130.6
59208	NEVADA	5 161	59308	NEVADA	269.0 1	59208 NEVADA 5 161	59308 NEVADA 269.0 2 TR	50.0	30.0	57.2	114.3	30.0	57.4	114.9
59208	NEVADA	5 161	59308	NEVADA	269.0 2	59208 NEVADA 5 161	59308 NEVADA 269.0 1 TR	50.0	34.0	58.6	117.3	34.0	58.9	117.8
59209	SEDALIA5	161	59272	SEDS	269.0 1	59209 SEDALIA5 161	59271 SEDN 269.0 1 TR	50.0	33.0	51.5	103.0	33.0	51.6	103.1
59225	PHILL	5 161	59280	PHILL	269.0 1	59239 HSNVL 5 161	59295 HSNVL 269.0 1 TR	50.0	38.0	55.4	110.7	39.0	57.7	115.4
59242	CLINTON5	161	59303	CLINTON	269.0 1	59242 CLINTON5 161	59303 CLINTON269.0 2 TR	50.0	35.0	55.7	111.4	35.0	55.8	111.6
59242	CLINTON5	161	59303	CLINTON	269.0 2	59242 CLINTON5 161	59303 CLINTON269.0 1 TR	50.0	36.0	56.3	112.7	36.0	56.4	112.9
59242	CLINTON5	161	96071	5CLINTN	161 1	59228 WBURGE 5 161	59269 WBURGE 269.0 1 TR	50.0	45.0	71.0	142.0	44.0	70.8	141.6
56752	HOYT	7 345	56758	STRANGR7	345 1	56791 LAWHILL6 230	56945 LWRNCHL3 115 1 TR	280.0	239.0			245.0	284.3	101.5
					56807 MIDLAND5 161	56946 MIDLAND3 115 1 TR	167.0	115.0			125.0	168.5	100.9	
57965	W.GRDNR7	345	57977	CRAIG	7 345 1	57966 WGARDNR5 161	58044 MOONLT 5 161 1 LN	293.0	160.0			173.0	316.8	108.1
					58036 OLATHEE5 161	58046 OXFORD 5 161 1 LN	224.0	156.0			179.0	236.6	105.6	
57965	W.GRDNR7	345	58105	LACYGNE	345 1	57968 STILWEL7 345	57969 STILWEL5 161 11 TR	550.0	332.0			404.0	551.7	100.3
					57993 STHTOWN5 161	59210 MARTCTY5 161 1 LN	224.0	154.0			176.0	244.2	109.0	
					58036 OLATHEE5 161	58046 OXFORD 5 161 1 LN	224.0	156.0			179.0	336.8	150.4	
57966	WGARDNR5	161	58044	MOONLT	5 161 1	58036 OLATHEE5 161	58046 OXFORD 5 161 1 LN	224.0	156.0			179.0	229.4	102.4
57968	STILWEL7	345	57969	STILWEL5	161 11	57968 STILWEL7 345	57969 STILWEL5 161 22 TR	550.0	315.0			383.0	594.6	108.1
57968	STILWEL7	345	57969	STILWEL5	161 22	57968 STILWEL7 345	57969 STILWEL5 161 11 TR	550.0	332.0			404.0	609.3	110.8

57968	STILWEL7	345	59200	PHILL	7	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	197.0	238.0	311.1	106.2		
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	178.0	218.0	295.1	100.7		
57969	STILWEL5	161	57994	HICKMAN5	161	1		57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	154.0	176.0	244.3	109.1			
57973	HAWTH N5	161	57976	LEVVEE	5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	212.0	231.0	346.0	118.1			
								57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	259.0	264.0	327.1	111.6			
								57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	203.0	221.0	338.2	115.4			
								58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	236.0	240.0	306.6	104.6			
57993	STHTOWN5	161	57994	HICKMAN5	161	1		57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	154.0	176.0	224.7	100.3			
59200	PHILL	7	345	59201	SIBLEY	7	345	1	59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	186.0	239.0	107.2
59219	RAYTOWN5	161	59220	FROSTRD5	161	1		59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	186.0	234.0	104.9	
59225	PHILL	5	161	59243	LKWINGB5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	197.0	238.0	301.6	102.9		
59243	LKWINGB5	161	59249	HOKKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	197.0	238.0	297.2	101.4		

Branch Violations

Table A-5 Base case vs. Customer study w/ LaCygne-W. Gardner #2 345kV circuit addition.

*** MUST 4.00 *** FRI, JAN 05 2001 7:42 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 10:41:11 AM
 end: 10:45:31 AM
 elapsed: 0:04:20

Notes:

Base case vs Customer study with 345kV system improvements applied. Parallel circuit added for LaCygne-W. Gardner #2 345kV line.

*****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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	296.0	105.7	246.0	295.7	105.6
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	287.7	102.8	239.0	286.1	102.2
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56994 EMANHAT3 115 1 TR	280.0	245.0	288.7	103.1	246.0	289.8	103.5
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	239.0	355.2	126.9	239.0	355.7	127.0
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	793.0	1230.2	111.9	843.0		
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	156.0	283.3	126.5	114.0		
	57965 W.GRDNR7 345 57981 LACYGNE7 345 1 LN	1099.0	634.0	1099.4	100.0			
57968 STILWEL7 345 57981 LACYGNE7 345 1	57965 W.GRDNR7 345 57977 CRAIG 7 345 1 LN	1099.0	459.0			787.0	1239.5	112.8
	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	174.0	112.0			130.0	194.9	112.0
	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	259.0	309.5	105.6	257.0	311.7	106.4
57973 HAWTH N5 161 58011 CHOUTEU5 161 1	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	328.2	112.0	234.0	341.9	116.7
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			234.0	341.7	116.6
	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	297.8	101.6	221.0	307.6	105.0
57976 LEVEE 5 161 57985 NEAST N5 161 1	57976 LEVEE 5 161 57985 NEAST N5 161 1 LN	293.0	227.0	318.7	108.8	234.0	327.4	111.8
	57973 HAWTH N5 161 57976 LEVEE 5 161 1 LN	293.0	71.0			234.0	327.2	111.7
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0			211.0	299.7	102.3
	57973 HAWTH N5 161 58011 CHOUTEU5 161 1 LN	293.0	212.0	317.5	108.3	221.0	331.5	113.2
57973 HAWTH N5 161 58011 CHOUTEU5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	315.6	107.7	257.0	317.6	108.4
	57986 NEAST S5 161 58011 CHOUTEU5 161 1 LN	293.0	203.0	309.7	105.7	211.0	323.7	110.5
	58015 AVONDAL5 161 58027 RANDLPH5 161 1 LN	293.0	236.0	295.3	100.8	234.0	297.1	101.4
	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	300.1	102.4	257.0		
57985 NEAST N5 161 58018 NKANCY5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	259.0	307.4	104.9	257.0	309.6	105.7

					57976	LEVEE	5	161	57985	NEAST	N5	161	1	LN	293.0	227.0	324.2	110.6	234.0	337.9	115.3			
					57973	HAWTH	N5	161	57976	LEVEE	5	161	1	LN	293.0	71.0			234.0	337.7	115.3			
58015	AVONDAL5	161	58027	RANDLPH5	161	1			57976	LEVEE	5	161	1	LN	293.0	227.0	310.8	106.1	234.0	319.6	109.1			
					57973	HAWTH	N5	161	57976	LEVEE	5	161	1	LN	293.0	71.0			234.0	319.4	109.0			
					57973	HAWTH	N5	161	58011	CHOUTEU5	161	1	LN	293.0	212.0				221.0	300.2	102.5			
59220	FROSTRD5	161	59245	KCSOUTH5	161	1			59206	PRALEE	5	161	1	LN	223.0	173.0	239.1	107.2	176.0	246.1	110.4			
					59205	BLSPE	5	161	59211	BLSPS	5	161	1	LN	223.0	151.0			154.0	225.2	101.0			
59224	LNGVW	5	161	59245	KCSOUTH5	161	1		59205	BLSPE	5	161	1	LN	223.0	151.0	230.3	103.3	154.0	237.4	106.4			
					59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	173.0	251.4	112.7	176.0	258.5	115.9			
56791	LAWHILL6	230	56945	LWRNCHL3	115	1			56793	MIDLAND6	230	56946	MIDLAND3	115	1	TR	280.0	169.0	316.1	112.9	170.0	316.6	113.1	
56793	MIDLAND6	230	56946	MIDLAND3	115	1			56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	239.0	355.3	126.9	239.0	355.8	127.1	
59208	NEVADA	5	161	59308	NEVADA	269.0	1		59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	30.0	57.2	114.3	30.0	58.2	116.4
59208	NEVADA	5	161	59308	NEVADA	269.0	2		59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	34.0	58.6	117.3	34.0	58.9	117.8
59209	SEDALIA5	161	59272	SEDS	269.0	1			59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	33.0	51.5	103.0	33.0	51.8	103.5	
59225	PHILL	5	161	59280	PHILL	269.0	1		59239	HSNVL	5	161	59295	HSNVL	269.0	1	TR	50.0	38.0	55.4	110.7	39.0	57.4	114.7
59242	CLINTON5	161	59303	CLINTON	269.0	1			59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	35.0	55.7	111.4	35.0	56.1	112.2	
59242	CLINTON5	161	59303	CLINTON	269.0	2			59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	36.0	56.3	112.7	36.0	56.7	113.4	
59242	CLINTON5	161	96071	5CLINTN	161	1			59228	WBURGE	5	161	59269	WBURGE	269.0	1	TR	50.0	45.0	71.0	142.0	44.0	71.1	142.2
57965	W.GRDNR7	345	57977	CRAIG	7	345	1		57965	W.GRDNR7	345	57966	WGARDNR5	161	11	TR	400.0	179.0			251.0	484.3	121.1	
					57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	160.0				208.0	383.9	131.0			
					57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	793.0					843.0	1235.2	112.4			
					58037	OLATHEW5	161	58043	MURLEN	5	161	1	LN	293.0	80.0				126.0	306.6	104.7			
					58043	MURLEN	5	161	58044	MOONLT	5	161	1	LN	293.0	123.0			169.0	348.9	119.1			
57973	HAWTH	N5	161	57976	LEVEE	5	161	1	57973	HAWTH	N5	161	58011	CHOUTEU5	161	1	LN	293.0	212.0			221.0	331.5	113.1
					57973	HAWTH	N5	161	58027	RANDLPH5	161	1	LN	293.0	259.0				257.0	317.6	108.4			
					57986	NEAST	S5	161	58011	CHOUTEU5	161	1	LN	293.0	203.0				211.0	323.6	110.4			
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	236.0					234.0	297.1	101.4			
57978	CRAIG	5	161	57979	PFLUMM	5	161	1	57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	155.0			228.0	298.3	101.8
57993	STHTOWN5	161	58001	FOREST	5	161	1		58032	MERRIAM5	161	58040	ROEPARK5	161	1	LN	187.0	55.0			95.0	190.8	102.0	

Appendix B

Winter 2004

1. Contingency Analysis Data

Table B-1 Base case vs. Customer study w/o fixes

Table B-2 Base case vs. Customer study w/ fixes

Table B-3 Base case vs. Customer study w/Raymore

Table B-4 Base case vs. Customer study w/LaCygne-Stilwell #2

Table B-5 Base case vs. Customer study w/LaCygne-W. Gardner #2

Branch Violations

Table B-1 Base case vs. Customer study w/ no fixes

*** MUST 4.00 *** TUE, DEC 19 2000 12:47 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 WINTER PEAK SPP-00-86 MIN ATC BASE CASE

start: 3:49:25 PM
 end: 3:52:46 PM
 elapsed: 0:03:21

Notes:

Base case vs Customer study with no fixes applied.

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

Contingency		Monitored Element				Rating	Normal	Base Case Contingency Flow	% of Rating	Normal	Study Case Contingency Flow	% of Rating
56791	LAWHILL6 230 56793 MIDLAND6 230 1	56791	LAWHILL6 230 56945	LWRNCHL3 115 1	TR	280.0	204.0	292.5	104.5	206.0	295.5	105.5
56793	MIDLAND6 230 56946 MIDLAND3 115 1	56791	LAWHILL6 230 56945	LWRNCHL3 115 1	TR	280.0	204.0	292.5	104.5	206.0	295.6	105.6
57965	W.GRDNR7 345 58105 LACYGNE 345 1	57968	STILWEL7 345 57981	LACYGNE7 345 1	LN	1315.0	874.0			920.0	1381.8	105.1
59225	PHILL 5 161 59280 PHILL 269.0 1	59239	HSNVL 5 161 59295	HSNVL 269.0 1	TR	50.0	29.0			32.0	54.1	108.2
59242	CLINTON5 161 96071 5CLINTN 161 1	59228	WBURGE 5 161 59269	WBURGE 269.0 1	TR	50.0	33.0			34.0	52.1	104.3

Branch Violations

Table B-2 Base Case vs. Customer study w/ Hart/Archie 345kV additions

*** MUST 4.00 *** TUE, DEC 19 2000 12:47 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 WINTER PEAK SPP-00-86 MIN ATC BASE CASE

start: 3:49:35 PM
 end: 3:52:56 PM
 elapsed: 0:03:21

Notes:

Base case vs Customer study w/ 345kV system improvements applied. New Hart station and transformer on the Archie-Stilwell line and 345kV LaCygne-Hart line.

*****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
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	204.0	292.5 104.5	203.0 291.3 104.0	
56793 MIDLAND6 230 56946 MIDLAND3 115 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	204.0	292.5 104.5	203.0 291.4 104.1	
57968 STILWEL7 345 57981 LACYGNE7 345 1	58120 HART1 2 161 58121 HART3 345 1 TR	550.0			387.0 622.8 113.2	
59225 PHILL 5 161 59280 PHILL 269.0 1	59239 HSNVL 5 161 59295 HSNVL 269.0 1 TR	50.0	29.0		35.0 56.2 112.4	
59242 CLINTON5 161 96071 5CLINTN 161 1	59228 WBURGE 5 161 59269 WBURGE 269.0 1 TR	50.0	33.0		33.0 51.7 103.3	

Branch Violations

Table B-3 Base Case vs. Customer study w/ Raymore 345kV additions

*** MUST 4.00 *** MON, DEC 18 2000 14:21 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 WINTER PEAK SPP-00-86 MIN ATC BASE CASE

start: 8:34:42 AM
 end: 8:35:10 AM
 elapsed: 0:00:28

Notes:

Base case vs Customer study with 345kV system improvements applied. Raymore Station Added to the Stilwell-Sibley circuit with 345kV line from LaCygne and 345/161kV transformer on the Montrose-Loma Vista 161kV circuit.

*****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
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	204.0	292.5 104.5	202.0	289.6 103.4
56793 MIDLAND6 230 56946 MIDLAND3 115 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	204.0	292.5 104.5	202.0	289.6 103.4
59225 PHILL 5 161 59280 PHILL 269.0 1	59239 HSNVL 5 161 59295 HSNVL 269.0 1 TR	50.0	29.0		32.0	54.2 108.4
59242 CLINTON5 161 96071 5CLINTN 161 1	59228 WBURGE 5 161 59269 WBURGE 269.0 1 TR	50.0	33.0		34.0	52.1 104.3

Branch Violations

Table B-4 Base Case vs. Customer study w/ LaCygne-Stilwell #2 345kV circuit additions

*** MUST 4.00 *** TUE, DEC 19 2000 9:05 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 WINTER PEAK SPP-00-86 MIN ATC BASE CASE

start: 10:14:12 AM
 end: 10:17:21 AM
 elapsed: 0:03:09

Notes:

Base case vs Customer study with 345kV system improvements applied. New LaCygne-Stilwell #2 345kV circuit.

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

Contingency		Monitored Element				Rating	Normal	Base Case Contingency Flow	% of Rating	Normal	Study Case Contingency Flow	% of Rating					
56791	LAWHILL6 230	56793	MIDLAND6 230	1	56791	LAWHILL6 230	56945	LWRNCHL3 115	1	TR	280.0	204.0	292.5	104.5	207.0	297.8	106.3
56793	MIDLAND6 230	56946	MIDLAND3 115	1	56791	LAWHILL6 230	56945	LWRNCHL3 115	1	TR	280.0	204.0	292.5	104.5	207.0	297.8	106.4
59225	PHILL 5 161	59280	PHILL 269.0	1	59239	HSNVL 5 161	59295	HSNVL 269.0	1	TR	50.0	29.0		32.0	54.3	108.7	
59242	CLINTON5 161	96071	5CLINTN 161	1	59228	WBURGE 5 161	59269	WBURGE 269.0	1	TR	50.0	33.0		34.0	51.9	103.8	

Branch Violations

Table B-5 Base Case vs. Customer study w/ LaCygne-W. Gardner #2 345kV circuit additions

*** MUST 4.00 *** FRI, JAN 05 2001 16:00 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2004 WINTER PEAK SPP-00-86 MIN ATC BASE CASE

start: 8:54:18 AM
 end: 8:55:39 AM
 elapsed: 0:01:21

Notes:

Base case vs Customer study with 345kV system improvements applied. Parallel circuit added for LaCygne-W. Gardner #2 345kV line.

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

Contingency		Monitored Element				Rating	Normal	Base Case Contingency Flow	% of Rating	Normal	Study Case Contingency Flow	% of Rating					
56791	LAWHILL6 230	56793	MIDLAND6 230	1	56791	LAWHILL6 230	56945	LWRNCHL3 115	1	TR	280.0	204.0	292.5	104.5	201.0	288.3	103.0
56793	MIDLAND6 230	56946	MIDLAND3 115	1	56791	LAWHILL6 230	56945	LWRNCHL3 115	1	TR	280.0	204.0	292.5	104.5	201.0	288.4	103.0
59225	PHILL 5 161	59280	PHILL 269.0	1	59239	HSNVL 5 161	59295	HSNVL 269.0	1	TR	50.0	29.0			32.0	54.0	108.0
59242	CLINTON5 161	96071	5CLINTN 161	1	59228	WBURGE 5 161	59269	WBURGE 269.0	1	TR	50.0	33.0			34.0	52.2	104.3

Appendix C

Summer 2006

1. Contingency Analysis Data

Table C-1 Base case vs. Customer study w/o fixes

Table C-2 Base case vs. Customer study w/ fixes

Table C-3 Base case vs. Customer study w/Raymore

Table C-4 Base case vs. Customer study w/LaCygne-Stilwell #2

Table C-5 Base case vs. Customer study w/LaCygne-W. Gardner #2

Branch Violations

Table C-1 Base case vs. Customer Study w/o fixes

*** MUST 4.00 *** TUE, DEC 19 2000 13:12 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2006 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 3:49:51 PM
 end: 4:25:31 PM
 elapsed: 0:35:40

Notes:

Base case vs Customer study w/ 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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	499.3	112.0	383.0	500.3	112.2
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	291.2	104.0	244.0	295.0	105.4
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.2	102.8	165.0		
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0			139.0	169.6	101.5
56752 HOYT 7 345 56758 STRANGR7 345 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	282.6	100.9	244.0	286.7	102.4
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0	174.3	104.4	139.0	181.2	108.5
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	226.8	101.3	165.0		
56758 STRANGR7 345 57977 CRAIG 7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.9	103.1	165.0		
56758 STRANGR7 345 59231 STRANGR5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	275.0	294.3	100.5	260.0		
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	456.4	102.3	383.0	457.1	102.5
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	359.1	128.3	244.0	366.2	130.8
57965 W.GRDNR7 345 57977 CRAIG 7 345 1	57966 WGARDNR5 161 58044 MOONLT 5 161 1 LN	293.0	192.0	333.8	113.9	222.0	421.2	143.8
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	232.4	103.7	165.0	231.0	103.1
	57965 W.GRDNR7 345 57966 WGARDNR5 161 11 TR	400.0	153.0			193.0	452.1	113.0
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	749.0			940.0	1272.6	115.8
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			276.0	311.6	106.3
	58037 OLATHEW5 161 58043 MURLEN 5 161 1 LN	293.0	93.0			124.0	325.2	111.0
	58043 MURLEN 5 161 58044 MOONLT 5 161 1 LN	293.0	142.0			171.0	373.5	127.5
	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	293.0	248.0			263.0	312.0	106.5
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	749.0	1202.1	109.4	940.0		
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	320.0	142.9	165.0		
57966 WGARDNR5 161 58044 MOONLT 5 161 1	58036 OLATHEE5 161 58037 OLATHEW5 161 1 LN	334.0	242.0	393.2	117.7	226.0	400.1	119.8
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	242.3	108.2	165.0	230.4	102.9
	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	293.0	248.0			263.0	295.2	100.7

57966	WGARDNR5	161	58077	SRICHLN5	161	1	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	306.7	104.7	263.0	311.7	106.4
57968	STILWEL7	345	57969	STILWEL5	161	22	57968	STILWEL7	345	57969	STILWEL5	161	11	TR		550.0	367.0	557.1	101.3	396.0	602.3	109.5
57968	STILWEL7	345	57981	LACYGNE7	345	1	57965	W.GRDNR7	345	57981	LACYGNE7	345	1	LN	1099.0	660.0	1102.6	100.3				
							58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	307.2	104.9	263.0	338.8	115.6
							57965	W.GRDNR7	345	57977	CRAIG	7	345	1	LN	1099.0	515.0			720.0	1178.6	107.2
							57965	W.GRDNR7	345	58105	LACYGNE	345	1	LN	1099.0				907.0	1482.6	134.9	
							57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	192.0			222.0	295.0	100.7
							57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0			164.0	227.9	101.7	
							58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	LN	293.0	220.0			234.0	306.5	104.6	
							58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0			238.0	312.3	106.6	
57969	STILWEL5	161	57994	HICKMAN5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	306.8	104.7	276.0	334.1	114.0
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	224.6	100.3	165.0		
							57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0			154.0	228.1	101.8	
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			253.0	315.3	107.6
57969	STILWEL5	161	58050	ANTIOCH5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	300.1	102.4	276.0	319.5	109.0
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			253.0	300.7	102.6
57969	STILWEL5	161	58053	REDEL	5	161	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	228.8	102.1	165.0		
57973	HAWTH N5	161	57976	LEVEE	5	161	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	301.9	103.0	227.0	341.8	116.6	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	304.6	104.0	260.0	322.9	110.2	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	294.2	100.4	217.0	333.9	114.0	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0			236.0	302.6	103.3	
57973	HAWTH N5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	334.8	114.3	260.0	316.8	108.1	
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	379.6	129.6	241.0	352.6	120.3
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	314.5	107.4	236.0	296.5	101.2	
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			241.0	352.4	120.3
57973	HAWTH N5	161	58027	RANDLPH5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	335.5	114.5	227.0	314.7	107.4	
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	359.0	122.5	241.0	335.1	114.4
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	327.7	111.8	217.0	306.9	104.7	
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			241.0	334.8	114.3
57976	LEVEE	5	161	57985	NEAST N5	161	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	367.2	125.3	227.0	341.9	116.7	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	341.9	116.7	260.0	323.0	110.2	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	359.5	122.7	217.0	334.1	114.0	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	321.7	109.8	236.0	302.7	103.3	
57978	CRAIG	5	161	58048	COLLEGE5	161	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	233.8	104.4	165.0		
57985	NEAST N5	161	58018	NKANCTY5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	299.1	102.1	260.0			

57986	NEAST S5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	332.7	113.5	260.0	314.7	107.4
							57976	LEVEE 5	161	57985	NEAST N5	161	1	LN	293.0	261.0	375.7	128.2	241.0	348.6	119.0
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	312.5	106.7	236.0	294.5	100.5
							57973	HAWTH N5	161	57976	LEVEE 5	161	1	LN	293.0	129.0			241.0	348.4	118.9
58002	MARTCIT5	161	58053	REDEL 5	161	1	58036	OLATHEE5	161	58046	OXFORD 5	161	1	LN	224.0	186.0	225.6	100.7	165.0		
58015	AVONDAL5	161	58027	RANDLPH5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	328.3	112.1	227.0	307.5	104.9
							57976	LEVEE 5	161	57985	NEAST N5	161	1	LN	293.0	261.0	351.3	119.9	241.0	327.4	111.7
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	320.6	109.4	217.0	299.8	102.3
							57973	HAWTH N5	161	57976	LEVEE 5	161	1	LN	293.0	129.0			241.0	327.2	111.7
58028	NASHUA-5	161	58029	SHOLCRK5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	297.0	101.4	260.0		
58033	BRKRIDG5	161	58047	OVERLPK5	161	1	58036	OLATHEE5	161	58037	OLATHEW5	161	1	LN	334.0	242.0	377.3	113.0	226.0	352.6	105.6
							58036	OLATHEE5	161	58046	OXFORD 5	161	1	LN	224.0	186.0	225.0	100.4	165.0		
58043	MURLEN 5	161	58044	MOONLT 5	161	1	58036	OLATHEE5	161	58037	OLATHEW5	161	1	LN	334.0	242.0	353.0	105.7	226.0	361.2	108.2
							58036	OLATHEE5	161	58046	OXFORD 5	161	1	LN	224.0	186.0	227.7	101.6	165.0		
58046	OXFORD 5	161	58050	ANTIOCH5	161	1	57969	STILWEL5	161	58053	REDEL 5	161	1	LN	293.0	254.0	296.2	101.1	276.0	315.5	107.7
							58002	MARTCIT5	161	58053	REDEL 5	161	1	LN	293.0	231.0			253.0	296.8	101.3
58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	223.5	128.4	78.0	220.6	126.8
58062	SALSBRYS	161	58064	NORTON-5	161	1	59217	WINDSR 5	161	96071	5CLINTN	161	1	LN	123.0	86.0	123.7	100.5	74.0		
58065	CNTRVIL5	161	58069	PAOLA 5	161	1	58067	CENTENL5	161	58069	PAOLA 5	161	1	LN	293.0	248.0	304.3	103.9	263.0	318.0	108.5
58066	S.OTTWA5	161	58069	PAOLA 5	161	1	57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0	240.9	107.6	164.0	237.1	105.9
							58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	LN	293.0	220.0	319.2	109.0	234.0	324.1	110.6
							58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0	325.0	110.9	238.0	329.9	112.6
							58067	CENTENL5	161	58069	PAOLA 5	161	1	LN	293.0	248.0	350.9	119.8	263.0	356.0	121.5
58066	S.OTTWA5	161	58077	SRICHLN5	161	1	58067	CENTENL5	161	58069	PAOLA 5	161	1	LN	293.0	248.0	317.2	108.2	263.0	322.1	109.9
							58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0			238.0	296.4	101.1
58067	CENTENL5	161	58068	WAGSTAF5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	228.1	131.1	78.0	224.4	129.0
58067	CENTENL5	161	58069	PAOLA 5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	244.7	140.6	78.0	241.0	138.5
59202	SIBLEY 5	161	59215	HLLMRK 5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	302.6	103.3	260.0		
59215	HLLMRK 5	161	59247	LBRTYWT5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	293.9	100.3	260.0		
59221	PLTCTY 5	161	59231	STRANGR5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	294.7	100.6	260.0		

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59224	LNGVW	5	161	59245	KCSOUTH5	161	1	59206	PRALEE	5	161	59211	BLSPTS	5	161	1	LN	223.0	146.0	232.2	104.1	153.0	243.5	109.2
59224	LNGVW	5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	308.7	105.4	276.0	330.5	112.8
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.0	103.0	91.0	102.6	102.6
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			253.0	311.6	106.4
59225	PHILL	5	161	59243	LKWINGB5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	318.3	108.6	276.0	340.0	116.0	
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	299.4	102.2	253.0	321.1	109.6
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.8	104.8	91.0	104.5	104.5
59243	LKWINGB5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	313.6	107.0	276.0	335.2	114.4	
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	294.7	100.6	253.0	316.4	108.0
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.9	103.9	91.0	103.5	103.5
56758	STRANGR7	345	56777	STRANG7X			1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	1	TR	280.0	240.0	281.2	100.4	244.0	286.0	102.1	
56788	EMANHAT6	230	56994	EMANHAT3	115	1		56799	MCDOWEL6	230	57002	MCDOWEL3	115	1	1	TR	280.0	159.0	290.4	103.7	160.0	290.8	103.9	
56791	LAWHILL6	230	56945	LWRNCHL3	115	1		56793	MIDLAND6	230	56946	MIDLAND3	115	1	1	TR	280.0	173.0	320.4	114.4	177.0	327.2	116.8	
56793	MIDLAND6	230	56946	MIDLAND3	115	1		56791	LAWHILL6	230	56945	LWRNCHL3	115	1	1	TR	280.0	240.0	359.2	128.3	244.0	366.3	130.8	
59162	PHILL#1	22.0	59225	PHILL	5	161	1	59200	PHILL	7	345	59225	PHILL	5	161	1	TR	400.0	221.0	429.1	107.3	269.0	455.0	113.8
									57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	305.9	104.4
59208	NEVADA	5	161	59308	NEVADA	269.0	1	59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	32.0	62.4	124.8	32.0	62.8	125.6	
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	62.8	125.6	37.0	63.4	126.7	
59209	SEDALIA5	161	59271	SEDN	269.0	1		59209	SEDALIA5	161	59272	SEDS	269.0	1	TR	50.0	30.0	52.1	104.3	30.0	51.7	103.4		
59209	SEDALIA5	161	59272	SEDS	269.0	1		59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	33.0	54.1	108.2	33.0	53.7	107.3		
59210	MARTCTY5	161	59287	MARTCTY	269.0	1		59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	102.4	102.4	91.0	102.2	102.2	
59224	LNGVW	5	161	59282	LNGVW	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0	58.7	117.3	38.0	58.9	117.7		
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.7	104.7	91.0	104.3	104.3
59225	PHILL	5	161	59280	PHILL	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0	57.4	114.8	38.0	57.6	115.1		
59239	HSNVL	5	161	59295	HSNVL	269.0	1	59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	121.2	121.2	91.0	120.4	120.4	
59242	CLINTON5	161	59303	CLINTON	269.0	1		59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	38.0	59.6	119.2	36.0	57.1	114.2		
59242	CLINTON5	161	59303	CLINTON	269.0	2		59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	38.0	60.3	120.6	37.0	57.8	115.5		

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59242	CLINTON5	161	96071	5CLINTN	161	1	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	50.4	100.9	37.0	50.2	100.3		
56805	MARMATN5	161	58065	CNTRVIL5	161	1	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0			263.0	300.5	102.5		
57965	W.GRDNR7	345	58105	LACYGNE	345	1	57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	367.0			396.0	553.1	100.6			
							57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	749.0			940.0	1575.4	143.4			
							57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	312.7	106.7		
							57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0			154.0	233.1	104.0			
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			253.0	293.7	100.3		
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0			165.0	348.4	155.5		
57968	STILWEL7	345	57969	STILWEL5	161	11	57968	STILWEL7	345	57969	STILWEL5	161	22	TR	550.0	348.0			376.0	588.1	106.9			
57968	STILWEL7	345	59200	PHILL	7	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	322.9	110.2	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			253.0	304.2	103.8	
57981	LACYGNE7	345	58105	W GARDNER	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	749.0			940.0	1203.5	109.5			
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0			165.0	238.2	106.3		
57982	IATAN	7	345	69702	ST JOE	3	345	1	56807	MIDLAND5	161	56946	MIDLAND3	115	1	TR	167.0	132.0			139.0	167.1	100.0	
57993	STHTOWN5	161	57994	HICKMAN5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	317.3	108.3		
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			253.0	298.5	101.9		
58036	OLATHEE5	161	58037	OLATHEW5	161	1	57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	192.0			222.0	297.7	101.6		
58036	OLATHEE5	161	58046	OXFORD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	302.8	103.3	
59200	PHILL	7	345	59201	SIBLEY	7	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	302.3	103.2
								59200	PHILL	7	345	59225	PHILL	5	161	1	TR	400.0	221.0			269.0	407.8	102.0
59200	PHILL	7	345	59225	PHILL	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	324.5	110.7
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			253.0	305.7	104.3
59208	NEVADA	5	161	59216	BUTLER_5	161	1	59216	BUTLER_5	161	96689	2BUTLER	69.0	1	TR	56.0	37.0			38.0	56.1	100.2		
59220	FROSTRD5	161	59245	KCSOUTH5	161	1	59206	PRALEE	5	161	59211	BLSPTS	5	161	1	LN	223.0	146.0			153.0	230.3	103.3	
57951	HAW G5	122.0	57973	HAWTH N5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			276.0	294.2	100.4		

Branch Violations

Table C-2 Base case vs. Customer study w/ Hart/Archie 345kV additions

*** MUST 4.00 *** TUE, DEC 19 2000 13:12 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2006 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 3:50:05 PM
 end: 4:26:55 PM
 elapsed: 0:36:50

Notes:

Base case vs Customer Study w/ 345kV system improvements applied. New Hart station and transformer on the Archie-Stilwell 161kV line and LaCygne-Hart 345kV line.

*****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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	499.3	112.0	384.0	499.9	112.1
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	291.2	104.0	241.0	292.2	104.4
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.2	102.8	198.0	243.5	108.7
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			284.0	296.5	101.2
56752 HOYT 7 345 56758 STRANGR7 345 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	282.6	100.9	241.0	283.3	101.2
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0	174.3	104.4	135.0	177.5	106.3
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	226.8	101.3	198.0	239.6	107.0
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			284.0	294.8	100.6
56758 STRANGR7 345 57977 CRAIG 7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.9	103.1	198.0	235.4	105.1
56758 STRANGR7 345 59231 STRANGR5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	275.0	294.3	100.5	263.0		
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	456.4	102.3	384.0	457.2	102.5
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	359.1	128.3	241.0	361.2	129.0
57965 W.GRDNR7 345 57977 CRAIG 7 345 1	57966 WGARDNR5 161 58044 MOONLT 5 161 1 LN	293.0	192.0	333.8	113.9	208.0	374.8	127.9
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	232.4	103.7	198.0	263.9	117.8
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			284.0	315.7	107.7
	57993 STHTOWN5 161 59210 MARTCTY5 161 1 LN	224.0	151.0			171.0	225.0	100.4
	58002 MARTCIT5 161 58053 REDEL 5 161 1 LN	293.0	231.0			260.0	296.8	101.3
	58043 MURLEN 5 161 58044 MOONLT 5 161 1 LN	293.0	142.0			157.0	326.6	111.5
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	749.0	1202.1	109.4	731.0		
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	320.0	142.9	198.0		
57966 WGARDNR5 161 58044 MOONLT 5 161 1	58036 OLATHEE5 161 58037 OLATHEW5 161 1 LN	334.0	242.0	393.2	117.7	240.0		
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	242.3	108.2	198.0	260.6	116.3

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57966	WGARDNR5	161	58077	SRICHLN5	161	1	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	306.7	104.7	244.0	301.0	102.7
							57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0			187.0	230.6	102.9	
57968	STILWEL7	345	57969	STILWEL5	161	22	57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	367.0	557.1	101.3	327.0			
57968	STILWEL7	345	57981	LACYGNE7	345	1	57965	W.GRDNR7	345	57981	LACYGNE7	345	1	LN	1099.0	660.0	1102.6	100.3				
							58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	307.2	104.9	244.0		
							57965	W.GRDNR7	345	58105	LACYGNE	345	1	LN	1099.0				804.0	1104.3	100.5	
							57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0			187.0	234.9	104.9	
							58120	HART1	2	58121	HART3	345	1	TR	550.0				417.0	655.0	119.1	
							59207	ARCHIE	5	58120	HART1	2	161	1	LN	293.0				231.0	300.0	102.4
57969	STILWEL5	161	57994	HICKMAN5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	306.8	104.7	284.0	344.1	117.4
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	224.6	100.3	198.0	241.3	107.7
							57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0			171.0	248.3	110.9	
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			260.0	325.3	111.0
57969	STILWEL5	161	58050	ANTIOCH5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	300.1	102.4	284.0	331.6	113.2
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			260.0	312.8	106.8
57969	STILWEL5	161	58053	REDEL	5	161	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	228.8	102.1	198.0	245.9	109.8
							57993	STHTOWN5	161	57994	HICKMAN5	161	1	LN	224.0	139.0			163.0	226.2	101.0	
57973	HAWTH N5	161	57976	LEVEE	5	161	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	301.9	103.0	232.0	347.8	118.7	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	304.6	104.0	263.0	327.3	111.7	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	294.2	100.4	221.0	340.0	116.0	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0			240.0	307.0	104.8	
57973	HAWTH N5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	334.8	114.3	263.0	321.1	109.6	
							57976	LEVEE	5	57985	NEAST N5	161	1	LN	293.0	261.0	379.6	129.6	245.0	358.9	122.5	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	314.5	107.4	240.0	300.8	102.7	
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	358.6	122.4
57973	HAWTH N5	161	58027	RANDLPH5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	335.5	114.5	232.0	319.7	109.1	
							57976	LEVEE	5	57985	NEAST N5	161	1	LN	293.0	261.0	359.0	122.5	245.0	340.5	116.2	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	327.7	111.8	221.0	312.0	106.5	
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	340.3	116.1
57976	LEVEE	5	57985	NEAST N5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	367.2	125.3	232.0	347.9	118.7	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	341.9	116.7	263.0	327.3	111.7	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	359.5	122.7	221.0	340.1	116.1	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	321.7	109.8	240.0	307.1	104.8	
57978	CRAIG	5	58048	COLLEGE5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	233.8	104.4	198.0	241.2	107.7
57985	NEAST N5	161	58018	NKANCTY5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	299.1	102.1	263.0			

57986	NEAST S5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	332.7	113.5	263.0	319.0	108.9		
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	375.7	128.2	245.0	354.9	121.1	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	312.5	106.7	240.0	298.7	101.9		
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	354.7	121.0	
58002	MARTCIT5	161	58053	REDEL	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	225.6	100.7	198.0	242.7	108.3
58015	AVONDAL5	161	58027	RANDLPH5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	328.3	112.1	232.0	312.6	106.7		
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	351.3	119.9	245.0	332.8	113.6	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	320.6	109.4	221.0	304.8	104.0		
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	332.6	113.5	
58028	NASHUA-5	161	58029	SHOLCRK5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	297.0	101.4	263.0				
58033	BRKRIDG5	161	58047	OVERLPK5	161	1	58036	OLATHEE5	161	58037	OLATHEW5	161	1	LN	334.0	242.0	377.3	113.0	240.0				
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	225.0	100.4	198.0	233.9	104.4	
58043	MURLEN	5	161	58044	MOONLT	5	161	1	58036	OLATHEE5	161	58037	OLATHEW5	161	1	LN	334.0	242.0	353.0	105.7	240.0		
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	227.7	101.6	198.0	245.9	109.8	
58046	OXFORD	5	161	58050	ANTIOCH5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	296.2	101.1	284.0	327.7	111.8
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			260.0	309.0	105.5	
58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	223.5	128.4	88.0	219.3	126.0		
58062	SALSBRYS	161	58064	NORTON-5	161	1	59217	WINDSR	5	161	96071	5CLINTN	161	1	LN	123.0	86.0	123.7	100.5	83.0			
58065	CNTRVIL5	161	58069	PAOLA	5	161	1	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	304.3	103.9	244.0	305.3	104.2
							57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0			187.0	232.7	103.9		
58066	S.OTTWA5	161	58069	PAOLA	5	161	1	57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0	240.9	107.6	187.0	265.9	118.7	
							58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	LN	293.0	220.0	319.2	109.0	215.0	313.6	107.0		
							58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0	325.0	110.9	219.0	319.4	109.0		
							58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	350.9	119.8	244.0	345.5	117.9	
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0			198.0	230.3	102.8	
58066	S.OTTWA5	161	58077	SRICHLN5	161	1	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	317.2	108.2	244.0	311.5	106.3	
							57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0			187.0	238.9	106.7		
58067	CENTENL5	161	58068	WAGSTAF5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	228.1	131.1	88.0	223.1	128.2		
58067	CENTENL5	161	58069	PAOLA	5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	244.7	140.6	88.0	239.7	137.7	
59202	SIBLEY	5	161	59215	HLLMRK	5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	302.6	103.3	263.0		
59215	HLLMRK	5	161	59247	LBRTYWT5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	293.9	100.3	263.0			

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59221	PLTCTY	5	161	59231	STRANGR5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	294.7	100.6	263.0				
59224	LNGVW	5	161	59245	KCSOUTH5	161	1	59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	146.0	232.2	104.1	164.0	256.4	115.0
								59205	BLSPE	5	161	59211	BLSPS	5	161	1	LN	223.0	123.0			141.0	234.0	104.9
59224	LNGVW	5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	308.7	105.4	284.0	340.5	116.2
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.0	103.0	90.0	101.2	101.2
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			260.0	321.6	109.8
59225	PHILL	5	161	59243	LKWINGB5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	318.3	108.6	284.0	350.0	119.5	
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	299.4	102.2	260.0	331.1	113.0
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.8	104.8	90.0	103.1	103.1
59243	LKWINGB5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	313.6	107.0	284.0	345.3	117.9	
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	294.7	100.6	260.0	326.4	111.4
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.9	103.9	90.0	102.2	102.2
56758	STRANGR7	345	56777	STRANG7X			1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	240.0	281.2	100.4	241.0	282.8	101.0		
56788	EMANHAT6	230	56994	EMANHAT3	115	1	56799	MCDOWEL6	230	57002	MCDOWEL3	115	1	TR	280.0	159.0	290.4	103.7	159.0	290.5	103.8			
56791	LAWHILL6	230	56945	LWRNCHL3	115	1	56793	MIDLAND6	230	56946	MIDLAND3	115	1	TR	280.0	173.0	320.4	114.4	174.0	322.4	115.1			
56793	MIDLAND6	230	56946	MIDLAND3	115	1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	240.0	359.2	128.3	241.0	361.3	129.0			
59162	PHILL#1	22.0	59225	PHILL	5	161	1	59200	PHILL	7	345	59225	PHILL	5	161	1	TR	400.0	221.0	429.1	107.3	204.0		
									57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			284.0	313.0	106.8
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			260.0	294.1	100.4
59208	NEVADA	5	161	59308	NEVADA	269.0	1	59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	32.0	62.4	124.8	32.0	63.2	126.4	
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	62.8	125.6	37.0	63.8	127.5	
59209	SEDALIA5	161	59271	SEDN	269.0	1	59209	SEDALIA5	161	59272	SEDS	269.0	1	TR	50.0	30.0	52.1	104.3	30.0	51.7	103.4			
59209	SEDALIA5	161	59272	SEDS	269.0	1	59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	33.0	54.1	108.2	33.0	53.6	107.2			
59210	MARTCTY5	161	59287	MARTCTY269.0	1	59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	102.4	102.4	90.0	100.4	100.4			
59224	LNGVW	5	161	59282	LNGVW	269.0	1	59210	MARTCTY5	161	59287	MARTCTY269.0	1	TR	50.0	38.0	58.7	117.3	38.0	57.8	115.7			
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.7	104.7	90.0	102.5	102.5
59225	PHILL	5	161	59280	PHILL	269.0	1	59210	MARTCTY5	161	59287	MARTCTY269.0	1	TR	50.0	38.0	57.4	114.8	38.0	56.7	113.4			
59239	HSNVL	5	161	59295	HSNVL	269.0	1	59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	121.2	121.2	90.0	120.8	120.8	
59242	CLINTON5	161	59303	CLINTON269.0	1	59242	CLINTON5	161	59303	CLINTON269.0	2	TR	50.0	38.0	59.6	119.2	37.0	57.8	115.6					

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59242	CLINTON5	161	59303	CLINTON	269.0	2	59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	38.0	60.3	120.6	37.0	58.5	117.0		
59242	CLINTON5	161	96071	5CLINTN	161	1	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	50.4	100.9	37.0	50.5	101.0	
56753	JEC	7	345	56755	MORRIS	7	345	1	56788	EMANHAT6	230	56790	JEC	6	230	1	LN	446.0	383.0		384.0	446.8	100.2
57965	W.GRDNR7	345	57966	WGARDNR5	161	11	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0		198.0	224.6	100.3		
57965	W.GRDNR7	345	58105	LACYGNE	345	1	57968	STILWEL7	345	57981	LACYGNE7	345	1	LN	1099.0	749.0		731.0	1153.1	104.9			
							57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	317.7	108.4		
							57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0		171.0	244.6	109.2			
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0		260.0	298.7	102.0		
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0		198.0	368.1	164.3		
58120	HART1	2	161	58121	HART3	345	1	TR	550.0			417.0	595.9	108.3									
57968	STILWEL7	345	59200	PHILL	7	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	316.2	107.9	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0		260.0	297.4	101.5	
57969	STILWEL5	161	58012	UNION	5	161	1	57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0		187.0	224.1	100.0		
57981	LACYGNE7	345	58105	W GARDNER	345	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0		198.0	253.5	113.2		
57982	IATAN	7	345	69702	ST JOE	3	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	293.7	100.2
57993	STHTOWN5	161	57994	HICKMAN5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	327.4	111.7		
							57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0		171.0	229.0	102.2			
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0		260.0	308.6	105.3		
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0		198.0	230.3	102.8		
58002	MARTCIT5	161	59210	MARTCTY5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0		198.0	235.1	105.0		
58036	OLATHEE5	161	58046	OXFORD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	315.2	107.6	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0		260.0	296.4	101.2	
58037	OLATHEW5	161	58043	MURLEN	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0		198.0	230.8	103.0	
58037	OLATHEW5	161	58045	SWITZER5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	296.0	101.0		
59207	ARCHIE	5	161	58120	HART1	2	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	307.2	104.8
59200	PHILL	7	345	59201	SIBLEY	7	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	309.8	105.7
									58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0		198.0	239.4	106.9
									59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	146.0		164.0	231.1
59200	PHILL	7	345	59225	PHILL	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0		284.0	317.8	108.5

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						58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	260.0	299.0	102.1			
59208	NEVADA	5	161	59216	BUTLER_5	161	1	59216	BUTLER_5	161	96689	2BUTLER	69.0	1	TR	56.0	37.0	41.0	61.6	110.1		
59218	GRNWD	5	161	59233	LEESUM	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	284.0	293.5	100.2
59220	FROSTRD5	161	59245	KCSOUTH5	161	1	59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	146.0	164.0	243.3	109.1	
57951	HAW G5	122.0	57973	HAWTH N5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	284.0	301.9	103.0		
57957	IAT G1	124.0	57982	IATAN	7	345	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	230.6	102.9	
57995	MONTROS5	161	96071	5CLINTN	161	1	59216	BUTLER_5	161	96689	2BUTLER	69.0	1	TR	56.0	37.0	41.0	56.7	101.3			
59151	SIBLEY#322.0	59202	SIBLEY	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	284.0	294.5	100.5		

Branch Violations

Table C-3 Base case vs. Customer study w/ Raymore 345kV additions

*** MUST 4.00 *** MON, DEC 18 2000 15:31 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2006 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 8:57:15 AM
 end: 9:08:53 AM
 elapsed: 0:11:38

Notes:

Base case vs Customer study with 345kV system improvements applied. Raymore Station Added to the Stilwell-Sibley circuit with 345kV line from LaCygne and 345/161kV transformer on the Montrose-Loma Vista 161kV circuit.

*****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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	499.3	112.0	385.0	499.2	111.9
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	291.2	104.0	238.0	288.8	103.1
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.2	102.8	170.0		
56752 HOYT 7 345 56758 STRANGR7 345 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	282.6	100.9	238.0		
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0	174.3	104.4	130.0	171.7	102.8
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	226.8	101.3	170.0		
56758 STRANGR7 345 57977 CRAIG 7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.9	103.1	170.0		
56758 STRANGR7 345 59231 STRANGR5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	275.0	294.3	100.5	274.0	294.8	100.6
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	456.4	102.3	385.0	457.9	102.7
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	359.1	128.3	238.0	355.5	127.0
57965 W.GRDNR7 345 57977 CRAIG 7 345 1	57966 WGARDNR5 161 58044 MOONLT 5 161 1 LN	293.0	192.0	333.8	113.9	200.0	344.7	117.6
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	232.4	103.7	170.0		
	57999 LVISTAW5 161 58118 RAYMORE1 161 1 LN	224.0				210.0	237.2	105.9
	58043 MURLEN 5 161 58044 MOONLT 5 161 1 LN	293.0	142.0			150.0	296.8	101.3
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	749.0	1202.1	109.4	630.0		
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	320.0	142.9	170.0		
57966 WGARDNR5 161 58044 MOONLT 5 161 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	242.3	108.2	170.0	228.2	101.9
57966 WGARDNR5 161 58077 SRICHLN5 161 1	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	293.0	248.0	306.7	104.7	250.0	302.8	103.4
57968 STILWEL7 345 57969 STILWEL5 161 22	57968 STILWEL7 345 57969 STILWEL5 161 11 TR	550.0	367.0	557.1	101.3	353.0		
57968 STILWEL7 345 57981 LACYGNE7 345 1	57965 W.GRDNR7 345 57981 LACYGNE7 345 1 LN	1099.0	660.0	1102.6	100.3			

					58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	307.2	104.9	250.0				
57969	STILWEL5	161	57994	HICKMAN5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	306.8	104.7	241.0	
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	224.6	100.3	170.0				
					57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0					210.0	234.5	104.7		
57969	STILWEL5	161	58050	ANTIOCH5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	300.1	102.4	241.0	
57969	STILWEL5	161	58053	REDEL	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	228.8	102.1	170.0	
					57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0					210.0	228.5	102.0		
57973	HAWTH N5	161	57976	LEVEE	5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	301.9	103.0	244.0	364.3	124.3
					57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	304.6	104.0	274.0	340.1	116.1			
					57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	294.2	100.4	233.0	356.5	121.7			
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0			251.0	319.9	109.2			
57973	HAWTH N5	161	58011	CHOUTEU5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	334.8	114.3	274.0	333.6	113.9
					57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	379.6	129.6	258.0	375.9	128.3		
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	314.5	107.4	251.0	313.4	107.0			
					57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			258.0	375.7	128.2		
57973	HAWTH N5	161	58027	RANDLPH5	161	1		57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	335.5	114.5	244.0	333.8	113.9
					57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	359.0	122.5	258.0	355.6	121.4		
					57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	327.7	111.8	233.0	326.1	111.3			
					57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			258.0	355.3	121.3		
57976	LEVEE	5	161	57985	NEAST N5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	367.2	125.3	244.0	364.4	124.4
					57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	341.9	116.7	274.0	340.2	116.1			
					57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	359.5	122.7	233.0	356.7	121.7			
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	321.7	109.8	251.0	320.0	109.2			
57978	CRAIG	5	161	58048	COLLEGE5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	233.8	104.4	170.0	
57985	NEAST N5	161	58018	NKANCTY5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	299.1	102.1	274.0	298.8	102.0
57986	NEAST S5	161	58011	CHOUTEU5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	332.7	113.5	274.0	331.5	113.1
					57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	375.7	128.2	258.0	372.0	127.0		
					58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	312.5	106.7	251.0	311.4	106.3			
					57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			258.0	371.8	126.9		
58002	MARTCIT5	161	58053	REDEL	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	225.6	100.7	170.0	
					57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0					210.0	226.7	101.2		
58015	AVONDAL5	161	58027	RANDLPH5	161	1		57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	328.3	112.1	244.0	326.7	111.5
					57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	351.3	119.9	258.0	347.9	118.7		
					57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	320.6	109.4	233.0	319.0	108.9			
					57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			258.0	347.7	118.7		

58028	NASHUA-5	161	58029	SHOLCRK5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	297.0	101.4	274.0	296.4	101.2
58033	BRKRIDG5	161	58047	OVERLPK5	161	1	58036	OLATHEE5	161	58046	OXFORD 5	161	1	LN	224.0	186.0	225.0	100.4	170.0		
							58037	OLATHEW5	161	58045	SWITZER5	161	1	LN	293.0	209.0	357.5	122.0	205.0		
58036	OLATHEE5	161	58037	OLATHEW5	161	1	58033	BRKRIDG5	161	58047	OVERLPK5	161	1	LN	293.0	140.0	306.5	104.6	143.0		
58037	OLATHEW5	161	58045	SWITZER5	161	1	58033	BRKRIDG5	161	58047	OVERLPK5	161	1	LN	293.0	140.0	351.4	119.9	143.0		
58043	MURLEN 5	161	58044	MOONLT 5	161	1	58036	OLATHEE5	161	58046	OXFORD 5	161	1	LN	224.0	186.0	227.7	101.6	170.0		
58046	OXFORD 5	161	58050	ANTIOCH5	161	1	57969	STILWEL5	161	58053	REDEL 5	161	1	LN	293.0	254.0	296.2	101.1	241.0		
58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	223.5	128.4	84.0	217.2	124.8
58062	SALSBRYS	161	58064	NORTON-5	161	1	59217	WINDSR 5	161	96071	5CLINTN	161	1	LN	123.0	86.0	123.7	100.5	80.0		
58065	CNTRVIL5	161	58069	PAOLA 5	161	1	58067	CENTENL5	161	58069	PAOLA 5	161	1	LN	293.0	248.0	304.3	103.9	250.0	310.1	105.8
58066	S.OTTWA5	161	58069	PAOLA 5	161	1	57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0	240.9	107.6	158.0	233.8	104.4
							58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	LN	293.0	220.0	319.2	109.0	222.0	315.4	107.7
							58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0	325.0	110.9	225.0	321.2	109.6
							58067	CENTENL5	161	58069	PAOLA 5	161	1	LN	293.0	248.0	350.9	119.8	250.0	347.0	118.4
58066	S.OTTWA5	161	58077	SRICHLN5	161	1	58067	CENTENL5	161	58069	PAOLA 5	161	1	LN	293.0	248.0	317.2	108.2	250.0	313.3	106.9
58067	CENTENL5	161	58068	WAGSTAF5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	228.1	131.1	84.0	221.1	127.1
58067	CENTENL5	161	58069	PAOLA 5	161	1	58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	244.7	140.6	84.0	237.5	136.5
59202	SIBLEY 5	161	59215	HLLMRK 5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	302.6	103.3	274.0	300.7	102.6
59215	HLLMRK 5	161	59247	LBRTYWT5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	293.9	100.3	274.0		
59221	PLTCTY 5	161	59231	STRANGR5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	294.7	100.6	274.0	295.1	100.7
59224	LNGVW 5	161	59245	KCSOUTH5	161	1	59206	PRALEE 5	161	59211	BLSPS 5	161	1	LN	223.0	146.0	232.2	104.1	147.0	235.5	105.6
59224	LNGVW 5	161	59249	HOOKRD 5	161	1	57969	STILWEL5	161	58053	REDEL 5	161	1	LN	293.0	254.0	308.7	105.4	241.0		
							59225	PHILL 5	161	59280	PHILL 269.0	1	TR	100.0	92.0	103.0	103.0	91.0	101.2	101.2	
59225	PHILL 5	161	59243	LKWINGB5	161	1	57969	STILWEL5	161	58053	REDEL 5	161	1	LN	293.0	254.0	318.3	108.6	241.0	298.9	102.0
							58002	MARTCIT5	161	58053	REDEL 5	161	1	LN	293.0	231.0	299.4	102.2	219.0		
							59225	PHILL 5	161	59280	PHILL 269.0	1	TR	100.0	92.0	104.8	104.8	91.0	103.0	103.0	
							57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0			210.0	224.2	100.1	

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59243	LKWINGB5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	313.6	107.0	241.0	294.5	100.5	
								58002	MARTCTT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	294.7	100.6	219.0			
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.9	103.9	91.0	102.1	102.1	
56758	STRANGR7	345	56777	STRANG7X			1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	1	TR	280.0	240.0	281.2	100.4	238.0			
56788	EMANHAT6	230	56994	EMANHAT3	115	1		56799	MCDOWEL6	230	57002	MCDOWEL3	115	1	1	TR	280.0	159.0	290.4	103.7	159.0	290.3	103.7	
56791	LAWHILL6	230	56945	LWRNCHL3	115	1		56793	MIDLAND6	230	56946	MIDLAND3	115	1	1	TR	280.0	173.0	320.4	114.4	171.0	317.0	113.2	
56793	MIDLAND6	230	56946	MIDLAND3	115	1		56791	LAWHILL6	230	56945	LWRNCHL3	115	1	1	TR	280.0	240.0	359.2	128.3	238.0	355.6	127.0	
59162	PHILL#1	22.0	59225	PHILL	5	161	1	59200	PHILL	7	345	59225	PHILL	5	161	1	TR	400.0	221.0	429.1	107.3	250.0	444.3	111.1
59208	NEVADA	5	161	59308	NEVADA	269.0	1	59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	32.0	62.4	124.8	32.0	62.1	124.1	
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	62.8	125.6	36.0	62.6	125.3	
59209	SEDALIA5	161	59271	SEDN	269.0	1		59209	SEDALIA5	161	59272	SEDS	269.0	1	1	TR	50.0	30.0	52.1	104.3	30.0	51.6	103.2	
59209	SEDALIA5	161	59272	SEDS	269.0	1		59209	SEDALIA5	161	59271	SEDN	269.0	1	1	TR	50.0	33.0	54.1	108.2	33.0	53.5	107.1	
59210	MARTCTY5	161	59287	MARTCTY	269.0	1		59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	102.4	102.4	91.0	101.6	101.6	
59224	LNGVW	5	161	59282	LNGVW	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	1	TR	50.0	38.0	58.7	117.3	39.0	59.6	119.2	
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.7	104.7	91.0	103.4	103.4	
59225	PHILL	5	161	59280	PHILL	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	1	TR	50.0	38.0	57.4	114.8	39.0	58.3	116.6	
59239	HSNVL	5	161	59295	HSNVL	269.0	1	59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	121.2	121.2	91.0	119.2	119.2	
59242	CLINTON5	161	59303	CLINTON	269.0	1		59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	38.0	59.6	119.2	37.0	58.3	116.6		
59242	CLINTON5	161	59303	CLINTON	269.0	2		59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	38.0	60.3	120.6	37.0	59.0	117.9		
59242	CLINTON5	161	96071	5CLINTN	161	1		59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	50.4	100.9	36.0			
56753	JEC	7	345	56755	MORRIS	7	345	1	56788	EMANHAT6	230	56790	JEC	6	230	1	LN	446.0	383.0		385.0	448.2	100.5	
57965	W.GRDNR7	345	58105	LACYGNE	345	1		57999	LVISTAW5	161	58118	RAYMORE1	161	1	1	LN	224.0				210.0	259.9	116.0	
								58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0			170.0	312.8	139.6	
57968	STILWEL7	345	57969	STILWEL5	161	11		57999	LVISTAW5	161	58118	RAYMORE1	161	1	1	LN	224.0				210.0	225.2	100.5	
57993	STHTOWN5	161	57994	HICKMAN5	161	1		57999	LVISTAW5	161	58118	RAYMORE1	161	1	1	LN	224.0				210.0	225.1	100.5	
57993	STHTOWN5	161	58008	BUNKRDG5	161	1		57998	LVISTAE5	161	58119	RAYMORE2	161	1	1	LN	224.0				173.0	226.1	100.9	

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57993	STHTOWN5	161	59210	MARTCTY5	161	1	57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	225.8	100.8		
57996	MIDTOWN5	161	57997	LEEDS	5	161	1	57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	225.8	100.8	
57997	LEEDS	5	161	58009	WINJT	N5	161	1	57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	247.1	110.3
57998	LVISTAE5	161	58009	WINJT	N5	161	1	57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	250.6	111.9	
57998	LVISTAE5	161	58119	RAYMORE2	161	1	57993	STHTOWN5	161	58008	BUNKRDG5	161	1	LN	224.0	34.0	171.0	231.0	103.1		
							57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	266.7	119.1		
57999	LVISTAW5	161	58008	BUNKRDG5	161	1	57998	LVISTAE5	161	58119	RAYMORE2	161	1	LN	224.0		173.0	231.2	103.2		
57999	LVISTAW5	161	58118	RAYMORE1	161	1	57998	LVISTAE5	161	58119	RAYMORE2	161	1	LN	224.0		173.0	237.9	106.2		
59200	PHILL	7	345	58117	RAYMORE3	345	1	57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	228.3	101.9	
58118	RAYMORE1	161	58119	RAYMORE2	161	1	57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	246.7	110.1		
59200	PHILL	7	345	59201	SIBLEY	7	345	1	57998	LVISTAE5	161	58119	RAYMORE2	161	1	LN	224.0		173.0	230.5	102.9
							57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	234.1	104.5		
59208	NEVADA	5	161	59216	BUTLER_5	161	1	59216	BUTLER_5	161	96689	2BUTLER	69.0	1	TR	56.0	37.0	37.0	56.8	101.4	
57995	MONTROS5	161	96071	5CLINTN	161	1	57999	LVISTAW5	161	58118	RAYMORE1	161	1	LN	224.0		210.0	233.7	104.3		

Branch Violations

Table C-4 Base Case vs. Customer study w/ LaCygne-Stilwell #2 345kV circuit addition

*** MUST 4.00 *** TUE, DEC 19 2000 9:36 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2006 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 10:14:32 AM
 end: 10:51:47 AM
 elapsed: 0:37:15

Notes:

Base case vs Customer study with 345kV system improvements applied. New LaCygne-Stilwell #2 345kV circuit.

*****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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	499.3	112.0	383.0	499.7	112.0
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	291.2	104.0	246.0	296.7	106.0
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.2	102.8	198.0	241.4	107.8
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0			141.0	171.7	102.8
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			290.0	300.4	102.5
56752 HOYT 7 345 56758 STRANGR7 345 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	282.6	100.9	246.0	288.4	103.0
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0	174.3	104.4	141.0	183.7	110.0
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	226.8	101.3	198.0	238.1	106.3
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			290.0	299.0	102.0
56758 STRANGR7 345 57977 CRAIG 7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.9	103.1	198.0	235.8	105.3
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0			141.0	168.2	100.7
56758 STRANGR7 345 59231 STRANGR5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	275.0	294.3	100.5	263.0		
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	456.4	102.3	383.0	455.2	102.1
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	359.1	128.3	246.0	368.5	131.6
57965 W.GRDNR7 345 57977 CRAIG 7 345 1	57966 WGARDNR5 161 58044 MOONLT 5 161 1 LN	293.0	192.0	333.8	113.9	207.0	368.8	125.9
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	232.4	103.7	198.0	263.0	117.4
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			290.0	320.4	109.4
	58002 MARTCIT5 161 58053 REDEL 5 161 1 LN	293.0	231.0			266.0	301.6	102.9
	58043 MURLEN 5 161 58044 MOONLT 5 161 1 LN	293.0	142.0			156.0	320.8	109.5
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	749.0	1202.1	109.4	576.0		
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	320.0	142.9	198.0		
57966 WGARDNR5 161 58044 MOONLT 5 161 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	242.3	108.2	198.0	259.5	115.9

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57966	WGARDNR5	161	58077	SRICHLN5	161	1	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	306.7	104.7	248.0	302.5	103.3	
57968	STILWEL7	345	57969	STILWEL5	161	22	57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	367.0	557.1	101.3	447.0	673.7	122.5		
57968	STILWEL7	345	57981	LACYGNE7	345	1	57965	W.GRDNR7	345	57981	LACYGNE7	345	1	LN	1099.0	660.0	1102.6	100.3					
							58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	307.2	104.9	248.0			
57969	STILWEL5	161	57994	HICKMAN5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	306.8	104.7	290.0	349.1	119.1	
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	224.6	100.3	198.0	241.1	107.7	
							57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0			170.0	247.1	110.3		
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			266.0	330.4	112.8	
57969	STILWEL5	161	58050	ANTIOCH5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	300.1	102.4	290.0	336.0	114.7	
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			266.0	317.3	108.3	
57969	STILWEL5	161	58053	REDEL	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	228.8	102.1	198.0	246.2	109.9
								57993	STHTOWN5	161	57994	HICKMAN5	161	1	LN	224.0	139.0			165.0	229.2	102.3	
57973	HAWTH N5	161	57976	LEVEE	5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	301.9	103.0	231.0	347.2	118.5	
								57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	304.6	104.0	263.0	326.7	111.5	
								57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	294.2	100.4	221.0	339.4	115.8	
								58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0			239.0	306.4	104.6	
57973	HAWTH N5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	334.8	114.3	263.0	320.5	109.4		
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	379.6	129.6	245.0	358.2	122.3	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	314.5	107.4	239.0	300.2	102.5		
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	358.0	122.2	
57973	HAWTH N5	161	58027	RANDLPH5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	335.5	114.5	231.0	319.2	108.9		
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	359.0	122.5	245.0	339.9	116.0	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	327.7	111.8	221.0	311.4	106.3		
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	339.7	115.9	
57976	LEVEE	5	161	57985	NEAST N5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	367.2	125.3	231.0	347.3	118.5	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	341.9	116.7	263.0	326.8	111.5		
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	359.5	122.7	221.0	339.5	115.9		
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	321.7	109.8	239.0	306.5	104.6		
57978	CRAIG	5	161	58048	COLLEGE5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	233.8	104.4	198.0	241.9	108.0
57985	NEAST N5	161	58018	NKANCTY5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	299.1	102.1	263.0				
57986	NEAST S5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	332.7	113.5	263.0	318.4	108.7		
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	375.7	128.2	245.0	354.3	120.9	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	312.5	106.7	239.0	298.2	101.8		
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	354.0	120.8	

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58002	MARTCIT5	161	58053	REDEL	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	225.6	100.7	198.0	243.1	108.5		
								57993	STHTOWN5	161	57994	HICKMAN5	161	1	1	LN	224.0	139.0			165.0	225.0	100.4		
58015	AVONDAL5	161	58027	RANDLPH5	161	1		57973	HAWTH N5	161	58011	CHOUTEU5	161	1	1	LN	293.0	245.0	328.3	112.1	231.0	312.0	106.5		
								57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	351.3	119.9	245.0	332.2	113.4		
								57986	NEAST S5	161	58011	CHOUTEU5	161	1	1	LN	293.0	234.0	320.6	109.4	221.0	304.3	103.8		
								57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			245.0	332.0	113.3		
58028	NASHUA-5	161	58029	SHOLCRK5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	1	LN	293.0	275.0	297.0	101.4	263.0				
58033	BRKRIDG5	161	58047	OVERLPK5	161	1		58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	225.0	100.4	198.0	233.8	104.4		
58043	MURLEN	5	161	58044	MOONLT	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	227.7	101.6	198.0	244.9	109.3	
58046	OXFORD	5	161	58050	ANTIOCH5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	296.2	101.1	290.0	332.1	113.4	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			266.0	313.5	107.0		
58057	BUCYRUS5	161	58068	WAGSTAF5	161	1		58066	S.OTTWA5	161	58077	SRICHLN5	161	1	1	LN	174.0	91.0	223.5	128.4	86.0	218.7	125.7		
58062	SALSBRYS	161	58064	NORTON-5	161	1		59217	WINDSR	5	161	96071	5CLINTN	161	1	LN	123.0	86.0	123.7	100.5	74.0				
58065	CNTRVIL5	161	58069	PAOLA	5	161	1		58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	304.3	103.9	248.0	308.2	105.2	
58066	S.OTTWA5	161	58069	PAOLA	5	161	1		57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0	240.9	107.6	152.0	229.2	102.3		
								58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	1	LN	293.0	220.0	319.2	109.0	221.0	315.2	107.6		
								58067	CENTENL5	161	58068	WAGSTAF5	161	1	1	LN	293.0	223.0	325.0	110.9	223.0	320.9	109.5		
								58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	350.9	119.8	248.0	346.7	118.3		
								58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0			198.0	228.9	102.2		
58066	S.OTTWA5	161	58077	SRICHLN5	161	1		58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	317.2	108.2	248.0	312.9	106.8		
58067	CENTENL5	161	58068	WAGSTAF5	161	1		58066	S.OTTWA5	161	58077	SRICHLN5	161	1	1	LN	174.0	91.0	228.1	131.1	86.0	222.5	127.9		
58067	CENTENL5	161	58069	PAOLA	5	161	1		58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	244.7	140.6	86.0	239.1	137.4		
59202	SIBLEY	5	161	59215	HLLMRK	5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	302.6	103.3	263.0				
59215	HLLMRK	5	161	59247	LBRTYWT5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	293.9	100.3	263.0				
59221	PLTCTY	5	161	59231	STRANGR5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	294.7	100.6	263.0				
59224	LNGVW	5	161	59245	KCSOUTH5	161	1		59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	146.0	232.2	104.1	160.0	251.5	112.8
								59205	BLSPE	5	161	59211	BLSPS	5	161	1	LN	223.0	123.0			137.0	229.0	102.7	
59224	LNGVW	5	161	59249	HOOKRD	5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	308.7	105.4	290.0	343.4	117.2
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.0	103.0	92.0	103.7	103.7		
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			266.0	324.6	110.8		

59225	PHILL	5	161	59243	LKWINGB5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	318.3	108.6	290.0	352.8	120.4	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	299.4	102.2	266.0	334.0	114.0	
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.8	104.8	92.0	105.5	105.5	
59243	LKWINGB5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	313.6	107.0	290.0	348.1	118.8	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	294.7	100.6	266.0	329.3	112.4	
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.9	103.9	92.0	104.6	104.6	
56758	STRANGR7	345	56777	STRANG7X			1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	240.0	281.2	100.4	246.0	286.6	102.3		
56788	EMANHAT6	230	56994	EMANHAT3	115	1		56799	MCDOWEL6	230	57002	MCDOWEL3	115	1	TR	280.0	159.0	290.4	103.7	160.0	290.7	103.8		
56791	LAWHILL6	230	56945	LWRNCHL3	115	1		56793	MIDLAND6	230	56946	MIDLAND3	115	1	TR	280.0	173.0	320.4	114.4	178.0	329.5	117.7		
56793	MIDLAND6	230	56946	MIDLAND3	115	1		56791	LAWHILL6	230	56945	LWRNCHL3	115	1	TR	280.0	240.0	359.2	128.3	246.0	368.6	131.6		
59162	PHILL#1	22.0	59225	PHILL	5	161	1	59200	PHILL	7	345	59225	PHILL	5	161	1	TR	400.0	221.0	429.1	107.3	288.0	477.6	119.4
								57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			290.0	318.2	108.6	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			266.0	299.3	102.2	
59208	NEVADA	5	161	59308	NEVADA	269.0	1	59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	32.0	62.4	124.8	32.0	62.7	125.4	
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	62.8	125.6	37.0	63.3	126.5	
59209	SEDALIA5	161	59271	SEDN	269.0	1		59209	SEDALIA5	161	59272	SEDS	269.0	1	TR	50.0	30.0	52.1	104.3	29.0	51.5	103.0		
59209	SEDALIA5	161	59272	SEDS	269.0	1		59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	33.0	54.1	108.2	33.0	53.4	106.8		
59210	MARTCTY5	161	59287	MARTCTY	269.0	1		59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	102.4	102.4	92.0	103.1	103.1	
59224	LNGVW	5	161	59282	LNGVW	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0	58.7	117.3	38.0	58.9	117.8		
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.7	104.7	92.0	105.2	105.2	
59225	PHILL	5	161	59280	PHILL	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0	57.4	114.8	38.0	57.7	115.4		
59239	HSNVL	5	161	59295	HSNVL	269.0	1	59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	121.2	121.2	92.0	120.8	120.8	
59242	CLINTON5	161	59303	CLINTON	269.0	1		59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	38.0	59.6	119.2	36.0	56.8	113.6		
59242	CLINTON5	161	59303	CLINTON	269.0	2		59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	38.0	60.3	120.6	36.0	57.5	115.0		
59242	CLINTON5	161	96071	5CLINTN	161	1		59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	50.4	100.9	37.0	50.1	100.1	
57965	W.GRDNR7	345	57966	WGRDNR5	161	11		58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0			198.0	224.5	100.2	
57965	W.GRDNR7	345	58105	LACYGNE	345	1		57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	367.0			447.0	601.6	109.4		

					57968	STILWEL7	345	57969	STILWEL5	161	22	TR	550.0	348.0	424.0	571.3	103.9					
					57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	323.3	110.3				
					57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0	170.0	242.1	108.1					
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	266.0	304.4	103.9				
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	364.9	162.9				
57968	STILWEL7	345	57969	STILWEL5	161	11		57968	STILWEL7	345	57969	STILWEL5	161	22	TR	550.0	348.0	424.0	657.4	119.5		
57968	STILWEL7	345	59200	PHILL	7	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	345.1	117.8	
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	266.0	326.4	111.4				
57969	STILWEL5	161	58042	SPRGHL	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	294.1	100.4	
57978	CRAIG	5	161	57979	PFLUMM	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	294.4	100.5
57981	LACYGNE7	345	58105	W GARDNER	345	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	296.5	101.2	
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	251.0	112.1				
57982	IATAN	7	345	69702	ST JOE	3	345	1	56807	MIDLAND5	161	56946	MIDLAND3	115	1	TR	167.0	132.0	141.0	168.4	100.8	
					57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	298.3	101.8				
57993	STHTOWN5	161	57994	HICKMAN5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	332.4	113.5	
					57993	STHTOWN5	161	59210	MARTCTY5	161	1	LN	224.0	151.0	170.0	227.7	101.7					
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	266.0	313.7	107.1				
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	230.2	102.7				
58002	MARTCIT5	161	59210	MARTCTY5	161	1		58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	235.5	105.1	
58012	UNION	5	161	59207	ARCHIE	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	300.6	102.6
58036	OLATHEE5	161	58037	OLATHEW5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	297.2	101.4	
58036	OLATHEE5	161	58046	OXFORD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	319.7	109.1	
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	266.0	301.0	102.7				
58037	OLATHEW5	161	58043	MURLEN	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	229.7	102.6	
58037	OLATHEW5	161	58045	SWITZER5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	300.5	102.6	
58045	SWITZER5	161	58051	RILEY	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	293.9	100.3	
59200	PHILL	7	345	59201	SIBLEY	7	345	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	315.6	107.7
					58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	266.0	296.8	101.3				
					58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	238.6	106.5				
					59200	PHILL	7	345	59225	PHILL	5	161	1	TR	400.0	221.0	288.0	436.8	109.2			
					59206	PRALEE	5	161	59211	BLSPTS	5	161	1	LN	223.0	146.0	160.0	232.8	104.4			

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59200	PHILL	7	345	59225	PHILL	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	339.4	115.8	
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	266.0	320.7	109.4	
59206	PRALEE	5	161	59233	LEESUM	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	294.7	100.6	
59208	NEVADA	5	161	59216	BUTLER_5	161	1		59216	BUTLER_5	161	96689	2BUTLER	69.0	1		TR	56.0	37.0	39.0	57.9	103.5	
59218	GRNWD	5	161	59225	PHILL	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	295.1	100.7	
59218	GRNWD	5	161	59233	LEESUM	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	297.4	101.5	
59220	FROSTRD5	161		59245	KCSOUTH5	161	1		59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	146.0	160.0	238.4	106.9
56960	SPRINGH3	115		58042	SPRGHL	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	294.1	100.4	
57951	HAW G5	122.0		57973	HAWTH N5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	306.6	104.6	
57957	IAT G1	124.0		57982	IATAN	7	345	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	198.0	230.9	103.1	
59151	SIBLEY#322.0			59202	SIBLEY	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	290.0	299.3	102.1	

Branch Violations

Table C-5 Base Case vs. Customer study w/ LaCygne-W. Gardner #2 345kV circuit addition

*** MUST 4.00 *** MON, JAN 08 2001 8:09 ***
 1-2000 SOUTHWEST POWER POOL BASE CASE POWER FLOW MODEL
 2006 SUMMER PEAK SPP-00-86 MIN ATC BASE CASE

start: 9:05:51 AM
 end: 9:40:23 AM
 elapsed: 0:34:32

Notes:

Base case vs Customer study with 345kV system improvements applied. Parallel circuit added for LaCygne-W. Gardner #2 345kV line.

*****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		
56752 HOYT 7 345 56753 JEC 7 345 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	499.3	112.0	386.0	499.3	112.0
	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	291.2	104.0	239.0	289.0	103.2
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.2	102.8	132.0		
56752 HOYT 7 345 56758 STRANGR7 345 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	282.6	100.9	239.0		
	56807 MIDLAND5 161 56946 MIDLAND3 115 1 TR	167.0	132.0	174.3	104.4	135.0	174.8	104.7
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	226.8	101.3	132.0		
56758 STRANGR7 345 57977 CRAIG 7 345 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	230.9	103.1	132.0		
56758 STRANGR7 345 59231 STRANGR5 161 1	57973 HAWTH N5 161 58027 RANDLPH5 161 1 LN	293.0	275.0	294.3	100.5	256.0		
56786 AUBURN 6 230 56790 JEC 6 230 1	56788 EMANHAT6 230 56790 JEC 6 230 1 LN	446.0	383.0	456.4	102.3	386.0	459.7	103.1
56791 LAWHILL6 230 56793 MIDLAND6 230 1	56791 LAWHILL6 230 56945 LWRNCHL3 115 1 TR	280.0	240.0	359.1	128.3	239.0	357.7	127.8
57965 W.GRDNR7 345 57977 CRAIG 7 345 1	57966 WGARDNR5 161 58044 MOONLT 5 161 1 LN	293.0	192.0	333.8	113.9	243.0	436.6	149.0
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	232.4	103.7	132.0	224.8	100.4
	57965 W.GRDNR7 345 57966 WGARDNR5 161 11 TR	400.0	153.0			229.0	481.5	120.4
	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	749.0			831.0	1258.4	114.5
	57969 STILWEL5 161 58053 REDEL 5 161 1 LN	293.0	254.0			269.0	311.4	106.3
	58037 OLATHEW5 161 58043 MURLEN 5 161 1 LN	293.0	93.0			142.0	340.0	116.0
	58043 MURLEN 5 161 58044 MOONLT 5 161 1 LN	293.0	142.0			191.0	388.4	132.5
	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	293.0	248.0			270.0	316.0	107.8
57965 W.GRDNR7 345 57981 LACYGNE7 345 1	57968 STILWEL7 345 57981 LACYGNE7 345 1 LN	1099.0	749.0	1202.1	109.4	831.0		
	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	320.0	142.9	132.0		
57966 WGARDNR5 161 58044 MOONLT 5 161 1	58036 OLATHEE5 161 58046 OXFORD 5 161 1 LN	224.0	186.0	242.3	108.2	132.0		
	58067 CENTENL5 161 58069 PAOLA 5 161 1 LN	293.0	248.0			270.0	303.5	103.6

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57966	WGARDNR5	161	58077	SRICHLN5	161	1	58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	306.7	104.7	270.0	308.2	105.2
57968	STILWEL7	345	57969	STILWEL5	161	22	57968	STILWEL7	345	57969	STILWEL5	161	11	TR	550.0	367.0	557.1	101.3	366.0	554.6	100.8	
57968	STILWEL7	345	57981	LACYGNE7	345	1	57965	W.GRDNR7	345	57981	LACYGNE7	345	1	LN	1099.0	660.0	1102.6	100.3				
							58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	307.2	104.9	270.0	335.1	114.4
							57965	W.GRDNR7	345	57977	CRAIG	7	345	1	LN	1099.0	515.0			859.0	1309.4	119.1
							57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	192.0			243.0	311.1	106.2
							57978	CRAIG	5	161	58039	LENEXAN5	161	1	LN	293.0	168.0			237.0	294.6	100.5
							58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	LN	293.0	220.0			241.0	303.0	103.4	
							58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0			244.0	308.8	105.4	
57969	STILWEL5	161	57994	HICKMAN5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	306.8	104.7	269.0	323.4	110.4
							58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	224.6	100.3	132.0		
							58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			246.0	304.6	104.0
57969	STILWEL5	161	58050	ANTIOCH5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	300.1	102.4	269.0	304.6	104.0
57969	STILWEL5	161	58053	REDEL	5	161	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	228.8	102.1	132.0		
57973	HAWTH N5	161	57976	LEVEE	5	161	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	301.9	103.0	221.0	332.2	113.4	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	304.6	104.0	256.0	316.8	108.1	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	294.2	100.4	211.0	324.4	110.7	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0			232.0	296.5	101.2	
57973	HAWTH N5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	334.8	114.3	256.0	310.9	106.1	
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	379.6	129.6	234.0	342.7	117.0
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	314.5	107.4	232.0			
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			234.0	342.5	116.9
57973	HAWTH N5	161	58027	RANDLPH5	161	1	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	335.5	114.5	221.0	306.9	104.7	
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	359.0	122.5	234.0	326.8	111.5
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	327.7	111.8	211.0	299.1	102.1	
							57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			234.0	326.5	111.4
57976	LEVEE	5	161	57985	NEAST N5	161	57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	367.2	125.3	221.0	332.3	113.4	
							57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	341.9	116.7	256.0	316.8	108.1	
							57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	359.5	122.7	211.0	324.5	110.7	
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	321.7	109.8	232.0	296.6	101.2	
57978	CRAIG	5	161	58048	COLLEGE5	161	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	233.8	104.4	132.0		
57985	NEAST N5	161	58018	NKANCTY5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	299.1	102.1	256.0			
57986	NEAST S5	161	58011	CHOUTEU5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	332.7	113.5	256.0	308.8	105.4	
							57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	375.7	128.2	234.0	338.8	115.6
							58015	AVONDAL5	161	58027	RANDLPH5	161	1	LN	293.0	251.0	312.5	106.7	232.0			

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						57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			234.0	338.5	115.5				
58002	MARTCIT5	161	58053	REDEL	5	161	1		58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	225.6	100.7	132.0			
58015	AVONDAL5	161	58027	RANDLPH5	161	1		57973	HAWTH N5	161	58011	CHOUTEU5	161	1	LN	293.0	245.0	328.3	112.1	221.0	299.7	102.3			
								57976	LEVEE	5	161	57985	NEAST N5	161	1	LN	293.0	261.0	351.3	119.9	234.0	319.1	108.9		
								57986	NEAST S5	161	58011	CHOUTEU5	161	1	LN	293.0	234.0	320.6	109.4	211.0					
								57973	HAWTH N5	161	57976	LEVEE	5	161	1	LN	293.0	129.0			234.0	318.9	108.8		
58028	NASHUA-5	161	58029	SHOLCRK5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	297.0	101.4	256.0					
58033	BRKRIDG5	161	58047	OVERLPK5	161	1		58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	225.0	100.4	132.0				
58043	MURLEN	5	161	58044	MOONLT	5	161	1	58036	OLATHEE5	161	58046	OXFORD	5	161	1	LN	224.0	186.0	227.7	101.6	132.0			
								58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0			270.0	296.8	101.3		
58046	OXFORD	5	161	58050	ANTIOCH5	161	1		57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	296.2	101.1	269.0	300.8	102.7	
58057	BUCYRUS5	161	58068	WAGSTAF5	161	1		58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	223.5	128.4	67.0	212.1	121.9			
58062	SALSBRY5	161	58064	NORTON-5	161	1		59217	WINDSR	5	161	96071	5CLINTN	161	1	LN	123.0	86.0	123.7	100.5	74.0				
58065	CNTRVIL5	161	58069	PAOLA	5	161	1		58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	304.3	103.9	270.0	328.2	112.0	
								58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	LN	293.0	220.0			241.0	296.6	101.2			
								58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0			244.0	302.3	103.2			
58066	S.OTTWA5	161	58069	PAOLA	5	161	1		57969	STILWEL5	161	58057	BUCYRUS5	161	1	LN	224.0	160.0	240.9	107.6	170.0	234.5	104.7		
								58057	BUCYRUS5	161	58068	WAGSTAF5	161	1	LN	293.0	220.0	319.2	109.0	241.0	320.7	109.4			
								58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0	325.0	110.9	244.0	326.4	111.4			
								58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	350.9	119.8	270.0	352.4	120.3		
58066	S.OTTWA5	161	58077	SRICHLN5	161	1		58067	CENTENL5	161	58069	PAOLA	5	161	1	LN	293.0	248.0	317.2	108.2	270.0	318.6	108.7		
								58067	CENTENL5	161	58068	WAGSTAF5	161	1	LN	293.0	223.0			244.0	293.1	100.0			
58067	CENTENL5	161	58068	WAGSTAF5	161	1		58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	228.1	131.1	67.0	216.0	124.1			
58067	CENTENL5	161	58069	PAOLA	5	161	1		58066	S.OTTWA5	161	58077	SRICHLN5	161	1	LN	174.0	91.0	244.7	140.6	67.0	232.4	133.6		
								57966	WGARDNR5	161	58044	MOONLT	5	161	1	LN	293.0	192.0			243.0	296.7	101.3		
59202	SIBLEY	5	161	59215	HLLMRK	5	161	1	57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	302.6	103.3	256.0				
59215	HLLMRK	5	161	59247	LBRTYWT5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	293.9	100.3	256.0				
59221	PLTCTY	5	161	59231	STRANGR5	161	1		57973	HAWTH N5	161	58027	RANDLPH5	161	1	LN	293.0	275.0	294.7	100.6	256.0				
59224	LNGVW	5	161	59245	KCSOUTH5	161	1		59206	PRALEE	5	161	59211	BLSPS	5	161	1	LN	223.0	146.0	232.2	104.1	150.0	239.9	107.6

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59224	LNGVW	5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	308.7	105.4	269.0	321.3	109.7
									59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.0	103.0	91.0	102.0	102.0
									58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0			246.0	302.5	103.3
59225	PHILL	5	161	59243	LKWINGB5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	318.3	108.6	269.0	330.9	112.9	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	299.4	102.2	246.0	312.0	106.5	
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.8	104.8	91.0	103.8	103.8	
59243	LKWINGB5	161	59249	HOOKRD	5	161	1	57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0	313.6	107.0	269.0	326.2	111.3	
								58002	MARTCIT5	161	58053	REDEL	5	161	1	LN	293.0	231.0	294.7	100.6	246.0	307.3	104.9	
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	103.9	103.9	91.0	102.9	102.9	
56758	STRANGR7	345	56777	STRANG7X			1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	1	TR	280.0	240.0	281.2	100.4	239.0	282.0	100.7	
56788	EMANHAT6	230	56994	EMANHAT3	115	1	56799	MCDOWEL6	230	57002	MCDOWEL3	115	1	1	TR	280.0	159.0	290.4	103.7	159.0	290.4	103.7		
56791	LAWHILL6	230	56945	LWRNCHL3	115	1	56793	MIDLAND6	230	56946	MIDLAND3	115	1	1	TR	280.0	173.0	320.4	114.4	172.0	319.1	114.0		
56793	MIDLAND6	230	56946	MIDLAND3	115	1	56791	LAWHILL6	230	56945	LWRNCHL3	115	1	1	TR	280.0	240.0	359.2	128.3	239.0	357.8	127.8		
59162	PHILL#1	22.0	59225	PHILL	5	161	1	59200	PHILL	7	345	59225	PHILL	5	161	1	TR	400.0	221.0	429.1	107.3	257.0	444.1	111.0
								57969	STILWEL5	161	58053	REDEL	5	161	1	LN	293.0	254.0			269.0	297.9	101.7	
59208	NEVADA	5	161	59308	NEVADA	269.0	1	59208	NEVADA	5	161	59308	NEVADA	269.0	2	TR	50.0	32.0	62.4	124.8	32.0	62.7	125.3	
59208	NEVADA	5	161	59308	NEVADA	269.0	2	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	62.8	125.6	36.0	63.2	126.5	
59209	SEDALIA5	161	59271	SEDN	269.0	1	59209	SEDALIA5	161	59272	SEDS	269.0	1	TR	50.0	30.0	52.1	104.3	30.0	51.7	103.3			
59209	SEDALIA5	161	59272	SEDS	269.0	1	59209	SEDALIA5	161	59271	SEDN	269.0	1	TR	50.0	33.0	54.1	108.2	33.0	53.6	107.2			
59210	MARTCTY5	161	59287	MARTCTY	269.0	1	59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	102.4	102.4	91.0	102.0	102.0		
59224	LNGVW	5	161	59282	LNGVW	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0	58.7	117.3	39.0	59.3	118.7		
								59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	104.7	104.7	91.0	103.9	103.9	
59225	PHILL	5	161	59280	PHILL	269.0	1	59210	MARTCTY5	161	59287	MARTCTY	269.0	1	TR	50.0	38.0	57.4	114.8	39.0	58.0	116.1		
59239	HSNVL	5	161	59295	HSNVL	269.0	1	59225	PHILL	5	161	59280	PHILL	269.0	1	TR	100.0	92.0	121.2	121.2	91.0	119.6	119.6	
59242	CLINTON5	161	59303	CLINTON	269.0	1	59242	CLINTON5	161	59303	CLINTON	269.0	2	TR	50.0	38.0	59.6	119.2	36.0	57.1	114.2			
59242	CLINTON5	161	59303	CLINTON	269.0	2	59242	CLINTON5	161	59303	CLINTON	269.0	1	TR	50.0	38.0	60.3	120.6	37.0	57.8	115.5			
59242	CLINTON5	161	96071	5CLINTN	161	1	59208	NEVADA	5	161	59308	NEVADA	269.0	1	TR	50.0	36.0	50.4	100.9	36.0	50.1	100.2		
56753	JEC	7	345	56755	MORRIS	7	345	1	56788	EMANHAT6	230	56790	JEC	6	230	1	LN	446.0	383.0			386.0	449.6	100.8

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56753 JEC 7 345	56759 SUMMIT 7 345 1	56788 EMANHAT6 230	56790 JEC 6 230 1 LN	446.0	383.0	386.0	447.3	100.3
56805 MARMATN5 161	58065 CNTRVIL5 161 1	58067 CENTENL5 161	58069 PAOLA 5 161 1 LN	293.0	248.0	270.0	310.8	106.1
57968 STILWEL7 345	59200 PHILL 7 345 1	57969 STILWEL5 161	58053 REDEL 5 161 1 LN	293.0	254.0	269.0	307.6	105.0
57977 CRAIG 7 345	57978 CRAIG 5 161 11	57977 CRAIG 7 345	57978 CRAIG 5 161 33 TR	400.0	238.0	297.0	414.4	103.6
57977 CRAIG 7 345	57978 CRAIG 5 161 22	57977 CRAIG 7 345	57978 CRAIG 5 161 33 TR	400.0	238.0	297.0	412.9	103.2
57978 CRAIG 5 161	57979 PFLUMM 5 161 1	57978 CRAIG 5 161	58039 LENEXAN5 161 1 LN	293.0	168.0	237.0	310.7	106.0
		58031 GRNWOOD5 161	58039 LENEXAN5 161 1 LN	293.0	150.0	218.0	293.3	100.1
57978 CRAIG 5 161	58049 CEDRCRK5 161 1	57978 CRAIG 5 161	58039 LENEXAN5 161 1 LN	293.0	168.0	237.0	298.1	101.8
57979 PFLUMM 5 161	58047 OVERLPK5 161 1	57978 CRAIG 5 161	58039 LENEXAN5 161 1 LN	293.0	168.0	237.0	304.0	103.7
57993 STHTOWN5 161	57994 HICKMAN5 161 1	57969 STILWEL5 161	58053 REDEL 5 161 1 LN	293.0	254.0	269.0	306.6	104.7
57993 STHTOWN5 161	58001 FOREST 5 161 1	58032 MERRIAM5 161	58040 ROEPARK5 161 1 LN	187.0	52.0	100.0	195.0	104.3
58036 OLATHEE5 161	58037 OLATHEW5 161 1	57966 WGARDNR5 161	58044 MOONLT 5 161 1 LN	293.0	192.0	243.0	309.8	105.7
58057 BUCYRUS5 161	58058 NLOUISB5 161 1	57969 STILWEL5 161	58057 BUCYRUS5 161 1 LN	224.0	160.0	170.0	225.4	100.6
59200 PHILL 7 345	59225 PHILL 5 161 1	57969 STILWEL5 161	58053 REDEL 5 161 1 LN	293.0	254.0	269.0	314.3	107.3
		58002 MARTCIT5 161	58053 REDEL 5 161 1 LN	293.0	231.0	246.0	295.6	100.9
59208 NEVADA 5 161	59216 BUTLER_5 161 1	59216 BUTLER_5 161	96689 2BUTLER 69.0 1 TR	56.0	37.0	38.0	56.5	100.9
59220 FROSTRD5 161	59245 KCSOUTH5 161 1	59206 PRALEE 5 161	59211 BLSPS 5 161 1 LN	223.0	146.0	150.0	226.7	101.7
56759 SUMMIT 7 345	56778 SUMMIT7X 1	56788 EMANHAT6 230	56790 JEC 6 230 1 LN	446.0	383.0	386.0	446.4	100.1
56778 SUMMIT7X	56795 SUMMIT 6 230 1	56788 EMANHAT6 230	56790 JEC 6 230 1 LN	446.0	383.0	386.0	446.4	100.1