DPA-2025-NOVEMBER-2233

Delivery Point Network Study

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By SPP Engineering, Transmission Services

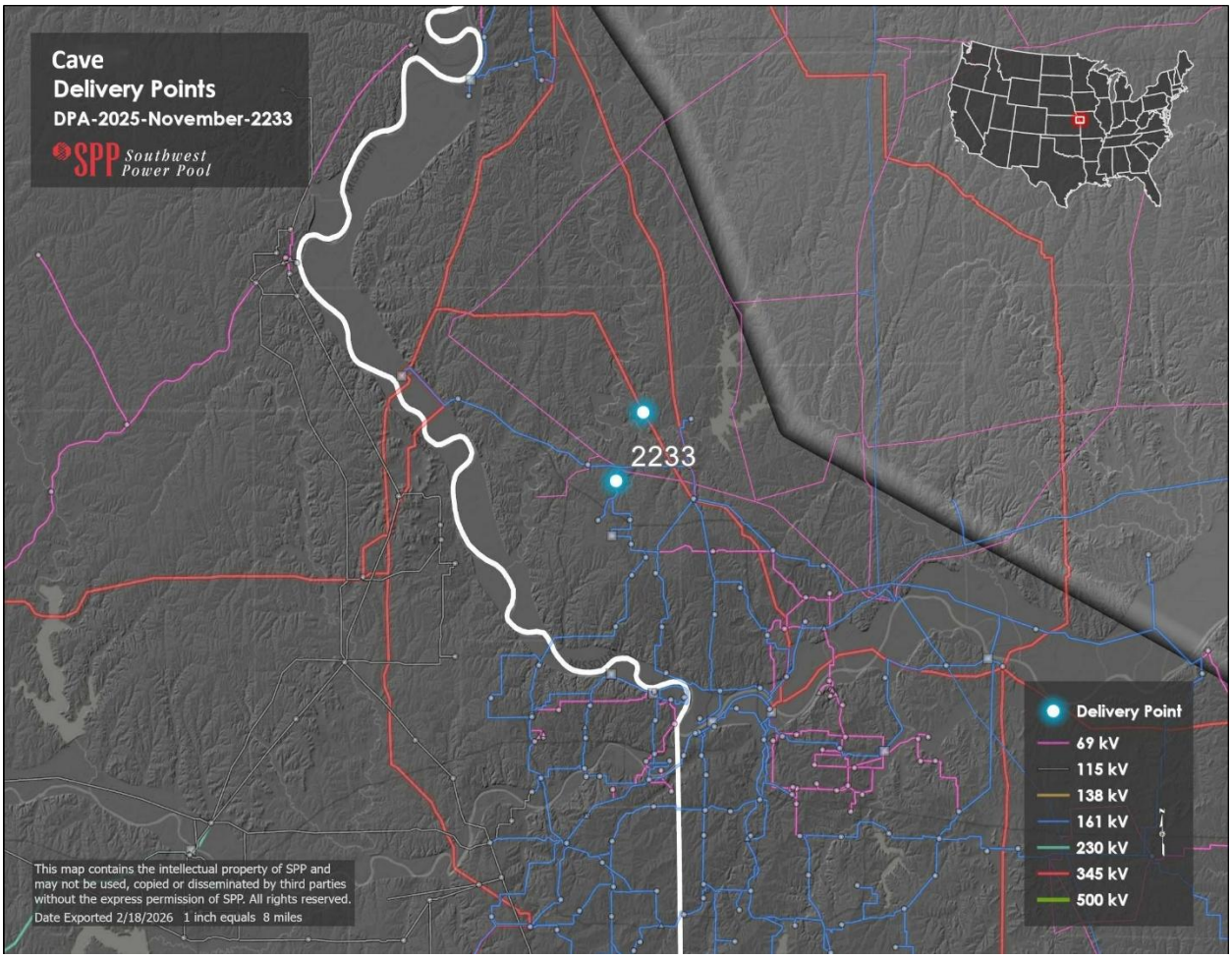
REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
3/31/2026	SPP	Original	
4/14/2026	SPP	First Revision	
6/12/2026	SPP	2nd Revision	Added solution 3 and updated cost estimates.
6/29/2026	SPP	3rd Revision	Delivery point name changes

CONTENTS

SECTION 1: INTRODUCTION

This report outlines the results of an evaluation of regional transmission impacts from delivery point request DPA-2025-November-2233. The requesting entity plans to add new load to the existing delivery points called Cave 161 kV and Cave 345 kV (Cave) with an in-service date of 4/1/2028. The Cave delivery points are in the Evergy Metro (Evergy) Transmission System.



The load flow models used for the evaluation were 2025 Integrated Transmission Planning (ITP) base reliability models. Southwest Power Pool (SPP) performed an Alternating Current (AC) contingency analysis on these models using PSS®E.

SECTION 2: STUDY METHODOLOGY

OBJECTIVE

The purpose of this study was to determine the regional Transmission System impacts within the SPP footprint due to the new load served by Evergy. SPP performed a Delivery Point Network Study (DPNS) with the configurations shown in Table 2-1 below.

STUDY PROCESS

- Model Assumptions
  - 2025 ITP Base Reliability Model Series
    - Model years 2029 and 2034
    - Summer Peak (2029S and 2034S), Winter Peak (2029W and 2034W), and Light Load (2029L and 2034L)
  - 2025 ITP Short Circuit Model Series
    - 2029 Summer Max Fault
  - 2025 Transmission System Planning (TPL) Dynamic Model Series
    - 2034 Summer Peak Base and Change Cases

Table 2-1: Study Cases

Case Name	Study Year	Season	Scenario	Load (MW/MVAR)
2025ITPFinal-29L.sav	2029	Light Load	Base Reliability	Base Case
2025ITPFinal-29S.sav	2029	Summer Peak	Base Reliability	Base Case
2025ITPFinal-29W.sav	2029	Winter Peak	Base Reliability	Base Case
2025ITPFinal-34L.sav	2034	Light Load	Base Reliability	Base Case
2025ITPFinal-34S.sav	2034	Summer Peak	Base Reliability	Base Case
2025ITPFinal-34W.sav	2034	Winter Peak	Base Reliability	Base Case
2025ITPFinal-29L_2233.sav	2029	Light Load	Base Reliability	Cave 345 kV = 514/168.9 Cave 161 kV = 250/82.2
2025ITPFinal-29S_2233.sav	2029	Summer Peak	Base Reliability	Cave 345 kV = 514/168.9 Cave 161 kV = 250/82.2
2025ITPFinal-29W_2233.sav	2029	Winter Peak	Base Reliability	Cave 345 kV = 514/168.9 Cave 161 kV = 250/82.2
2025ITPFinal-34L_2233.sav	2034	Light Load	Base Reliability	Cave 345 kV = 725/238.3 Cave 161 kV = 250/82.2
2025ITPFinal-34S_2233.sav	2034	Summer Peak	Base Reliability	Cave 345 kV = 725/238.3 Cave 161 kV = 250/82.2
2025ITPFinal-34W_2233.sav	2034	Winter Peak	Base Reliability	Cave 345 kV = 725/238.3 Cave 161 kV = 250/82.2

- Steady State Analysis
    - Assumptions (consistent with the ITP analysis)
        - AC contingency analysis on all load flow models using PSS®E
        - Monitored Elements
            - SPP facilities 69 kV and above
            - First-tier companies 100 kV and above
        - Contingencies (consistent with the ITP analysis)
            - Provided for the ITP by SPP members and first-tier companies
        - Apply SPP Criteria and National American Electric Reliability Corporation (NERC) reliability standards
    - Compare thermal and voltage violations that occur with and without the Cave delivery point changes to determine thermal and voltage violations resulting from the load addition to the Transmission System.
- Dynamics Analysis
    - Assumptions
        - 2025 TPL Dynamics Model Series
            - 2034 Summer Peak Base and Change Cases
    - Analyses
        - Fast Fault Screening using Physical and Operational Margins Studio
- Short Circuit Analysis
    - Assumptions
        - Used 2025 Final ITP Short Circuit models (Max Fault)
            - Placed all available facilities in service
                - Generation
                - Transmission lines
                - Transformers
                - Buses
            - Short Circuit Output
                - Physical
            - Short Circuit Coordinates
                - Polar
            - Short Circuit Parameters
                - 3 Phase
            - FLAT – classical fault analysis conditions
    - Analyses
        - Three-phase fault

SECTION 3: RESULTS OF ANALYSIS

POTENTIAL THERMAL AND VOLTAGE VIOLATIONS

The analysis identified potential thermal and voltage violations resulting from the new load at the Cave delivery point. Table 3-1 details the potential thermal violations and Table 3-2 details the potential voltage violations resulting from the load addition. Potential violations which occurred due to P3 contingencies were omitted from these tables due to redundancy of the results below.

Table 3-1: Potential Thermal Violations

Model	Voltage Level (kV)	Facility Name	Contingency Name	Rate A, Rate B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
29S	115	INDIANH3 - 17&FAIR3 - 1	AUBURN 3 - SHERWOD3 - 1	140/156	156.624	100.4
29S	115	BISMARK3 - MIDLADS3 - 1	LAWHILL6 - LWRNCHL3 - 1	115/117	118.053	100.9
29S	69	LNGVW 2 - BRMALL 2 - 1	P12:161:GMO:PRAIRIELEE-BLUESPRINGSS-BLUESPRINGSE_1 OPEN LINE FROM BUS 541206 TO BUS 541211 OPEN LINE FROM BUS 541205 TO BUS 541211	43/49	52.038	106.2
29S	69	BRMALL 2 - SUB N - 1	P12:161:GMO:PRAIRIELEE-BLUESPRINGSS-BLUESPRINGSE_1 OPEN LINE FROM BUS 541206 TO BUS 541211 OPEN LINE FROM BUS 541205 TO BUS 541211	43/47	49.82	106
29S	69	LNGVW 2 - BRMALL 2 - 1	PHILL 7 - SIBLEY 7 - 1	43/49	49.833	101.7
29S	69	BRMALL 2 - SUB N - 1	PHILL 7 - SIBLEY 7 - 1	43/47	47.611	101.3
29S	69	LNGVW 2 - BRMALL 2 - 1	SIBLEY 7 - HAWTH 7 - 1	43/49	50.911	103.9
29S	69	BRMALL 2 - SUB N - 1	SIBLEY 7 - HAWTH 7 - 1	43/47	48.692	103.6
29S	345/161	SIBLEY 7 - SIBLEY11 - 11	SIBLEY 7 - HAWTH 7 - 1	400/440	491.04	111.6
29S	345/161	SIBLEY 5 - SIBLEY11 - 11	SIBLEY 7 - HAWTH 7 - 1	400/440	480.92	109.3
29S	69	LNGVW 2 - BRMALL 2 - 1	BLSPE 5 - BLSPS 5 - 1	43/49	51.303	104.7
29S	69	BRMALL 2 - SUB N - 1	BLSPE 5 - BLSPS 5 - 1	43/47	49.068	104.4
29S	69	LNGVW 2 - BRMALL 2 - 1	PRALEE 5 - BLSPS 5 - 1	43/49	52.038	106.2
29S	69	BRMALL 2 - SUB N - 1	PRALEE 5 - BLSPS 5 - 1	43/47	49.82	106
29S	161	PHILL 5 - LKWINBG5 - 1	PRALEE 5 - LEESUM 5 - 1	542/557	565.912	101.6
29S	345	STILWEL7 - LACYGNE7 - 1	W.GRDNR7 - LACYGNE7 - 1	1713/1792	1863.68	104
29S	161	WGARDNR5 - BNSF 5 - 1	WGARDNR5 - CEDRCRK5 - 1	311/334	339.01	101.5
29S	69	LNGVW 2 - BRMALL 2 - 1	P23:345:GMO:SIBLEY_R3-8::SIBLEY-PHILL-OVERTON_1 OPEN LINE FROM BUS 541200 TO BUS 541201	43/49	53.851	109.9

Model	Voltage Level (kV)	Facility Name	Contingency Name	Rate A, Rate B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
			OPEN LINE FROM BUS 345408 TO BUS 541201			
29S	69	BRMALL 2 - SUB N - 1	P23:345:GMO:SIBLEY_R3-8::SIBLEY-PHILL-OVERTON_1 OPEN LINE FROM BUS 541200 TO BUS 541201 OPEN LINE FROM BUS 345408 TO BUS 541201	43/47	51.7	110
29S	69	LNGVW 2 - BRMALL 2 - 1	P23:345:GMO-KCPL:SIBLEY_R8-10::SIBLEY-HAWTHORN-PHILL_1 OPEN LINE FROM BUS 541201 TO BUS 542972 OPEN LINE FROM BUS 541200 TO BUS 541201	43/49	53.165	108.5
29S	69	BRMALL 2 - SUB N - 1	P23:345:GMO-KCPL:SIBLEY_R8-10::SIBLEY-HAWTHORN-PHILL_1 OPEN LINE FROM BUS 541201 TO BUS 542972 OPEN LINE FROM BUS 541200 TO BUS 541201	43/47	50.901	108.3
29S	69	LNGVW 2 - BRMALL 2 - 1	P12:161:GMO:PRAIRIELEE-BLUESPRINGSS-BLUESPRINGS:::HV: OPEN LINE FROM BUS 541206 TO BUS 541211 CKT 1 OPEN LINE FROM BUS 541205 TO BUS 541211 CKT 1	43/49	52.038	106.2
29S	69	BRMALL 2 - SUB N - 1	P12:161:GMO:PRAIRIELEE-BLUESPRINGSS-BLUESPRINGS:::HV: OPEN LINE FROM BUS 541206 TO BUS 541211 CKT 1 OPEN LINE FROM BUS 541205 TO BUS 541211 CKT 1	43/47	49.82	106
34S	115	AUBURN 3 - INDIANH3 - 1	P12:115:WERE:AUBN-SGAG-115:HV: OPEN LINE FROM BUS 533151 TO BUS 533194 CKT 1 OPEN LINE FROM BUS 533178 TO BUS 533194 CKT 1	226/239	245.453	102.7
34S	345	EMPEC 7 - SWISVAL7 - 1	P23:345:KCPL:WGARDNER-R10-12:::EHV: OPEN LINE FROM BUS 542965 TO BUS 542968 CKT 1 OPEN LINE FROM BUS 542965 TO BUS 542981 CKT 1	1076/1076	1127.648	104.8

Model	Voltage Level (kV)	Facility Name	Contingency Name	Rate A, Rate B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
34S	161	MARTCTY5 - STHTOWN5 - 1	P23:345:KCPL:WGARDNER-R10-12:::EHV: OPEN LINE FROM BUS 542965 TO BUS 542968 CKT 1 OPEN LINE FROM BUS 542965 TO BUS 542981 CKT 1	311/334	334.334	100.1
34S	138	MULVANE 4 - FARBER 4 - 1	P42:345:OKGE:SB_OPKY7319:::EHV: OPEN BRANCH FROM BUS 514825 TO BUS 515621 CKT 1 OPEN BRANCH FROM BUS 515621 TO BUS 532794 CKT 1	121/121	123.783	102.3
34S	138	MULVANE 4 - SC10BEL4 - 1	P42:345:OKGE:SB_OPKY7319:::EHV: OPEN BRANCH FROM BUS 514825 TO BUS 515621 CKT 1 OPEN BRANCH FROM BUS 515621 TO BUS 532794 CKT 1	121/121	133.826	110.6
34S	138	MULVANE 4 - FARBER 4 - 1	P42:345:OKGE:SB_OPKY7388:::EHV: OPEN BRANCH FROM BUS 514825 TO BUS 515621 CKT 1 OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1	121/121	124.267	102.7
34S	138	MULVANE 4 - SC10BEL4 - 1	P42:345:OKGE:SB_OPKY7388:::EHV: OPEN BRANCH FROM BUS 514825 TO BUS 515621 CKT 1 OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1	121/121	134.189	110.9
34S	138	MULVANE 4 - FARBER 4 - 1	P42:345:OKGE:SB_OPKY7308:::EHV: OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1 OPEN BRANCH FROM BUS 515621 TO BUS 532794 CKT 1	121/121	123.783	102.3
34S	138	MULVANE 4 - SC10BEL4 - 1	P42:345:OKGE:SB_OPKY7308:::EHV: OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1 OPEN BRANCH FROM BUS 515621 TO BUS 532794 CKT 1	121/121	133.826	110.6
34S	161	MARTCTY5 - STHTOWN5 - 1	SIBLEY 7 - HAWTH 7 - 1	311/334	342.016	102.4
34S	345/161	SIBLEY 7 - SIBLEY11 - 11	SIBLEY 7 - HAWTH 7 - 1	400/440	541.2	123
34S	345/161	SIBLEY 5 - SIBLEY11 - 11	SIBLEY 7 - HAWTH 7 - 1	400/440	528.44	120.1
34S	345	SIBLEY 7 - HAWTH 7 - 1	SIBLEY 5 - SIBLEYPL - 1	896/896	921.088	102.8
34S	345	SIBLEY 7 - HAWTH 7 - 1	CAVE345 - IATAN 7 - 1	896/896	908.544	101.4
34S	161	WGARDNR5 - BNSF 5 - 1	WGARDNR5 - CEDRCRK5 - 1	311/334	349.698	104.7
34S	161	MARTCTY5 - STHTOWN5 - 1	STILWEL5 - HICKMAN5 - 1	311/334	341.014	102.1

Model	Voltage Level (kV)	Facility Name	Contingency Name	Rate A, Rate B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
34S	345	EMPEC 7 - SWISVAL7 - 1	LACYGNE7 - WAVERLY7 - 1	1076/1076	1106.128	102.8
34S	138	MULVANE 4 - FARBER 4 - 1	P23:345:WERE:WICH-345-116:EHV: OPEN LINE FROM BUS 532782 TO BUS 532796 CKT 1 OPEN LINE FROM BUS 532796 TO BUS 532798 CKT 1	121/121	124.146	102.6
34S	138	MULVANE 4 - SC10BEL4 - 1	P23:345:WERE:WICH-345-116:EHV: OPEN LINE FROM BUS 532782 TO BUS 532796 CKT 1 OPEN LINE FROM BUS 532796 TO BUS 532798 CKT 1	121/121	134.431	111.1
34S	161	MARTCTY5 - STHTOWN5 - 1	P23:345:GMO-KCPL:SIBLEY_R8-10::SIBLEY-HAWTHORN-PHILL_1 OPEN LINE FROM BUS 541201 TO BUS 542972 OPEN LINE FROM BUS 541200 TO BUS 541201	311/334	344.354	103.1
34S	345/161	SIBLEY 7 - SIBLEY11 - 11	P23:345:GMO-KCPL:SIBLEY_R8-10::SIBLEY-HAWTHORN-PHILL_1 OPEN LINE FROM BUS 541201 TO BUS 542972 OPEN LINE FROM BUS 541200 TO BUS 541201	400/440	523.6	119
34S	345/161	SIBLEY 5 - SIBLEY11 - 11	P23:345:GMO-KCPL:SIBLEY_R8-10::SIBLEY-HAWTHORN-PHILL_1 OPEN LINE FROM BUS 541201 TO BUS 542972 OPEN LINE FROM BUS 541200 TO BUS 541201	400/440	510.84	116.1
34S	161	GRNWD 5 - LEESUM 5 - 1	PHILL 5 - LKWINBG5 - 1	487/546	552.552	101.2
34S	161	S.OTTWA5 - PAOLA 5 - 1	CENTENL5 - PAOLA 5 - 1	161/167	168.002	100.6
34S	138	MULVANE 4 - FARBER 4 - 1	P42:345:OKGE:SB_RARD7311:::EHV: OPEN BRANCH FROM BUS 515576 TO BUS 515688 CKT 1 OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1	121/121	121.968	100.8
34S	138	MULVANE 4 - SC10BEL4 - 1	P42:345:OKGE:SB_RARD7311:::EHV: OPEN BRANCH FROM BUS 515576 TO BUS 515688 CKT 1 OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1	121/121	132.011	109.1
34S	138	MULVANE 4 - SC10BEL4 - 1	P42:345:OKGE:SB_RARD7313:::EHV: OPEN BRANCH FROM BUS 515576 TO BUS 515688 CKT 1	121/121	127.534	105.4

Model	Voltage Level (kV)	Facility Name	Contingency Name	Rate A, Rate B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
34S	138	MULVANE 4 - FARBER 4 - 1	RANCHRD7 - OPENSKY7 - 1	121/121	122.331	101.1
34S	138	MULVANE 4 - SC10BEL4 - 1	RANCHRD7 - OPENSKY7 - 1	121/121	132.253	109.3
34S	138	MULVANE 4 - FARBER 4 - 1	WICHITA7 - VIOLA 7 - 1	121/121	122.331	101.1
34S	138	MULVANE 4 - SC10BEL4 - 1	WICHITA7 - VIOLA 7 - 1	121/121	132.495	109.5
34S	345	EMPEC 7 - SWISVAL7 - 1	WOLFCRK7 - WAVERLY7 - 1	1076/1076	1077.076	100.1
34S	138	MULVANE 4 - SC10BEL4 - 1	ELPASO 4 - ELPASOE4 - Z1	121/121	122.694	101.4
34S	115	AUBURN 3 - SHERWOD3 - 1	AUBURN 3 - INDIANH3 - 1	226/254	264.414	104.1
34S	115	AUBURN 3 - INDIANH3 - 1	AUBURN 3 - SHERWOD3 - 1	226/239	249.038	104.2
34S	115	AUBURN 3 - INDIANH3 - 1	S GAGEE3 - SHERWOD3 - 1	226/239	239.956	100.4
34S	345	EMPEC 7 - SWISVAL7 - 1	WAVERLY7 - LACYGNE7 - 1	1076/1076	1106.128	102.8
34S	138	MULVANE 4 - SC10BEL4 - 1	P42:345:OKGE:SB_SOER7383:::EHV: OPEN BRANCH FROM BUS 514803 TO BUS 516010 CKT 1 OPEN BRANCH FROM BUS 514803 TO BUS 515576 CKT 1	121/121	126.203	104.3
34S	138	MULVANE 4 - FARBER 4 - 1	P42:345:OKGE:SB_RARD7381:::EHV: OPEN BRANCH FROM BUS 515576 TO BUS 516066 CKT 1 OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1	121/121	122.331	101.1
34S	138	MULVANE 4 - SC10BEL4 - 1	P42:345:OKGE:SB_RARD7381:::EHV: OPEN BRANCH FROM BUS 515576 TO BUS 516066 CKT 1 OPEN BRANCH FROM BUS 515576 TO BUS 515621 CKT 1	121/121	132.253	109.3

Table 3-2: Potential Voltage Violations

Model	Facility Name	Facility Voltage (kV)	Contingency Name	Voltage Maximum (pu)	Voltage Minimum (pu)	Bus Voltage (pu)
29S	FAIRFAX2	69	BASE CASE	1.05	0.95	0.94981
29S	NTHWARD2	69	BASE CASE	1.05	0.95	0.94965
29S	SWAVCAP5	161	MALTABN5 - NORTON 5 - 1	1.05	0.9	0.89087
29S	MALTABN5	161	MALTABN5 - NORTON 5 - 1	1.05	0.9	0.89025
29S	SWAVRLY5	161	MALTABN5 - NORTON 5 - 1	1.05	0.9	0.89067
29S	CLINTON5	161	CLINTON5 - 5CLINTN - 1	1.05	0.9	0.85457
34S	HOYT 7	345	BASE CASE	1.05	0.95	0.94542
34S	TARKIO_2	69	BASE CASE	1.05	0.95	0.94974
34S	FAIRFAX2	69	BASE CASE	1.05	0.95	0.94906
34S	NTHWARD2	69	BASE CASE	1.05	0.95	0.9489

Model	Facility Name	Facility Voltage (kV)	Contingency Name	Voltage Maximum (pu)	Voltage Minimum (pu)	Bus Voltage (pu)
34S	CAVE161	161	BASE CASE	1.05	0.95	0.94985
34S	CLINTON5	161	CLINTON5 - 5CLINTN - 1	1.05	0.9	0.85707
34W	HOYT 7	345	HOYT 7 - STRANGR7 - 1	1.05	0.95	0.87683
34W	HOYT 7	345	P23:345:WERE:STRA-345-634:EHV: OPEN LINE FROM BUS 532765 TO BUS 532772 CKT 1 OPEN LINE FROM BUS 532772 TO BUS 542982 CKT 2	1.05	0.95	0.87687

SHORT CIRCUIT

SPP performed short circuit analysis for the 2029 Summer Peak with the new load addition. The analysis identified the currents listed in Table 3-3.

Table 3-3: Short Circuit Results

Season	Model	Fault	Bus	Current (Amps)
29S	Max Fault	Three Phase	103&ROKEBY3 345.00	21,307
29S	Max Fault	Three Phase	166TH 3 115.00	16,716
29S	Max Fault	Three Phase	1FRPT3TR 13.800	71,064
29S	Max Fault	Three Phase	1PLATTTR 13.200	9,545
29S	Max Fault	Three Phase	2FARLEY 69.000	5,429
29S	Max Fault	Three Phase	2GRNBRI 69.000	6,079
29S	Max Fault	Three Phase	2HOOVER 69.000	7,637
29S	Max Fault	Three Phase	2JOHNST 69.000	6,196
29S	Max Fault	Three Phase	2PLATCTY 69.000	8,592
29S	Max Fault	Three Phase	2WOODRUF 69.000	5,095
29S	Max Fault	Three Phase	54&MERI3 115.00	14,848
29S	Max Fault	Three Phase	5FAIRPTB2 161.00	19,195
29S	Max Fault	Three Phase	5FAIRPTXF3 161.00	19,187
29S	Max Fault	Three Phase	5PLATCTY 161.00	17,157
29S	Max Fault	Three Phase	7FAIRPT 345.00	12,967
29S	Max Fault	Three Phase	7OVERTON 345.00	15,715
29S	Max Fault	Three Phase	87TH 1X1 14.400	78,618
29S	Max Fault	Three Phase	87TH 2X1 14.400	52,419
29S	Max Fault	Three Phase	87TH 3 115.00	39,786
29S	Max Fault	Three Phase	87TH 7 345.00	21,384
29S	Max Fault	Three Phase	AMELIA 3 115.00	8,028
29S	Max Fault	Three Phase	ARNO T1 TER12.4000	14,935
29S	Max Fault	Three Phase	ARNO T2 TER12.4000	14,228
29S	Max Fault	Three Phase	ARNOLD 3 115.00	9,154
29S	Max Fault	Three Phase	ARNOLD T1 1 12.470	4,100
29S	Max Fault	Three Phase	ARNOLD T2 1 12.470	3,987
29S	Max Fault	Three Phase	ATCHSN 3 345.00	18,728

Season	Model	Fault	Bus	Current (Amps)
29S	Max Fault	Three Phase	ATLNTIC7 345.00	23,799
29S	Max Fault	Three Phase	AVENUECTY 5 161.00	17,389
29S	Max Fault	Three Phase	AVONDAL5 161.00	30,380
29S	Max Fault	Three Phase	BARRY 5 161.00	19,244
29S	Max Fault	Three Phase	BLUEVLY5 161.00	38,765
29S	Max Fault	Three Phase	BRMGHAM5 161.00	30,483
29S	Max Fault	Three Phase	CAROSEL3 115.00	14,677
29S	Max Fault	Three Phase	CHARGER3 115.00	5,513
29S	Max Fault	Three Phase	CHOUTEU5 161.00	36,461
29S	Max Fault	Three Phase	CLAYCM15 161.00	21,765
29S	Max Fault	Three Phase	CLEARVW3 115.00	24,515
29S	Max Fault	Three Phase	COOK 5 161.00	14,980
29S	Max Fault	Three Phase	COOPER 869.000	6,323
29S	Max Fault	Three Phase	COOPER 3 345.00	28,306
29S	Max Fault	Three Phase	COOPER 5 161.00	17,941
29S	Max Fault	Three Phase	COOPER T2 913.800	44,883
29S	Max Fault	Three Phase	COOPER T5 913.800	25,695
29S	Max Fault	Three Phase	COOPER T6 913.800	6,599
29S	Max Fault	Three Phase	COOPER1G 22.000	56,888
29S	Max Fault	Three Phase	CRAI T11 13.800	12,262
29S	Max Fault	Three Phase	CRAI T22 13.800	19,192
29S	Max Fault	Three Phase	CRAI T33 13.800	18,856
29S	Max Fault	Three Phase	CRAIG 5 161.00	43,404
29S	Max Fault	Three Phase	CRAIG 7 345.00	22,497
29S	Max Fault	Three Phase	CSA-345 345.00	18,728
29S	Max Fault	Three Phase	EAST 5 161.00	16,486
29S	Max Fault	Three Phase	EAST_T2_1 34.500	6,761
29S	Max Fault	Three Phase	EAST_T2_TER17.9700	16,156
29S	Max Fault	Three Phase	EASTOWN1 13.800	57,666
29S	Max Fault	Three Phase	EASTOWN5 161.00	18,120
29S	Max Fault	Three Phase	EASTOWN7 345.00	18,792
29S	Max Fault	Three Phase	EDMOND5 161.00	13,673
29S	Max Fault	Three Phase	EFAIRMNT3 115.00	10,958
29S	Max Fault	Three Phase	FRLVW 5 161.00	16,536
29S	Max Fault	Three Phase	FRSTCRK5 161.00	31,075
29S	Max Fault	Three Phase	GEARY 7 345.00	10,634
29S	Max Fault	Three Phase	GLADSTN_CAP5161.00	18,310
29S	Max Fault	Three Phase	GLADSTN5 161.00	20,602
29S	Max Fault	Three Phase	HALLMRK3 115.00	12,450
29S	Max Fault	Three Phase	HAW G5 1 22.000	2,718
29S	Max Fault	Three Phase	HAWT T20 13.800	12,202
29S	Max Fault	Three Phase	HAWT T22 13.800	12,202
29S	Max Fault	Three Phase	HAWTH 7 345.00	22,118
29S	Max Fault	Three Phase	HAWTHN5 161.00	59,062
29S	Max Fault	Three Phase	HAWTHS5 161.00	58,483
29S	Max Fault	Three Phase	HI_BNKS1_WF7345.00	4,022
29S	Max Fault	Three Phase	HLLMRK 5 161.00	13,682

Season	Model	Fault	Bus	Current (Amps)
29S	Max Fault	Three Phase	HOYT 1 14.400	47,894
29S	Max Fault	Three Phase	HOYT 3 115.00	21,120
29S	Max Fault	Three Phase	HOYT 7 345.00	11,857
29S	Max Fault	Three Phase	HTI JCT3 115.00	15,806
29S	Max Fault	Three Phase	IAT G1 1 24.000	35,874
29S	Max Fault	Three Phase	IAT G2 1 24.500	46,000
29S	Max Fault	Three Phase	IATAN 7 345.00	29,560
29S	Max Fault	Three Phase	IATAN 11 14.400	24,198
29S	Max Fault	Three Phase	IATAN5 161.00	15,013
29S	Max Fault	Three Phase	IC_LV1_1 34.500	21,976
29S	Max Fault	Three Phase	IC_TERT1_1 13.800	37,297
29S	Max Fault	Three Phase	IND PRK5 161.00	15,923
29S	Max Fault	Three Phase	IRSH_CK_WF7 345.00	5,457
29S	Max Fault	Three Phase	JARBALO3 115.00	25,911
29S	Max Fault	Three Phase	JEC 6 230.00	24,845
29S	Max Fault	Three Phase	JEC 13 1 14.400	33,428
29S	Max Fault	Three Phase	JEC 26 1 14.400	33,638
29S	Max Fault	Three Phase	JEC N 7 345.00	23,487
29S	Max Fault	Three Phase	JEC U2 26.000	10,216
29S	Max Fault	Three Phase	JEC U3 26.000	9,564
29S	Max Fault	Three Phase	KCI 5 161.00	15,080
29S	Max Fault	Three Phase	KERFORD3 115.00	8,795
29S	Max Fault	Three Phase	CAVE161 161.00	15,099
29S	Max Fault	Three Phase	CAVE345 345.00	18,767
29S	Max Fault	Three Phase	KETCHEM7 345.00	7,657
29S	Max Fault	Three Phase	LBRTYWT5 161.00	15,512
29S	Max Fault	Three Phase	LEC U4 3 115.00	20,508
29S	Max Fault	Three Phase	LEVEE 5 161.00	52,934
29S	Max Fault	Three Phase	MIDWAY_5 161.00	11,063
29S	Max Fault	Three Phase	MNTCLLO3 115.00	28,925
29S	Max Fault	Three Phase	MOCHILA5 161.00	13,545
29S	Max Fault	Three Phase	MOORE 3 345.00	25,015
29S	Max Fault	Three Phase	MORRIS 7 345.00	13,100
29S	Max Fault	Three Phase	MWGRAIN3 115.00	7,745
29S	Max Fault	Three Phase	NASH T11 13.800	12,020
29S	Max Fault	Three Phase	NASHUA 5 161.00	34,371
29S	Max Fault	Three Phase	NASHUA 7 345.00	21,918
29S	Max Fault	Three Phase	NASHUA_CAP5 161.00	28,433
29S	Max Fault	Three Phase	NASHUA-5 161.00	34,590
29S	Max Fault	Three Phase	NASHXF 13.800	12,020
29S	Max Fault	Three Phase	NCONGRS5 161.00	21,446
29S	Max Fault	Three Phase	NEBCTY1G 18.000	23,794
29S	Max Fault	Three Phase	NEBCTY2G 23.000	91,692
29S	Max Fault	Three Phase	NTHLAND3 115.00	15,484
29S	Max Fault	Three Phase	NW LEAV3 115.00	17,493
29S	Max Fault	Three Phase	OLIVECREEK 3345.00	24,387
29S	Max Fault	Three Phase	OLIVECREEK 7115.00	45,062

Season	Model	Fault	Bus	Current (Amps)
29S	Max Fault	Three Phase	OLIVECRK.T1913.800	32,216
29S	Max Fault	Three Phase	OLIVECRK.T2913.800	32,214
29S	Max Fault	Three Phase	PARALEL3 115.00	7,500
29S	Max Fault	Three Phase	PHILL 7 345.00	18,808
29S	Max Fault	Three Phase	PLTCTY 5 161.00	17,233
29S	Max Fault	Three Phase	POPE 161.00	13,503
29S	Max Fault	Three Phase	RANDLPH5 161.00	32,422
29S	Max Fault	Three Phase	RNRDGE 2 69.000	4,937
29S	Max Fault	Three Phase	RNRIDGE_CAP5161.00	21,784
29S	Max Fault	Three Phase	RNRIDGE5 161.00	25,107
29S	Max Fault	Three Phase	S1280 5 161.00	10,237
29S	Max Fault	Three Phase	S3456 3 345.00	34,963
29S	Max Fault	Three Phase	S3458 3 345.00	31,957
29S	Max Fault	Three Phase	S3458-HOLT 3345.00	31,957
29S	Max Fault	Three Phase	S3740 3 345.00	26,128
29S	Max Fault	Three Phase	SC_CLCT1_1 34.500	21,864
29S	Max Fault	Three Phase	SC_CLCT2_1 34.500	21,589
29S	Max Fault	Three Phase	SC_LV1_1 34.500	23,281
29S	Max Fault	Three Phase	SC_LV2_1 34.500	23,017
29S	Max Fault	Three Phase	SC_TERT1_1 13.800	14,236
29S	Max Fault	Three Phase	SC_TERT2_1 13.800	14,064
29S	Max Fault	Three Phase	SHALE 7 345.00	20,406
29S	Max Fault	Three Phase	SHOLCRK5 161.00	23,800
29S	Max Fault	Three Phase	SIB REA1 345.00	18,570
29S	Max Fault	Three Phase	SIBLEY 5 161.00	26,993
29S	Max Fault	Three Phase	SIBLEY 7 345.00	20,880
29S	Max Fault	Three Phase	SIBLEY T 13.800	66,288
29S	Max Fault	Three Phase	SLDR_CK_WF7 345.00	5,918
29S	Max Fault	Three Phase	SMTHVL 5 161.00	23,800
29S	Max Fault	Three Phase	SPRUCE 3 115.00	15,075
29S	Max Fault	Three Phase	ST JOE 5 161.00	21,943
29S	Max Fault	Three Phase	ST JOE 7 345.00	20,485
29S	Max Fault	Three Phase	ST JOE_CAP5 161.00	19,363
29S	Max Fault	Three Phase	STJOE 1T 13.800	88,648
29S	Max Fault	Three Phase	STJOE 2T 13.800	88,647
29S	Max Fault	Three Phase	STRAN1 1 14.400	33,293
29S	Max Fault	Three Phase	STRAN3 1 14.400	42,184
29S	Max Fault	Three Phase	STRANGR3 115.00	35,729
29S	Max Fault	Three Phase	STRANGR7 345.00	25,744
29S	Max Fault	Three Phase	THORNTN3 115.00	15,776
29S	Max Fault	Three Phase	TIFFANY5 161.00	20,812
29S	Max Fault	Three Phase	TIMBRLN3 115.00	15,422
29S	Max Fault	Three Phase	TONGATP3 115.00	14,993
29S	Max Fault	Three Phase	TWA 5 161.00	18,115
29S	Max Fault	Three Phase	TWA#1 13.000	7,181
29S	Max Fault	Three Phase	TWA#2 13.000	8,746
29S	Max Fault	Three Phase	WAVERLY3 115.00	25,937

Season	Model	Fault	Bus	Current (Amps)
29S	Max Fault	Three Phase	WESTON 5 161.00	13,094
29S	Max Fault	Three Phase	WOODBIN5 161.00	18,011

STABILITY

SPP performed a Fast Fault Screening (FFS) using the 2034 Summer Peak for the base case and change case models. The change case models include the Cave delivery point changes. SPP determined no significant differences in the critical clearing times between the base and change cases. Therefore, a transient stability analysis is not required.

TRANSMISSION SOLUTIONS

The addition of the load at the existing Cave delivery points caused potential thermal overloads and low voltages on the Evergy Metro and Evergy Kansas Central Transmission System. SPP's solutions consisted of addressing each violation and by bringing in a 345 kV Transmission source from the southwest of Kansas City into an area of load growth. The third solution is a modified solution 2 but with a TO planned project substituted to solve the 69 kV violations. The solutions are listed below.

Solution #1: Total cost $345.3M

- Sub - Fairfax 69 kV 2.5 MVAR capacitor bank
- Line – Indian H3 to 17 Fair 115 kV circuit 1 rebuild
- Line – Bismark to Midlands 115 kV circuit 1 rebuild
- Line – West Gardner to BNSF 161 kV in line reactor
- Line – Blue Ridge to Sub N 69 kV circuit 1 rebuild
- Line – Blue Ridge to Longview 69 kV circuit 1 rebuild
- XFR – Sibley 345/161 kV transformer
- Line – Stillwell to La Cygne 345 kV circuit 1 rebuild
- Line – Swissvale to Emporia Energy Center 345 kV circuit 1 rebuild
- Line – Sibley to Hawthorne 345 kV circuit 1 rebuild
- Line – South Ottawa to Paola 161 kV circuit 1 rebuild
- Multi – Indian Hills to Auburn to Sherwood 115 kV circuit 1 rebuild
- Line – Mulvane to Belle Plaine 138 kV circuit 1 rebuild
- Line – Mulvane to Farber 138 kV circuit 1 rebuild
- Line – Martin City to Southtown 161 kV circuit 1 rebuild
- Line – Greenwood to Lee Summit East to 161 kV circuit 1 rebuild
- Sub – Hoyt 345 kV 125 MVAR capacitor bank

Solution #2: Total cost $268.3M

- Line – Waverly to Sailor 345 kV circuit 1 new line
- Line – Wolf Creek to Waverly 345 kV circuit 1 rebuild
- Sub – Hoyt 345 kV 50 MVAR capacitor bank
- XFR – Sibley 345/161 kV transformer
- Line – Blue Ridge to Sub N 69 kV circuit 1 rebuild
- Line – Blue Ridge to Longview 69 kV circuit 1 rebuild
- Line – Sailor to Astra North 345 kV circuit 1 new line
- Line – Mulvane to Belle Plaine 138 kV circuit 1 rebuild
- Line – Mulvane to Farber 138 kV circuit 1 rebuild
- Multi – Indian Hills to Auburn to Sherwood 115 kV circuit 1 rebuild

Solution #3: Total cost $267.4M

- Line – Waverly to Sailor 345 kV circuit 1 new line
- Line – Wolf Creek to Waverly 345 kV circuit 1 rebuild
- Sub – Hoyt 345 kV 50 MVAR capacitor bank

- XFR – Sibley 345/161 kV transformer
- XFR – Raytown 161/69 kV transformer
- Sub – Raytown 161 kV expansion
- Line – Raytown 161 kV cut-in
- Line – Sailor to Astra North 345 kV circuit 1 new line
- Line – Mulvane to Belle Plaine 138 kV circuit 1 rebuild
- Line – Mulvane to Farber 138 kV circuit 1 rebuild
- Multi – Indian Hills to Auburn to Sherwood 115 kV circuit 1 rebuild

SPP chose to move forward with Solution #3. This solution solves all issues identified in Table 3-1 and Table 3-2 in the most cost-effective manner.

Table 3-4: Recommended Upgrade Solution #3

New Upgrade Description*	Mileage	MVA (Rate B)	Date Needed**	Host Transmission Owner	Estimated Cost***
Line – Waverly to Sailor 345 kV circuit 1 new line	60	1792	6/1/2028	TBD	$186,000,000
Line – Wolf Creek to Waverly 345 kV circuit 1 rebuild	5.6	1792	6/1/2028	Evergy Kansas Central	$12,320,000
Sub – Hoyt 345 kV 50 MVAR capacitor bank	-	-	6/1/2028	Evergy Kansas Central	$15,000,000
XFR – Sibley 345/161 kV transformer	-	440	6/1/2028	Evergy Missouri West	$12,200,000
Sub – Raytown 161/69 kV transformer	-	110	6/1/2028	Evergy Missouri West	$6,075,000
Sub – Raytown 161 kV expansion	-	-	6/1/2028	Evergy Missouri West	$3,077,500
Line – Raytown 161 kV cut-in	0.1	223	6/1/2028	Evergy Missouri West	$210,000
Line – Sailor to Astra North 345 kV circuit 1 new line	3.7	1792	6/1/2034	TBD	$11,470,000
Line – Mulvane to Farber 138 kV circuit 1 rebuild	5.56	286	6/1/2034	Evergy Kansas Central	$6,674,400
Line – Mulvane to Belle Plaine 138 kV circuit 1 rebuild	7.63	286	6/1/2034	Evergy Kansas Central	$9,153,600
Multi – Indian Hills to Auburn to Sherwood 115 kV circuit 1 rebuild	5.17	317	6/1/2034	Evergy Kansas Central	$5,170,000
TOTAL NEW UPGRADE COST					**$267,350,500**

*All requests with a Network Upgrade(s) identified in the DPNS will be subject to further evaluation in the soonest available Integrated Transmission Planning Assessment that is able to include the load changes, if it is determined that the Network Upgrade(s) will be able to meet the study timeframe requirements pursuant to the standardized project timelines in SPP Business Practices, based on the SPP determined Network Upgrade(s) need date. If it is determined that a Network Upgrade(s) identified from a DPNS is unable to be further evaluated pursuant to the Integrated Transmission Planning Assessment, the DPNS report will be posted on the SPP website once SPP is notified by the Transmission Customer to update the applicable Network Integration Transmission Service Agreement to reflect the changes in delivery points and the Network Upgrade(s).

Pursuant to Attachment AQ of the Tariff, the Transmission provider is responsible for assessing the impacts on the Transmission System caused by modifying an existing delivery point or establishing the new delivery point through the Delivery Point Network Study ("DPNS"). The DPNS may determine the need for a Network Upgrade(s) necessary for the modification of an existing delivery point or the establishment of a new delivery point. A Network Upgrade(s) that the Transmission Customer or Host Transmission Owner desires that exceeds the needed Network Upgrade(s) identified in the DPNS will need to be studied through the Transmission Provider's Sponsored Upgrade study process to evaluate the impacts of the desired changes on the Transmission System.

**If the project need date specified in this study cannot be met, the Transmission Owner will be required to submit mitigations pursuant to the SPP Project Tracking process. All upgrades or mitigations must be in place prior to the dates shown in Table 3-4.

***Note that the estimated new upgrade cost provided in this report is an SPP Conceptual Cost Estimate only; this is preliminary, and a more refined Study Cost Estimate will be developed after issuance of this report through a Standardized Cost Estimate Reporting Template (SCERT).

SECTION 4: CONCLUSION

The AC analysis revealed potential thermal and voltage violations associated with the Cave load addition. The study shows that the following upgrades are required to reliably serve the load addition:

- Line – Waverly to Sailor 345 kV circuit 1 new line
- Line – Wolf Creek to Waverly 345 kV circuit 1 rebuild
- Sub – Hoyt 345 kV 50 MVAR capacitor bank
- XFR – Sibley 345/161 kV transformer
- XFR – Raytown 161/69 kV transformer
- Sub – Raytown 161 kV expansion
- Line – Raytown 161 kV cut-in
- Line – Sailor to Astra North 345 kV circuit 1 new line
- Line – Mulvane to Belle Plaine 138 kV circuit 1 rebuild
- Line – Mulvane to Farber 138 kV circuit 1 rebuild
- Multi – Indian Hills to Auburn to Sherwood 115 kV circuit 1 rebuild

The transmission upgrades in Table 3-4 are recommended to mitigate the potential voltage and thermal violations.