DPNS-2022-SEPTEMBER-1658

Delivery Point Network Study

Published on 1/31/2024

By SPP Engineering, Transmission Services

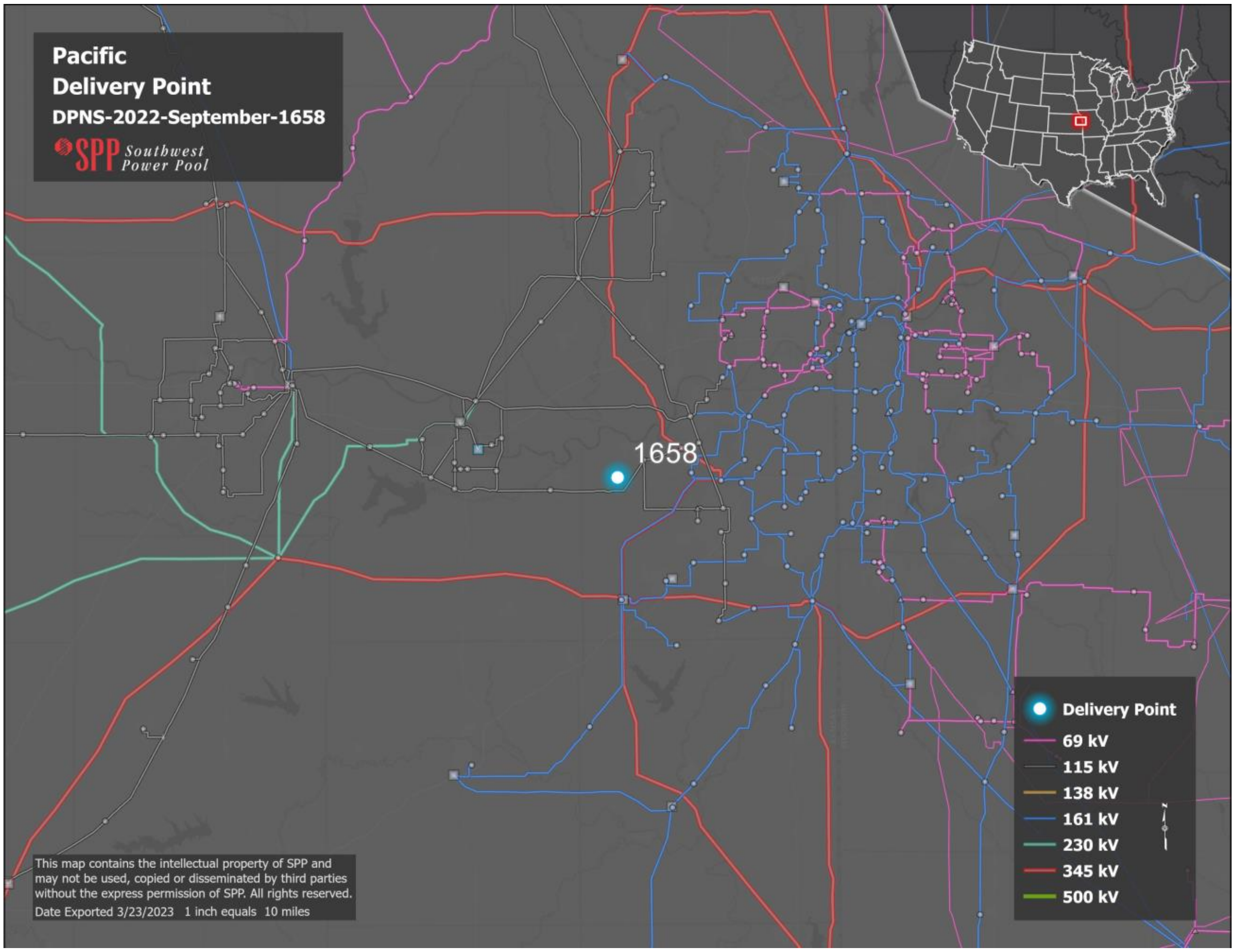
REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
1/4/2023	SPP	Pause in study	Host TO asked to put study on hold until new 2023 ITP models were built
4/18/2023	SPP	Original Report sent to TO	
9/6/2023	SPP	Changed load amount that was studied	Customer asked for a change in the load amount on 4/28/2023
1/31/2024	SPP	Changed the location of the project in Table 3-4	Evergy put the Pacific 115kV sub under functional control of SPP

CONTENTS

SECTION 1: INTRODUCTION

This report outlines the results of an evaluation of regional transmission impacts from delivery point request DPNS-2022-September-1658. The requesting entity plans to add a new delivery point called Pacific. The Pacific delivery point is located on the Evergy transmission system.



The load flow models used for the evaluation were 2023 ITP models. SPP performed an 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 WERE. SPP performed a Delivery Point Network Study ("DPNS") with the configurations shown in Table 2-1 below.

STUDY PROCESS

- Model Assumptions
    - 2023 ITP models
        - Model years 2024, 2027, and 2032
        - Summer Peak (2024S, 2027S, and 2032S), Winter Peak (2024W, 2027W, and 2032W), and Light Load (2024L, 2027L, and 2032L)
    - The models include the Pacific delivery point with the two interconnection points at Clearview and 95th and Waverly.
    - 2023 ITP Short Circuit model set
        - 2027 Summer Max Fault
    - MDWG Dynamic model set
        - 2031 MDWG Summer Peak Base and Change Case

Case Name	Study Year	Season	Scenario	Load (MW/MVAR)
2023ITPPF-24L.sav	2024	Light Load	Base Reliability	Base Case
2023ITPPF-24S.sav	2024	Summer Peak	Base Reliability	Base Case
2023ITPPF-24W.sav	2024	Winter Peak	Base Reliability	Base Case
2023ITPPF-27L.sav	2027	Light Load	Base Reliability	Base Case
2023ITPPF-27S.sav	2027	Summer Peak	Base Reliability	Base Case
2023ITPPF-27W.sav	2027	Winter Peak	Base Reliability	Base Case
2023ITPPF-32L.sav	2032	Light Load	Base Reliability	Base Case
2023ITPPF-32S.sav	2032	Summer Peak	Base Reliability	Base Case
2023ITPPF-32W.sav	2032	Winter Peak	Base Reliability	Base Case
2023ITPPF-24L_1658.sav	2024	Light Load	Base Reliability	Pacific = 1.6/1.2
2023ITPPF-24S_1658.sav	2024	Summer Peak	Base Reliability	Pacific = 42.4/31.8
2023ITPPF-24W_1658.sav	2024	Winter Peak	Base Reliability	Pacific = 113/84.75
2023ITPPF-27L_1658.sav	2027	Light Load	Base Reliability	Pacific = 236/177
2023ITPPF-27S_1658.sav	2027	Summer Peak	Base Reliability	Pacific = 236/177
2023ITPPF-27W_1658.sav	2027	Winter Peak	Base Reliability	Pacific = 236/177
2023ITPPF-32L_1658.sav	2032	Light Load	Base Reliability	Pacific = 236/177
2023ITPPF-32S_1658.sav	2032	Summer Peak	Base Reliability	Pacific = 236/177
2023ITPPF-32W_1658.sav	2032	Winter Peak	Base Reliability	Pacific = 236/177

Table 2-1: Study Cases

- 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 NERC reliability standards
    - Compare thermal overloads and voltage violations that occur with and without the Pacific delivery point to determine thermal overloads and voltage violations resulting from the load addition to the transmission system.
- Dynamics Analysis
    - Assumptions
        - MDWG Dynamics Model Set
            - 2031 MDWG Summer Peak Base and Change Case
    - Analyses
        - Fast Fault Screening using POM Studio
- Short Circuit Analysis
    - Assumptions
        - Used 2023 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 OVERLOADS AND VOLTAGE VIOLATIONS

The analysis identified potential thermal and voltage violations resulting from the load being added to the Pacific delivery point. The potential thermal violations on Bismark-Fairgrounds 115kV and Lawrence Hill-Wren 115kV that were identified by SPP in this DPNS analysis were also identified in the Base Case models. The potential thermal violation issues on Bismark-Fairgrounds 115kV and Lawrence Hill-Wren 115kV will be addressed as part of the 2023 ITP Assessment. Table 3-1 details the potential thermal violations resulting from the load addition to the Pacific delivery point.

Year	Season	Facility Name	Contingencies	RATE A, RATE B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
2027	Summer	EUDORA 3 - CLEARVW3 - 1	87TH 7 - 87TH 3 - 1	118/118	130.744	110.8
2027	Summer	BISMARK3 - FAIRGDS3 - 1	FREESTATE3 - WREN 3 - 1	118/118	127.794	108.3
2027	Summer	LWRNCHL3 - WREN 3 - 1	BALDCRK3 - LWRNCHL3 - 1	141/141	151.857	107.7
2027	Summer	PENTAGN3 - MNTCLLO3 - 1	87TH 7 - 87TH 3 - 1	173/206	216.712	105.2
2027	Summer	LWRNCHL3 - WREN 3 - 1	LWRNCHL3 - 6TH ST 3 - 1	141/141	144.948	102.8
2027	Summer	LWRNCHL3 - WREN 3 - 1	'P12:115:WERE:LAWH-SWLA-115:::HV:'	141/141	142.269	100.9
2027	Winter	WAVERLY3 - 87TH 3 - 1	CLEARVW3 - PACIFIC3 - 1	218/262	279.816	106.8
2032	Summer	WAVERLY3 - 87TH 3 - 1	CLEARVW3 - PACIFIC3 - 1	218/262	300.776	114.8
2032	Summer	BISMARK3 - FAIRGDS3 - 1	FREESTATE3 - WREN 3 - 1	118/118	133.93	113.5
2032	Summer	EUDORA 3 - CLEARVW3 - 1	87TH 7 - 87TH 3 - 1	118/118	131.924	111.8
2032	Summer	PENTAGN3 - MNTCLLO3 - 1	87TH 7 - 87TH 3 - 1	173/206	220.008	106.8
2032	Summer	LWRNCHL3 - WREN 3 - 1	LWRNCHL3 - 6TH ST 3 - 1	141/141	149.46	106
2032	Summer	LWRNCHL3 - WREN 3 - 1	'P12:115:WERE:LAWH-SWLA-115:::HV:'	141/141	147.345	104.5
2032	Summer	BISMARK3 - FAIRGDS3 - 1	87TH 7 - 87TH 3 - 1	118/118	121.776	103.2
2032	Summer	BISMARK3 - FAIRGDS3 - 1	19THST 3 - FREESTATE3 - 1	118/118	119.298	101.1
2032	Summer	LWRNCHL3 - WREN 3 - 1	BALDCRK3 - SWLWRNC3 - 1	141/141	142.41	101
2032	Summer	LWRNCHL3 - WREN 3 - 1	TECHILE3 - STULL T3 - 1	141/141	141.282	100.2
2032	Winter	EUDORA 3 - CLEARVW3 - 1	87TH 7 - 87TH 3 - 1	118/118	132.16	112
2032	Winter	WAVERLY3 - 87TH 3 - 1	CLEARVW3 - PACIFIC3 - 1	218/262	280.602	107.1
2032	Winter	BISMARK3 - FAIRGDS3 - 1	LWRNCHL3 - WREN 3 - 1	118/118	124.372	105.4
2032	Winter	EUDORA 3 - CLEARVW3 - 1	STRANGR7 - 87TH 7 - 1	118/118	121.54	103
2032	Winter	EUDORA 3 - CLEARVW3 - 1	'P12:115:WERE:87TH-MOON-115::FUTURE:HV:'	118/118	120.36	102
2032	Winter	EUDORA 3 - CLEARVW3 - 1	'P23:345:WERE:STRA-345-643:::EHV:'	118/118	120.006	101.7

Table 3-1: Potential Thermal Violations

Table 3-2 details the potential voltage violations resulting from the load addition.

Year	Season	Facility Name	Facility Voltage (kV)	Contingency Name	Voltage Maximum (pu)	Voltage Minimum (pu)	Bus Voltage (pu)
2027	Light Load	PACIFIC3	115	N-0	1.05	0.95	0.94507
2027	Summer	PACIFIC3	115	N-0	1.05	0.95	0.91795
2027	Summer	CLEARVW3	115	N-0	1.05	0.95	0.92595
2027	Summer	EUDORA 3	115	N-0	1.05	0.95	0.93706
2027	Summer	WAVERLY3	115	N-0	1.05	0.95	0.93782
2027	Summer	FAIRGDS3	115	N-0	1.05	0.95	0.94599
2027	Summer	WREN 3	115	N-0	1.05	0.95	0.94949
2027	Winter	PACIFIC3	115	N-0	1.05	0.95	0.93186
2027	Winter	CLEARVW3	115	N-0	1.05	0.95	0.94092
2032	Summer	PACIFIC3	115	N-0	1.05	0.95	0.91783
2032	Summer	CLEARVW3	115	N-0	1.05	0.95	0.9273
2032	Summer	WAVERLY3	115	N-0	1.05	0.95	0.93832
2032	Summer	EUDORA 3	115	N-0	1.05	0.95	0.94472
2032	Winter	PACIFIC3	115	N-0	1.05	0.95	0.93612
2032	Winter	CLEARVW3	115	N-0	1.05	0.95	0.94507
2027	Light Load	PACIFIC3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.88514
2027	Light Load	WAVERLY3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.88538
2027	Light Load	PACIFIC3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.88575
2027	Light Load	PACIFIC3	115	CLEARVW3 - PACIFIC3 - 1	1.05	0.9	0.89563
2027	Summer	WAVERLY3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.85052
2027	Summer	PACIFIC3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.85139
2027	Summer	PACIFIC3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.85716
2027	Summer	PACIFIC3	115	87TH 7 - 87TH 3 - 1	1.05	0.9	0.8643
2027	Summer	CLEARVW3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.87367
2027	Summer	CLEARVW3	115	87TH 7 - 87TH 3 - 1	1.05	0.9	0.87386
2027	Summer	CLEARVW3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.87869
2027	Summer	WAVERLY3	115	87TH 7 - 87TH 3 - 1	1.05	0.9	0.88404
2027	Summer	PACIFIC3	115	WAVERLY3 - 87TH 3 - 1	1.05	0.9	0.88457
2027	Summer	WAVERLY3	115	WAVERLY3 - 87TH 3 - 1	1.05	0.9	0.89395
2027	Summer	PACIFIC3	115	87TH 3 - CLEARVW3 - 1	1.05	0.9	0.897
2027	Summer	EUDORA 3	115	87TH 7 - 87TH 3 - 1	1.05	0.9	0.89954
2027	Summer	CLEARVW3	115	87TH 3 - CLEARVW3 - 1	1.05	0.9	0.89959
2027	Summer	CLEARVW3	115	WAVERLY3 - 87TH 3 - 1	1.05	0.9	0.89972
2027	Winter	PACIFIC3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.87031
2027	Winter	WAVERLY3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.87031
2027	Winter	PACIFIC3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.87205
2027	Winter	PACIFIC3	115	CLEARVW3 - PACIFIC3 - 1	1.05	0.9	0.88659
2027	Winter	CLEARVW3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.89322
2027	Winter	CLEARVW3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.89489
2032	Light Load	PACIFIC3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.89214
2032	Light Load	WAVERLY3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.89239
2032	Light Load	PACIFIC3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.89266
2032	Summer	WAVERLY3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.85111
2032	Summer	PACIFIC3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.85203
2032	Summer	PACIFIC3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.85779

Year	Season	Facility Name	Facility Voltage (kV)	Contingency Name	Voltage Maximum (pu)	Voltage Minimum (pu)	Bus Voltage (pu)
2032	Summer	PACIFIC3	115	CLEARVW3 - PACIFIC3 - 1	1.05	0.9	0.86794
2032	Summer	PACIFIC3	115	87TH 7 - 87TH 3 - 1	1.05	0.9	0.86933
2032	Summer	CLEARVW3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.87603
2032	Summer	CLEARVW3	115	87TH 7 - 87TH 3 - 1	1.05	0.9	0.88037
2032	Summer	CLEARVW3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.88103
2032	Summer	PACIFIC3	115	WAVERLY3 - 87TH 3 - 1	1.05	0.9	0.88446
2032	Summer	WAVERLY3	115	87TH 7 - 87TH 3 - 1	1.05	0.9	0.88925
2032	Summer	WAVERLY3	115	WAVERLY3 - 87TH 3 - 1	1.05	0.9	0.89399
2032	Summer	PACIFIC3	115	87TH 3 - CLEARVW3 - 1	1.05	0.9	0.89792
2032	Winter	PACIFIC3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.87393
2032	Winter	WAVERLY3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.87393
2032	Winter	PACIFIC3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.87628
2032	Winter	PACIFIC3	115	CLEARVW3 - PACIFIC3 - 1	1.05	0.9	0.88885
2032	Winter	CLEARVW3	115	'P12:115:WERE:87TH-MOON-115:::HV:'	1.05	0.9	0.89675
2032	Winter	CLEARVW3	115	WAVERLY3 - PACIFIC3 - 1	1.05	0.9	0.89901

Table 3-2: Potential Voltage Violations

SHORT CIRCUIT

SPP performed short circuit analysis for the 2027 Summer Peak with the new load addition. The analysis identified the currents as listed in Table 3-3.

Season	Model	Fault	Bus	Current(Amps)
27S	Max Fault	Three Phase	HOYT 7 34	15,934
27S	Max Fault	Three Phase	EMPEC 7 34	17,868
27S	Max Fault	Three Phase	STRANGR7 34	26,688
27S	Max Fault	Three Phase	SWISVAL7 34	15,942
27S	Max Fault	Three Phase	87TH 7 34	19,862
27S	Max Fault	Three Phase	SLDR_CK_WF7 34	6,374
27S	Max Fault	Three Phase	NEOSHO 7 34	17,480
27S	Max Fault	Three Phase	WAVERLY7 34	16,226
27S	Max Fault	Three Phase	STRAN1 1 14	33,316
27S	Max Fault	Three Phase	SWISV1X1 14	35,982
27S	Max Fault	Three Phase	STRAN3 1 14	42,212
27S	Max Fault	Three Phase	87TH 1X1 14	72,833
27S	Max Fault	Three Phase	SWISV2X2 14	44,564
27S	Max Fault	Three Phase	SWISVAL6 23	20,134
27S	Max Fault	Three Phase	BALDCRK3 11	12,685
27S	Max Fault	Three Phase	BISMARK3 11	16,863
27S	Max Fault	Three Phase	FAIRGDS3 11	17,165
27S	Max Fault	Three Phase	EUDORA 3 11	13,173
27S	Max Fault	Three Phase	FMC 3 11	15,701
27S	Max Fault	Three Phase	JAGGARD3 11	16,288

Season	Model	Fault	Bus	Current(Amps)
27S	Max Fault	Three Phase	MIDLADN3 11	21,431
27S	Max Fault	Three Phase	MOONLIT3 11	12,401
27S	Max Fault	Three Phase	19THST 3 11	15,762
27S	Max Fault	Three Phase	FREESTATE3 11	16,733
27S	Max Fault	Three Phase	MIDLADS3 11	21,443
27S	Max Fault	Three Phase	PENTAGN3 11	22,339
27S	Max Fault	Three Phase	BONITA 3 11	10,080
27S	Max Fault	Three Phase	SOUTHTN3 11	11,841
27S	Max Fault	Three Phase	STRANGR3 11	35,934
27S	Max Fault	Three Phase	STULL T3 11	11,692
27S	Max Fault	Three Phase	SWLWRNC3 11	16,319
27S	Max Fault	Three Phase	TIMBRLN3 11	14,502
27S	Max Fault	Three Phase	WAVERLY3 11	23,381
27S	Max Fault	Three Phase	ATLNTIC3 11	32,454
27S	Max Fault	Three Phase	MNTCLLO3 11	24,766
27S	Max Fault	Three Phase	MUND 3 11	16,454
27S	Max Fault	Three Phase	87TH 3 11	31,410
27S	Max Fault	Three Phase	CLEARVW3 11	24,176
27S	Max Fault	Three Phase	PACIFIC3 11	29,562
27S	Max Fault	Three Phase	ATLNT1X1 14	50,295
27S	Max Fault	Three Phase	ATLNT2X1 14	50,295
27S	Max Fault	Three Phase	PECULR 7 34	20,592
27S	Max Fault	Three Phase	ATLNTIC7 34	19,759
27S	Max Fault	Three Phase	CRAIG_CAP 5 16	33,103
27S	Max Fault	Three Phase	LAC G1 1 22	8,174
27S	Max Fault	Three Phase	LAC G2 1 24	33,391
27S	Max Fault	Three Phase	W.GRDNR7 34	25,632
27S	Max Fault	Three Phase	WGARDNR5 16	28,817
27S	Max Fault	Three Phase	STILWEL7 34	25,311
27S	Max Fault	Three Phase	STILWEL5 16	40,582
27S	Max Fault	Three Phase	CRAIG 7 34	20,721
27S	Max Fault	Three Phase	CRAIG 5 16	41,438
27S	Max Fault	Three Phase	PFLUMM 5 16	28,610
27S	Max Fault	Three Phase	LACYGNE7 34	28,124
27S	Max Fault	Three Phase	IATAN 7 34	30,277
27S	Max Fault	Three Phase	LENEXA 5 16	35,531
27S	Max Fault	Three Phase	COLLEGE5 16	29,115
27S	Max Fault	Three Phase	CEDRCRK5 16	29,499
27S	Max Fault	Three Phase	CEDARNL5 16	10,351
27S	Max Fault	Three Phase	PLSTVAL5 16	9,722
27S	Max Fault	Three Phase	BULLCRK5 16	27,937
27S	Max Fault	Three Phase	BNSF 5 16	21,260
27S	Max Fault	Three Phase	WGARDNR1 34	4,715
27S	Max Fault	Three Phase	LACYGNE11_7 34	27,334
27S	Max Fault	Three Phase	LACYGNE22_7 34	27,334

Season	Model	Fault	Bus	Current(Amps)
27S	Max Fault	Three Phase	CRAI T11 13	12,231
27S	Max Fault	Three Phase	CRAI T22 13	19,157
27S	Max Fault	Three Phase	CRAI T33 13	18,823
27S	Max Fault	Three Phase	STIL T11 13	18,460
27S	Max Fault	Three Phase	STIL T22 13	19,863
27S	Max Fault	Three Phase	WGAR T11 13	16,079
27S	Max Fault	Three Phase	LACYGNE2 69	2,685
27S	Max Fault	Three Phase	LACYGN7_TER16.	81,240
27S	Max Fault	Three Phase	LACYG_AQC3_16.	54,995
27S	Max Fault	Three Phase	LC_AQC3TER_13.	49,258
27S	Max Fault	Three Phase	LACYG_AQC8_16.	54,995
27S	Max Fault	Three Phase	LC_AQC8TER_13.	49,258

Table 3-3: Short Circuit Results

STABILITY

SPP performed a Fast Fault Screening (FFS) for the base case and change case models. The change case models include the Pacific delivery point changes. The FFS was performed for the 2031 Summer Peak. There were 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 new load at Pacific caused potential thermal overloads and voltage violations on the 115kV system. The potential thermal issues are solved by extending the Craig – West Gardner 345kV line and adding a new 345/115kV substation tie into the Clearview 115kV substation. The extension of the Craig – West Gardner 345kV line and addition of a new 345/115kV substation tie into the Clearview 115kV substation is identified as a transmission upgrade in the 2023 ITP Assessment. A new cap bank at Pacific was identified in this DPNS to mitigate the potential voltage issues of adding this new load at the Pacific delivery point. These identified upgrades solve all of the potential thermal and voltage issues. If the extension of the Craig – West Gardner 345kV line and addition of a new 345/115kV substation tie into the Clearview 115kV substation is not included in the final 2023 ITP Assessment, SPP will need to re-study this request to ensure that the potential thermal issues identified in this study are mitigated.

New Upgrade Description*	Mileage	MVAR	Date Needed**	Estimated Cost***
Add new 100 MVAR cap bank at Pacific 115kV substation	-	100	4/1/2025	$5,000,975
TOTAL NEW UPGRADE COST				**$5,000,975**

Table 3-4: Recommended Upgrades

*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 Pacific load addition. The study shows that the following upgrades are required to reliably serve the load addition:

Add new 100 MVAR cap bank at Pacific 115kV substation

2023 ITP identified transmission upgrade that extends Craig-West Gardner 345kV line into a new 345/115kV substation that ties back into the 115kV system at Clearview.

If the extension of the Craig – West Gardner 345kV line and addition of a new 345/115kV substation tie into the Clearview 115kV substation is not included in the final 2023 ITP Assessment, SPP will need to re-study this request to ensure that the potential thermal issues identified in this study are mitigated. The transmission upgrade in Table 3-4 is recommended to mitigate the potential thermal and voltage violations.