DPA-2024-MARCH-1919

Delivery Point Network Study

Published on 6/21/2024

By SPP Engineering, Transmission Services

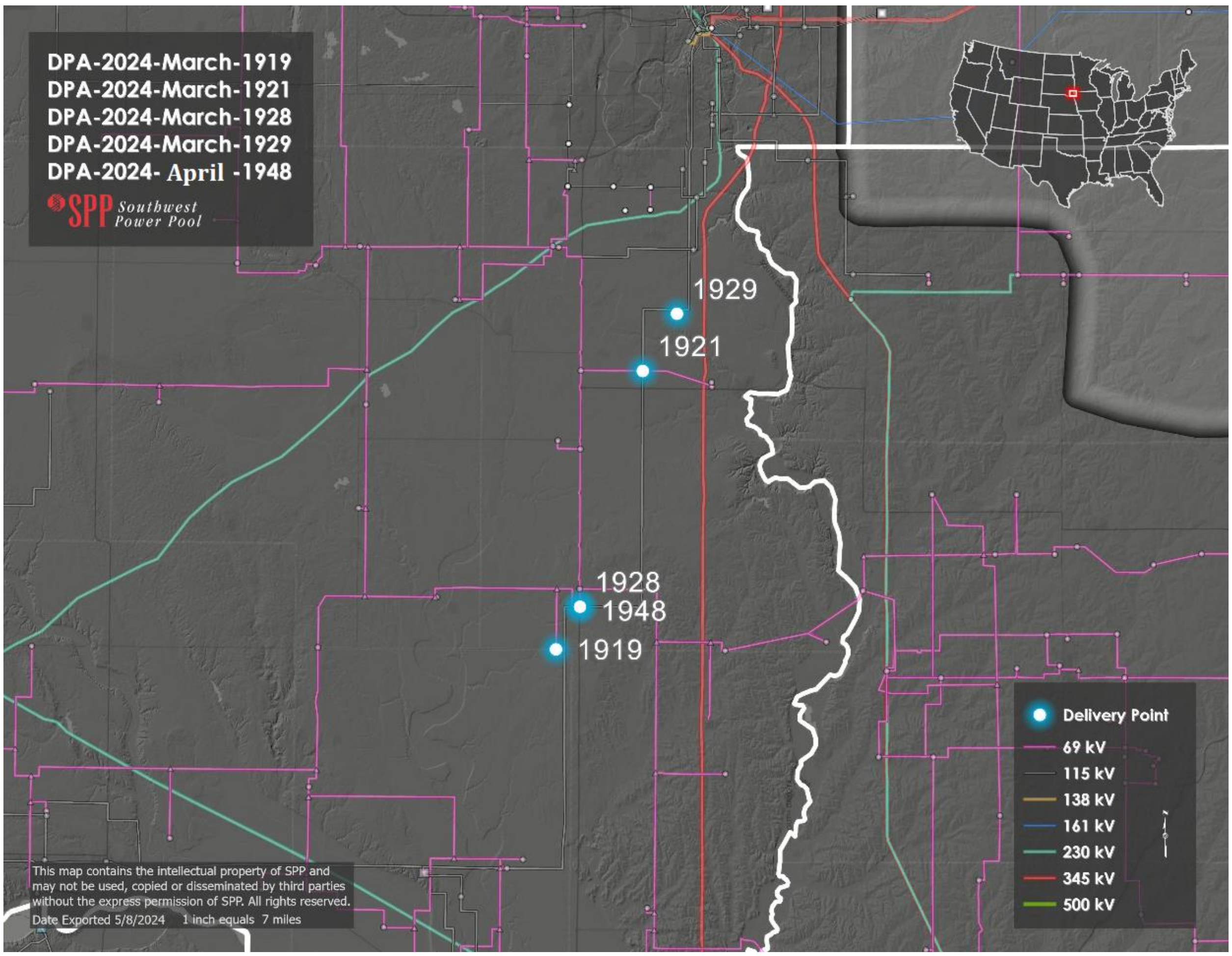
REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
6/21/2024	SPP	Original	

CONTENTS

SECTION 1: INTRODUCTION

This report outlines the results of an evaluation of regional transmission impacts from delivery point requests DPA-2024-March-1919, DPA-2024-March-1921, DPA-2024-March-1928, DPA-2024-March-1929, and DPA-2024-April-1948. The requesting entity plans to add new loads at the Delaware, Worthing, Beresford, Beaver Creek, and Alcester delivery points (Delaware Cluster). The Delaware Cluster delivery points are in the East River Electric Power Coop (EREPC) transmission system.



The load flow models used for the evaluation were 2024 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 loads served by Basin Electric Power Coop (BEPC). SPP performed a Delivery Point Network Study (DPNS) with the configurations shown in Table 2-1 below.

STUDY PROCESS

- Model Assumptions
  - 2024 ITP models
    - Model years 2024, 2025, 2028, and 2033
    - Summer Peak (2025S, 2028S and 2033S), Winter Peak (2024W, 2025W 2028W, and 2033W), and Light Load (2025L, 2028L, and 2033L)
  - 2024 ITP Short Circuit model set
    - 2028 Summer Max Fault
  - 2024 TPL Dynamic model set
    - 2033 Summer Peak Base and Change Case

Case Name	Study Year	Season	Scenario	Load (MW/MVAR)
2024ITPPF-24W.sav	2024	Winter Peak	Base Reliability	Base Case
2024ITPPF-25L.sav	2025	Light Load	Base Reliability	Base Case
2024ITPPF-25S.sav	2025	Summer Peak	Base Reliability	Base Case
2024ITPPF-25W.sav	2025	Winter Peak	Base Reliability	Base Case
2024ITPPF-28L.sav	2028	Light Load	Base Reliability	Base Case
2024ITPPF-28S.sav	2028	Summer Peak	Base Reliability	Base Case
2024ITPPF-28W.sav	2028	Winter Peak	Base Reliability	Base Case
2024ITPPF-33L.sav	2033	Light Load	Base Reliability	Base Case
2024ITPPF-33S.sav	2033	Summer Peak	Base Reliability	Base Case
2024ITPPF-33W.sav	2032	Winter Peak	Base Reliability	Base Case
2024ITPPF-24W_1919.sav	2024	Winter Peak	Base Reliability	Delaware: 6.5/2.14 Worthing = 3.5/1.25
2024ITPPF-25L_1919.sav	2025	Light Load	Base Reliability	Delaware = 6.5/2.14 Worthing = 3.5/1.25
2024ITPPF-25S_1919.sav	2025	Summer Peak	Base Reliability	Delaware = 6.5/2.14 Worthing = 3.5/1.25
2024ITPPF-25W_1919.sav	2025	Winter Peak	Base Reliability	Delaware = 6.5/2.14 Worthing = 3.5/1.25
2024ITPPF-28L_1919.sav	2028	Light Load	Base Reliability	Delaware = 6.5/2.14 Worthing = 3.5/1.25 Beaver Creek = 11.0/3.62 Alcester = 3.76/-0.3
2024ITPPF-28S_1919.sav	2028	Summer Peak	Base Reliability	Delaware = 6.5/2.14 Worthing = 3.5/1.25 Beaver Creek = 11.0/3.62 Alcester = 3.76/-0.3

Case Name	Study Year	Season	Scenario	Load (MW/MVAR)
2024ITPPF-28W_1919.sav	2028	Winter Peak	Base Reliability	Delaware = 6.5/2.14 Centerville = 9.76/1.91 Worthing = 3.5/1.25 Beaver Creek = 11.0/3.62 Alcester = 3.76/-0.3
2024ITPPF-33L_1919.sav	2033	Light Load	Base Reliability	Delaware = 6.5/2.14 Centerville = 9.9/1.95 Worthing = 3.5/1.25 Beaver Creek = 11.0/3.62 Alcester = 3.76/-0.3
2024ITPPF-33S_1919.sav	2033	Summer Peak	Base Reliability	Delaware = 6.5/2.14 Centerville = 9.9/1.95 Worthing = 3.5/1.25 Beaver Creek = 11.0/3.62 Alcester = 3.76/-0.3
2024ITPPF-33W_1919.sav	2033	Winter Peak	Base Reliability	Delaware = 6.5/2.14 Centerville = 9.9/1.95 Worthing = 3.5/1.25 Beaver Creek = 11.0/3.62 Alcester = 3.76/-0.3

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 Delaware Cluster delivery point change to determine thermal overloads and voltage violations resulting from the load addition to the transmission system.
- Dynamics Analysis
  - Assumptions
    - 2024 TPL Dynamics Model Set
      - 2033 Summer Peak Base and Change Case
  - Analyses
    - Fast Fault Screening using POM Studio
- Short Circuit Analysis
  - Assumptions
    - Used 2024 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 voltage violations resulting from the new Delaware Cluster loads. Table 3-1 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)
2028	Winter	BUCKSNRT-ER7	115	VFODNES4 - SIOUXFL4 - 1	1.05	0.9	0.897
2028	Winter	SW1109-ER7	115	VFODNES4 - SIOUXFL4 - 1	1.05	0.9	0.899
2033	Winter	BUCKSNRT-ER7	115	VFODNES4 - SIOUXFL4 - 1	1.05	0.9	0.869
2033	Winter	SW1109-ER7	115	VFODNES4 - SIOUXFL4 - 1	1.05	0.9	0.872
2033	Winter	VFODNES-ER7	115	VFODNES4 - SIOUXFL4 - 1	1.05	0.9	0.875

Table 3-1: Potential Voltage Violations

SHORT CIRCUIT

SPP performed short circuit analysis for the 2028 Summer Peak with the new load addition. The analysis identified the currents as listed in Table 3-2.

Season	Model	Fault	Bus	Current(Amps)
28S	Max Fault	Three Phase	SPLT RK4 230.00	13,653
28S	Max Fault	Three Phase	MINEHAH7 115.00	13,662
28S	Max Fault	Three Phase	LAWRENC7 115.00	32,860
28S	Max Fault	Three Phase	SPLT RK7 115.00	42,452
28S	Max Fault	Three Phase	LAWRENC8 69.000	16,353
28S	Max Fault	Three Phase	CNTRVIL8 69.000	4,769
28S	Max Fault	Three Phase	LENNOX 8 69.000	3,062
28S	Max Fault	Three Phase	BLMFLD 7 115.00	6,316
28S	Max Fault	Three Phase	HARTGTN7 115.00	5,480
28S	Max Fault	Three Phase	FLANDR19 12.470	5,006
28S	Max Fault	Three Phase	FLANDRU8 69.000	6,244
28S	Max Fault	Three Phase	SIOUXF19 13.200	32,018
28S	Max Fault	Three Phase	SIOUXF29 13.200	31,965
28S	Max Fault	Three Phase	SIOUXFL8 69.000	5,050
28S	Max Fault	Three Phase	BERSFRD8 69.000	4,891
28S	Max Fault	Three Phase	BERSFR19 12.500	6,092
28S	Max Fault	Three Phase	BERSFRD9 12.500	3,441
28S	Max Fault	Three Phase	VFODNES4 230.00	7,963
28S	Max Fault	Three Phase	AURORA 7 115.00	4,926
28S	Max Fault	Three Phase	BERSFRD7 115.00	5,365
28S	Max Fault	Three Phase	FLANDRU7 115.00	5,321
28S	Max Fault	Three Phase	GAVINS 7 115.00	10,707
28S	Max Fault	Three Phase	HANLON 4 230.00	6,946
28S	Max Fault	Three Phase	SIOUXFL4 230.00	14,160

Season	Model	Fault	Bus	Current(Amps)
28S	Max Fault	Three Phase	SIOUXFL7 115.00	29,089
28S	Max Fault	Three Phase	GAVINS1G 13.200	22,538
28S	Max Fault	Three Phase	GAVINS2G 13.200	22,538
28S	Max Fault	Three Phase	GAVINS3G 13.200	25,318
28S	Max Fault	Three Phase	LETCHER4 230.00	4,739
28S	Max Fault	Three Phase	SW101-ER8 69.000	3,962
28S	Max Fault	Three Phase	MOS-VERM-ER869.000	5,852
28S	Max Fault	Three Phase	MOS-ALDA-ER869.000	4,460
28S	Max Fault	Three Phase	SW804-ER7 115.00	3,879
28S	Max Fault	Three Phase	SW806-ER8 69.000	1,996
28S	Max Fault	Three Phase	SW813-ER8 69.000	6,428
28S	Max Fault	Three Phase	MOS-VBRG-ER869.000	5,120
28S	Max Fault	Three Phase	SW825-ER8 69.000	4,441
28S	Max Fault	Three Phase	SW829-ER8 69.000	4,805
28S	Max Fault	Three Phase	SW848-ER8 69.000	4,699
28S	Max Fault	Three Phase	MOS-CNTN-ER7115.00	3,055
28S	Max Fault	Three Phase	MOS-SPMD-ER869.000	6,636
28S	Max Fault	Three Phase	PALISADE-ER7115.00	13,305
28S	Max Fault	Three Phase	MOS-PRRI-ER869.000	5,672
28S	Max Fault	Three Phase	DAVIS-ER7 115.00	2,742
28S	Max Fault	Three Phase	ALCESTER-ER869.000	1,479
28S	Max Fault	Three Phase	VERMLLON-ER869.000	5,432
28S	Max Fault	Three Phase	IRENE-ER8 69.000	4,507
28S	Max Fault	Three Phase	CNTRVILE-ER869.000	3,436
28S	Max Fault	Three Phase	CANTON-ER7 115.00	2,735
28S	Max Fault	Three Phase	BGSPRING-ER869.000	1,239
28S	Max Fault	Three Phase	SPRTMND-ER8 69.000	6,710
28S	Max Fault	Three Phase	PRARIEBE-ER869.000	3,801
28S	Max Fault	Three Phase	SW1145-ER7 115.00	27,623
28S	Max Fault	Three Phase	SWR5123-ER8 69.000	1,592
28S	Max Fault	Three Phase	MAPLE ST-ER7115.00	13,643
28S	Max Fault	Three Phase	SW167 -ER7115.00	16,726
28S	Max Fault	Three Phase	MANNING-ER7 115.00	6,497
28S	Max Fault	Three Phase	MANNING-ER8 69.000	6,560
28S	Max Fault	Three Phase	SPRTMND-ER7 115.00	7,793
28S	Max Fault	Three Phase	WORTHING-ER7115.00	2,760
28S	Max Fault	Three Phase	DELAWARE-ER869.000	3,770
28S	Max Fault	Three Phase	MOS-DLWR-ER869.000	4,602
28S	Max Fault	Three Phase	LEWCLK.T-ER7115.00	9,938
28S	Max Fault	Three Phase	BEAVRCRK-ER7115.00	5,816
28S	Max Fault	Three Phase	VERMLN 7 115.00	5,121
28S	Max Fault	Three Phase	VERMLNE 7 115.00	5,076
28S	Max Fault	Three Phase	BERSFRDW 115.00	4,880
28S	Max Fault	Three Phase	BERSFRDE 115.00	4,837
28S	Max Fault	Three Phase	SPIRIT_1-BEG13.800	42,562
28S	Max Fault	Three Phase	SPIRIT_2-BEG13.800	42,562
28S	Max Fault	Three Phase	SPIRIT_M-BE7115.00	7,793

Season	Model	Fault	Bus	Current(Amps)
28S	Max Fault	Three Phase	PAHOJA__-BE4230.00	8,003
28S	Max Fault	Three Phase	MAPLETAP-LO7115.00	13,694
28S	Max Fault	Three Phase	STATELIN-LO7115.00	4,691
28S	Max Fault	Three Phase	HOLLAND -LO7115.00	2,676
28S	Max Fault	Three Phase	FLANTERT 12.470	5,006

Table 3-2: 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 Delaware Cluster delivery point changes. The FFS was performed for 2033 Summer Peak. There were no significant differences in the critical clearing times between the base and change case. Therefore, a transient stability analysis is not required.

TRANSMISSION SOLUTIONS

The addition of the loads in the Delaware Cluster delivery points caused potential low voltages on the 115 kV systems around the Delaware Cluster. SPP's solution consisted of adding VAR support in the area. The solution is below.

Solution: 25 MVAR capacitor bank at the Virgil Fodness 115 kV substation (Total cost $2,480,262)

SPP chose to move forward with this solution because it solves all issues identified in Table 3-1 in the most cost-effective manner.

New Upgrade Description*	Mileage	MVA (Rate B)	Date Needed**	Host Transmission Owner	Estimated Cost***
25 MVAR capacitor bank at the Virgil Fodness 115 kV substation	-	-	12/1/2028	EREPC	$2,480,262
TOTAL NEW UPGRADE COST					**$2,480,262**

Table 3-3: Recommended Upgrade Solution

*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 3-3.

***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 voltage violations associated with the Delaware Cluster load addition. The study shows that the following upgrade is required to reliably serve the load addition:

- 25 MVAR capacitor bank at the Virgil Fodness 115 kV substation

The transmission upgrade in Table 3-3 is recommended to mitigate the potential voltage violations.