



DPA-2025-JULY-2161

Delivery Point Network Study

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By SPP Engineering, Transmission Services

REVISION HISTORY

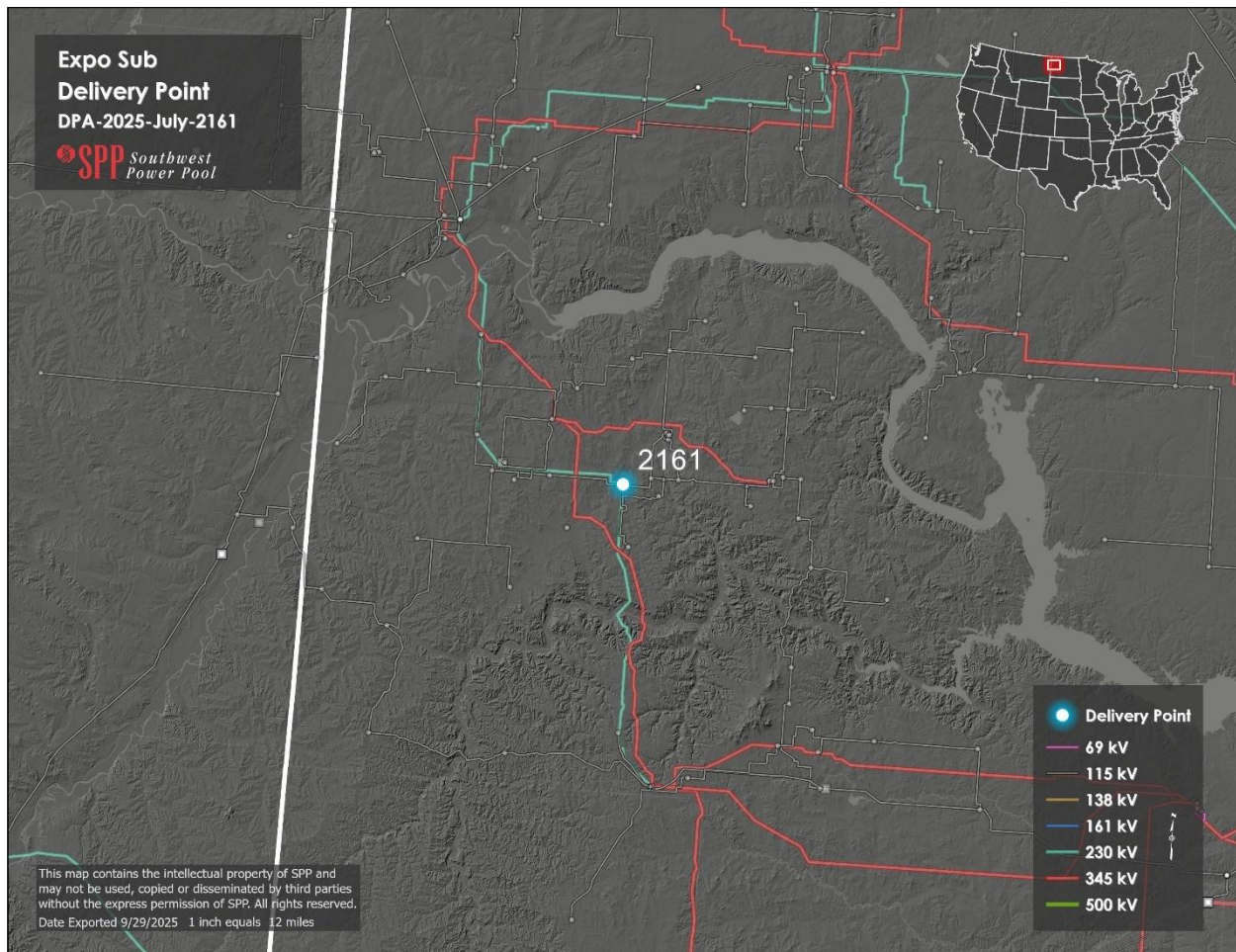
DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
10/27/2025	SPP	Original	
11/12/2025	SPP	Updated (**) Footnote in Table 3-3	Added language to show the dependency of the three line rebuilds on the closing in of the Lonesome Creek Switchyard.

CONTENTS

Revision History	i
Section 1: Introduction.....	1
Section 2: Study Methodology.....	2
Objective	2
Study Process	2
Section 3: Results of Analysis	4
Potential Thermal and Voltage Violations	4
Short Circuit	4
Stability	5
Transmission Solutions	6
Sensitivity Analysis	7
Section 4: Conclusion	8

SECTION 1: INTRODUCTION

This report outlines the results of an evaluation of regional transmission impacts from delivery point request DPA-2025-July-2161. The requesting entity plans to add new load to a new delivery point called Expo with an in-service date of 10/1/2025. The Expo delivery point is in the Basin Electric Power Cooperative (BEPC) 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 BEPC. SPP performed a Delivery Point Network Study (DPNS) with the configurations shown in Table 2-1 below.

STUDY PROCESS

- Model Assumptions
 - BEPC provided load updates consistent with the 2026 ITP BR models
 - 2025 ITP Base Reliability Model Series
 - Model years 2025, 2026, 2029, and 2034
 - Summer Peak (2026S, 2029S, and 2034S), Winter Peak (2025W, 2026W, 2029W, and 2034W), and Light Load (2026L, 2029L, and 2034L)
 - 2025 ITP Short Circuit Model Series
 - 2029 Summer Max Fault
 - 2025 Transmission System Planning (TPL) Dynamic Model Series
 - 2026 and 2034 Summer Peak Base and Change Cases

Table 2-1: Study Cases

Case Name	Study Year	Season	Scenario	Load (MW/MVAR)
2025ITPFinal-25W.sav	2025	Winter	Base Reliability	Base Case
2025ITPFinal-26L.sav	2026	Light Load	Base Reliability	Base Case
2025ITPFinal-26S.sav	2026	Summer Peak	Base Reliability	Base Case
2025ITPFinal-26W.sav	2026	Winter Peak	Base Reliability	Base Case
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-25W_2161.sav	2025	Winter	Base Reliability	Expo = 9.8/3.22
2025ITPFinal-26L_2161.sav	2026	Light Load	Base Reliability	Expo = 12/3.94
2025ITPFinal-26S_2161.sav	2026	Summer Peak	Base Reliability	Expo = 12/3.94
2025ITPFinal-26W_2161.sav	2026	Winter Peak	Base Reliability	Expo = 12/3.94
2025ITPFinal-29L_2161.sav	2029	Light Load	Base Reliability	Expo = 14.2/4.66
2025ITPFinal-29S_2161.sav	2029	Summer Peak	Base Reliability	Expo = 14.2/4.66

Case Name	Study Year	Season	Scenario	Load (MW/MVAR)
2025ITPFinal-29W_2161.sav	2029	Winter Peak	Base Reliability	Expo = 14.2/4.66
2025ITPFinal-34L_2161.sav	2034	Light Load	Base Reliability	Expo = 17.3/5.68
2025ITPFinal-34S_2161.sav	2034	Summer Peak	Base Reliability	Expo = 17.3/5.68
2025ITPFinal-34W_2161.sav	2034	Winter Peak	Base Reliability	Expo = 17.3/5.68

- 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 delivery point change to determine thermal and voltage violations resulting from the load addition to the Transmission System.
- Dynamics Analysis
 - Assumptions
 - 2025 TPL Dynamics Model Series
 - 2026 and 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 violations resulting from the new load at the Expo delivery point. Table 3-1 details the potential thermal violations resulting from the load addition.

Table 3-1: Potential Thermal Violations

Model	Facility Name	Facility Voltage (kV)	Contingency Name	Rate A, Rate B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
29L	WATFORD4 - WC KV2A - 1	230/115	WATFORD4 - WATFORD7 - 1	167/208	219.02	105.3
29L	WATFORD4 - WC KV2A - 1	230/115	WATFORD4 - WATFORD7 - 1	167/208	212.58	102.2
34L	WATFORD4 - WC KV2A - 1	230/115	WATFORD4 - WATFORD7 - 1	167/208	238.576	114.7
34L	WATFORD4 - WC KV2A - 1	230/115	WATFORD4 - WATFORD7 - 1	167/208	226.72	109

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 3-2.

Table 3-2: Short Circuit Results

Season	Model	Fault	Bus	Current (Amps)
29S	Max Fault	Three Phase	WATFORD4 230.00	8,044
29S	Max Fault	Three Phase	WILLISTON27 115.00	20,697
29S	Max Fault	Three Phase	WILISTN4 230.00	16,567
29S	Max Fault	Three Phase	DAWSONC4 230.00	6,706
29S	Max Fault	Three Phase	WATFORD7 115.00	14,585
29S	Max Fault	Three Phase	WILISTN7 115.00	20,695
29S	Max Fault	Three Phase	WATFORD9 13.200	12,202
29S	Max Fault	Three Phase	WATFORD29 13.200	12,202
29S	Max Fault	Three Phase	WILISTN9 13.200	22,571
29S	Max Fault	Three Phase	WILISTN29 13.200	22,571
29S	Max Fault	Three Phase	CHRRYCRK-MK7115.00	14,585
29S	Max Fault	Three Phase	ARNEGARD-MK7115.00	12,197
29S	Max Fault	Three Phase	HAYBUTTE-MK7115.00	10,548
29S	Max Fault	Three Phase	TIMBERCK-MK7115.00	8,259
29S	Max Fault	Three Phase	GRDNCRK2-MK7115.00	10,929
29S	Max Fault	Three Phase	ROOSEVLT-MK7115.00	8,094
29S	Max Fault	Three Phase	STNJOHNY-MK7115.00	9,379
29S	Max Fault	Three Phase	DPLWC__ -MK7115.00	11,716
29S	Max Fault	Three Phase	DPLWCTAP-MK7115.00	13,725
29S	Max Fault	Three Phase	LITTLMS4-MK7115.00	8,460

Season	Model	Fault	Bus	Current (Amps)
29S	Max Fault	Three Phase	CRESTWD_-MK7115.00	7,980
29S	Max Fault	Three Phase	OASIS__-MK7115.00	10,870
29S	Max Fault	Three Phase	SCHAFR_T-MK7115.00	12,574
29S	Max Fault	Three Phase	BANKS_-MK7115.00	9,031
29S	Max Fault	Three Phase	LC_GAS_P-MK7115.00	10,040
29S	Max Fault	Three Phase	GARDN-FB-MK7115.00	10,694
29S	Max Fault	Three Phase	COYOTCHR-MK7115.00	12,286
29S	Max Fault	Three Phase	SCHAFER_-MK7115.00	10,150
29S	Max Fault	Three Phase	FNCYBTAP-MK7115.00	13,038
29S	Max Fault	Three Phase	EXPO__-MK7115.00	12,006
29S	Max Fault	Three Phase	LONESM_1-BEG13.800	64,828
29S	Max Fault	Three Phase	LC_CT4-5-BE7115.00	19,199
29S	Max Fault	Three Phase	LONESM_2-BEG13.800	44,284
29S	Max Fault	Three Phase	LONESM_3-BEG13.800	44,284
29S	Max Fault	Three Phase	LONESM_4-BEG13.800	38,637
29S	Max Fault	Three Phase	LONESM_5-BEG13.800	38,637
29S	Max Fault	Three Phase	LONESM_6-BEG13.800	38,638
29S	Max Fault	Three Phase	CHARL_CK-BE3345.00	11,452
29S	Max Fault	Three Phase	CHARL_CK-BE4230.00	12,009
29S	Max Fault	Three Phase	CCR.KV3A-BE913.800	23,210
29S	Max Fault	Three Phase	CCR.KV4A-BE913.800	30,865
29S	Max Fault	Three Phase	JUDSON_-BE4230.00	16,977
29S	Max Fault	Three Phase	LC_SWY.S-BE7115.00	19,828
29S	Max Fault	Three Phase	LC_CT1-3-BE7115.00	19,570
29S	Max Fault	Three Phase	LC_SWY.N-BE7115.00	19,828
29S	Max Fault	Three Phase	WHEELock-BE4230.00	9,314
29S	Max Fault	Three Phase	PATENTGT-MK7115.00	24,376
29S	Max Fault	Three Phase	PG.KU17A-BE7115.00	24,005
29S	Max Fault	Three Phase	PG.KU19A-BE7115.00	24,047
29S	Max Fault	Three Phase	WATFRDSOUTH4230.00	7,941

STABILITY

SPP performed a Fast Fault Screening (FFS) using the 2026 and 2034 Summer Peak for the base case and change case models. The change case models include the Expo 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 new Expo delivery point caused potential thermal overloads on the Watford 230/115kV transformers, one for the loss of the other. These issues only showed up in the light load cases because the Lonesome Creek 4, 5, and 6 units were not dispatched in these models. Some of the solutions that SPP considered are listed below.

Solution #1 includes rebuilds of the Lonesome Creek Switchyard South – Arnegard – Expo – Cherry Creek 115kV lines due to potential thermal overloads caused by the closing in of the Lonesome Creek Switchyard.

Solution #1: Total cost \$15.59 M

- Close in the Lonesome Creek Switchyard
- Rebuild Arnegard – Lonesome Creek Switchyard South 115 kV line (6.65 miles)
- Rebuild Arnegard - Expo 115 kV line (4.47 miles)
- Rebuild Expo – Cherry Creek 115 kV line (4.47 miles)

Solution #2: Total cost \$18.9 M

- Add 3rd Watford City 230/115kV transformer
- Expand Watford City 230kV substation

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

Table 3-3: Recommended Upgrade Solution 1

New Upgrade Description*	Mileage	MVA (Rate B)	Date Needed**	Host Transmission Owner	Estimated Cost***
Close in the Lonesome Creek Switchyard	-	-	4/1/2027	BEPC	\$0
Rebuild Arnegard – Lonesome Creek Switchyard South 115kV line	6.65	205	12/1/2025	BEPC	\$6,650,000
Rebuild Arnegard – Expo 115kV line	4.47	150	6/1/2026	BEPC	\$4,470,000
Rebuild Expo – Cherry Creek 115kV line	4.47	135	6/1/2028	BEPC	\$4,470,000
TOTAL NEW UPGRADE COST					\$15,590,000

*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.

The three line rebuilds listed in Table 3-3 (Arnegard – Lonesome Creek Switchyard South, Arnegard – Expo, and Expo – Cherry Creek) are all contingent on the closing in of the Lonesome Creek Switchyard. The need date for those three projects are the dates listed in Table 3-3 or the date that the Lonesome Creek Switchyard is closed in, whichever comes last.

***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).

SENSITIVITY ANALYSIS

BEPC asked for the Expo load to be studied as a sensitivity analysis with the Lonesome Creek 4, 5, and 6 units turned off. With those three units not dispatched, potential thermal overloads appeared in the models without the Expo load starting with the 25W model. Because of this, the Watford City 230/115kV transformer overloads were considered as pre-existing conditions. No other thermal or voltage violations were identified in the sensitivity analysis.

SECTION 4: CONCLUSION

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

- Close in the Lonesome Creek Switchyard
- Rebuild Arnegard – Lonesome Creek Switchyard South 115 kV line (6.65 miles)
- Rebuild Arnegard - Expo 115 kV line (4.47 miles)
- Rebuild Expo – Cherry Creek 115 kV line (4.47 miles)

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