DPNS-2022-AUGUST-1629

Delivery Point Network Study

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By SPP Engineering, Transmission Services

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION	COMMENTS
1/25/2023	SPP	Original	

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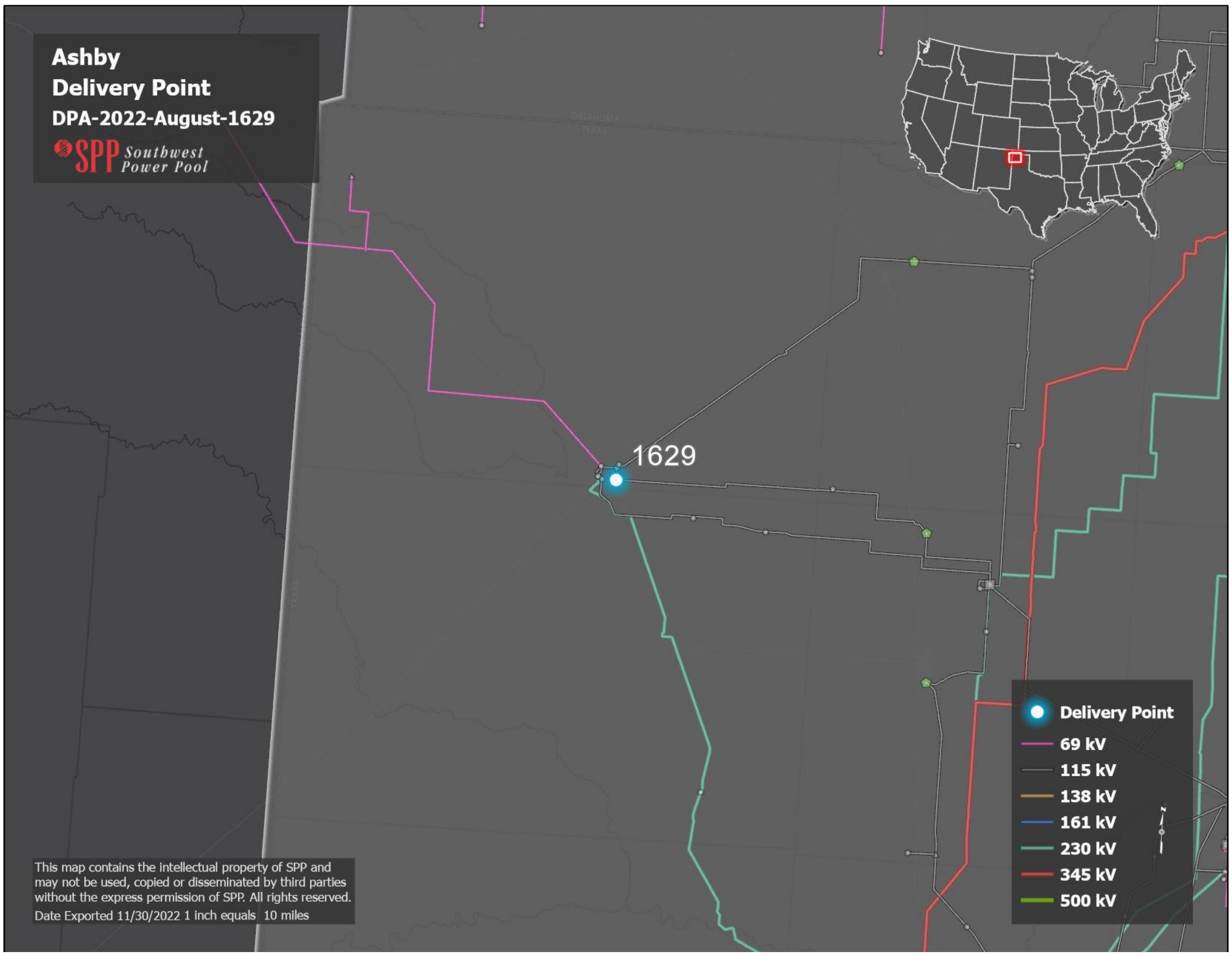
SECTION 1: INTRODUCTION

This report outlines the results of an evaluation of regional transmission impacts from delivery point request DPA-2022-August-1629. The requesting entity plans to add a new delivery point called Ashby. The Ashby delivery point is in the Southwestern Public Service (SPS) transmission system.



The load flow models used for the evaluation were 2022 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 SPS. SPP performed a Delivery Point Network Study ("DPNS") with the configurations shown in Table 2-1 below. The proposed in-service date is December, 15th 2023 for the upgraded Ashby delivery point.

STUDY PROCESS

- Model Assumptions
    - 2022 ITP Base Reliability models
        - Model years 2023, 2024, 2027, and 2032
        - Summer Peak (2024S, 2027S, and 2032S), Winter Peak (2023W, 2024W, 2027W, and 2032W), and Light Load (2024L, 2027L, and 2032L)
    - The models include the Ashby delivery point. SPP compared results from study models both with and without the Ashby load addition to determine the impact to the transmission system.
    - 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)
2022ITPP3a-23W.sav	2023	Winter Peak	Base Reliability	Base Case
2022ITPP3a-24L.sav	2024	Light Load	Base Reliability	Base Case
2022ITPP3a-24S.sav	2024	Summer Peak	Base Reliability	Base Case
2022ITPP3a-24W.sav	2024	Winter Peak	Base Reliability	Base Case
2022ITPP3a-27L.sav	2027	Light Load	Base Reliability	Base Case
2022ITPP3a-27S.sav	2027	Summer Peak	Base Reliability	Base Case
2022ITPP3a-27W.sav	2027	Winter Peak	Base Reliability	Base Case
2022ITPP3a-32L.sav	2032	Light Load	Base Reliability	Base Case
2022ITPP3a-32S.sav	2032	Summer Peak	Base Reliability	Base Case
2022ITPP3a-32W.sav	2032	Winter Peak	Base Reliability	Base Case
2022ITPP3a-23W_1629.sav	2023	Winter Peak	Base Reliability	Ashby = 1: 4.9, 1.611 D1: 4.1, 1.348
2022ITPP3a-24L_1629.sav	2024	Light Load	Base Reliability	Ashby = 1: 7.0, 2.301 D1: 5.0, 1.643
2022ITPP3a-24S_1629.sav	2024	Summer Peak	Base Reliability	Ashby = 1: 7.0, 2.301 D1: 5.5, 1.808
2022ITPP3a-24W_1629.sav	2024	Winter Peak	Base Reliability	Ashby = 1: 4.9, 1.611 D1: 4.1, 1.348
2022ITPP3a-27L_1629.sav	2027	Light Load	Base Reliability	Ashby = 1: 10.2, 3.353 D1: 8.0, 2.629
2022ITPP3a-27S_1629.sav	2027	Summer Peak	Base Reliability	Ashby = 1: 10.2, 3.353 D1: 8.2, 2.695

Case Name	Study Year	Season	Scenario	Load (MW/MVAR)
2022ITPP3a-27W_1629.sav	2027	Winter Peak	Base Reliability	Ashby = 1: 7.1, 2.334 D1: 6.2, 2.038
2022ITPP3a-32L_1629.sav	2032	Light Load	Base Reliability	Ashby = 1: 11.7, 3.846 D1: 8.4, 2.761
2022ITPP3a-32S_1629.sav	2032	Summer Peak	Base Reliability	Ashby = 1: 11.7, 3.846 D1: 8.4, 2.761
2022ITPP3a-32W_1629.sav	2032	Winter Peak	Base Reliability	Ashby = 1: 8.2, 2.695 D1: 6.3, 2.071

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 Ashby delivery point addition 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 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 overloads and voltage violations resulting from the load added to the Ashby delivery point. Table 3-1 details the potential thermal violations resulting from the load addition.

Year	Season	Facility Name	Contingencies	RATE A, RATE B (MVA)	Max Flow (MVA)	Change Case Max Loading (%)
2027	Summer	RB-FARIA - MOORE_E 3 - 1	DALLAM 3 - DALHART 3 - 1	92.81/92.81	96.8	104.3
2032	Summer	RB-HOGUE 3 - TUMBLE - 1	RB-FARIA - MOORE_E 3 - 1	82/82	85.4	104.2
2032	Summer	DALHART 3 - TUMBLE - 1	RB-FARIA - MOORE_E 3 - 1	82/82	89.8	109.6
2032	Summer	RB-FARIA - MOORE_E 3 - 1	XIT_INTG 6 - CHAN+TASCOS6 - 1	92.81/92.81	101.9	109.8
2032	Summer	RB-FARIA - MOORE_E 3 - 1	DALLAM 3 - DALHART 3 - 1	92.81/92.81	113.7	122.6
2032	Summer	RB-FARIA - MOORE_E 3 - 1	XIT_INTG 3 - XIT_INTG 6 - 1	92.81/92.81	101.9	109.8
2032	Summer	RB-FARIA - MOORE_E 3 - 1	CHAN+TASCOS6 - POTTER_CO 6 - 1	92.81/92.81	102.8	110.8

Table 3-1: 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)
2024	Summer	RB-HOGUE 3	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.89855
2024	Summer	RB-FARIA	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.89128
2024	Summer	TUMBLE	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.89569
2024	Summer	DALHART 3	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.88541
2027	Summer	ASHBY 3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.8879
2027	Summer	CHAN+TASCOS6	230	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.89076
2027	Summer	HILMRCHZ_TP3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.8871
2027	Summer	XIT_INTG 6	230	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88988
2027	Summer	RB-KEMP 3	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.8805
2027	Summer	DALHART 3	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.88826
2027	Summer	XIT_INTG 6	230	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.87737
2027	Summer	HARTMR	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.87463
2027	Summer	TUMBLE	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.89488
2027	Summer	RB-HOGUE 3	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.8967
2027	Summer	RB-1ST_ST 3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.89668
2027	Summer	HILMARCHZ 3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.88667
2027	Summer	RB-FARIA	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.86317
2032	Light	EAST_PLANT 6	230	HARRNG_WST 6 - EAST_PLANT 6 - 1	1.05	0.9	0.89925
2032	Summer	DALHART 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88592

Year	Season	Facility Name	Facility Voltage (kV)	Contingency Name	Voltage Maximum (pu)	Voltage Minimum (pu)	Bus Voltage (pu)
2032	Summer	TUMBLE	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88641
2032	Summer	XIT_INTG 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88927
2032	Summer	RB-1ST_ST 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.89233
2032	Summer	HARTMR	115	HARTMR - RB-FARIA - 1	1.05	0.9	0.88105
2032	Summer	HARTMR	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.82299
2032	Summer	RB-HOGUE 3	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.85781
2032	Summer	ASHBY 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88567
2032	Summer	RB-KEMP 3	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.88032
2032	Summer	HILMRCHZ_TP3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.86369
2032	Summer	TUMBLE	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.86458
2032	Summer	RB-KEMP 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.89609
2032	Summer	TUMBLE	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88861
2032	Summer	XIT_INTG 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88603
2032	Summer	TUMBLE	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88598
2032	Summer	RB-HOGUE 3	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.86661
2032	Summer	RB-HOGUE 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88651
2032	Summer	RB-FARIA	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.81076
2032	Summer	XIT_INTG 6	230	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.77748
2032	Summer	RB-KEMP 3	115	HARTMR - RB-FARIA - 1	1.05	0.9	0.88484
2032	Summer	ASHBY 3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.8645
2032	Summer	DALHART 3	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.85724
2032	Summer	XIT_INTG 6	230	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.77155
2032	Summer	RB-KEMP 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.89454
2032	Summer	RB-WOLVES	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88883
2032	Summer	DALLAM 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88622
2032	Summer	HILMARCHZ 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88494
2032	Summer	ASHBY 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88609
2032	Summer	HILMARCHZ 3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.86324
2032	Summer	HILMRCHZ_TP3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.8858
2032	Summer	DALLAM 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88664
2032	Summer	HILMRCHZ_TP3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88862
2032	Summer	RB-HOGUE 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88608
2032	Summer	DALHART 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.8855
2032	Summer	DALHART 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88875
2032	Summer	HILMARCHZ 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88819
2032	Summer	XIT_INTG 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88562
2032	Summer	RB-HOGUE 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88853
2032	Summer	DALLAM 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88957
2032	Summer	RB-1ST_ST 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.8919
2032	Summer	RB-WOLVES	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88517
2032	Summer	ASHBY 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.88885
2032	Summer	CHAN+TASCOS6	230	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.77799
2032	Summer	HILMRCHZ_TP3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.88538
2032	Summer	HARTMR	115	DALLAM 3 - DALHART 3 - 1	1.05	0.9	0.88902
2032	Summer	TUMBLE	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.87054
2032	Summer	RB-1ST_ST 3	115	DALLAM 3 - HILMRCHZ_TP3 - 1	1.05	0.9	0.87394
2032	Summer	RB-1ST_ST 3	115	CHAN+TASCOS6 - POTTER_CO 6 - 1	1.05	0.9	0.89469

Year	Season	Facility Name	Facility Voltage (kV)	Contingency Name	Voltage Maximum (pu)	Voltage Minimum (pu)	Bus Voltage (pu)
2032	Summer	RB-WOLVES	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88558
2032	Summer	RB-KEMP 3	115	XIT_INTG 6 - CHAN+TASCOS6 - 1	1.05	0.9	0.89412
2032	Summer	RB-KEMP 3	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.83074
2032	Summer	HILMARCHZ 3	115	XIT_INTG 3 - XIT_INTG 6 - 1	1.05	0.9	0.88536
2032	Winter	RB-FARIA	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.88652
2032	Winter	HARTMR	115	RB-FARIA - MOORE_E 3 - 1	1.05	0.9	0.89541

Table 3-2: 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	FRISCO_WND 311	6,921
27S	Max Fault	Three Phase	EW5_COL 134	3,199
27S	Max Fault	Three Phase	SHERMAN 134	3,249
27S	Max Fault	Three Phase	EW6_COL 134	3,122
27S	Max Fault	Three Phase	SHERMAN 311	4,382
27S	Max Fault	Three Phase	LASLEY 311	5,756
27S	Max Fault	Three Phase	RB-ELKS 311	5,689
27S	Max Fault	Three Phase	RB-SPURLCK+311	5,846
27S	Max Fault	Three Phase	RB-HOGUE 311	4,529
27S	Max Fault	Three Phase	RB-KEMP 311	5,437
27S	Max Fault	Three Phase	XIT_INTG TR113	14,159
27S	Max Fault	Three Phase	XIT_INTG 311	6,634
27S	Max Fault	Three Phase	XIT_INTG 623	3,354
27S	Max Fault	Three Phase	RB-WOLVES 11	6,274
27S	Max Fault	Three Phase	DALLAM_TR1 113	2,777
27S	Max Fault	Three Phase	RB-DALLAM 269	2,376
27S	Max Fault	Three Phase	DALLAM 311	6,762
27S	Max Fault	Three Phase	HILMRCHZ_TP311	6,656
27S	Max Fault	Three Phase	HILMARCHZ 311	6,399
27S	Max Fault	Three Phase	RB-EXUM 311	6,066
27S	Max Fault	Three Phase	RB-DALHART 269	2,326
27S	Max Fault	Three Phase	DALHRT_TR1 113	3,823
27S	Max Fault	Three Phase	RB-1ST_ST 311	5,103
27S	Max Fault	Three Phase	DALHART 269	2,282
27S	Max Fault	Three Phase	DALHART 311	6,167
27S	Max Fault	Three Phase	EW7_COL 134	5,181
27S	Max Fault	Three Phase	EW8_COL 134	4,715
27S	Max Fault	Three Phase	ETTER 134	5,392
27S	Max Fault	Three Phase	ETTER 311	6,511
27S	Max Fault	Three Phase	RB-477_TP 269	2,188

Season	Model	Fault	Bus	Current(Amps)
27S	Max Fault	Three Phase	ASHBY 311	6,281
27S	Max Fault	Three Phase	VALERO 311	11,058
27S	Max Fault	Three Phase	RB-HARTMOOR311	5,994
27S	Max Fault	Three Phase	TWIST 311	6,610
27S	Max Fault	Three Phase	MOORE_E 112	12,334
27S	Max Fault	Three Phase	MOORE_TR1 113	21,029
27S	Max Fault	Three Phase	MOORE_W 311	12,151
27S	Max Fault	Three Phase	MOORE_E 311	12,151
27S	Max Fault	Three Phase	MOORE_CNTY 623	6,913
27S	Max Fault	Three Phase	CHAN+TASCOS623	4,364

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 Ashby 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 addition of the new load at Ashby caused potential thermal overloads and voltage violations on the 115kV system around Ashby. SPP's solution consisted of connecting the two 115kV lines from the XIT Interchange sub and the Moore sub. The solution is listed below.

New Upgrade Description*	Mileage	MVAR	Date Needed**	Estimated Cost***
Build new Twist substation connecting the RB-Exum – Hilmar Cheese Plant and RB-Kemp – Moore County line.	-	-	12/1/2023	$9,044,750
Build new double circuit 115kV line into the new Twist substation by tapping RB-Exum to Hilmar Cheese Plant.	4	-	12/1/2023	$3,622,274
Build new double circuit 115kV line into the new Twist substation by tapping RB-Kemp to RB-Hartmoore.	3.6	-	12/1/2023	$3,315,173
TOTAL NEW UPGRADE COST				**$15,982,197**

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).

**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 thermal and voltage violations associated with the Ashby load addition. The study shows that the following upgrades are required to reliably serve the load addition:

Build new Twist substation connecting the RB-Exum – Hilmar Cheese Plant and RB-Kemp – Moore County line.
Build new double circuit 115kV line into the new Twist substation by tapping RB-Exum to Hilmar Cheese Plant.
Build new double circuit 115kV line into the new Twist substation by tapping RB-Kemp to RB-Hartmoore.

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