



TRI-STATE G&T

A Touchstone Energy® Cooperative



Large Generator Interconnection Procedures Cluster Study Report

2025 Annual Cluster

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Tri-State Transmission Planning Department

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1.0 BACKGROUND AND SCOPE

On August 25, 2025 Tri-State initiated a Cluster Request Window which remained open for a forty-five (45) Calendar Day period closing October 8, 2025. The 2025 Interconnection Cluster Study Scoping meeting occurred on November 18, 2025. This process resulted in execution of twenty-four (24) Cluster Study Agreements forming the basis for this Cluster Study.

Table 1-1: Cluster Interconnection Requests

Generator Interconnection Number	Point of Interconnection	Interconnection Service Requested	MW Capacity	Requested COD
GI-CS-2025-02	West Sand Creek 230 kV	NRIS/ERIS	199	6/2031
GI-CS-2025-03	Windtalker 230 kV	NRIS/ERIS	300	4/2028
GI-CS-2025-04	Ault – LRS 345 kV	NRIS/ERIS	330	11/2029
GI-CS-2025-05	Redtail 115 kV	ERIS	300	12/2029
GI-CS-2025-07	Looff 230 kV (Burlington Expansion)	ERIS	199	12/2029
GI-CS-2025-08	Looff 230 kV (Burlington Expansion)	ERIS	199	12/2029
GI-CS-2025-09	San Luis Valley 230 kV	ERIS	199	12/2028
GI-CS-2025-10	Boone – La Juna 115 kV	NRIS/ERIS	100	12/2029
GI-CS-2025-11	Big Sandy 230 kV	ERIS	199	12/2028
GI-CS-2025-12	Walsenburg – Gladstone 230 kV	NRIS/ERIS	165	12/2029
GI-CS-2025-16	Henry Lake – Badger Creek 230 kV	NRIS/ERIS	150	6/2029
GI-CS-2025-17	Craig – Meeker 345 kV	NRIS/ERIS	199.5	6/2029
GI-CS-2025-18	Clapham – Gladstone 115 kV	ERIS	199	12/2029
GI-CS-2025-19	Story 230 kV	NRIS/ERIS	199.9	12/2029
GI-CS-2025-20	Story 230 kV	NRIS/ERIS	199.9	12/2029
GI-CS-2025-21	Walsenburg – Comanche 230 kV	NRIS/ERIS	325	2/2030
GI-CS-2025-22	Walsenburg – Comanche 230 kV	NRIS/ERIS	150	2/2030
GI-CS-2025-23	Walsenburg – Gladstone 230 kV	NRIS/ERIS	150	2/2030
GI-CS-2025-24	Big Sandy – Windtalker 230 kV	NRIS/ERIS	225	12/2029
GI-CS-2025-25	Laramie River Station 345 kV	ERIS	800	12/2030
GI-CS-2025-26	Crossing Trails 230 kV	ERIS	199	6/2029
GI-CS-2025-27	Start Nelson 115 kV	NRIS/ERIS	199	4/2029
GI-CS-2025-28	Lamar – Vilas 115 kV	NRIS/ERIS	110	2/2030
GI-CS-2025-29	Burlington – Wray 230 kV	ERIS	300	8/2031

This 2025 Cluster Study was prepared in accordance with Tri-State’s Order 2023 LGIP and relevant FERC, NERC, WECC and Tri-State guidelines. For study purposes, the Cluster projects (“Projects”) were segmented into one of seven Cluster Areas:

- Cluster Area 1 – Northeast Colorado/Southeast Wyoming
- Cluster Area 2 – Western Colorado
- Cluster Area 3 – San Luis Valley
- Cluster Area 4 – Eastern Colorado
- Cluster Area 5 – Southeastern Colorado
- Cluster Area 6 – North Denver Metro

- Cluster Area 7 – Northeast New Mexico

The 2025 Cluster Study considered the Base Case as well as all generating facilities (and with respect to (iii) below, any identified Network Upgrades associated with such higher queued interconnection) that, on the date the Cluster Request Window closes:

- i. are existing and directly interconnection to the Transmission System;
- ii. are existing and interconnected to Affected Systems and may have an impact on the Interconnection Request;
- iii. have a pending higher queued Interconnection Request to interconnect to the Transmission System; and
- iv. have no Queue Position but have executed a Large Generator Interconnection Agreement (“LGIA”) or requested that an unexecuted LGIA be filed with FERC.

The 2025 Cluster Study provides the following information:

- identification of any thermal overload or voltage limit violations resulting from the interconnection(s);
- identification of any reactive power capability criteria violations from the interconnection(s);
- identification of any transient stability violations resulting from the interconnections(s);
- identification of any short-circuit violations results from the interconnection(s);
- Transmission Provider’s Interconnection Facilities and Transmission Provider’s Network Upgrades that are expected to be required as a result of the Interconnection Request(s) and a non-binding, good faith indicative-level estimate of cost responsibility and a non-binding, good faith estimated time to construct.

The 2025 Cluster Study consists of steady state power flow, voltage, reactive power capability, transient stability, short-circuit, and cost/schedule estimate analyses.

2.0 STUDY ASSUMPTIONS

Pursuant to Section 2.4 of the Tri-State’s Order 2023 filed LGIP, “Nothing in this LGIP shall constitute a request for transmission service or confer upon an Interconnection Customer any right to receive transmission service.” See Tri-State’s Open Access Same Time Information System (“OASIS”) web site for information regarding requests for transmission service, related requirements and contact information. Since the queue of higher priority transmission service requests may be different when a Network Customer requests network resource designation for one of these proposed Generating Facilities, the available capacity or transmission modifications, if any, necessary to provide Network Integration Transmission Service may be significantly different.

2.1 Steady State Power Flow Analysis

PowerWorld version 24 (Version 24.2025_12_22) software was used for performing the steady-state power flow analysis, with the following study criteria:

1. Tri-State's LGIP 2025, HS and LS (PowerWorld) base cases were developed from WECC approved seed cases with updates from the latest available loads and resources data, topology (line and transformer ratings, planned and budgeted projects, etc.), and updates received from regional utilities and Affected Systems. These LGIP base cases were further updated by Tri-State for the 2025 Cluster Study to reflect appropriate generation dispatching for this study by Cluster Area. The cases were reviewed by neighboring entities, who recommended planned generation to be included in the study. The following base cases were utilized for the study:
 - a. 2026 Heavy Summer 3 Operating Case with and without the proposed Projects,
 - b. 2026 Light Summer 1 Operating Case with and without the proposed Projects.
2. The requests were not studied as stand-alone projects. The IRs in each geographic and electrically relevant region were studied together as a Cluster Area.
3. In addition, the following higher queued projects (Generation Interconnection, Wire-to-wire, and Transmission Service) were considered in the study, as were their required network upgrades:
 - a. 2024 Transitional Cluster
 - i. GI-TC-2024-03 (160 MW)
 - ii. GI-TC-2024-04 (150 MW)
 - iii. GI-TC-2024-05 (150 MW)
 - iv. GI-TC-2024-06 (150 MW)
 - v. GI-TC-2024-07 (199 MW)
 - vi. GI-TC-2024-09 (199 MW)
 - vii. GI-TC-2024-10 (199 MW)
 - viii. GI-TC-2024-14 (206.01 MW)
 - ix. GI-TC-2024-18 (100 MW)
 - x. GI-TC-2024-20 (250 MW)
 - xi. GI-TC-2024-22 (140 MW)
 - xii. GI-TC-2024-23 (199 MW)
 - xiii. GI-TC-2024-24 (199 MW)
 - xiv. GI-TC-2024-25 (350 MW)
 - xv. GI-TC-2024-27 (222.3 MW)
 - xvi. GI-TC-2024-28 (222.3 MW)
 - xvii. GI-TC-2024-29 (170 MW)
 - b. LGIA
 - i. TI-19-0227 (155 MW)

- ii. GI-DISIS-2021-04 (100 MW)
 - iii. GI-DISIS-2021-06 (140 MW)
 - iv. GI-DISIS-2021-11 (200 MW)
 - v. GI-DISIS-2022-02 (199 MW)
 - vi. GI-DISIS-2022-04 (158 MW)
 - vii. GI-DISIS-2022-07 (199 MW)
 - viii. GI-DISIS-2022-13 (199 MW)
 - ix. GI-DISIS-2022-17 (199 MW)
 - x. GI-DISIS-2022-22 (90 MW)
 - xi. GI-DISIS-2022-28 (199 MW)
 - xii. GI-DISIS-2022-29 (199 MW)
 - xiii. GI-DISIS-2022-41 (49.6 MW)
 - xiv. GI-DISIS-2022-44 (199 MW)
 - xv. GI-DISIS-2022-45 (199 MW)
 - xvi. GI-DISIS-2022-49 (150 MW)
 - xvii. GI-TC-2024-01 (150 MW)
 - xviii. GI-TC-2024-02 (150 MW)
 - xix. GI-TC-2024-08 (150 MW)
 - xx. GI-TC-2024-11 (150 MW)
 - xxi. GI-TC-2024-12 (170 MW)
 - xxii. GI-TC-2024-15 (250 MW)
 - xxiii. GI-TC-2024-16 (400 MW)
 - xxiv. GI-TC-2024-17 (225 MW)
 - xxv. GI-TC-2024-19 (100 MW)
 - xxvi. GI-TC-2024-21 (125 MW)
 - xxvii. GI-TC-2024-26 (199 MW)
 - xxviii. GI-TC-2024-30 (199.9 MW)
 - xxix. GI-TC-2024-31 (398 MW)
 - xxx. GI-RSC-2025-02 (200 MW)
 - xxxi. GI-RSC-2025-03 (50 MW)
- c. Transmission Construction Interconnection Agreement

- i. Mora Transmission Line with Dona Carlos Wind Farm
 - d. Transmission Service
 - i. TSOA-25-0049 (150 MW)
 - ii. TSOA-25-0050 (150 MW)
 - iii. TSOA-25-0071 (50 MW)
 - iv. TSOA-25-0074 (200 MW)
 - v. TSOA-25-0115 (150 MW)
- 4. The following entities provided a response to request for model and generation updates considered in the study:
 - e. Public Service Company of Colorado
 - f. Black Hills Energy
- 5. Power flow (N-0) solution parameters were as follows: Transformer LTC Taps – stepping; Area Interchange Control – tie lines and loads; Phase Shifters and DC Taps – non-adjusting; and Switched Shunts - enabled.
- 6. Power flow contingencies (N-1) utilized the following solution settings: Transformer LTC Taps – locked taps; Area Interchange Control – disabled; Phase Shifters and DC Taps – non-adjusting; and Switched Shunts – locked all. (Not allowing voltage solution parameters to adjust provides worst-case results.)
- 7. All buses, lines and transformers with nominal voltage levels greater than or equal to 69 kV in the Tri-State and surrounding areas were monitored in all study cases for N-0 and N-1 system conditions.
- 8. Tri-State’s transmission system and potential Affected Systems (Western Area Power Administration (“WAPA”), Basin Electric Power Cooperative (“Basin”), PacifiCorp (“PACE”), Platte River Power Authority (“PRPA”), Public Service Company of New Mexico (“PNM”), Colorado Springs utilities (“CSU”), Black Hills Energy (“BHEC”), and/or Xcel Energy (“Xcel” or “PSCo”)) were monitored using the same overload criteria. Any thermal loading greater than 98% of the branch rating with a thermal overload increase of 2% or more was tabulated.
- 9. Analysis assumes that the GF controls the high voltage bus at the POI and should not negatively impact any voltage-controlled buses on the transmission system.
- 10. Post-contingency power transfer capability is subject to voltage constraints as well as equipment ratings. The project was tested against NERC/WECC reliability criteria with additions/exceptions as listed in the following table.

Table 2-1: Voltage Criteria

Tri-State Voltage Criteria for Steady State Power Flow Analysis		
Conditions	Operating Voltages	Delta-V
Normal (P0 Event)	0.95 - 1.05	N/A
Contingency (P1 Event)	0.90 - 1.10	8%

Tri-State Voltage Criteria for Steady State Power Flow Analysis		
Conditions	Operating Voltages	Delta-V
Contingency (P1 Event)	0.92 – 1.10 (PRPA Only)	8%
Contingency (P2-P7 Event)	0.90 - 1.10	None

2.2 Voltage Regulation and Reactive Power Criteria

1. The generating facility (“GF”) must be capable of either producing or absorbing VAR to achieve a 0.94 power factor (“pf”) as measured at the high-side of the generator substation across the range of near 0% to 100% of facility MW rating under normal operating voltage conditions, 0.95-1.05 per unit voltage, at the POI.
2. The GF may be required to either produce VAR or absorb VAR from .90 per unit to 1.10 per unit voltage at the POI, with typical target regulating voltage range being 1.01-1.03 per unit voltage.
3. The GF must operate in the automatic voltage control mode, regulating voltage at the POI.
4. Small voltage disturbances within the continuous operating range must be responded to within 500 ms of the disturbance. The GF may be required to reach 90% of its final reactive power output within 10 seconds. An overshoot of 5% of rated reactive power is permitted.
5. Large voltage disturbances beyond the continuous operating range must be responded to within 16 ms (one cycle). The GF may be required to reach 90% of its final reactive power output within 100 ms.
6. The power factor range for the GF at the high-side of the generator substation shall be dynamic and can be met using, for example, power electronics designed to supply dynamic reactive support, fixed/switched capacitors, or a combination of the two.
7. The GF may utilize switched capacitors or reactors as long as the individual step size results in less than 3% change at the POI operating bus voltage. This step change voltage magnitude shall be calculated based on the minimum system (N-1) short circuit POI bus MVA level as supplied by Tri-State.
8. When the GF is not producing any real power (near 0 MW), the VAR exchange at the POI shall be less than 2 MVAR, i.e., VAR neutral.
9. All generator interconnections are subject to additional detailed study, as may be required, utilizing more complex models and software such as PSCAD, or similar, and may require mitigation in excess of minimums imposed by published standards.

Note that reactive power and voltage regulation requirements identified in this analysis are *informational* based on the preliminary system model provided. The IC will be required to demonstrate ability to meet Tri-State’s reactive power and voltage regulation criteria as a milestone in the LGIA once the final system model is determined

3.0 Cluster Area 1 – Northeast Colorado/Southeast Wyoming

The Northeast Colorado/Southeast Wyoming Cluster Area is made up of five (5) IRs:

- GI-CS-2025-04 (“GI-2025-04”)

- GI-CS-2025-05 (“GI-2025-05”)
- GI-CS-2025-19 (“GI-2025-19”)
- GI-CS-2025-20 (“GI-2025-20”)
- GI-CS-2025-25 (“GI-2025-25”)

3.1 Generator Modeling Data

3.1.1 GI-2025-04

The project consists of ninety-four (94) General Electric Sierra 3.8-154 wind turbines (one (1) 357.2 MW equivalent wind generator) and sixty-nine (69) SMA SCS 3950 UP-US 3.61 MW BESS inverters (one (1) 249.1 MW equivalent BESS generators), four (4) 34.5-345-13.8 kV transformers, and a 0.10-mile 345 kV generator tie line that will interconnect to a new 345kV POI Switching Station approximately 56 miles south of Laramie River Station on the Ault – Laramie River Station 345 kV Line. Model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation. The IC has requested to be studied at 330 MW (injected at the POI) for Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

3.1.2 GI-2025-05

The project consists of ninety-two (92) Power Electronics FS4200M 3.3953 MW solar inverters (one (1) 312.4 MW equivalent solar generator), two (2) 34.5-115-13.8 kV transformers, and a 0.10-mile 115 kV generator tie line that will interconnect to the existing Redtail 115 kV Substation. Model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation. The IC has requested to be studied at 300 MW (injected at the POI) for Energy Resource Interconnection Service (“ERIS”).

3.1.3 GI-2025-19

The project consists of forty-seven (47) Power Electronics HEM FS5000M 4.54 MW solar inverters (one (1) 213.4 MW equivalent solar generator) and seventy-two (72) Power Electronic FP42000 3.0331 MW BESS inverters (one (1) 218.4 MW equivalent BESS generators), one (1) 34.5-230-13.8 kV transformer, and a 0.93-mile 230 kV generator tie line that will interconnect to the existing Story 230 kV Substation (sharing the 230kV Gen Tie line with GI-TC-2024-30). Model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation. The IC has requested to be studied at 199.9 MW (injected at the POI) for Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

3.1.4 GI-2025-20

The project consists of forty-seven (47) Power Electronics HEM FS5000M 4.45 MW solar inverters (one (1) 209.2 MW equivalent solar generator) and seventy-two (72) Power Electronic FP42000 3.0331 MW BESS inverters (one (1) 218.4 MW equivalent BESS generators), one (1) 34.5-230-13.8 kV transformer, and a 0.93-mile 230 kV generator tie line that will interconnect to the existing Story 230 kV Substation (sharing the 230kV Gen Tie line with GI-TC-2024-30). Model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation. The IC has requested to be studied at 199.9 MW (injected at the POI) for Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

3.1.5 GI-2025-25

The project consists of two-hundred twenty-four (224) Sungrow SG4400UD 3.73 MW solar inverters (one (1) 835.5 MW equivalent solar generator) and two-hundred four (204) Sungrow SC5000UD 4.07 MW BESS inverters (one (1) 830.3 MW equivalent BESS generators), four (4) 34.5-345-13.8 kV transformers, and a 0.81-mile 345 kV generator tie line that will interconnect to the existing Laramie River Station 345 kV. Model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation. The IC has requested to be studied at 800 MW (injected at the POI) for Energy Resource Interconnection Service (“ERIS”).

3.2 Steady State Power Flow Analysis

3.2.1 Cluster Area Criteria and Assumptions

1. The proposed Project outputs were accommodated by displacing generation resources at Springerville U3, Tri-State renewable resources in south/southeast Colorado and Northern New Mexico, and Craig powerplant.
2. TOT3 was stressed in accordance with limited TOT3 path rating methodology which includes 8 different case variations.
3. A newly identified operating condition where eastern Colorado wind generation is high was also studied.

3.2.2 Steady-State Power Flow Results

Three (3) of the five (5) projects in this Cluster Area requested to be studied as both ERIS and NRIS while the remaining two (2) elected to be studied as ERIS. Due to the proximity of GI-CS-2025-19 and GI-CS-2025-20 an additional scenario is also studied. In total five (5) scenarios were identified and shown below in Table 3-1:

Table 3-1: Northwest Colorado/Southeast Wyoming Cluster Area Scenarios

Scenario	GI-CS- 2025-04 (330 MW)	GI-CS- 2025-05 (300 MW)	GI-CS- 2025-19 (200 MW)	GI-CS- 2025-20 (200 MW)	GI-CS- 2025-25 (800 MW)
1	NRIS	ERIS	NRIS	NRIS	ERIS
2	NRIS	ERIS	ERIS	ERIS	ERIS
3	ERIS	ERIS	NRIS	ERIS	ERIS
4	ERIS	ERIS	ERIS	NRIS	ERIS
5	ERIS	ERIS	NRIS	NRIS	ERIS

The results below reflect **Scenario 1**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. None.
2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies using the 2029 Heavy Summer case are shown in **Table 3-2** below.

2029 Heavy Summer Results:

 - a. Loss of Keota 345/115 kV T1 (or T2) overloads Keota 345/115 kV T2 (or T1) to 170.2% of its 400 MVA rating.

Mitigation: Install Keota 345/115 kV T3, 400 MVA.
 - b. Loss of Ault – GI-2024-25 POI 345 kV line overloads Archer – Wayne Child 230 kV to 104.1% of its 637 MVA rating.

Mitigation: New Archer – Wayne Child 230 kV, 637 MVA.
3. N-k (System Intact, Category P2-7) Study Results:

No P2-7 contingencies were performed for this cluster as a stressed TOT3 analysis only considers and evaluates N-1 contingencies.

The results below reflect **Scenario 2**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. None.
2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies using the 2029 Heavy Summer case are shown in **Table 3-3** below.

2029 Heavy Summer Results:

- a. Loss of Keota 345/115 kV T1 (or T2) overloads Keota 345/115 kV T2 (or T1) to 170.2% of its 400 MVA rating.

Mitigation: Install Keota 345/115 kV T3, 400 MVA.

3. N-k (System Intact, Category P2-7) Study Results:

No P2-7 contingencies were performed for this cluster as a stressed TOT3 analysis only considers and evaluates N-1 contingencies.

The results below reflect **Scenario 3.**¹

1. N-0 (System Intact, Category P0) Study Results:

- a. None.

2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies using the 2029 Heavy Summer case are shown in **Table 3-4** below.

2029 Heavy Summer Results:

- a. Loss of Keota 345/115 kV T1 (or T2) overloads Keota 345/115 kV T2 (or T1) to 170.2% of its 400 MVA rating.

Mitigation: Install Keota 345/115 kV T3, 400 MVA.

- b. Loss of Alcova – Miracle Mile 115 kV #1 (or #2) overloads Alcova – Miracle Mile #2 (or #1) to 106.2% of its 109 MVA rating.

Mitigation: Increase thermal rating of both Alcova – Miracle Mile 115 kV #1 and #2. Contact WAPA.

- c. Loss of West Cheyenne – CLFPG16 POI 230 kV overloads Laramie River Station – GI-CS-2021-10 230 kV to 107.6% of its 478 MVA rating.

Mitigation: Increase thermal rating of Laramie River Station – GI-CS-2021-10 POI 230 kV. Contact MBPP.

3. N-k (System Intact, Category P2-7) Study Results:

No P2-7 contingencies were performed for this cluster as a stressed TOT3 analysis only considers and evaluates N-1 contingencies.

The results below reflect **Scenario 4.**

1. N-0 (System Intact, Category P0) Study Results:

- a. None.

¹ In Scenarios 3, 4, and 5, the location of GI-CS-2025-19 and GI-CS-2025-20 have a negative impact to TOT 3 resulting in a reduction of TOT 3 flow by approximately 50% of the dispatched capacity (e.g. for a 199.9 MW dispatch, TOT 3 flow reduces by 100 MW). This results in TOT 3 becoming 'overstressed' when re-stressed back to its original value causing the incremental overload value to increase above 2% triggering the Network Upgrade need.

2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies using the 2029 Heavy Summer case are shown in **Table 3-5** below.

2029 Heavy Summer Results:

- a. Loss of Keota 345/115 kV T1 (or T2) overloads Keota 345/115 kV T2 (or T1) to 170.2% of its 400 MVA rating.

Mitigation: Install Keota 345/115 kV T3, 400 MVA.

- b. Loss of Alcova – Miracle Mile 115 kV #1 (or #2) overloads Alcova – Miracle Mile #2 (or #1) to 105.4% of its 109 MVA rating.

Mitigation: Increase thermal rating of both Alcova – Miracle Mile 115 kV #1 and #2. Contact WAPA.

- c. Loss of West Cheyenne – CLFPG16 POI 230 kV overloads Laramie River Station – GI-CS-2021-10 230 kV to 107.5% of its 478 MVA rating.

Mitigation: Increase thermal rating of Laramie River Station – GI-CS-2021-10 POI 230 kV. Contact MBPP.

3. N-k (System Intact, Category P2-7) Study Results:

No P2-7 contingencies were performed for this cluster as a stressed TOT3 analysis only considers and evaluates N-1 contingencies.

The results below reflect **Scenario 5**.

1. N-0 (System Intact, Category P0) Study Results:

- a. None.

2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies using the 2029 Heavy Summer case are shown in **Table 3-6** below.

2029 Heavy Summer Results:

- a. Loss of Keota 345/115 kV T1 (or T2) overloads Keota 345/115 kV T2 (or T1) to 170.2% of its 400 MVA rating.

Mitigation: Install Keota 345/115 kV T3, 400 MVA.

- b. Loss of Alcova – Miracle Mile 115 kV #1 (or #2) overloads Alcova – Miracle Mile #2 (or #1) to 113.5% of its 109 MVA rating.

Mitigation: Increase thermal rating of both Alcova – Miracle Mile 115 kV #1 and #2. Contact WAPA.

- c. Loss of West Cheyenne – CLFPG16 POI 230 kV overloads Laramie River Station – GI-CS-2021-10 230 kV to 110.5% of its 478 MVA rating.

Mitigation: Increase thermal rating of Laramie River Station – GI-CS-2021-10 POI 230 kV. Contact MBPP.

3. N-k (System Intact, Category P2-7) Study Results:

No P2-7 contingencies were performed for this cluster as a stressed TOT3 analysis only considers and evaluates N-1 contingencies.

3.2.2.1 Network Upgrades

The following Network Upgrades and constraints on Affected Systems were identified for the Northeast Colorado/Southeast Wyoming Cluster Area in one or more scenarios.

1. Add 3rd Keota 345/115 kV 400 MVA transformer.
2. New Archer – Wayne Child 230 kV #2
3. Coordinate with MBPP to remove terminal limitations from Dave Johnston – GI-2021-10 POI – Laramie River Station 230 kV line at the Laramie River Station terminal
4. Coordinate with WAPA to increase thermal rating of both Alcova – Miracle Mile 115 kV lines #1 and #2.

Table 3-2: Thermal Analysis Northeast Colorado/Southeast Wyoming Cluster
Scenario 1: NRIS: 2025-05, 2025-19, 2025-20;
ERIS: 2025-04, 2025-25

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P1	Archer – Wayne Child 345 kV	Ault – GI-2024-25 POI 345 kV	637.0	81.3%	104.1%	TSGT
P1	Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2)	400.0	100.0%	170.2%	TSGT

Table 3-3: Thermal Analysis Northeast Colorado/Southeast Wyoming Cluster
Scenario 2: NRIS: 2025-05;
ERIS: 2025-04, 2025-19, 2025-20, 2025-25

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P1	Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2)	400.0	100.0%	170.2%	TSGT

Table 3-4: Thermal Analysis Northeast Colorado/Southeast Wyoming Cluster
Scenario 3: NRIS: 2025-19;
ERIS: 2025-04, 2025-05, 2025-20, 2025-25

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P1	Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2)	400.0	100.0%	170.2%	TSGT
P1	Alcova – Miracle Mile 115 kV #1 (or #2)	Alcova – Miracle Mile 115 kV #1 (or #2)	109.0	103.1%	106.2%	WAPA
P1	Laramie River Station – GI-CS-2021-10 230 kV	West Cheyenne – CLFPG16 POI 230 kV	478.0	103.4%	107.6%	MBPP

Table 3-5: Thermal Analysis Northeast Colorado/Southeast Wyoming Cluster
Scenario 4: NRIS: 2025-20;
ERIS: 2025-04, 2025-05, 2025-19, 2025-25

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P1	Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2)	400.0	100.0%	170.2%	TSGT
P1	Alcova – Miracle Mile 115 kV #1 (or #2)	Alcova – Miracle Mile 115 kV #1 (or #2)	109.0	103.0%	105.4%	WAPA
P1	Laramie River Station – GI-CS-2021-10 230 kV	West Cheyenne – CLFPG16 POI 230 kV	478.0	104.8%	107.4%	MBPP

Table 3-6: Thermal Analysis Northeast Colorado/Southeast Wyoming Cluster
Scenario 5: NRIS: 2025-19, 2025-20;
ERIS: 2025-04, 2025-05, 2025-25

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P1	Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2)	400.0	100.0%	170.2%	TSGT
P1	Alcova – Miracle Mile 115 kV #1 (or #2)	Alcova – Miracle Mile 115 kV #1 (or #2)	109.0	108.0%	113.5%	WAPA
P1	Laramie River Station – GI-CS-2021-10 230 kV	West Cheyenne – CLFPG16 POI 230 kV	478.0	104.8%	110.5%	MBPP

3.2.3 Reactive Power Analysis

3.2.3.1 GI-CS-2025-04 Wind

At the full 330.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 119.8 MVAR produced (0.940 p.f. lag) to -119.8 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.89 lag (producing) and 0.89 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 3-7 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 330.0 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 10 MVAR capacitor bank may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 20 MVAR reactor bank may be required.

Table 3-7: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-CS-2025-04 Wind, Project Size: 330.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.89 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.059	-0.0	21.3	1.050	-----	-0.0	-21.3
1.05	66.0	-33.8	1.042	65.6	-15.7	1.050	0.973	-23.8	-8.1
1.05	132.0	-67.7	1.022	130.4	-59.8	1.050	0.909	-47.3	None
1.05	198.0	-101.5	1.000	194.2	-112.0	1.050	0.866	-70.5	None
1.05	264.0	-135.4	0.973	256.8	-173.9	1.050	0.828	-93.2	None
1.05	330.0	-169.2	0.942	318.0	-247.9	1.049	0.789	-115.4	None
0.950 POI Voltage at 0.89 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.958	0.0	17.5	0.950	-----	0.0	-17.5
0.95	66.0	33.8	0.985	65.5	47.7	0.950	0.808	23.8	None
0.95	132.0	67.7	1.009	130.2	71.3	0.950	0.877	47.3	None
0.95	198.0	101.5	1.030	194.1	89.1	0.950	0.909	70.4	None
0.95	264.0	135.4	1.050	257.5	101.5	0.950	0.930	93.5	None
0.95	330.0	169.2	1.067	320.2	108.9	0.950	0.947	116.2	7.3

3.2.3.2 GI-CS-2025-04 BESS

At the full 249.1 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 90.4 MVAR produced (0.940 p.f. lag) to -90.4 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-8** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 249.1 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 3-8: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-CS-2025-04 BESS, Project Size: 249.1 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.050	0.0	0.3	1.050	-----	0.0	-0.3
1.05	49.8	-37.4	1.027	49.6	-39.6	1.050	0.781	-18.0	None
1.05	99.6	-74.7	1.001	98.8	-85.2	1.050	0.757	-35.9	None
1.05	149.5	-112.1	0.972	147.4	-137.5	1.050	0.731	-53.5	None
1.05	199.3	-149.5	0.939	195.3	-198.2	1.049	0.702	-70.9	None
1.05	249.1	-186.8	0.900	242.4	-269.8	1.049	0.668	-88.0	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.950	0.0	0.2	0.950	-----	0.0	-0.2
0.95	49.8	37.4	0.979	49.6	34.8	0.950	0.819	18.0	None
0.95	99.6	74.7	1.005	98.8	64.3	0.950	0.838	35.9	None
0.95	149.5	112.1	1.030	147.6	89.4	0.950	0.855	53.6	None
0.95	199.3	149.5	1.052	196.1	110.7	0.950	0.871	71.2	None
0.95	249.1	186.8	1.073	244.4	128.4	0.950	0.885	88.7	None

3.2.3.3 GI-CS-2025-05 PV

At the full 312.4 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 113.4 MVAR produced (0.940 p.f. lag) to -113.4 MVAR absorbed (0.940 p.f. lead). This is the net

MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.87 lag (producing) and 0.87 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-9** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 312.4 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 5 MVAR reactor bank may be required.

Table 3-9: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-CS-2025-05, Project Size: 312.4 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.87 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.052	0.0	4.9	1.050	-----	0.0	-4.9
1.05	62.5	-35.4	1.034	62.3	-33.3	1.050	0.882	-22.6	None
1.05	124.9	-70.8	1.014	124.1	-77.4	1.050	0.848	-45.0	None
1.05	187.4	-106.2	0.992	185.3	-128.3	1.050	0.822	-67.3	None
1.05	249.9	-141.6	0.967	246.0	-187.2	1.049	0.796	-89.3	None
1.05	312.4	-177.0	0.939	305.9	-255.9	1.049	0.767	-111.0	None
0.950 POI Voltage at 0.87 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	4.0	0.950	-----	0.0	-4.0
0.95	62.5	35.4	0.975	62.2	36.3	0.950	0.864	22.6	None
0.95	124.9	70.8	0.996	124.0	62.9	0.950	0.892	45.0	None
0.95	187.4	106.2	1.015	185.4	84.4	0.950	0.910	67.3	None
0.95	249.9	141.6	1.032	246.4	101.3	0.951	0.925	89.4	None
0.95	312.4	177.0	1.048	307.1	113.9	0.951	0.938	111.5	None

3.2.3.4 GI-CS-2025-19 PV

At the full 203.5 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 73.9 MVAR produced (0.940 p.f. lag) to -73.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.933 lag (producing) and 0.933 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by

the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-10** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 203.5 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 35 MVAR capacitor bank may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 5 MVAR reactor bank may be required. Use of the adjoining BESS inverters to meet these requirements is acceptable.

**Table 3-10: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-CS-2025-19 PV, Project Size: 203.5 MW**

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.933 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.053	0.0	5.0	1.050	-----	0.0	-5.0
1.05	40.7	-15.7	1.040	40.6	-12.4	1.050	0.956	-14.7	-2.3
1.05	81.4	-31.4	1.026	80.8	-33.6	1.050	0.923	-29.3	None
1.05	122.1	-47.1	1.009	120.7	-58.8	1.050	0.899	-43.8	None
1.05	162.8	-62.8	0.990	160.1	-88.8	1.050	0.875	-58.1	None
1.05	203.5	-78.4	0.967	199.1	-124.3	1.050	0.848	-72.3	None
0.950 POI Voltage at 0.933 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.953	0.0	4.1	0.950	-----	0.0	-4.1
0.95	40.7	15.7	0.972	40.5	17.8	0.950	0.916	14.7	None
0.95	81.4	31.4	0.988	80.7	27.7	0.950	0.946	29.3	1.6
0.95	122.1	47.1	1.003	120.6	34.2	0.950	0.962	43.8	9.6
0.95	162.8	62.8	1.016	160.2	37.4	0.951	0.974	58.1	20.7
0.95	203.5	78.4	1.027	199.6	37.5	0.951	0.983	72.4	34.9

3.2.3.5 GI-CS-2025-19 BESS

At the full 203.5 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 73.9 MVAR produced (0.940 p.f. lag) to -73.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.833 lag (producing) and 0.833 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-11** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 203.5 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 3-11: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-CS-2025-19 BESS, Project Size: 203.5 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.833 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.050	0.0	0.9	1.050	-----	0.0	-0.9
1.05	40.7	-27.1	1.029	40.6	-28.1	1.050	0.822	-14.7	None
1.05	81.4	-54.1	1.005	80.9	-61.4	1.050	0.797	-29.4	None
1.05	122.1	-81.2	0.978	121.0	-99.8	1.050	0.772	-43.9	None
1.05	162.8	-108.2	0.948	160.7	-144.2	1.049	0.744	-58.3	None
1.05	203.5	-135.3	0.913	200.0	-196.6	1.049	0.713	-72.6	None
0.950 POI Voltage at 0.833 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.950	0.0	0.7	0.950	-----	0.0	-0.7
0.95	40.7	27.1	0.976	40.6	25.6	0.950	0.846	14.7	None
0.95	81.4	54.1	0.999	80.9	46.6	0.950	0.867	29.4	None
0.95	122.1	81.2	1.021	121.1	64.0	0.951	0.884	44.0	None
0.95	162.8	108.2	1.040	161.1	78.3	0.951	0.899	58.5	None
0.95	203.5	135.3	1.058	200.9	89.8	0.951	0.913	72.9	None

3.2.3.6 GI-CS-2025-20 PV

At the full 203.5 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 73.9 MVAR produced (0.940 p.f. lag) to -73.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.933 lag (producing) and 0.933 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-12** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 203.5 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 35 MVAR capacitor bank may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 5 MVAR reactor bank may be required. Use of the adjoining BESS inverters to meet these requirements is acceptable.

**Table 3-12: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-CS-2025-20 PV, Project Size: 203.5 MW**

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.933 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.053	0.0	5.0	1.050	-----	0.0	-5.0
1.05	40.7	-15.7	1.039	40.5	-12.6	1.050	0.955	-14.7	-2.1
1.05	81.4	-31.4	1.023	80.8	-34.4	1.050	0.920	-29.3	None
1.05	122.1	-47.2	1.003	120.6	-60.8	1.050	0.893	-43.8	None
1.05	162.8	-62.9	0.980	160.0	-92.6	1.050	0.865	-58.1	None
1.05	203.5	-78.6	0.953	198.9	-131.1	1.050	0.835	-72.2	None
0.950 POI Voltage at 0.933 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.953	0.0	4.1	0.950	-----	0.0	-4.1
0.95	40.7	15.7	0.974	40.5	17.6	0.950	0.917	14.7	None
0.95	81.4	31.4	0.991	80.7	27.1	0.950	0.948	29.3	2.2
0.95	122.1	47.2	1.007	120.6	32.8	0.950	0.965	43.8	11.0
0.95	162.8	62.9	1.020	160.2	34.9	0.950	0.977	58.1	23.2
0.95	203.5	78.6	1.031	199.5	33.7	0.951	0.986	72.4	38.7

3.2.3.7 GI-CS-2025-20 BESS

At the full 203.5 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 73.9 MVAR produced (0.940 p.f. lag) to -73.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.833 lag (producing) and 0.833 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-13** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 203.5 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

**Table 3-13: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-CS-2025-20 BESS, Project Size: 203.5 MW**

P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
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Fixed Voltage at POI Bus	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.833 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	0.0	0.9	1.050	-----	0.0	-0.9
1.05	40.7	-27.1	1.026	40.6	-28.4	1.050	0.820	-14.7	None
1.05	81.4	-54.1	0.999	80.9	-62.5	1.050	0.792	-29.4	None
1.05	122.1	-81.2	0.968	120.9	-102.4	1.050	0.763	-43.9	None
1.05	162.8	-108.2	0.932	160.5	-149.8	1.049	0.731	-58.3	None
1.05	203.5	-127.7	0.900	199.8	-195.6	1.049	0.715	-72.5	None
0.950 POI Voltage at 0.833 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	0.7	0.950	-----	0.0	-0.7
0.95	40.7	27.1	0.979	40.6	25.4	0.950	0.848	14.7	None
0.95	81.4	54.1	1.004	80.9	45.7	0.950	0.871	29.4	None
0.95	122.1	81.2	1.027	121.0	62.2	0.951	0.889	43.9	None
0.95	162.8	108.2	1.048	161.0	75.4	0.951	0.906	58.4	None
0.95	203.5	135.3	1.067	200.8	85.4	0.951	0.920	72.9	None

3.2.3.8 GI-CS-2025-25 PV

At the full 800.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 290.4 MVAR produced (0.940 p.f. lag) to -290.4 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.848 lag (producing) and 0.848 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-14** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 800.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 45 MVAR reactor bank may be required.

Table 3-14: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-CS-2025-25 PV, Project Size: 800.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)

1.050 POI Voltage at 0.848 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.055	-0.0	44.7	1.054	-----	-0.0	-44.7
1.05	160.0	-100.1	1.045	159.4	-59.1	1.052	0.938	-57.9	None
1.05	320.0	-200.3	1.035	317.5	-170.8	1.051	0.881	-115.2	None
1.05	480.0	-300.4	1.024	474.1	-290.7	1.049	0.853	-172.1	None
1.05	640.0	-400.5	1.012	629.2	-419.6	1.047	0.832	-228.4	None
1.05	800.0	-500.6	0.999	782.7	-558.3	1.044	0.814	-284.1	None
0.950 POI Voltage at 0.848 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.954	0.0	36.7	0.953	-----	0.0	-36.7
0.95	160.0	100.1	0.974	159.2	132.9	0.958	0.768	57.8	None
0.95	320.0	200.3	0.992	317.0	221.1	0.962	0.820	115.1	None
0.95	480.0	300.4	1.009	473.6	302.2	0.965	0.843	171.9	None
0.95	640.0	400.5	1.025	629.0	376.7	0.969	0.858	228.3	None
0.95	800.0	500.6	1.040	783.4	445.1	0.972	0.869	284.3	None

3.2.3.9 GI-CS-2025-25 BESS

At the full 800.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 290.4 MVAR produced (0.940 p.f. lag) to -290.4 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.814 lag (producing) and 0.814 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 3-15** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 800.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 5 MVAR reactor bank may be required.

**Table 3-15: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-CS-2025-25 BESS, Project Size: 800.0 MW**

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.814 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.053	0.0	5.1	1.053	-----	0.0	-5.1
1.05	160.0	-114.3	1.044	159.6	-112.1	1.051	0.818	-57.9	None
1.05	320.0	-228.5	1.034	318.3	-235.3	1.049	0.804	-115.5	None

1.05	480.0	-342.8	1.024	476.0	-364.9	1.047	0.794	-172.8	None
1.05	640.0	-457.0	1.014	632.7	-501.3	1.045	0.784	-229.6	None
1.05	800.0	-571.3	1.003	788.4	-645.0	1.042	0.774	-286.2	None
0.950 POI Voltage at 0.814 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.952	-0.0	4.1	0.952	-----	-0.0	-4.1
0.95	160.0	114.3	0.969	159.5	115.1	0.957	0.811	57.9	None
0.95	320.0	228.5	0.984	318.1	219.7	0.962	0.823	115.5	None
0.95	480.0	342.8	0.999	475.8	318.5	0.966	0.831	172.7	None
0.95	640.0	457.0	1.013	632.7	412.0	0.970	0.838	229.6	None
0.95	800.0	571.3	1.027	788.9	500.6	0.974	0.844	286.3	None

3.3 Transient Stability Analysis

3.3.1 Cluster Area Assumptions

1. The equivalent generators were modeled with data provided by the customer and in accordance with the WECC approved model list.
2. The collector systems, transformers, and generators were modeled with the same parameters as during steady-state analysis.

3.3.2 Methodology

Transient stability was evaluated as follows:

1. The 2029 Heavy Summer base case was utilized with the GFs in service and all previously identified network upgrades included.
2. System stability is observed by monitoring the voltage and relative rotor angles of the local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Line faults were typically assumed to be at the midpoint of the line. The corresponding contingencies to evaluate the facility's compliance with NERC/WECC criteria for transient stability are listed in Appendix B.

3.3.3 Transient Stability Results

Transient stability results identified that the Projects do not require additional mitigation and are compliant with the NERC/WECC criteria.

Simulation results for the 2029 Heavy Summer conditions showed that:

1. No adverse dynamic responses were observed.
2. GI-CS-2025-05 PID values in the REPC_A model were over-tuned, resulting in 'hunting' around a voltage setpoint. The "KVI" parameter was reduced to 5.0 from 50.0 to eliminate the oscillation caused by the 'hunting'.

3.4 Short-Circuit Analysis

Short circuit analysis was performed by the Transmission Provider for three phase and single line to ground faults at the generating facility's Point of Interconnection.

Table 3-16 shows the detailed results of the bus faults, contributions from each of the sources into the faults, and the network Thevenin equivalent impedances. The resultant total fault currents are with planned and existing equipment ratings.

Table 3-16: Cluster 1 Short Circuit Results

POI Location	L-G (Pre)	L-G (Post)	3L-G (Pre)	3L-G (Post)	R1+X1, R0+X0 (Pre)	R1+X1, R0+X0 (Post)
CS-2025-04	9,926 A	10,256 A	9,233 A	9,609 A	0.00490+j0.05056	0.00499+j0.04976
					0.00166+j0.01813	0.00159+j0.09462
CS-2025-05	6,810 A	7,439 A	5,414 A	6,026 A	0.03523+j0.22063	0.02911+j0.20540
					0.01557+j0.09238	0.01246+j0.08445
CS-2025-19	21,416 A	21,624 A	20,343 A	21,148 A	0.00451+j0.03550	0.00437+j0.03496
					0.00178+j0.01243	0.00164+j0.01190
CS-2025-20	21,416 A	21,624 A	20,343 A	21,148 A	0.00451+j0.03550	0.00437+j0.03496
					0.00178+j0.01243	0.00164+j0.01190
CS-2025-25	18,742 A	18,693 A	14,505 A	14,564 A	0.00210+j0.02751	0.00208+j0.02738
					0.00086+j0.01185	0.00085+j0.01172

3.5 Contingent Facilities

The following Interconnection Facilities and/or Network Upgrades to the transmission system are Contingent Facilities applicable to this Cluster Area. These are facilities not yet in service which the costs, timing, and study findings in this report are dependent upon, and if delayed or not built, could cause a need for re-studies of the interconnection request or a reassessment of the facilities, costs and timing.

1. Uprate/Rebuild Monolith Tap – Spring Creek – Snowy Range 115 kV to a minimum rating of 174.0 MVA.
2. Replace both Keota 345/115 kV XFMRs with 400 MVA units.
3. New Keota – Lloyd Sisson 115 kV line #2.
4. New Ault – Wayne Child 230 kV line.
5. New Wayne Child 345/230 kV T4.
6. New Ault – Fort St. Vrain 345 kV line.
7. Coordinated with PSCo to remove terminal limitations from Fort St. Vrain 230 kV line #1.

3.6 Scope, Cost, and Schedule

The cost estimate is broken out into two categories: 1) Interconnection Facilities, which include all equipment installed between the POI at the main bus and the Point of Change of Ownership (PCO) at the line dead-end structure² just outside the POI substation fence, and 2) Network Upgrades consisting of the rest of the facilities installed in the existing POI substation or at other locations to

² The Interconnection Customer's Interconnection Facilities are required to end at a vertically configured full tension monopole deadend structure located outside of the substation fence and approximately 10 feet inside Tri-State's property line. The vertically configured full tension monopole deadend structure shall create zero line angle with the Transmission Providers A-frame deadend structure, unless another location is mutually agreed upon by the parties in writing.

accommodate the interconnection. The estimate includes all site work such as grounding and conduit installation inside the substation.

Note that the IC will be responsible for constructing the radial transmission line from the PCO to the GF site and for providing the primary protection (relaying and interrupting device) for the IC's step-up transformer. Equipment at the POI will only provide backup protection for the IC's main transformer in the event of equipment failure or malfunction at the IC's facility. To facilitate protective relaying and data acquisition, the IC will need to include fiber optic cables ("OPGW") on its radial transmission line to provide communication channels for SCADA, metering (real time), and protective relaying.

The IC is responsible for all engineering, procurement and construction of all GF facilities, including any STATCOM type voltage regulation / reactive compensation devices.

All costs are good faith estimates based on assumptions as stated in this 2025 Cluster Study report. All estimates are in 2026 dollars.

It is estimated that it will take approximately 60 months after receiving authorization to proceed to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work. It is also estimated that it may take approximately 84 months after receiving authorization to proceed for the permitting activities and ROW to be completed for transmission line construction, if applicable. It is possible that the Generating facility may be able to operate at some level of generation prior to the completion of the requisite Interconnection Facilities, Network Upgrades, Contingent Facilities, or System Protection Facilities. However, that level of generation is not known at this phase of the study and would be addressed through a Provisional Interconnection Service Request per 5.9.2 of the LGIA.

3.6.1 Cost Allocation

There are violations requiring Network Upgrades which one or more of the projects contribute to. The following cost estimates are provided for the identified network upgrades. **Cost estimates are not provided for the mitigations of constraints on Affected Systems.** It is the responsibility of the Interconnecting Customer(s) to coordinate with the applicable entities to determine these costs, **which Tri-State can help facilitate.**

Cost is allocated to each project **according to the Business Practice Manual.** The cost allocation is detailed below in Table 3-17.

Table 3-17: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
New Keota 345/115 kV T3	Install necessary equipment to install a new 345/115 kV, 400 MVA transformer in TSGT's Keota substation. Scope includes typical testing, checkout, and commissioning. • One (1) 345/115 kV, 400 MVA XFMR • One (1) 345 kV power circuit breakers. • Three (3) 345 kV 3-ph gang disconnect switches and associated structures. • One (1) 115 kV power circuit breakers. • Three (3) 115 kV 3-ph gang disconnect switches and associated structures. • Circuit breaker station control panels. • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 24.70 M
New Archer – Wayne Child 230 kV #2	New 0.25-mile 230 kV 1272 ACSR Bittern conductor, two (2) bay positions.	\$ 10.40 M
Alcova – Miracle Mile 115 kV #1 & #2 Line Upgrades	Reconductor both Alcova – Miracle Mile 115 kV lines #1 and #2 to increase their thermal ratings. Remove any terminal limitations.	Contact WAPA
Laramie River Station – GI-CS-2021-10 POI 230 kV Line Upgrades	Remove terminal limitations on Laramie River Station – GI-CS-2021-10 POI (Dave Johnston) 230 kV to achieve conductor limit.	Contact MBPP

Table 3-18: Scenario 1 – Northeast Colorado/Southeast Wyoming Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency, Case	GI-2025-04	GI-2025-05	GI-2025-19	GI-2025-20	GI-2025-25
Archer – Wayne Child 230 kV	Ault – GI-2024-25 POI 345 kV (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		0.298	---	0.351	0.351	---
Cost Allocation (New Archer – Wayne Child 230 kV line #2 = \$ 10.4 M)		\$ 3.10 M	---	\$ 3.65 M	\$ 3.65 M	---
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	1.000	---	---	---
Cost Allocation (New Keota 345/115 kV T3 = \$ 23.5 M)		---	\$ 23.50 M	---	---	---
TOTAL NETWORK UPGRADE COST ALLOCATED		\$ 3.10 M	\$ 23.50 M	\$ 3.65 M	\$ 3.65 M	\$ 0.00 M

Table 3-19: Scenario 2 – Northeast Colorado/Southeast Wyoming Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency, Case	GI-2025-04	GI-2025-05	GI-2025-19	GI-2025-20	GI-2025-25
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	1.000	---	---	---
Cost Allocation (New Keota 345/115 kV T3 = \$ 23.5 M)		---	\$ 23.50 M	---	---	---
TOTAL NETWORK UPGRADE COST ALLOCATED		\$ 0.00 M	\$ 23.50 M	\$ 0.00 M	\$ 0.00 M	\$ 0.00 M

Table 3-20: Scenario 3 – Northeast Colorado/Southeast Wyoming Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency, Case	GI-2025-04	GI-2025-05	GI-2025-19	GI-2025-20	GI-2025-25
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	1.000	---	---	---
Cost Allocation (New Keota 345/115 kV T3 = \$ 23.5 M)		---	\$ 23.50 M	---	---	---

Overloaded Element (Constraint)	Contingency, Case	GI-2025-04	GI-2025-05	GI-2025-19	GI-2025-20	GI-2025-25
Alcova – Miracle Mile 115 kV #1 (or #2) (2029 Heavy Summer)	Alcova – Miracle Mile 115 kV #2 (or #1) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	---	1.000	---	---
Cost Allocation (Reconductor both Alcova – Miracle Mile 115 kV #1 & #2 = WAPA)		---	---	WAPA	---	---
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	---	1.000	---	---
Cost Allocation (Remove terminal limits from Laramie River Station – GI-CS-2021-10 POI 230 kV = MBPP)		---	---	MBPP	---	---
TOTAL NETWORK UPGRADE COST ALLOCATED		\$ 0.00 M	\$ 23.50 M	Contact WAPA, MBPP	\$ 0.00 M	\$ 0.00 M

Table 3-21: Scenario 4 – Northeast Colorado/Southeast Wyoming Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency, Case	GI-2025-04	GI-2025-05	GI-2025-19	GI-2025-20	GI-2025-25
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	1.000	---	---	---
Cost Allocation (New Keota 345/115 kV T3 = \$ 23.5 M)		---	\$ 23.50 M	---	---	---
Alcova – Miracle Mile 115 kV #1 (or #2) (2029 Heavy Summer)	Alcova – Miracle Mile 115 kV #2 (or #1) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	---	1.000	---	---
Cost Allocation (Reconductor both Alcova – Miracle Mile 115 kV #1 & #2 = WAPA)		---	---	WAPA	---	---
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	---	1.000	---	---
Cost Allocation		---	---	MBPP	---	---

Overloaded Element (Constraint)	Contingency, Case	GI-2025-04	GI-2025-05	GI-2025-19	GI-2025-20	GI-2025-25
(Remove terminal limits from Laramie River Station – GI-CS-2021-10 POI 230 kV = MBPP)						
TOTAL NETWORK UPGRADE COST ALLOCATED		\$ 0.00 M	\$ 23.50 M	Contact WAPA, MBPP	\$ 0.00 M	\$ 0.00 M

Table 3-22: Scenario 5 – Northeast Colorado/Southeast Wyoming Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency, Case	GI-2025-04	GI-2025-05	GI-2025-19	GI-2025-20	GI-2025-25
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	1.000	---	---	---
Cost Allocation (New Keota 345/115 kV T3 = \$ 23.5 M)		---	\$ 23.50 M	---	---	---
Alcova – Miracle Mile 115 kV #1 (or #2) (2029 Heavy Summer)	Alcova – Miracle Mile 115 kV #2 (or #1) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	---	1.000	---	---
Cost Allocation (Reconductor both Alcova – Miracle Mile 115 kV #1 & #2 = WAPA)		---	---	WAPA	---	---
Keota 345/115 kV T1 (or T2)	Keota 345/115 kV T1 (or T2) (2029 Heavy Summer)					
<i>Percent Cost Allocation</i>		---	---	1.000	---	---
Cost Allocation (Remove terminal limits from Laramie River Station – GI-CS-2021-10 POI 230 kV = MBPP)		---	---	MBPP	---	---
TOTAL NETWORK UPGRADE COST ALLOCATED		\$ 0.00 M	\$ 23.50 M	Contact WAPA, MBPP	\$ 0.00 M	\$ 0.00 M

3.6.2 GI-2025-04 Costs

Interconnection Facilities Costs:	\$3.10 M
Network Upgrade Costs, Interconnection:	\$26.80 M
TOTAL Costs (2026 dollars) for Interconnection:	\$ 29.90 M

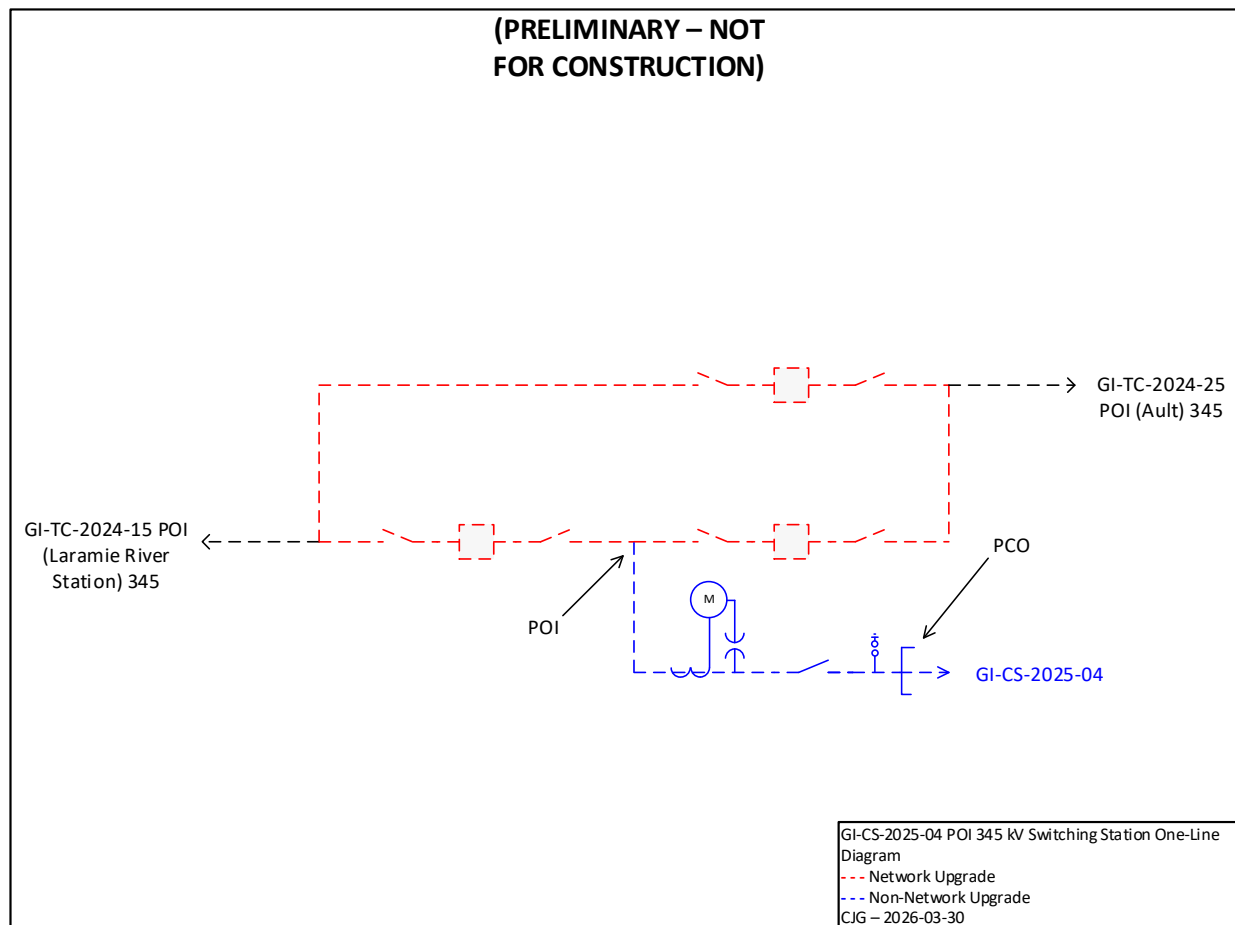


Figure 3-1: GI-CS-2025-04 POI One-Line Diagram

Table 3-23: Summary Cost Estimate Details for 345 kV POI – Interconnection Facilities

Element	Description	Cost Est. Millions
345 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 345 kV line dead-end structure. 345 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 345 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 345 kV metering current transformers, high accuracy class, extended range.	\$ 3.10 M

Element	Description	Cost Est. Millions
	• *Three (3) 345 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. • Relaying for the Interconnecting Customers radial 345 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). • Three (3) 345 kV surge arresters (345 kV MCOV or as required). • Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	

Table 3-24: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
GI-CS-2025-04 POI Substation	• Three (3) 345 kV power circuit breaker and associated disconnect switches • Circuit breaker station control panels • Digital Fault Recorder and associated panel • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 26.80 M

3.6.3 GI-2025-05 Costs

Interconnection Facilities Costs:	\$1.50 M
Network Upgrade Costs, Interconnection:	\$2.70 M
TOTAL Costs (2026 dollars) for Interconnection:	\$4.20 M

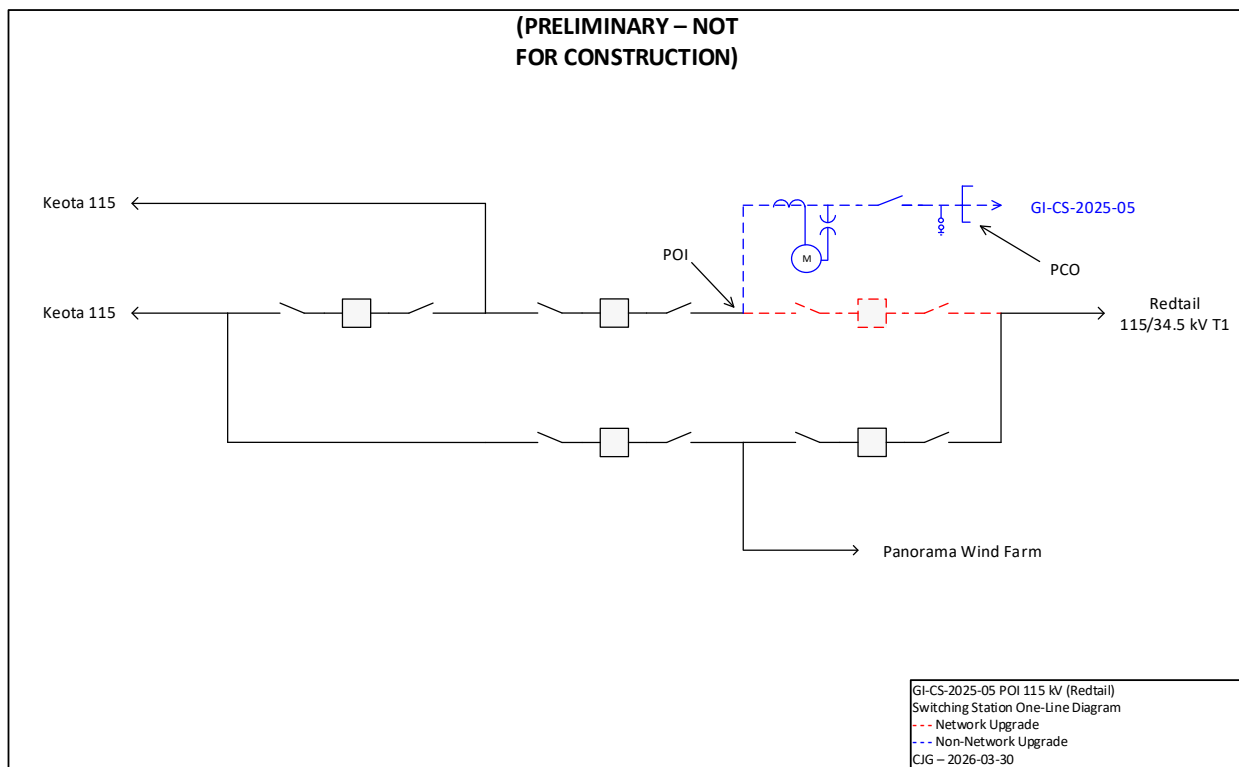


Figure 3-2: GI-CS-2025-05 POI One-Line Diagram

Table 3-25: Summary Cost Estimate Details for 115 kV POI – Interconnection Facilities

Element	Description	Cost Est. Millions
115 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 115 kV line dead-end structure. 115 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 115 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 115 kV metering current transformers, high accuracy class, extended range. *Three (3) 115 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units.	\$ 1.50 M

Element	Description	Cost Est. Millions
	- PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. - Relaying for the Interconnecting Customers radial 115 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). - Three (3) 115 kV surge arresters (115 kV MCOV or as required). - Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	

Table 3-26: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Redtail 115 kV Bay Addition	- One (1) 115 kV power circuit breaker and associated disconnect switches - Circuit breaker station control panels - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 2.70 M

3.6.4 GI-2025-19 Costs

Interconnection Facilities Costs:	\$0.00 M
Network Upgrade Costs, Interconnection:	\$0.00 M
TOTAL Costs (2026 dollars) for Interconnection:	\$0.00 M

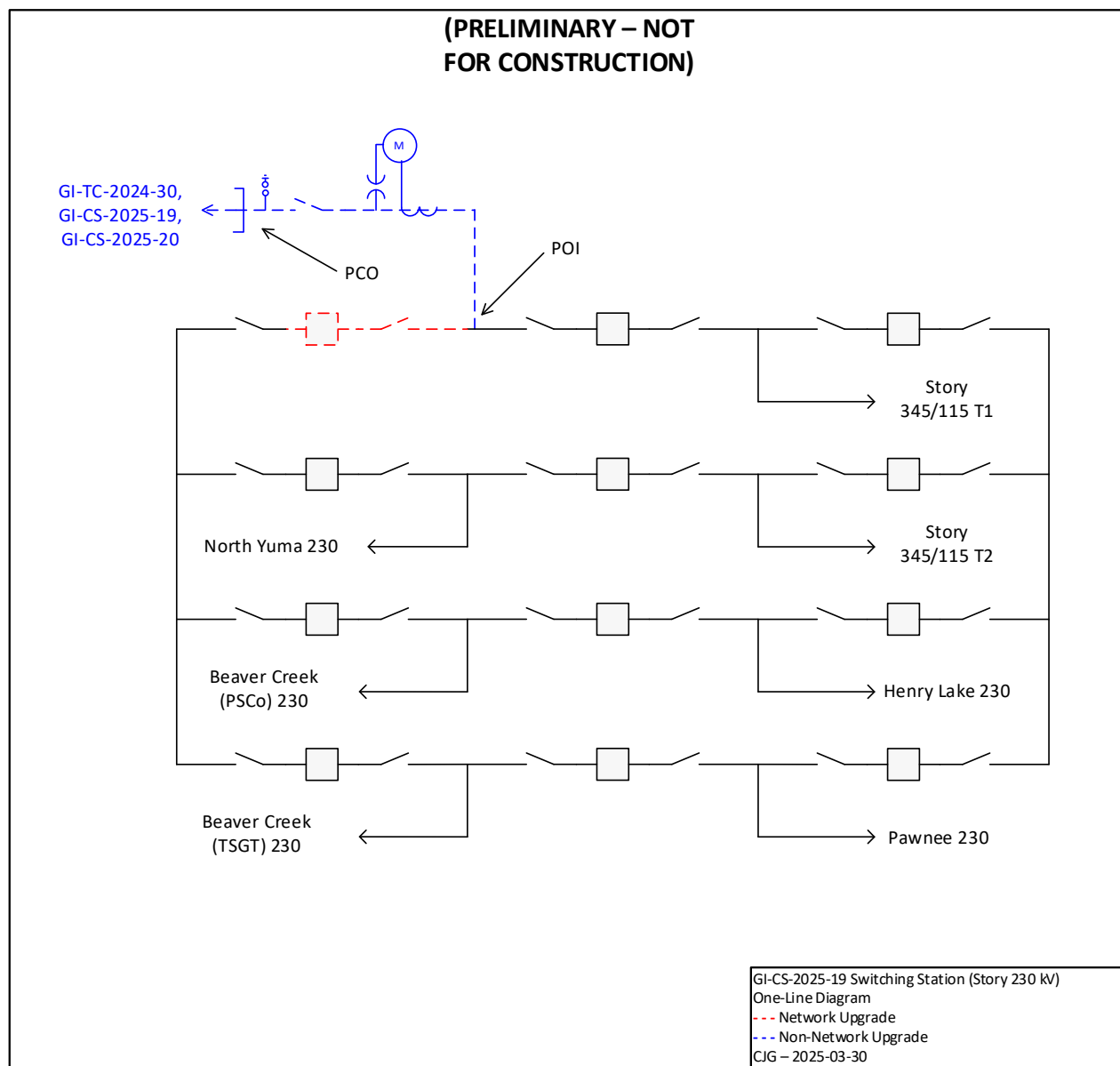


Figure 3-3: GI-CS-2025-19 POI One-Line Diagram

Table 3-27: Summary Cost Estimate Details for 230 kV POI – Interconnection Facilities

Element	Description	Cost Est. Millions
230 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 230 kV line dead-end structure. 230 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 230 kV metering current transformers, high accuracy class, extended range. *Three (3) 230 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. - Relaying for the Interconnecting Customers radial 230 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). - Three (3) 230 kV surge arresters (230 kV MCOV or as required). - Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	\$ 0.00 M³

Table 3-28: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Story 230 kV Bay Addition	- One (1) 230 kV power circuit breaker and associated disconnect switches - Circuit breaker station control panels - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 0.00 M⁴ (Funded by GI-TC-2024-30)

³ GI-CS-2025-19 and -20 share a gen-tie with GI-TC-2024-30. These costs are funded by the higher queue project.

⁴ GI-CS-2025-19 and -20 share a gen-tie with GI-TC-2024-30. These costs are funded by the higher queue project.

3.6.5 GI-2025-20 Costs

Interconnection Facilities Costs:	\$0.00 M
Network Upgrade Costs, Interconnection:	\$0.00 M
TOTAL Costs (2026 dollars) for Interconnection:	\$0.00 M

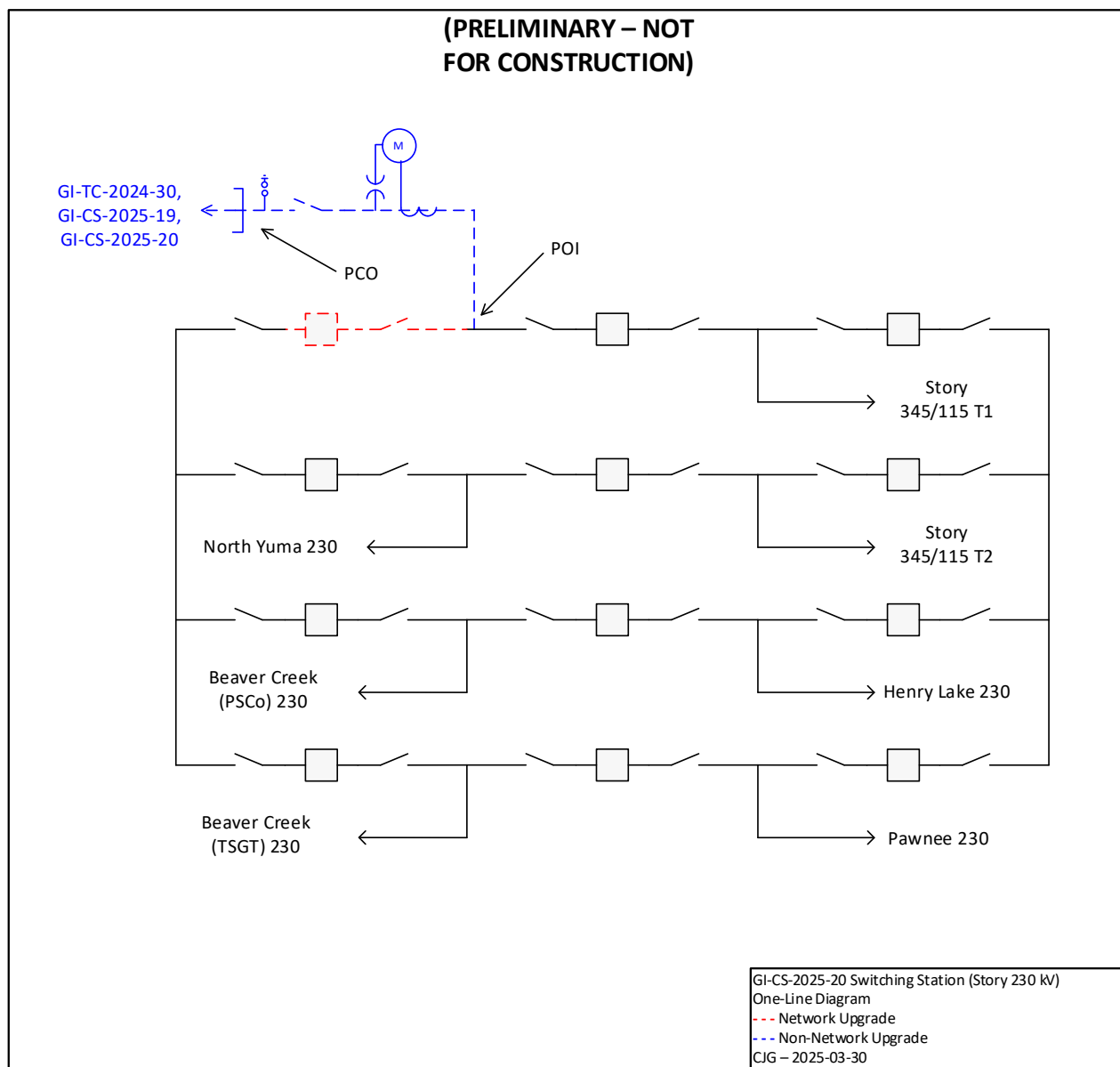


Figure 3-2: GI-CS-2025-20 POI One-Line Diagram

Table 3-29: Summary Cost Estimate Details for 230 kV POI – Interconnection Facilities

Element	Description	Cost Est. Millions
230 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 230 kV line dead-end structure. 230 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 230 kV metering current transformers, high accuracy class, extended range. *Three (3) 230 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. - Relaying for the Interconnecting Customers radial 230 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). - Three (3) 230 kV surge arresters (230 kV MCOV or as required). - Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	\$ 0.00 M⁵

Table 3-30: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Story 230 kV Bay Addition	- One (1) 230 kV power circuit breaker and associated disconnect switches - Circuit breaker station control panels - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 0.00 M⁶

⁵ GI-CS-2025-19 and -20 share a gen-tie with GI-TC-2024-30. These costs are funded by the higher queue project.

⁶ GI-CS-2025-19 and -20 share a gen-tie with GI-TC-2024-30. These costs are funded by the higher queue project.

3.6.6 GI-2025-25 Costs

Interconnection Facilities Costs:	\$3.10 M
Network Upgrade Costs, Interconnection:	\$33.40 M
TOTAL Costs (2026 dollars) for Interconnection:	\$36.50 M

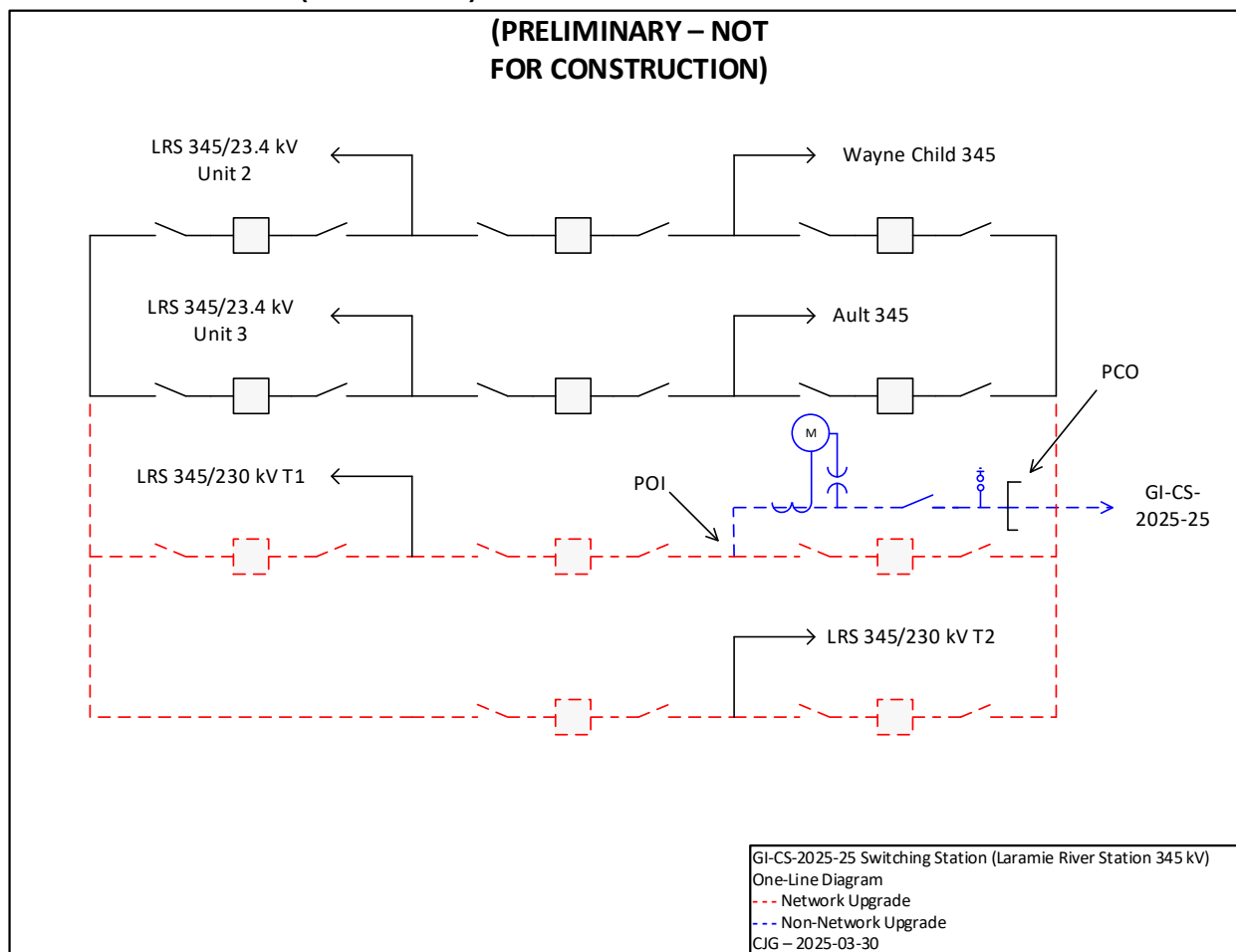


Figure 3-4: GI-CS-2025-25 POI One-Line Diagram

Table 3-31: Summary Cost Estimate Details for 345 kV POI – Interconnection Facilities

Element	Description	Cost Est. Millions
345 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 345 kV line dead-end structure. 345 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 345 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 345 kV metering current transformers, high accuracy class, extended range.	\$ 3.10 M

Element	Description	Cost Est. Millions
	• *Three (3) 345 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. • Relaying for the Interconnecting Customers radial 345 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). • Three (3) 345 kV surge arresters (345 kV MCOV or as required). • Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	

Table 3-32: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Expand Laramie River Station to 7-Position Breaker and a Half (from 6-Position Ring Bus)	• Five (5) 345 kV power circuit breaker and associated disconnect switches • Circuit breaker station control panels • Digital Fault Recorder and associated panel • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 33.40 M

4.0 CLUSTER AREA 2 – WESTERN COLORADO

The Western Colorado Cluster Area is made up of two (2) IRs:

- GI-CS-2025-17 (“GI-2025-17”)
- GI-CS-2025-27 (“GI-2025-27”)

4.1 Generator Modeling Data

For each project, model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation.

4.1.1 GI-2025-17

The project consists of fifty-eight (58) SMA SC4000UP-U PV inverters (one (1) 202.3 MW equivalent solar generator), one-hundred eight (108) Megapack 2 XL Tesla (GT01,P132,EC24) storage inverters (one (1) 101.2 MW equivalent BESS generator), one (1) 34.5-345-13.8 kV transformer, and a 0.066-mile 345 kV generator tie line that will interconnect to a new 345kV POI Switching Station approximately 6 miles north of the existing Milk Creek Switching Station on the Craig – Milk Creek 345 kV line. The IC has requested to be studied at 199.5 MW (injected at the POI) for both Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

4.1.2 GI-2025-27

The project consists of ten (10) Everllence 18V51/60G engines (one (1) 253.6 MW equivalent gas generator), four (4) 13.8-115 kV transformers and a 0.87-mile 115 kV generator tie line that will interconnect to the existing Starr Nelson 115 kV Substation. The IC has requested to be studied at 199 MW (injected at the POI) for both Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

4.2 Steady State Power Flow Analysis

4.2.1 Cluster Area Criteria and Assumptions

1. The proposed Projects’ outputs were accommodated by displacing generation resources in the Eastern Plains of Colorado.
2. To stress the system Cluster Area transmission system, WECC Path 31 (“TOT 2A”) flows were increased by reducing generation in New Mexico and increasing generation in Colorado. TOT 2A flows in Heavy Summer cases were stressed to 527 MW pre-project and post-project, and TOT 2A flows in Light Summer cases were stressed to 443 MW pre-project and post-project.
3. WECC Path 30 (“TOT 1A”) flows were increased by reducing generation in Utah and increasing generation in Colorado. TOT 2A flows in Heavy Summer cases were stressed to 524 MW pre-project and post-project, and TOT 2A flows in Light Summer cases were stressed to 431 MW pre-project and post-project.

4.2.2 Steady-State Power Flow Results

In this Cluster area, both projects have requested to be studied as either NRIS or ERIS. Three (3) scenarios have been defined as shown in **Table 4-1**.

Table 4-1: Western Colorado Cluster Area Scenarios

Scenario	CS-2025-17 (199.5 MW)	CS-2025-27 (199 MW)
1	NRIS	NRIS
2	NRIS	ERIS
3	ERIS	NRIS

For Scenario 1, all NRIS projects are studied as a group, and Network Upgrades are determined to accommodate all projects. For the other Scenarios, only one project is treated as NRIS, and Network Upgrades are determined just for that project. ERIS projects are then studied individually with those Network Upgrades in place. When studying ERIS projects, other generation may be redispatched to avoid overloads, including NRIS generation or other generation at the POI. The results for the NRIS projects and for each ERIS project are shown below.

The results below reflect **Scenario 1** and treats projects CS-2025-17 and CS-2025-27 as **NRIS**

1. N-0 (System Intact, Category P0) Study Results:

2029 Heavy Summer Results:

- a. No violations occurred under 2029 Heavy Summer conditions.

2029 Light Summer Results:

- a. Montrose – Starr Nelson 115 kV line is overloaded to 105.2% of its 95 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A) and upgrade terminally limiting bus equipment.

2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies are shown in **Table 4-2** below.

2029 Heavy Summer Results:

- a. Loss of Garnet Mesa – Garnet Mesa Tap 115 kV line overloads Montrose – Starr Nelson 115 kV line to 174.9% of its 95 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A) and upgrade terminally limiting bus equipment.

- b. Loss of Montrose – Starr Nelson 115 kV line overloads Garnet Mesa – Garnet Mesa Tap 115 kV line to 108.1% of its 143 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A).

- c. Loss of Lost Canyon – Towaoc Canal - Main 115 kV line overloads Empire – Lost Canyon 115 kV line to 130.4% of its 77 MVA rating.

Mitigation: New Lost Canyon – Main 115 kV line.

- d. Loss of Lost Canyon – Towaoc Canal - Main 115 kV line overloads Great Cut Tap – Empire 115 kV line to 111.6% of its 135 MVA rating.

Mitigation: New Lost Canyon – Main 115 kV line.

- e. Loss of Lost Canyon – Towaoc Canal - Main 115 kV line overloads Cahone – Great Cut Tap 115 kV line to 115.8% of its 135 MVA rating.

Mitigation: New Lost Canyon – Main 115 kV line.

2029 Light Summer Results:

- a. Loss of Doughspoon – Starr Nelson 115 kV line overloads Montrose – Starr Nelson 115 kV line to 166.0% of its 95 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A) and upgrade terminally limiting bus equipment.

- b. Loss of Montrose – Starr Nelson 115 kV line overloads Doughspoon – Starr Nelson 115 kV line to 106.1% of its 129 MVA rating.

Mitigation: Upgrade terminally limiting meter at Starr Nelson.

3. N-k (System Intact, Category P2-7) Study Results:

- a. Loss of Doughspoon – Starr Nelson 115 kV line and Montrose – Starr Nelson 115 kV line overloads Grand Junction – Starr Nelson 115 kV line to 230% of its 95 MVA rating.

Mitigation: CS-2025-27 generation must be curtailed.

- b. Loss of Doughspoon – Starr Nelson 115 kV line and Grand Junction – Starr Nelson 115 kV line overloads Montrose – Starr Nelson 115 kV line to 230% of its 95 MVA rating.

Mitigation: CS-2025-27 generation must be curtailed.

- c. Loss of Grand Junction – Starr Nelson 115 kV line and Montrose – Starr Nelson 115 kV line overloads Doughspoon – Starr Nelson 115 kV line to 170% of its 129 MVA rating.

Mitigation: CS-2025-27 generation must be curtailed.

The results below reflect **Scenario 2** and treats projects CS-2025-17 as **NRIS** and CS-2025-27 as **ERIS**

1. N-0 (System Intact, Category P0) Study Results:

- a. None

2. N-1 (Single Contingency, Category P1) Study Results:

NRIS project results:

- a. None

ERIS project results:

- a. Loss of Doughspoon – Starr Nelson 115 kV line overloads Montrose – Starr Nelson 115 kV line to 131.6% of its 95 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A)

3. N-k (System Intact, Category P2-7) Study Results:

NRIS project results:

- a. None

ERIS project results:

- a. Loss of Doughspoon – Starr Nelson 115 kV line and Montrose – Starr Nelson 115 kV line overloads Grand Junction – Starr Nelson 115 kV line to 230% of its 95 MVA rating.

Mitigation: CS-2025-27 generation must be curtailed.

- b. Loss of Doughspoon – Starr Nelson 115 kV line and Grand Junction – Starr Nelson 115 kV line overloads Montrose – Starr Nelson 115 kV line to 230% of its 95 MVA rating.

Mitigation: CS-2025-27 generation must be curtailed.

- c. Loss of Grand Junction – Starr Nelson 115 kV line and Montrose – Starr Nelson 115 kV line overloads Doughspoon – Starr Nelson 115 kV line to 170% of its 129 MVA rating.

Mitigation: CS-2025-27 generation must be curtailed.

The results below reflect **Scenario 3** and treats projects CS-2025-27 as **NRIS** and CS-2025-17 as **ERIS**

1. N-0 (System Intact, Category P0) Study Results:

2029 Heavy Summer Results:

- a. No violations occurred under 2029 Heavy Summer conditions.

2029 Light Summer Results:

- a. Montrose – Starr Nelson 115 kV line is overloaded to 105.2% of its 95 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A) and upgrade terminally limiting bus equipment.

2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies are shown in **Table 4-3** below.

2029 Heavy Summer Results:

- a. Loss of Garnet Mesa – Garnet Mesa Tap 115 kV line overloads Montrose – Starr Nelson 115 kV line to 174.9% of its 95 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A) and upgrade terminally limiting bus equipment.

- b. Loss of Montrose – Starr Nelson 115 kV line overloads Garnet Mesa – Garnet Mesa Tap 115 kV line to 108.1% of its 143 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A).

- c. Loss of Lost Canyon – Towaoc Canal - Main 115 kV line overloads Empire – Lost Canyon 115 kV line to 129.7% of its 77 MVA rating.

Mitigation: New Lost Canyon – Main 115 kV line.

- d. Loss of Lost Canyon – Towaoc Canal - Main 115 kV line overloads Great Cut Tap – Empire 115 kV line to 111.1% of its 135 MVA rating.

Mitigation: New Lost Canyon – Main 115 kV line.

- e. Loss of Lost Canyon – Towaoc Canal - Main 115 kV line overloads Cahone – Great Cut Tap 115 kV line to 115.1% of its 135 MVA rating.

Mitigation: New Lost Canyon – Main 115 kV line.

2029 Light Summer Results:

- a. Loss of Doughspoon – Starr Nelson 115 kV line overloads Montrose – Starr Nelson 115 kV line to 166.0% of its 95 MVA rating.

Mitigation: Rebuild line to reach a maximum conductor temp of 100° C (856 A) and upgrade terminally limiting bus equipment.

- b. Loss of Montrose – Starr Nelson 115 kV line overloads Doughspoon – Starr Nelson 115 kV line to 106.1% of its 129 MVA rating.

Mitigation: Upgrade terminally limiting meter at Starr Nelson.

3. N-k (System Intact, Category P2-7) Study Results:

- a. None.

4.2.2.1 Network Upgrades

The following Network Upgrades were identified for the Western Colorado Cluster Area in scenario 1 and 3:

1. Rebuild Montrose – Starr Nelson to reach a maximum conductor temp of 100° C (856 A) and upgrade terminally limiting bus equipment.
2. Rebuild Garnet Mesa – Garnet Mesa Tap to reach a maximum conductor temp of 100° C (856 A).
3. Build a new Lost Canyon – Main 115 kV line with Drake conductor (856 A).

4. Upgrade Starr Nelson Meter to reach a line rating of 170 MVA (856 A).

The following Network Upgrades were identified for the Western Colorado Cluster Area in scenario 2:

1. Rebuild Montrose – Starr Nelson to reach a maximum conductor temp of 100° C (856 A).

Table 4-2: Thermal Analysis Western Colorado Cluster - Scenario 1

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P2.1	MONTROSE – STARR NELSON 115 kV #1	GARNET M – GARNET M TAP 115 kV #1	95	37.6	174.9	TSGT
P1.2	GARNET M – GARNET M TAP 115 kV #1	MONTROSE – STARR NELSON 115 kV #1	143	38.4	108.1	TSGT
P1.2	EMPIRE – LOST CANYON 115 kV #1	LOST CANYON – TOWAOC – MAIN 115 kV #1	77	124.8	130.4	TSGT
P1.2	GREAT CUT TAP – EMPIRE 115 kV #1	LOST CANYON – TOWAOC – MAIN 115 kV #1	135	107.3	111.6	TSGT
P1.2	CAHONE – GREAT CUT TAP 115 kV #1	LOST CANYON – TOWAOC – MAIN 115 kV #1	135	111.0	115.8	TSGT
2029 Light Summer						
P2.1	MONTROSE – STARR NELSON 115 kV #1	DOUGHSPoon – STARR NELSON 115 kV #1	95	13.4	166.0	TSGT
P1.2	DOUGHSPoon – STARR NELSON 115 kV #1	MONTROSE – STARR NELSON 115 kV #1	129	10.1	106.1	TSGT

Table 4-3: Thermal Analysis Western Colorado Cluster – Scenario 3

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P2.1	MONTROSE – STARR NELSON 115 kV #1	GARNET M – GARNET M TAP 115 kV #1	95	37.0	173.4	TSGT
P1.2	GARNET M – GARNET M TAP 115 kV #1	MONTROSE – STARR NELSON 115 kV #1	143	29.1	107.6	TSGT
P1.2	EMPIRE – LOST CANYON 115 kV #1	LOST CANYON – TOWAOC – MAIN 115 kV #1	77	124.0	129.7	TSGT
P1.2	GREAT CUT TAP – EMPIRE 115 kV #1	LOST CANYON – TOWAOC – MAIN 115 kV #1	135	106.6	111.1	TSGT
P1.2	CAHONE – GREAT CUT TAP 115 kV #1	LOST CANYON – TOWAOC – MAIN 115 kV #1	135	111.2	115.1	TSGT
2029 Light Summer						
P2.1	MONTROSE – STARR NELSON 115 kV #1	DOUGHSPoon – STARR NELSON 115 kV #1	95	13.4	164.2	TSGT
P1.2	DOUGHSPoon – STARR NELSON 115 kV #1	MONTROSE – STARR NELSON 115 kV #1	129	10.1	104.6	TSGT

4.2.3 Reactive Power Analysis

4.2.3.1 CS-2025-17 PV

At the full 199.5 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 72.4 MVAR produced (0.940 p.f. lag) to -72.4 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.873 lag (producing) and 0.873 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 4-3 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 199.5 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 5 MVAR capacitor bank may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 5 MVAR reactor bank may be required.

Table 4-3: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
CS-2025-17 PV, Project Size: 199.5 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.873 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.052	0.0	4.0	1.050	-----	0.0	-4.0
1.05	39.9	-22.3	1.034	39.8	-20.2	1.050	0.892	-14.4	None
1.05	79.8	-44.6	1.013	79.3	-48.3	1.050	0.854	-28.8	None
1.05	119.7	-67.0	0.990	118.6	-80.9	1.050	0.826	-43.0	None
1.05	159.6	-89.3	0.963	157.5	-119.0	1.050	0.798	-57.2	None
1.05	199.5	-111.6	0.933	195.9	-163.7	1.050	0.767	-71.1	None
0.950 POI Voltage at 0.873 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.952	0.0	3.2	0.950	-----	0.0	-3.2
0.95	39.9	22.3	0.975	39.8	23.5	0.950	0.861	14.4	None
0.95	79.8	44.6	0.996	79.3	40.0	0.950	0.893	28.8	None
0.95	119.7	67.0	1.015	118.6	53.2	0.950	0.912	43.0	None
0.95	159.6	89.3	1.032	157.7	63.2	0.950	0.928	57.2	None
0.95	199.5	111.6	1.047	196.6	70.4	0.950	0.941	71.4	1.0

4.2.3.2 CS-2025-17 BESS

At the full 100.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 36.3 MVAR produced (0.940 p.f. lag) to -36.3 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.71 lag (producing) and 0.71 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 4-4 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 100.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 4-4: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
CS-2025-17 BESS, Project Size: 100.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.71 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.050	0.0	0.1	1.050	-----	0.0	None
1.05	20.0	-19.9	1.034	20.0	-20.4	1.050	0.700	-7.3	None
1.05	40.0	-39.7	1.017	39.9	-42.2	1.050	0.687	-14.5	None
1.05	60.0	-59.6	1.000	59.7	-65.6	1.050	0.673	-21.7	None
1.05	80.0	-79.4	0.981	79.5	-90.7	1.050	0.659	-28.9	None
1.05	100.0	-99.3	0.961	99.1	-117.7	1.050	0.644	-36.0	None
0.950 POI Voltage at 0.71 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.950	0.0	0.1	0.950	-----	0.0	None
0.95	20.0	19.9	0.968	20.0	19.2	0.950	0.720	7.3	None
0.95	40.0	39.7	0.986	39.9	37.0	0.950	0.733	14.5	None
0.95	60.0	59.6	1.003	59.7	53.5	0.950	0.745	21.7	None
0.95	80.0	79.4	1.018	79.5	68.9	0.950	0.755	28.9	None
0.95	100.0	99.3	1.034	99.3	83.3	0.950	0.766	36.0	None

4.2.3.3 CS-2025-27

At the full 199.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 73.3 MVAR produced (0.940 p.f. lag) to -73.3 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.793 lag (producing) and 0.793 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 4-5 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 199.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 4-5: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, CS-2025-27 PV, Project Size: 199.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.793 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.050	0.0	0.0	1.050	-----	0.0	None
1.05	40.4	-31.1	1.034	40.3	-32.4	1.050	0.779	-14.6	None
1.05	80.8	-62.1	1.016	80.6	-67.9	1.050	0.765	-29.3	None
1.05	121.2	-93.2	0.997	120.6	-106.6	1.050	0.749	-43.8	None
1.05	161.6	-124.2	0.977	160.6	-149.1	1.050	0.733	-58.3	None
1.05	199.0	-155.3	0.955	200.3	-195.9	1.050	0.715	-72.7	None
0.950 POI Voltage at 0.793 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.950	0.0	0.0	0.950	-----	0.0	None
0.95	40.4	31.1	0.969	40.3	29.5	0.950	0.807	14.6	None
0.95	80.8	62.1	0.987	80.5	56.0	0.950	0.821	29.2	None
0.95	121.2	93.2	1.004	120.6	80.0	0.950	0.834	43.8	None
0.95	161.6	124.2	1.019	160.6	101.5	0.950	0.846	58.3	None
0.95	199.0	155.3	1.034	200.6	120.7	0.950	0.857	72.8	None

4.3 Transient Stability Analysis

4.3.1 Cluster Area Assumptions

1. The equivalent generators were modeled with data provided by the customer and in accordance with the WECC approved model list.
2. The collector systems, transformers, and generators were modeled with the same parameters as during steady-state analysis.

4.3.2 Methodology

Transient stability was evaluated as follows:

1. The 2029 Light Summer base case was utilized with all GFs in service and all previously identified network upgrades included.
2. System stability is observed by monitoring the voltage and relative rotor angles of local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Line faults were assumed to be at the midpoint of the line. The corresponding contingencies to evaluate the facility's compliance with NERC/WECC criteria for transient stability are listed in Appendix B.
4. Unstable contingencies were simulated with the GF out of service, to verify that the Project is the cause of the instability.

4.3.3 Transient Stability Results

Transient stability results identified that the Projects do not require additional mitigation and are compliant with the NERC/WECC criteria.

Simulation results for the 2029 Light Summer conditions show that:

1. No adverse dynamic responses were observed.

4.4 Short Circuit Analysis

Short circuit analysis was performed by the Transmission Provider for three phase and single line to ground faults at the generating facility's Point of Interconnection.

Table 4-6 shows the detailed results of the bus faults, contributions from each of the sources into the faults, and the network grid Thevenin equivalent impedances. The resultant total fault currents are within planned and existing equipment ratings.

Table 4-6: Short Circuit Results

System Condition	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance (R + jX p.u. on 100 MVA)
2025-17 POI 345 kV Bus Fault (w/ IC Gen; all lines in service)	12229	13753	Z1 = 0.00120+j0.01397 Z0 = 0.00275+j 0.03731 MVA 3LG = 7307.5 MVA SLG = 8218.2
2025-27 POI 115 kV Bus Fault (w/ IC Gen; all lines in service)	5495	4169	Z1 = 0.01728+j0.08549 Z0 = 0.06954+j0.33781 MVA 3LG = 1094.5 MVA SLG = 830.4

4.5 Contingent Facilities

The following Interconnection Facilities and/or Network Upgrades to the transmission system are Contingent Facilities applicable to this Cluster Area. These are facilities not yet in service which the costs, timing, and study findings in this report are dependent upon, and if delayed or not built, could cause a need for re-studies of the interconnection request or a reassessment of the facilities, costs and timing.

- a. None

4.6 Scope, Cost, and Schedule

The cost estimate is broken out into two categories: 1) Interconnection Facilities, which include all equipment installed between the POI at the main bus and the Point of Change of Ownership (PCO) at the line dead-end structure⁷ just outside the POI substation fence, and 2) Network Upgrades consisting of the rest of the facilities installed in the existing POI substation or at other locations to accommodate the interconnection. The estimate includes all site work such as grounding and conduit installation inside the substation.

Note that the IC will be responsible for constructing the radial transmission line from the PCO to the GF site and for providing the primary protection (relaying and interrupting device) for the IC's step-up transformer. Equipment at the POI will only provide backup protection for the IC's main transformer in the event of equipment failure or malfunction at the IC's facility. To facilitate protective relaying and data acquisition, the IC will need to include fiber optic cables (OPGW) on its radial transmission line to provide communication channels for SCADA, metering (real time), and protective relaying.

The IC is responsible for all engineering, procurement and construction of all GF facilities, including any STATCOM type voltage regulation / reactive compensation devices.

All costs are good faith estimates based on assumptions as stated in this 2025 Generator Interconnection report. All estimates are in 2026 dollars.

It is estimated that it will take approximately 60 months after receiving authorization to proceed to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work. It is also estimated that it may take approximately 84 months after receiving authorization to proceed for the permitting activities and ROW to be completed for transmission line construction, if applicable. It is possible that the Generating facility may be able to operate at some level of generation prior to the completion of the requisite Interconnection Facilities, Network Upgrades, Contingent Facilities, or System Protection Facilities. However, that level of generation is not known at this phase of the study and would be addressed through a Provisional Interconnection Service Request per 5.9.2 of the LGIA.

4.6.1 Cost Allocation

There are violations requiring Network Upgrades which one or more of the projects contribute to. The following cost estimates are provided for the identified network upgrades. **Cost estimates are not provided for the mitigations of constraints on Affected Systems.** It is the responsibility of the Interconnecting Customer(s) to coordinate with the applicable entities to determine these costs, **which Tri-State can help facilitate.**

Cost is allocated to each project **according to the Business Practice Manual**. The cost allocation is detailed below in **Tables 4-7 to 4-13**.

⁷ The Interconnection Customer's Interconnection Facilities are required to end at a vertically configured full tension monopole deadend structure located outside of the substation fence and approximately 10 feet inside Tri-State's property line. The vertically configured full tension monopole deadend structure shall create zero line angle with the Transmission Providers A-frame deadend structure, unless another location is mutually agreed upon by the parties in writing.

Table 4-7: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Montrose – Starr Nelson 115 kV line rebuild	Rebuild Montrose – Starr Nelson 115 kV to reach a maximum conductor temp of 100° C and upgrade the meter and bus terminal limitations at Montrose to reach a rating of 170 MVA. 27.03-mile 115 kV transmission line rebuild. - Upgrade Montrose meter. - Upgrade Montrose bus.	\$25.0 M

Table 4-8: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Garnet Mesa – Garnet Mesa Tap 115 kV line rebuild	Rebuild Garnet Mesa – Garnet Mesa Tap 115 kV to reach a maximum conductor temp of 100° C and a rating of 170 MVA. 6.04-mile 115 kV transmission line rebuild.	\$10.0 M

Table 4-9: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
New Lost Canyon – Main 115 kV line	Build new Lost Canyon – Main 115 kV line with Drake conductor. Scope includes typical testing, checkout, and commissioning. - New 16-mile 115 kV 795 kcmil “Drake” ACSR transmission line. - Two 115 kV main and transfer bus bay additions at Main and Lost Canyon - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$27.5 M

Table 4-10: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Starr Nelson 115 kV Substation Meter Upgrade	Upgrade Starr Nelson Meter to allow for Starr Nelson – Doughspoon to reach 170 MVA line rating.	Minimal (\$0.5 M)

Table 4-11: Scenario 1 – Western Colorado Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency	CS-2025-17	CS-2025-27
Montrose – Starr Nelson 115 kV	Garnet Mesa – Garnet Mesa Tap 115 kV or Starr Nelson – Doughspoon 115 kV		
Percent Cost Allocation		0.00	100.00
(Montrose – Starr Nelson 115 kV line rebuild = \$25 M)		\$0.0 M	\$25.0 M
Garnet Mesa – Garnet Mesa Tap 115 kV	Montrose – Starr Nelson 115 kV		
Percent Cost Allocation		0.00	100.00
(Garnet Mesa – Garnet Mesa Tap 115 kV line rebuild = \$10 M)		\$0.0 M	\$10.0 M
Cahone – Great Cut Tap – Empire – Lost Canyon 115 kV	Lost Canyon – Towaoc – Main 115 kV		
Percent Cost Allocation		10.71	89.29
(Main – Lost Canyon 115 kV line = \$27.5 M)		\$2.95 M	\$24.55 M
Starr Nelson – Doughspoon 115 kV	Montrose – Starr Nelson 115 kV		
Percent Cost Allocation		0.00	100.00
(Starr Nelson Meter Upgrade = \$0.5 M)		\$0.0 M	\$0.5 M
TOTAL NETWORK UPGRADE COST ALLOCATED		\$2.95 M	\$60.05 M

Table 4-12: Scenario 2 – Western Colorado Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency	CS-2025-17	CS-2025-27
Montrose – Starr Nelson 115 kV	Starr Nelson – Doughspoon 115 kV		
Percent Cost Allocation		0.00	100.00
(Montrose – Starr Nelson 115 kV line rebuild = \$25 M)		\$0.0 M	\$25.0 M
TOTAL NETWORK UPGRADE COST ALLOCATED		\$0.00 M	\$25.0 M

Table 4-13: Scenario 3 – Western Colorado Cluster Area Cost Allocation

Overloaded Element (Constraint)	Contingency	CS-2025-17	CS-2025-27
Montrose – Starr Nelson 115 kV	Garnet Mesa – Garnet Mesa Tap 115 kV or Starr Nelson – Doughspoon 115 kV		
Percent Cost Allocation		0.00	100.00
(Montrose – Starr Nelson 115 kV line rebuild = \$25 M)		\$0.0 M	\$25.0 M
Garnet Mesa – Garnet Mesa Tap 115 kV	Montrose – Starr Nelson 115 kV, Heavy Summer		
Percent Cost Allocation		0.00	100.00
(Garnet Mesa – Garnet Mesa Tap 115 kV line rebuild = \$10 M)		\$0.0 M	\$10.0 M
Cahone – Great Cut Tap – Empire – Lost Canyon 115 kV	Lost Canyon – Towaoc – Main 115 kV		
Percent Cost Allocation		0.00	100.00

(Main – Lost Canyon 115 kV line= \$27.5 M)		\$0.0 M	\$27.5 M
Starr Nelson – Doughspoon 115 kV	Montrose – Starr Nelson 115 kV, Light Summer		
Percent Cost Allocation		0.00	100.00
(Starr Nelson Meter Upgrade = \$0.5 M)		\$0.0 M	\$0.5 M
TOTAL NETWORK UPGRADE COST ALLOCATED		\$0.00 M	\$63.0 M

4.6.2 GI-2025-17 Costs

Scenario 1 Costs:

Interconnection Facilities Costs:	\$1.60 M
Network Upgrade Costs, Cost Allocation	\$2.95 M
Network Upgrade Costs, Interconnection	\$20.15 M
TOTAL Costs (2026 dollars) for Interconnection:	\$24.70 M

Scenario 2 and 3 Costs:

Interconnection Facilities Costs:	\$1.60 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$20.15 M
TOTAL Costs (2026 dollars) for Interconnection:	\$21.75 M

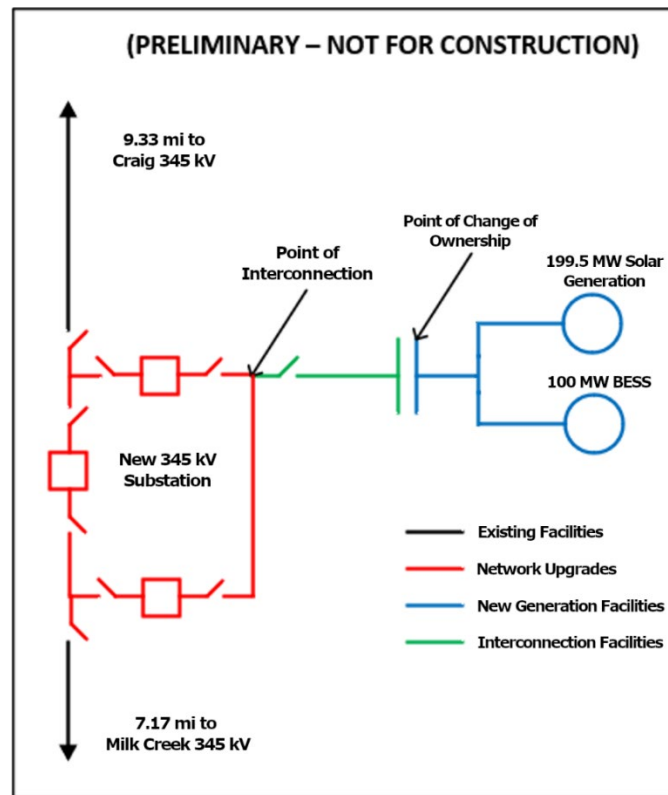


Figure 4-1: GI-CS-2025-17 POI One-Line Diagram

Table 4-14: Summary Cost Estimate Details – Interconnection Facilities CS-2025-17

Element	Description	Cost Est. Millions
345 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: One (1) 345 kV line dead-end structure.	\$1.60 M

Element	Description	Cost Est. Millions
	345 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 345 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 345 kV metering current transformers, high accuracy class, extended range. *Three (3) 345 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. - Relaying for the Interconnecting Customers radial 345 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). - Three (3) 345 kV surge arresters. - Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	

Table 4-15: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
New 345 kV Substation on Craig – Milk Creek Line New 345 kV 3-Breaker Ring Bus	Build a new 3-breaker ring bus on the Craig – Milk Creek 345 kV line (see Figure 4-1, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. - Three (3) 345 kV power circuit breakers - Eight (8) 345 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$20.15 M

4.6.3 GI-2025-27 Costs

Scenario 1 Costs:

Interconnection Facilities Costs:	\$0.90 M
Network Upgrade Costs, Cost Allocation	\$60.05 M
Network Upgrade Costs, Interconnection	\$2.17 M
TOTAL Costs (2026 dollars) for Interconnection:	\$63.12 M

Scenario 2 Costs:

Interconnection Facilities Costs:	\$0.90 M
Network Upgrade Costs, Cost Allocation	\$25.00 M
Network Upgrade Costs, Interconnection	\$2.17 M
TOTAL Costs (2026 dollars) for Interconnection:	\$28.07 M

Scenario 3 Costs:

Interconnection Facilities Costs:	\$0.90 M
Network Upgrade Costs, Cost Allocation	\$63.00 M
Network Upgrade Costs, Interconnection	\$2.17 M
TOTAL Costs (2026 dollars) for Interconnection:	\$66.07 M

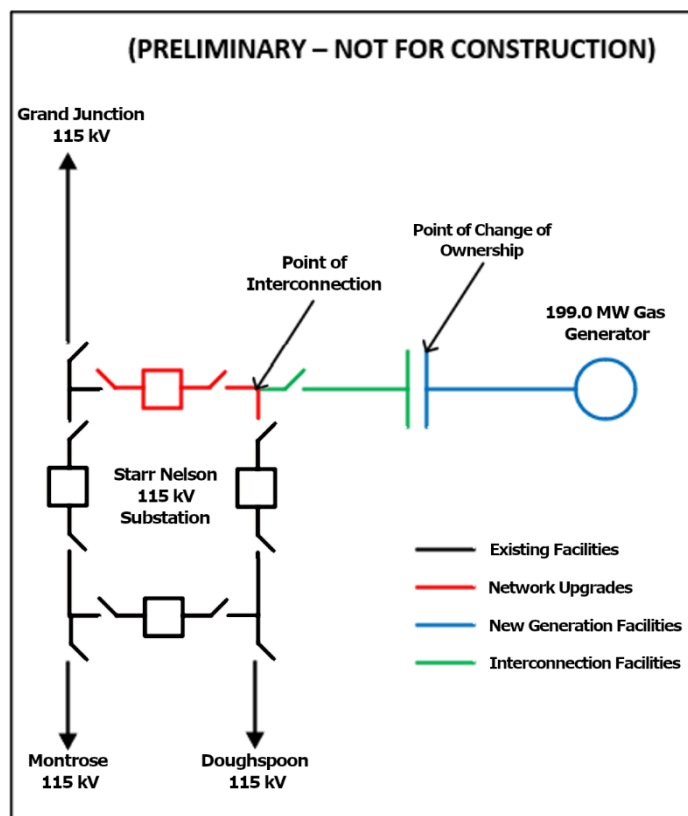


Figure 4-2, CS-2025-27 POI One-Line Diagram

Table 4-16: Summary Cost Estimate Details – Interconnection Facilities CS-2025-27

Element	Description	Cost Est. Millions
115 kV line termination equipment between PCO and POI	Design, purchase, construct / install and test all equipment installed inside the new Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 115 kV A-frame dead-end structure • One (1) 115 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside Hell Creek substation. • One (1) 115 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 115 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 115 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 115 kV line protection; primary, secondary, and breaker-failure. • Three (3) 115 kV surge arresters (140 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 0.90 M

Table 4-17: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
CS-2025-27 POI	• One (1) 115 kV power circuit breaker and associated switches. • Circuit breaker station control panels. • Digital Fault Recorder and associated panel • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$2.17 M

5.0 CLUSTER AREA 3 – SAN LUIS VALLEY

The San Luis Valley Cluster Area is made up of one (1) IRs:

- GI-CS-2025-09 ("GI-2025-09")

5.1 Generator Modeling Data

For each project, model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation.

5.1.1 GI-2025-09

The project consists of seventy (70) PE FS4200M solar inverters (one (1) 207.7 MW equivalent solar generator), one (1) 34.5-230-13.8 kV transformer, and a 1.5-mile 230 kV generator tie line that will interconnect to a new 230kV San Luis Valley Substation Satellite Yard on the 230kV Poncha- San Luis Valley 230 kV Line. The IC has requested to be studied at 199 MW (injected at the POI) for Energy Resource Interconnection Service ("ERIS").

5.2 Steady State Power Flow Analysis

5.2.1 Cluster Area Criteria and Assumptions

1. The proposed Project's output was accommodated by displacing generation resources at Craig.

5.2.2 Steady-State Power Flow Results

The one project in this Cluster Area requested to be studied as ERIS only. As ERIS projects permit redispatch to avoid violations, no scenario with stressed local generation is studied. The results for the ERIS project under ideal redispatch are shown below and in Tables 5-1 and 5-2.

1. N-0 (System Intact, Category P0) Study Results, Heavy Summer:
 - a. No N-0 violations occurred under Heavy Summer conditions.
2. N-0 (System Intact, Category P0) Study Results, Light Summer:
 - a. No N-0 violations occurred under Light Summer conditions.
3. N-1 (Single Contingency, Category P1) Study Results, Heavy Summer:
 - a. No N-1 violations occurred under Heavy Summer conditions under ideal dispatch. However, this requires all existing solar generation at San Luis Valley to be turned off, otherwise loss of the San Luis Valley – Poncha 230 kV line overloads the Stanley – Poncha 115 kV line. This generation is unlikely to be inactive when GI-2025-09 is at full output. To increase area capacity such that GI-2025-09 can generate alongside existing area resources, switch and CT replacements could be performed to improve the rating of Stanley – Poncha 115 kV.
4. N-1 (Single Contingency, Category P1) Study Results, Light Summer:
 - a. No N-1 violations occurred under Light Summer conditions under ideal dispatch.

5. N-k (Multiple Element Contingency, Category P2-7) Study Results, Heavy Summer:

- a. A circuit breaker failure resulting in the loss of the San Luis Valley – Poncha 230 kV line and the San Luis Valley 230/115 kV T1 transformer overloads the San Luis Valley 230/115 kV T2 transformer to 133.2% of its normal rating. No mitigation is required for a multiple element contingency. A reconfiguration of San Luis Valley would make this contingency less likely. A third San Luis Valley 230/115 kV transformer would resolve this contingency.
- b. A circuit breaker failure resulting in the loss of the San Luis Valley – Poncha 230 kV line and the San Luis Valley 230/115 kV T2 transformer overloads the San Luis Valley 230/115 kV T1 transformer to 168.0% of its normal rating. No mitigation is required for a multiple element contingency. A reconfiguration of San Luis Valley would make this contingency less likely. A third San Luis Valley 230/115 kV transformer would resolve this contingency. Alternatively, two switch replacements to improve the transformer rating would reduce the severity of the overload and reduce curtailment.
- c. A failure of San Luis Valley's 115 kV bus tie breaker, resulting in the loss of both 115 kV buses, overloads the San Luis Valley – Poncha 230 kV line to 111.3% of its normal rating. No mitigation is required for a multiple element contingency. The violation can be resolved, reducing the potential for curtailment, by changing meter settings to improve the line rating.
- d. Loss of both San Luis 230/115 kV transformers overloads the San Luis Valley – Poncha 230 kV line to 111.0% of its normal rating. No mitigation is required for a multiple element contingency. The violation can be resolved, reducing the potential for curtailment, by changing meter settings to improve the line rating.

6. N-k (Multiple Element Contingency, Category P2-7) Study Results, Light Summer:

- a. A circuit breaker failure resulting in the loss of the San Luis Valley – Poncha 230 kV line and the San Luis Valley 230/115 kV T1 transformer overloads the San Luis Valley 230/115 kV T2 transformer to 133.1% of its normal rating. No mitigation is required for a multiple element contingency. A reconfiguration of San Luis Valley would make this contingency less likely. A third San Luis Valley 230/115 kV transformer would resolve this contingency.
- b. A circuit breaker failure resulting in the loss of the San Luis Valley – Poncha 230 kV line and the San Luis Valley 230/115 kV T2 transformer overloads the San Luis Valley 230/115 kV T1 transformer to 168.1% of its normal rating. No mitigation is required for a multiple element contingency. A reconfiguration of San Luis Valley would make this contingency less likely. A third San Luis Valley 230/115 kV transformer would resolve this contingency. Alternatively, two switch replacements to improve the transformer rating would reduce the severity of the overload and reduce curtailment.
- c. A failure of San Luis Valley's 115 kV bus tie breaker, resulting in the loss of both 115 kV buses, overloads the San Luis Valley – Poncha 230 kV line to 111.0% of its normal rating. No mitigation is required for a multiple element contingency. The violation can be resolved, reducing the potential for curtailment, by changing meter settings to improve the line rating.

This contingency also causes severe voltage issues on PSCo's 69 kV system around Alamosa. While a gas generator could be used to support this system, it must be disabled to avoid N-1 overloads with GI-2025-09 in service. These voltage issues are pre-

existing and require no mitigation for this project. However, these issues may contribute to generation restrictions or curtailment under certain conditions. To reduce the frequency of these issues, the Stanley – Poncha 115 kV line rating can be improved by replacing switches and CTs.

- d. Loss of both San Luis 230/115 kV transformers overloads the San Luis Valley – Poncha 230 kV line to 111.2% of its normal rating. No mitigation is required for a multiple element contingency. The violation can be resolved, reducing the potential for curtailment, by changing meter settings to improve the line rating.

5.2.2.1 Network Upgrades

- a. No Network Upgrades were identified.

Table 5-1: 2029 Heavy Summer - Thermal Analysis San Luis Valley Cluster

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P2.3	San Luis Valley 230/115 kV Transformer T2	San Luis Valley 230/115 kV Transformer T1, San Luis Valley – Poncha 230 kV	150.0	22.5	133.2	TSGT
P2.3	San Luis Valley 230/115 kV Transformer T1	San Luis Valley 230/115 kV Transformer T2, San Luis Valley – Poncha 230 kV	119.0	28.4	168.0	TSGT
P2.4	San Luis Valley – Poncha 230 kV	San Luis Valley 115 kV Bus Tie Breaker CB 566	180.0	24.4	111.3	TSGT
P6	San Luis Valley – Poncha 230 kV	San Luis Valley 230/115 kV Transformer T1 and T2	180.0	24.4	111.0	TSGT

Table 5-2: 2029 Light Summer - Thermal Analysis San Luis Valley Cluster

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P2.3	San Luis Valley 230/115 kV Transformer T2	San Luis Valley 230/115 kV Transformer T1, San Luis Valley – Poncha 230 kV	150.0	0.0	133.1	TSGT
P2.3	San Luis Valley 230/115 kV Transformer T1	San Luis Valley 230/115 kV Transformer T2, San Luis Valley – Poncha 230 kV	119.0	0.0	168.1	TSGT
P2.4	San Luis Valley – Poncha 230 kV	San Luis Valley 115 kV Bus Tie Breaker CB 566	180.0	16.2	111.0	TSGT
P6	San Luis Valley – Poncha 230 kV	San Luis Valley 230/115 kV Transformer T1 and T2	180.0	16.2	111.2	TSGT

5.2.3 Reactive Power Analysis

5.2.3.1 GI-2025-09

At the full 199 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 72.2 MVAR produced (0.940 p.f. lag) to -72.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.861 lag (producing) and 0.861 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 5-3 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 199 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 2 MVAR reactor bank may be required.

**Table 5-3: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-2025-09, Project Size: 199 MW**

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.861 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.052	0.0	3.3	1.050	-----	0.0	-1.3
1.05	40.4	-23.9	1.032	40.3	-22.5	1.050	0.873	-14.6	None
1.05	80.8	-47.8	1.009	80.2	-52.5	1.049	0.837	-29.1	None
1.05	121.2	-71.7	0.983	119.9	-87.5	1.049	0.808	-43.5	None
1.05	161.6	-95.5	0.954	159.1	-128.5	1.048	0.778	-57.7	None
1.05	202.0	-119.4	0.920	197.7	-177.1	1.047	0.745	-71.8	None
0.950 POI Voltage at 0.861 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.952	0.0	2.7	0.950	-----	0.0	-0.7
0.95	40.4	23.9	0.977	40.2	24.5	0.951	0.854	14.6	None
0.95	80.8	47.8	1.000	80.2	42.3	0.951	0.885	29.1	None
0.95	121.2	71.7	1.021	119.9	56.6	0.952	0.904	43.5	None
0.95	161.6	95.5	1.040	159.4	67.8	0.952	0.920	57.9	None
0.95	202.0	119.4	1.057	198.7	76.0	0.952	0.934	72.1	None

5.3 Transient Stability Analysis

5.3.1 Cluster Area Assumptions

1. The equivalent generator was modeled with the use of the following transient stability models: regc_a, reec_a, repc_a, lhvrt, and lhfrt.
2. The collector system, transformer, and generator were modeled with the same parameters as during steady-state analysis.

5.3.2 Methodology

Transient stability was evaluated as follows:

1. The 2029 HS and 2029 LS base cases were utilized. The project was studied under the same surrounding dispatch as was used for steady-state analysis.
2. System stability is observed by monitoring the voltage and relative rotor angles of local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Line faults were typically assumed to be at the midpoint of the line. The corresponding stability contingencies to evaluate the facility's compliance with NERC/WECC criteria for transient stability are listed in Appendix B.
4. Unstable contingencies were simulated with the GF out of service, to verify that the Project is the cause of the instability.

5.3.3 Transient Stability Results

Transient stability results identified that the projects do require additional mitigation and are not compliant with the NERC/WECC criteria.

Simulation results for Heavy Summer and Light Summer conditions show that:

1. Loss of the San Luis Valley – Poncha 230 kV line, and any multiple-element contingency including this line, results in unstable behavior from GI-2025-09 that causes the simulation to crash.
2. Under Light Summer conditions, the generator also causes undamped oscillations following the loss of either the Poncha – Curecanti 230 kV line or the Poncha – West Canon 230 kV line.

Improved dynamic models that are stable under contingency conditions will be required. EMT studies to demonstrate stable behavior may also be required.

5.4 Short-Circuit

Short-circuit analysis was performed by the Transmission Provider for three-phase and single-line-to-ground faults at the generating facility's point of interconnection.

Table 5-4 shows the results of the 230 kV bus faults and the network grid Thevenin equivalent impedances. The resultant total fault currents are within planned and existing equipment ratings.

Table 5-4: Short-Circuit Results

System Condition	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance (R + jX p.u. on 100 MVA)
2025-09 POI 230 kV Bus Fault (w/o IC generation; all lines in service)	2310	2885	Z1 = 0.01477+j0.10931 Z0 = 0.00082+j0.04416
2025-09 POI 230 kV Bus Fault (w/ IC generation; all lines in service)	3050	3105	Z1 = 0.01477+j0.10932 Z0 = 0.00105+j0.02518

5.5 Contingent Facilities

The following Interconnection Facilities and/or Network Upgrades to the transmission system are Contingent Facilities applicable to this Cluster Area. These are facilities not yet in service which the costs, timing, and study findings in this report are dependent upon, and if delayed or not built, could cause a need for re-studies of the interconnection request or a reassessment of the facilities, costs and timing.

1. No contingent facilities were identified for this Cluster Area.

5.6 Scope, Cost, and Schedule

The cost estimate is broken out into two categories: 1) Interconnection Facilities, which include all equipment installed between the POI at the main bus and the Point of Change of Ownership (PCO) at the line dead-end structure⁸ just outside the POI substation fence, and 2) Network Upgrades consisting of the rest of the facilities installed in the existing POI substation or at other locations to accommodate the interconnection. The estimate includes all site work such as grounding and conduit installation inside the substation.

Note that the IC will be responsible for constructing the radial transmission line from the PCO to the GF site and for providing the primary protection (relaying and interrupting device) for the IC's step-up transformer. Equipment at the POI will only provide backup protection for the IC's main transformer in the event of equipment failure or malfunction at the IC's facility. To facilitate protective relaying and data acquisition, the IC will need to include fiber optic cables (OPGW) on its radial transmission line to provide communication channels for SCADA, metering (real time), and protective relaying.

The IC is responsible for all engineering, procurement and construction of all GF facilities, including any STATCOM type voltage regulation / reactive compensation devices.

All costs are good faith estimates based on assumptions as stated in this Cluster Report. All estimates are in 2026 dollars.

It is estimated that it will take approximately 60 months after receiving authorization to proceed to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work. It is also estimated that it may take approximately 84 months after receiving authorization to proceed for the permitting activities and ROW to be completed for transmission line

⁸ The Interconnection Customer's Interconnection Facilities are required to end at a vertically configured full tension monopole deadend structure located outside of the substation fence and approximately 10 feet inside Tri-State's property line. The vertically configured full tension monopole deadend structure shall create zero line angle with the Transmission Providers A-frame deadend structure, unless another location is mutually agreed upon by the parties in writing.

construction, if applicable. It is possible that the Generating facility may be able to operate at some level of generation prior to the completion of the requisite Interconnection Facilities, Network Upgrades, Contingent Facilities, or System Protection Facilities. However, that level of generation is not known at this phase of the study and would be addressed through a Provisional Interconnection Service Request per 5.9.2 of the LGIA.

5.6.1 GI-2025-09 Costs

ERIS Costs

Interconnection Facilities Costs:	\$ 2.60 M
Network Upgrade Costs, Interconnection	\$17.34 M
TOTAL Costs (2026 dollars) for Interconnection:	\$19.94 M

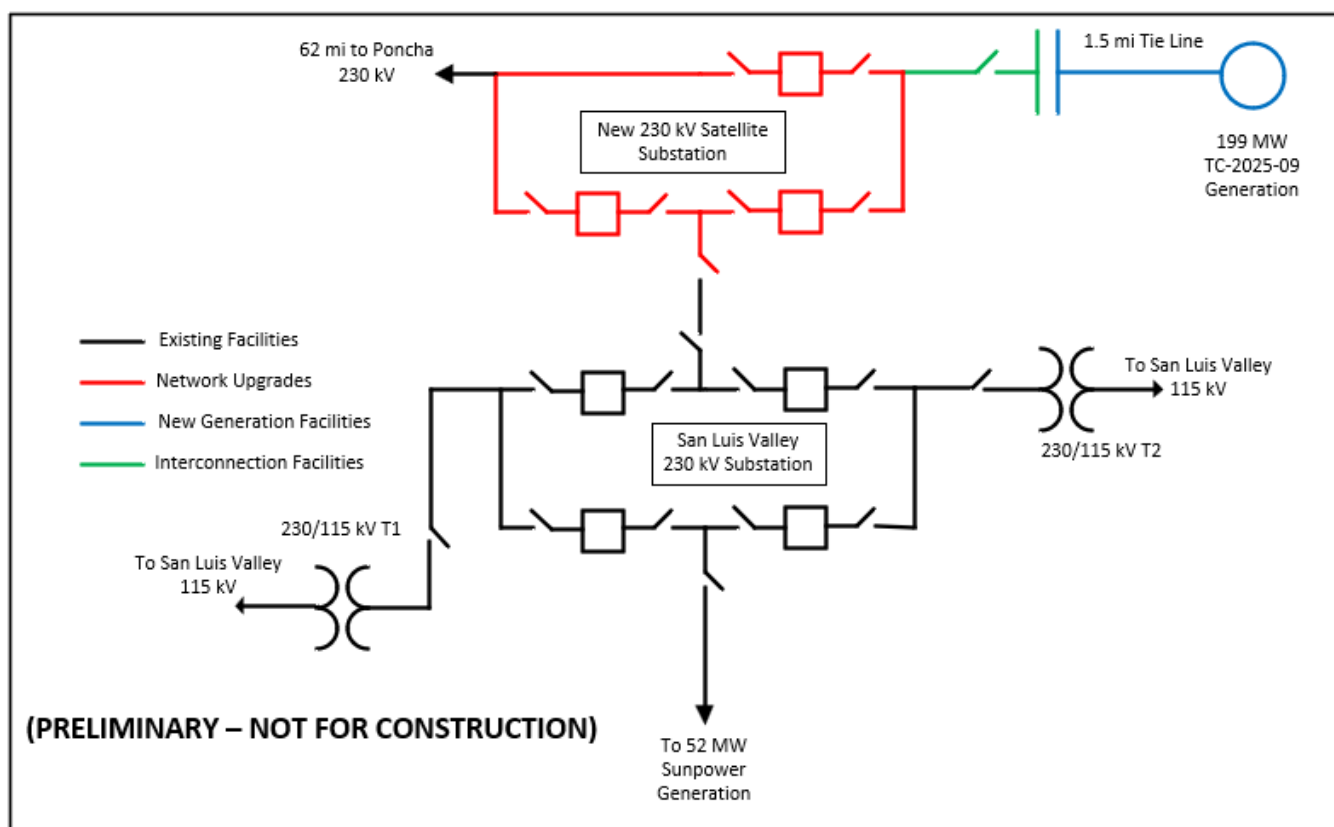


Figure 5-1: San Luis Valley 230 kV Substation One-Line Diagram

Note that the above figure is a preliminary drawing and does not necessarily represent the final configuration of San Luis Valley. The exact final configuration may alter which multiple-element contingencies are valid.

Table 5-5: Summary Cost Estimate Details - Interconnection Facilities GI-2025-09

Element	Description	Cost Est. Millions
San Luis Valley Satellite 230 kV Substation termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • Two (2) 230 kV A-frame dead-end structures • One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the new substation. • One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. • Three (3) 230 kV surge arresters (280 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$2.60 M

Table 5-6: Summary Cost Estimate Details - Network Upgrades GI-2025-09

Element	Description	Cost Est. Millions
New San Luis Valley Satellite 230 kV Substation	Build a new 3-breaker ring bus on the Poncha – San Luis Valley 230 kV line (see Figure 5-1, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. • Three (3) 230 kV power circuit breakers • Eight (8) 230 kV 3-ph gang disconnect switches and associated structures. • Circuit breaker station control panel. • Digital Fault Recorder and associated panel. • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$17.34 M
San Luis Valley Satellite – Poncha 230 kV Line	The San Luis Valley – Poncha 230 kV line is currently meter limited to 180 MVA. When constructing San Luis Valley Satellite, meter settings must be chosen that permit at least 318 MVA to avoid limiting the line.	\$Minimal

6.0 CLUSTER AREA 4 - EASTERN COLORADO

The Eastern Colorado Cluster Area is made up of eight (8) IRs:

- GI-CS-2025-03 ("GI-2025-03")
- GI-CS-2025-07 ("GI-2025-07")
- GI-CS-2025-08 ("GI-2025-08")
- GI-CS-2025-11 ("GI-2025-11")
- GI-CS-2025-24 ("GI-2025-24")
- GI-CS-2025-26 ("GI-2025-26")
- GI-CS-2025-28 ("GI-2025-28")
- GI-CS-2025-29 ("GI-2025-29")

6.1 Generator Modeling Data

For each project, model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation.

6.1.1 GI-2025-03

The project consists of eighty-six (86) Sungrow SG4400UD solar inverters (one (1) 340.5 MW equivalent solar generator), seventy-nine (79) SMA SCS 3950 UP-US storage inverters (one (1) 285.2 MW equivalent storage generator), four (4) 34.5-230-13.8 kV transformers, and a 0.11-mile 230 kV generator tie line that will interconnect to the existing Windtalker 230 kV Switching Station. The IC has requested to be studied at 300 MW (injected at the POI) for Network Resource Interconnection Service ("NRIS") and Energy Resource Interconnection Service ("ERIS").

6.1.2 GI-2025-07

The project consists of seventy-five (75) General Electric 2.82 MW wind turbines (one (1) 211.5 MW equivalent wind generator), one (1) 34.5-235.8-13.8 kV transformer, and a 10-mile 230 kV generator tie line that will interconnect to the planned Loeff 230kV Switching Station (sharing the 230kV Gen Tie line with GI-TC-2024-08, GI-TC-2024-10, and GI-TC-2024-11). The IC has requested to be studied at 199 MW (injected at the POI) for Energy Resource Interconnection Service ("ERIS").

6.1.3 GI-2025-08

The project consists of seventy-five (75) General Electric 2.82 MW wind turbines (one (1) 211.5 MW equivalent wind generator), one (1) 34.5-235.8-13.8 kV transformer, and a 10-mile 230 kV generator tie line that will interconnect to the planned Loeff 230kV Switching Station (sharing the 230kV Gen Tie line with GI-TC-2024-08, GI-TC-2024-10, and GI-TC-2024-11). The IC has requested to be studied at 199 MW (injected at the POI) for ERIS.

6.1.4 GI-2025-11

The project consists of seventy-five (75) General Electric 2.82 MW wind turbines (one (1) 211.5 MW equivalent wind generator), one (1) 34.5-235.8-13.8 kV transformer, and a 10-mile 230 kV generator

tie line that will interconnect to the existing Big Sandy 230 kV Substation. The IC has requested to be studied at 199 MW (injected at the POI) for ERIS.

6.1.5 GI-2025-24

The project consists of fifty-two (52) Vestas V163-4.5 wind turbines (one (1) 234 MW equivalent wind generator), two (2) 34.5-230-13.8 kV transformers, and a 0.7-mile 230 kV generator tie line that will interconnect to a new 230kV POI Switching Station approximately 17 miles west of the existing Windtalker Switching Station on the 230kV Big Sandy-Windtalker Line. The IC has requested to be studied at 225 MW (injected at the POI) for NRIS and ERIS.

6.1.6 GI-2025-26

The project consists of forty-six (46) Vestas V163-4.5 wind turbines (one (1) 207.0 MW equivalent wind generator), and one (1) 34.5-230-13.2 kV transformer. The project will share the existing 23-mile 230 kV generator tie line that interconnects to the existing Windtalker 230 kV Switching Station with TI-17-0224. The IC has requested to be studied at 199 MW (injected at the POI) for ERIS.

6.1.7 GI-2025-28

The project consists of thirty (30) Sungrow SG4400UD solar inverters (one (1) 115.5 MW equivalent solar generator), one-hundred six (106) Sungrow SC1375UD storage inverters (one (1) 145.8 MW equivalent storage generator), one (1) 34.5-115-13.8 kV transformer, and a 0.5-mile 115 kV generator tie line that will interconnect to a new 115kV POI Switching Station approximately 43 miles north of the existing Vilas Substation on the Lamar – Vilas 115 kV line. The IC has requested to be studied at 110 MW (injected at the POI) for NRIS and ERIS.

6.1.8 GI-2025-29

The project consists of seventy (70) Vestas V163-4.5 wind turbines (one (1) 315 MW equivalent wind generator), eighty-two (82) Sungrow SG4400UD solar inverters (one (1) 324.7 MW equivalent solar generator), sixty-eight (68) EPC M10 storage inverters (one (1) 365.7 MW equivalent storage generator), four (4) 34.5-230-13.8 kV transformers, and a 7.4-mile 230 kV generator tie line that will interconnect to a new 230kV POI Switching Station approximately 3 miles east of the existing Wray Substation on the Burlington – Wray 230 kV line. The IC has requested to be studied at 300 MW (injected at the POI) for ERIS.

6.2 Steady State Power Flow Analysis

6.2.1 Cluster Area Criteria and Assumptions

1. The proposed Projects' outputs were accommodated by displacing generation resources throughout Tri-State's system outside the study area. Further generation was displaced in Area 65 (PACE) and Western Colorado, as required.

6.2.2 Steady-State Power Flow Results

Three projects in the Cluster Area have requested to be studied as both NRIS and ERIS. Four scenarios are studied, representing these projects as NRIS or ERIS as shown below.

Table 6-1: Eastern Colorado Scenario Definitions

Scenario	GI-2025-03	GI-2025-24	GI-2025-28
1	NRIS	NRIS	NRIS
2	NRIS	ERIS	ERIS
3	ERIS	NRIS	ERIS
4	ERIS	ERIS	NRIS

For Scenario 1, all NRIS projects are studied as a group, and Network Upgrades are determined to accommodate all projects. For the other Scenarios, only one project is treated as NRIS, and Network Upgrades are determined just for that project. ERIS projects are then studied individually with those Network Upgrades in place. When studying ERIS projects, other generation may be redispatched to avoid overloads, including NRIS generation or generation at the POI. The results for the NRIS projects and for each ERIS project are shown below.

Required Network Upgrades were identified together to resolve all observed violations, rather than necessarily determined for individual violations in detail. As such, the listed mitigation may be insufficient to resolve a particular overload without mitigations listed elsewhere. The listed mitigations are generally the most direct or impactful towards resolving a particular overload, with all required Network Upgrades associated with at least one overload.

2. N-0 (System Intact, Category P0) Study Results, Heavy Summer:

- a. For Scenario 1, the GI-2024-26 POI – Lincoln 230 kV line is loaded to 112.8% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line and a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

- b. For Scenario 2, the GI-2024-26 POI – Lincoln 230 kV line is loaded to 103.3% of its normal rating, and the Windtalker – GI-2022-29 POI 230 kV line is loaded to 102.7% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line, a new GI-2024-26 POI – GI-2022-29 POI 230 kV line, a second GI-2022-29 POI – Windtalker 230 kV line, and a second Burlington – Wray 230 kV line.

- c. For Scenario 3, the GI-2024-26 POI – Lincoln 230 kV line is loaded to 102.3% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line and a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

3. N-0 (System Intact, Category P0) Study Results, Light Summer:

- a. For Scenario 1, the GI-2024-26 POI – Lincoln 230 kV line is loaded to 101.2% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line and a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

4. N-1 (Single Contingency, Category P1) Study Results, Heavy Summer:

- a. Under Scenario 1 Heavy Summer conditions, loss of any of the following transmission lines cannot be simulated by PowerWorld. The added generation with few export paths causes the simulation to collapse.

- i. GI-2022-29 POI – Windtalker 230 kV
 - ii. Lamar – GI-2025-28 POI 115 kV

Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line and a new GI-2025-28 POI – Willow Creek 115 kV line. The below overloads show the most severe loading among the contingencies that could be solved, some of these lines and others would experience worse overloads among the unsolved contingencies.

- b. Under Scenario 2 Heavy Summer conditions, loss of any of the following transmission lines cannot be simulated by PowerWorld. The added generation with few export paths causes the simulation to collapse.

- i. GI-2022-29 POI – Windtalker 230 kV

Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line. The below overloads show the most severe loading among the contingencies that could be solved, some of these lines and others would experience worse overloads among the unsolved contingencies.

- c. Loss of the GI-2022-29 POI – Big Sandy 230 kV line overloads the Story – GI-2022-29 POI 230 kV line.

- i. Scenario 1: The line overloads to 113.8% of its normal rating.

Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

- d. Loss of the GI-2024-17 POI – Burlington 230 kV line overloads the Bonny Creek – Burlington, Bonny Creek – South Fork, Idalia – South Fork, and Idalia – Vernon Switch 115 kV lines.

- i. Scenario 1: The lines overload to 121.6%, 154.3%, 133.8%, and 131.5% of their respective ratings.

Mitigation: Construct a second Loeff – Wray 230 kV line.

- ii. Scenario 2: The lines overload to 106.7%, 136.9%, 116.9%, and 114.1% of their respective ratings.

Mitigation: Construct a second Loeff – Wray 230 kV line.

- iii. Scenario 3: The Bonny Creek – South Fork, Idalia – South Fork, and Idalia – Vernon Switch 115 kV lines overload to 124.9%, 106.9%, and 104.3% of their respective ratings.

Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line. Rebuild the Bonny Creek – South Fork 115 kV line with 795 ACSR “Drake” conductor.

- iv. Scenario 4: The Bonny Creek – South Fork and Idalia – South Fork 115 kV lines overload to 121.1% and 102.3% of their respective ratings.

Mitigation: Rebuild the Bonny Creek – South Fork 115 kV line with 795 ACSR “Drake” conductor. Perform structure replacements to improve the Idalia – South Fork 115 kV line Maximum Operating Temperature to 100°C.

- e. Loss of the GI-2024-26 POI – Crosspoint 230 kV line overloads the GI-2024-26 POI – Midway 230 kV line.

- i. Scenario 1: The line overloads to 106.4% of its normal rating.

Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.

- f. Loss of the GI-2024-26 POI – Lincoln 230 kV line overloads the Big Sandy – Last Chance, Beaver Creek – Gary, Gary – Woodrow, Last Chance – South Woodrow, and South Woodrow – Woodrow 115 kV lines.

- i. Scenario 1: The lines overload to 125.0%, 140.2%, 138.1%, 137.0%, and 136.7% of their respective ratings. The GI-2025-24 GSUs are also overloaded to 101.4% of their normal rating, and the Story – Pawnee 230 kV line is overloaded to 113.3% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- ii. Scenario 2: The lines overload to 109.9%, 121.8%, 120.5%, 119.7%, and 119.6% of their respective ratings.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- iii. Scenario 3: The lines overload to 110.8%, 114.9%, 114.4%, 115.3%, and 114.3% of their respective ratings.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- iv. Scenario 4: The Beaver Creek – Gary, Gary – Woodrow, Last Chance – South Woodrow, and South Woodrow – Woodrow 115 kV lines overload to 104.2%, 104.3%, 105.7%, and 104.7% of their respective ratings.

Mitigation: Construct a second North Yuma – Wray 230 kV line. This does not fully resolve the violations, but reduces the increase to the pre-existing violations below the requisite 2% threshold.

- g. Loss of the GI-2025-29 POI – Wray 230 kV line overloads the GI-2022-29 POI – Windtalker 230 kV line.

- i. Scenario 1: The line overloads to 132.4% of its normal rating.

Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line.

- ii. Scenario 2: The line overloads to 133.2% of its normal rating.

Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line.

- h. Loss of the Badger Creek – Big Sandy 230 kV line overloads the GI-2024-26 POI – Lincoln 230 kV line.

- i. Scenario 1: The line overloads to 139.8% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- ii. Scenario 2: The line overloads to 128.0% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- iii. Scenario 3: The line overloads to 126.8% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- iv. Scenario 4: The line overloads to 115.2% of its normal rating.
Mitigation: This increases a pre-existing violation by less than 2%, no mitigation is required.
- i. Loss of the Beaver Creek – Hoyt 115 kV line overloads the Bijou Tap – Kiowa Creek 115 kV line.
 - i. Scenario 1: The line overloads to 102.9% of its normal rating.
Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.
- j. Loss of the Boone – Lamar 230 kV line overloads the Lamso – Willow Creek 115 kV line.
 - i. Scenario 1: The line overloads to 110.3% of its normal rating.
Mitigation: Construct a second Loeff – Wray 230 kV line.
- k. Loss of the Burlington 230/115 kV transformer #2 overloads the Burlington 230/115 kV transformer #1.
 - i. Scenario 1: The transformer overloads to 102.9% of its normal rating.
Mitigation: Construct a second Loeff – Wray 230 kV line.
- l. Loss of the Comanche 345/230 kV transformer #3 overloads the Comanche 345/230 kV transformer #4, and vice versa.
 - i. Scenario 1: The transformer overloads to 110.8% of its normal rating.
Mitigation: Consult with PSCo to determine the mitigation for overloads of these transformers.
 - ii. Scenario 4: The transformer overloads to 100.9% of its normal rating.
Mitigation: Consult with PSCo to determine the mitigation for overloads of these transformers.
- m. Loss of the Daniels Park – Fuller 230 kV line overloads the Gresham – Black Forest Tap, Fuller – Vollmer Tap, and Vollmer Tap – Black Squirrel 115 kV lines.
 - i. Scenario 1: The lines overload to 101.2%, 110.8%, and 100.4% of their respective ratings.
Mitigation: Replace switches at Gresham to improve the line rating. Rebuild the Fuller – Vollmer Tap – Black Squirrel 115 kV line with 795 ACSR “Drake” conductor.
 - ii. Scenario 2: The Fuller – Vollmer Tap 115 kV line overloads to 108.2% of its normal rating.
Mitigation: Rebuild the Fuller – Vollmer Tap 115 kV line with 795 ACSR “Drake” conductor.
 - iii. Scenario 3: The Fuller – Vollmer Tap 115 kV line overloads to 107.5% of its normal rating.
Mitigation: Rebuild the Fuller – Vollmer Tap 115 kV line with 795 ACSR “Drake” conductor.

- iv. Scenario 4: The Fuller – Vollmer Tap 115 kV line overloads to 106.7% of its normal rating.
Mitigation: This increases a pre-existing violation by less than 2%, including after other Network Upgrades, no mitigation is required.
- n. Loss of the Eckley – Wray 115 kV line overloads the Vernon Tap – Vernon 115 kV line.
 - i. Scenario 2: The line overloads to 101.1% of its normal rating.
Mitigation: Construct a second Looft – Wray 230 kV line.
- o. Loss of the Fuller 230/115 kV transformer #2 overloads the Fuller 230/115 kV transformer #1 and the Midway – Rancho 115 kV line.
 - i. Scenario 1: The transformer overloads to 115.4% and the line overloads to 101.1% of their respective ratings.
Mitigation: Construct a third Fuller 230/115 kV transformer.
 - ii. Scenario 2: The transformer overloads to 114.0% of its normal rating.
Mitigation: Construct a third Fuller 230/115 kV transformer.
 - iii. Scenario 3: The transformer overloads to 113.7% of its normal rating.
Mitigation: Construct a third Fuller 230/115 kV transformer.
 - iv. Scenario 4: The transformer overloads to 113.0% of its normal rating.
Mitigation: This increases a pre-existing violation by less than 2%, including after other Network Upgrades, no mitigation is required.
- p. Loss of the Lamar – GI-2025-28 POI 115 kV line overloads multiple lines.
 - i. Scenario 4: The Cheney – Holly, Cheney – Twin Buttes, Granada – Holly, Granada – Willow Creek, Stonington – Vilas, Stonington – Walsh, and Twin Buttes – Walsh 69 kV lines and the Vilas, Willow Creek #1 and Willow Creek #2 115/69 kV transformers overload to 253.7%, 290.3%, 218.5%, 274.5%, 229.4%, 223.5%, 312.4%, 187.5%, 106.2%, and 107.7% of their respective ratings.
Mitigation: Construct a new GI-2025-28 POI – Willow Creek 115 kV line.
- q. Loss of the Midway – GI-2024-26 POI 230 kV line overloads the Crosspoint – GI-2024-26 POI and Crosspoint – Midway 230 kV lines.
 - i. Scenario 1: The lines overload to 116.6% and 115.9% of their respective ratings.
Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.
 - ii. Scenario 2: The lines overload to 110.1% and 106.7% of their respective ratings.
Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.
 - iii. Scenario 3: The lines overload to 109.5% and 105.9% of their respective ratings.
Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.

- iv. Scenario 4: The Crosspoint – GI-2024-26 POI 230 kV line overloads to 102.4% of its normal rating.
Mitigation: This increases a pre-existing violation by less than 2%, no mitigation is required.
- r. Loss of the North Yuma – Story 230 kV line overloads the Beaver Creek – Akron, Akron – Otis, and Deering Lake – Otis 115 kV lines.
 - i. Scenario 1: The lines overload to 114.1%, 118.1%, and 128.5% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line.
 - ii. Scenario 2: The lines overload to 101.7%, 107.0%, and 117.5% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line.
 - iii. Scenario 3: The Deering Lake – Otis 115 kV line overloads to 108.2% of its normal rating.
Mitigation: Consult with WAPA to determine the mitigation for overloads of this line.
 - iv. Scenario 4: The Deering Lake – Otis 115 kV line overloads to 107.0% of its normal rating.
Mitigation: Consult with WAPA to determine the mitigation for overloads of this line.
- s. Loss of the North Yuma – Wray 230 kV line overloads multiple lines.
 - i. Scenario 1: The Alvin – Sandhill, Alvin – Wauneta, East Yuma Tap – Deering Lake, East Yuma Tap – Eckley, Eckley – Wray, Wray Tap – Sandhill, and Wray Tap – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 104.7%, 134.9%, 161.9%, 170.1%, 134.6%, 116.4%, 116.6%, and 138.9% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line.
 - ii. Scenario 2: The Alvin – Wauneta, East Yuma Tap – Deering Lake, East Yuma Tap – Eckley, Eckley – Wray, Wray Tap – Sandhill, and Wray Tap – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 115.5%, 135.8%, 144.1%, 117.1%, 102.7%, 102.9%, and 123.2% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line.
 - iii. Scenario 3: The Alvin – Wauneta, East Yuma Tap – Deering Lake, East Yuma Tap – Eckley, and Eckley – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 104.5%, 120.2%, 128.5%, 106.6%, and 113.6% of their respective ratings.
Mitigation: Construct a second North Yuma – Wray 230 kV line.
 - iv. Scenario 4: The East Yuma – Deering Lake, East Yuma – Eckley, and Eckley – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 113.9%, 122.1%, 102.3%, and 109.9% of their respective ratings.

Mitigation: Construct a second North Yuma – Wray 230 kV line.

- t. Loss of the Story – GI-2022-29 POI 230 kV line overloads the GI-2022-29 POI – Big Sandy and North Yuma – Wray 230 kV lines.

- i. Scenario 1: The lines overload to 147.7% and 113.1% of their respective ratings.

Mitigation: Construct a second Myth – Wray 230 kV line and a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

- ii. Scenario 2: The GI-2022-29 POI – Big Sandy 230 kV line overloads to 111.8% of its normal rating.

Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

- iii. Scenario 3: The GI-2022-29 POI – Big Sandy 230 kV line overloads to 109.7% of its normal rating.

Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

- u. Loss of the Vernon Switch – Wray 115 kV line overloads the Bethel – Vernon and Vernon – Vernon Switch 115 kV lines.

- i. Scenario 1: The lines overload to 100.6% and 112.5% of their respective ratings.

Mitigation: Construct a second Looff – Wray 230 kV line.

- v. Low voltages across Eastern and Central Colorado are associated with many contingencies.

Mitigation: Construct the previously identified transmission lines.

- w. With all Scenario 1 Network Upgrades in service, loss of the Daniels Park – Fuller 230 kV line overloads the Gresham – Fox Run 115 kV line to 114.1% of its normal rating.

Mitigation: Replace switches at Gresham to improve the line rating.

- x. With all Scenario 2 Network Upgrades in service, loss of the Daniels Park – Fuller 230 kV line overloads the Gresham – Black Forest, Gresham – Fox Run, and Vollmer Tap – Black Squirrel 115 kV lines to 114.7%, 108.4%, and 110.0% of their respective ratings.

Mitigation: Replace switches at Gresham to improve the line ratings. Rebuild the Vollmer Tap – Black Squirrel 115 kV line with 795 ACSR “Drake” conductor.

- y. With all Scenario 3 Network Upgrades in service, loss of the Daniels Park – Fuller 230 kV line overloads the Gresham – Black Forest, Gresham – Fox Run, and Vollmer Tap – Black Squirrel 115 kV lines to 114.8%, 108.5%, and 110.0% of their respective ratings.

Mitigation: Replace switches at Gresham to improve the line ratings. Rebuild the Vollmer Tap – Black Squirrel 115 kV line with 795 ACSR “Drake” conductor.

- z. With all Scenario 2 Network Upgrades in service, loss of the Comanche 345/230 kV transformer #3 overloads the Comanche 345/230 kV transformer #4 to 107.5% of its normal rating, and vice versa.

Mitigation: Consult with PSCo to determine the mitigation for overloads of these transformers.

- aa. With all Scenario 3 Network Upgrades in service, loss of the Comanche 345/230 kV transformer #3 overloads the Comanche 345/230 kV transformer #4 to 110.0% of its normal rating, and vice versa.

Mitigation: Consult with PSCo to determine the mitigation for overloads of these transformers.

- bb. With all Scenario 4 Network Upgrades in service, loss of the Boone – Lamar 230 kV line overloads the Willow Creek – Lamso 115 kV line to 100.4% of its normal rating.

Mitigation: Replace the meter at Willow Creek to improve the rating.

- cc. With all Scenario 1 Network Upgrades in service, loss of the Midway – Richard Nixon 230 kV line overloads the Midway – Fuller 230 kV line to 101.6% of its normal rating.

Mitigation: Consult with PSCo to determine the mitigation for overloads of this line.

5. N-1 (Single Contingency, Category P1) Study Results, Light Summer:

- a. Under Scenario 1 Light Summer conditions, loss of any of the following transmission lines cannot be simulated by PowerWorld. The added generation with few export paths causes the simulation to collapse.

- i. GI-2022-29 POI – Windtalker 230 kV

Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line and a new GI-2025-28 POI – Willow Creek 115 kV line. The below overloads show the most severe loading among the contingencies that could be solved, some of these lines and others would experience worse overloads among the unsolved contingencies.

- b. Loss of the GI-2022-29 POI – Windtalker 230 kV line overloads multiple lines.

- i. Scenario 2: The Bonny Creek – Burlington, Bonny Creek – South Fork, Hell Creek – Liberty, and Hell Creek – South Fork 115 kV lines, and the GI-2024-12 POI – GI-2025-29 POI, GI-2024-17 POI – GI-2024-12 POI, GI-2025-29 POI – Wray, Burlington – GI-2024-17 POI, Landsman Creek – GI-2024-29 POI, Landsman Creek – Burlington, and North Yuma – Wray 230 kV lines are overloaded to 108.0%, 137.5%, 105.5%, 102.9%, 101.2%, 109.8%, 101.4%, 111.2%, 110.9%, 130.9%, and 144.2% of their respective ratings.

Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line.

- ii. Scenario 3: The North Yuma – Wray 230 kV line overloads to 100.5% of its normal rating.

Mitigation: Construct a second North Yuma – Wray 230 kV line.

- iii. Scenario 4: The North Yuma – Wray 230 kV line overloads to 107.8% of its normal rating.

Mitigation: Construct a second North Yuma – Wray 230 kV line.

- c. Loss of the GI-2022-29 POI – Big Sandy 230 kV line overloads the Story – GI-2022-29 POI 230 kV line.

- i. Scenario 1: The line overloads to 112.4% of its normal rating.

Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.

- d. Loss of the GI-2024-17 POI – Burlington 230 kV line overloads the Bonny Creek – Burlington, Bonny Creek – South Fork, Idalia – South Fork, and Idalia – Vernon Switch 115 kV lines.

- i. Scenario 1: The lines overload to 115.2%, 151.6%, 133.5%, and 130.7% of their respective ratings.

Mitigation: Construct a second Burlington – Wray 230 kV line.

- ii. Scenario 2: The Idalia – South Fork and Idalia – Vernon Switch 115 kV lines overload to 115.8% and 114.4% of their respective ratings.

Mitigation: Construct a second Burlington – Wray 230 kV line.

- iii. Scenario 3: The Bonny Creek – South Fork, Idalia – South Fork, and Idalia – Vernon Switch 115 kV lines overload to 119.0%, 105.9%, and 104.2% of their respective ratings.

Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line. Rebuild the Bonny Creek – South Fork 115 kV line with 795 ACSR “Drake” conductor.

- iv. Scenario 4: The Bonny Creek – South Fork and Idalia – South Fork, 115 kV lines overload to 115.0% and 101.3% of their respective ratings.

Mitigation: Rebuild the Bonny Creek – South Fork 115 kV line with 795 ACSR “Drake” conductor. Perform structure replacements to improve the Idalia – South Fork 115 kV line Maximum Operating Temperature to 100°C.

- e. Loss of the GI-2024-26 POI – Lincoln 230 kV line overloads the Big Sandy – Last Chance, Beaver Creek – Gary, Gary – Woodrow, Last Chance – South Woodrow, and South Woodrow – Woodrow 115 kV lines.

- i. Scenario 1: The lines overload to 118.7%, 139.6%, 136.7%, 134.5%, and 134.8% of their respective ratings. The Story – Pawnee 230 kV line is also overloaded to 100.7% of its normal rating.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- ii. Scenario 2: The lines overload to 104.8%, 120.6%, 119.5%, 119.4%, and 118.9% of their respective ratings.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- iii. Scenario 3: The lines overload to 106.3%, 116.6%, 115.9%, 116.6%, and 115.7% of their respective ratings.

Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.

- iv. Scenario 4: The Beaver Creek – Gary, Gary – Woodrow, Last Chance – South Woodrow, and South Woodrow – Woodrow 115 kV lines overload to 103.3%, 103.2%, 104.6%, and 103.7% of their respective ratings.

Mitigation: Construct a second North Yuma – Wray 230 kV line. This does not fully resolve the violations, but reduces the increase to the pre-existing violations below the requisite 2% threshold.

- f. Loss of the GI-2025-29 POI – Wray 230 kV line overloads the GI-2022-29 POI – Windtalker 230 kV line.
 - i. Scenario 2: The line overloads to 130.6% of its normal rating.
Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line.
- g. Loss of the Badger Creek – Big Sandy 230 kV line overloads the GI-2024-26 POI – Lincoln 230 kV line.
 - i. Scenario 1: The line overloads to 130.4% of its normal rating.
Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.
 - ii. Scenario 2: The line overloads to 116.2% of its normal rating.
Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.
 - iii. Scenario 3: The line overloads to 115.2% of its normal rating.
Mitigation: Construct a second GI-2024-26 POI – Lincoln 230 kV line.
 - iv. Scenario 4: The line overloads to 103.3% of its normal rating.
Mitigation: This increases a pre-existing violation by less than 2%, no mitigation is required.
- h. Loss of the Beaver Creek – Hoyt 115 kV line overloads the Bijou Tap – Kiowa Creek 115 kV line.
 - i. Scenario 1: The line overloads to 102.7% of its normal rating.
Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.
- i. Loss of the Boone – Lamar 230 kV line overloads the Lamso – Willow Creek 115 kV line.
 - i. Scenario 1: The line overloads to 107.7% of its normal rating.
Mitigation: Construct a second Looff – Wray 230 kV line.
- j. Loss of the Burlington 230/115 kV transformer #2 overloads the Burlington 230/115 kV transformer #1.
 - i. Scenario 1: The transformer overloads to 103.9% of its normal rating.
Mitigation: Construct a second Looff – Wray 230 kV line.
- k. Loss of the Burlington – Landsman Creek 230 kV line overloads the GI-2022-29 POI – Windtalker 230 kV line.
 - i. Scenario 1: The line overloads to 130.1% of its normal rating.
Mitigation: Construct a second GI-2022-29 POI – Windtalker 230 kV line.
- l. Loss of the Daniels Park – Fuller 230 kV line overloads the Gresham – Black Forest Tap 115 kV line.
 - i. Scenario 1: The line overloads to 102.7% its normal rating.
Mitigation: Replace switches at Gresham to improve the line rating.
- m. Loss of the Kiowa Creek – Willoby 115 kV line overloads the Prospect Valley – Lost Creek Tap 115 kV line.

- i. Scenario 1: The line overloads to 105.6% of its normal rating.
Mitigation: Consult with WAPA to determine the mitigation for overloads of this line.
- n. Loss of the Lamar – GI-2025-28 POI 115 kV line overloads the Cheney Tap – Holly Tap, Cheney Tap – Twin Buttes, Granada Tap – Holly Tap, Granada Tap – Willow Creek, Stonington – Vilas, Stonington – Walsh, Twin Buttes – Walsh 69 kV lines and the Vilas 115/69 kV transformer.
 - i. Scenario 1: The lines overload to 144.2%, 163.1%, 132.8%, 175.5%, 198.7%, 185.9%, 177.5%, and 163.1% of their respective ratings.
Mitigation: Construct a new GI-2025-28 POI – Willow Creek 115 kV line.
 - ii. Scenario 4: The lines overload to 144.0%, 162.8%, 132.9%, 176.5%, 198.4%, 185.6%, 177.2%, and 162.9% of their respective ratings.
Mitigation: Construct a new GI-2025-28 POI – Willow Creek 115 kV line.
- o. Loss of the Midway – West Canon 230 kV line overloads the Buena Vista – Ray Lewis 115 kV line.
 - i. Scenario 1: The line overloads to 106.2% of its normal rating.
Mitigation: Consult with PSCo to determine the mitigation for overloads of this line.
- p. Loss of the Midway – GI-2024-26 POI 230 kV line overloads the Crosspoint – GI-2024-26 POI and Crosspoint – Midway 230 kV lines.
 - i. Scenario 1: The lines overload to 108.6% and 107.4% of their respective ratings.
Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.
 - ii. Scenario 2: The Crosspoint – GI-2024-26 POI 230 kV line overloads to 100.3% of its rating.
Mitigation: Construct a third GI-2024-26 POI – Midway 230 kV line.
- q. Loss of the North Yuma – Story 230 kV line overloads the Beaver Creek – Akron, Akron – Otis, and Deering Lake – Otis 115 kV lines.
 - i. Scenario 1: The lines overload to 113.8%, 118.0%, and 125.6% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line.
 - ii. Scenario 2: The lines overload to 104.9%, 108.8%, and 115.6% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line.
 - iii. Scenario 3: The Akron – Otis and Deering Lake – Otis 115 kV lines overload to 101.0% and 107.6% of their respective normal ratings.
Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line. Consult with WAPA to determine the mitigation for overloads of the Deering Lake – Otis 115 kV line.

- iv. Scenario 4: The Deering Lake – Otis 115 kV line overloads to 105.0% of its normal rating.
Mitigation: Consult with WAPA to determine the mitigation for overloads of the Deering Lake – Otis 115 kV line.
- r. Loss of the North Yuma – Wray 230 kV line overloads multiple lines.
 - i. Scenario 1: The Alvin – Wauneta, East Yuma Tap – Deering Lake, East Yuma Tap – Eckley, Eckley – Wray, Wray Tap – Sandhill, and Wray Tap – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 131.5%, 179.0%, 185.5%, 137.4%, 105.9%, 106.1%, and 131.0% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line. Consult with WAPA to determine the mitigation for any remaining overloads of East Yuma Tap – Eckley 115 kV.
 - ii. Scenario 2: The Alvin – Wauneta, East Yuma – Deering Lake, East Yuma – Eckley, and Eckley – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 113.6%, 155.7%, 161.5%, 121.1%, and 116.1% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line.
 - iii. Scenario 3: The Alvin – Wauneta, East Yuma – Deering Lake, East Yuma – Eckley, and Eckley – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 102.3%, 139.7%, 145.6%, 110.3%, and 106.3% of their respective ratings.
Mitigation: Construct a second North Yuma – Wray 230 kV line.
 - iv. Scenario 4: The East Yuma – Deering Lake, East Yuma – Eckley, and Eckley – Wray 115 kV lines, and the Wray 230/115 kV transformer overload to 133.0%, 138.9%, 105.9%, and 102.4% of their respective ratings.
Mitigation: Construct a second North Yuma – Wray 230 kV line.
- s. Loss of the Story – GI-2022-29 POI 230 kV line overloads the GI-2022-29 POI – Big Sandy and North Yuma – Wray 230 kV lines.
 - i. Scenario 1: The lines overload to 142.5% and 120.4% of their respective ratings.
Mitigation: Construct a second Myth – Wray 230 kV line and a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.
 - ii. Scenario 2: The GI-2022-29 POI – Big Sandy 230 kV line overloads to 108.6% of its normal rating.
Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.
 - iii. Scenario 3: The GI-2022-29 POI – Big Sandy 230 kV line overloads to 106.4% of its normal rating.
Mitigation: Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.
- t. Loss of the Vernon Switch – Wray 115 kV line overloads the Bethel – Vernon and Vernon – Vernon Switch 115 kV lines.

- i. Scenario 1: The lines overload to 103.8% and 111.5% of their respective ratings.

Mitigation: Construct a second Looft – Wray 230 kV line.

- u. Low voltages across Eastern and Central Colorado are associated with many contingencies.

Mitigation: Construct the previously identified transmission lines.

- v. With all Scenario 2 Network Upgrades in service, loss of the Midway – West Canon 230 kV line overloads the Buena Vista – Ray Lewis 115 kV line to 101.3% of its normal rating.

Mitigation: Consult with PSCo to determine the mitigation for overloads of this line.

- w. With all Scenario 4 Network Upgrades in service, loss of the GI-2024-17 – Burlington 230 kV line overloads the Idalia – Vernon Switch 115 kV line to 100.2% of its normal rating.

Mitigation: Perform structure replacements to improve the Idalia – Vernon Switch 115 kV line Maximum Operating Temperature to 100°C.

The below results study project GI-2025-03 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.

The below results study project GI-2025-07 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.

The below results study project GI-2025-08 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.

- b. No violations occurred under the 2029 Light Summer N-0 conditions.

The below results study project GI-2025-11 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.

The below results study project GI-2025-24 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.

The below results study project GI-2025-26 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.

The below results study project GI-2025-28 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. Loss of the Lamar – GI-2025-28 POI 115 kV line overloads the Cheney Tap – Holly Tap, Cheney Tap – Twin Buttes, Granada Tap – Holly Tap, Granada Tap – Willow Creek, Stonington – Vilas, Stonington – Walsh, Twin Buttes – Walsh 69 kV lines and the Vilas 115/69 kV transformer.
 - i. Heavy Summer: The lines overload to 126.6%, 145.0%, 116.2%, 158.8%, 185.7%, 173.3%, 159.6%, and 158.0% of their respective ratings.

Mitigation: Construct a new GI-2025-28 POI – Willow Creek 115 kV line.

- ii. Light Summer: The lines overload to 146.7%, 166.2%, 133.1%, 171.7%, 200.7%, 188.6%, 180.3%, and 164.4% of their respective ratings.

Mitigation: Construct a new GI-2025-28 POI – Willow Creek 115 kV line.

The below results study project GI-2025-29 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.

6.2.2.1 Network Upgrades

1. The following Network Upgrades and constraints on Affected Systems were identified for the Eastern Cluster Area **NRIS** projects for Scenario 1:
 - a. Construct a new Myth – Wray 230 kV #2 line.
 - b. Construct a new Looff – Wray 230 kV #2 line.
 - c. Construct a new GI-2024-26 POI – GI-2022-29 POI 230 kV line.
 - d. Construct a new GI-2025-28 POI – Willow Creek 115 kV line.
 - e. Construct a new GI-2022-29 POI – Windtalker 230 kV #2 line.
 - f. Construct a new Midway – GI-2024-26 POI 230 kV #3 line.
 - g. Construct a new GI-2024-26 POI – Lincoln 230 kV #2 line.
 - h. Construct a new Fuller 230/115 kV #3 transformer.
 - i. Rebuild the Fuller – Vollmer Tap – Black Squirrel 115 kV line with 795 ACSR “Drake” conductor.
 - j. Replace switches at Gresham to improve the Black Forest Tap – Gresham – Fox Run 115 kV line rating.
 - k. Consult with WAPA to determine the mitigation for overloads on:
 - i. Prospect Valley – Lost Creek Tap 115 kV
 - ii. Eckley – East Yuma Tap 115 kV
 - l. Consult with PSCO to determine the mitigation for overloads on:
 - i. Comanche 345/230 kV transformers #3 and #4
 - ii. Midway – Fuller 230 kV
 - iii. Ray Lewis – Buena Vista Tap 115 kV

The below map demonstrates the location of the new 230 kV lines. The red lines are existing or planned Tri-State lines and non-red lines are existing non-Tri-State lines. The pink paths are the

230 kV lines assigned to Transitional Cluster 2024, and the yellow paths are the 230 kV lines assigned to this cluster. The map is informational and does not show the exact route the new lines will take.

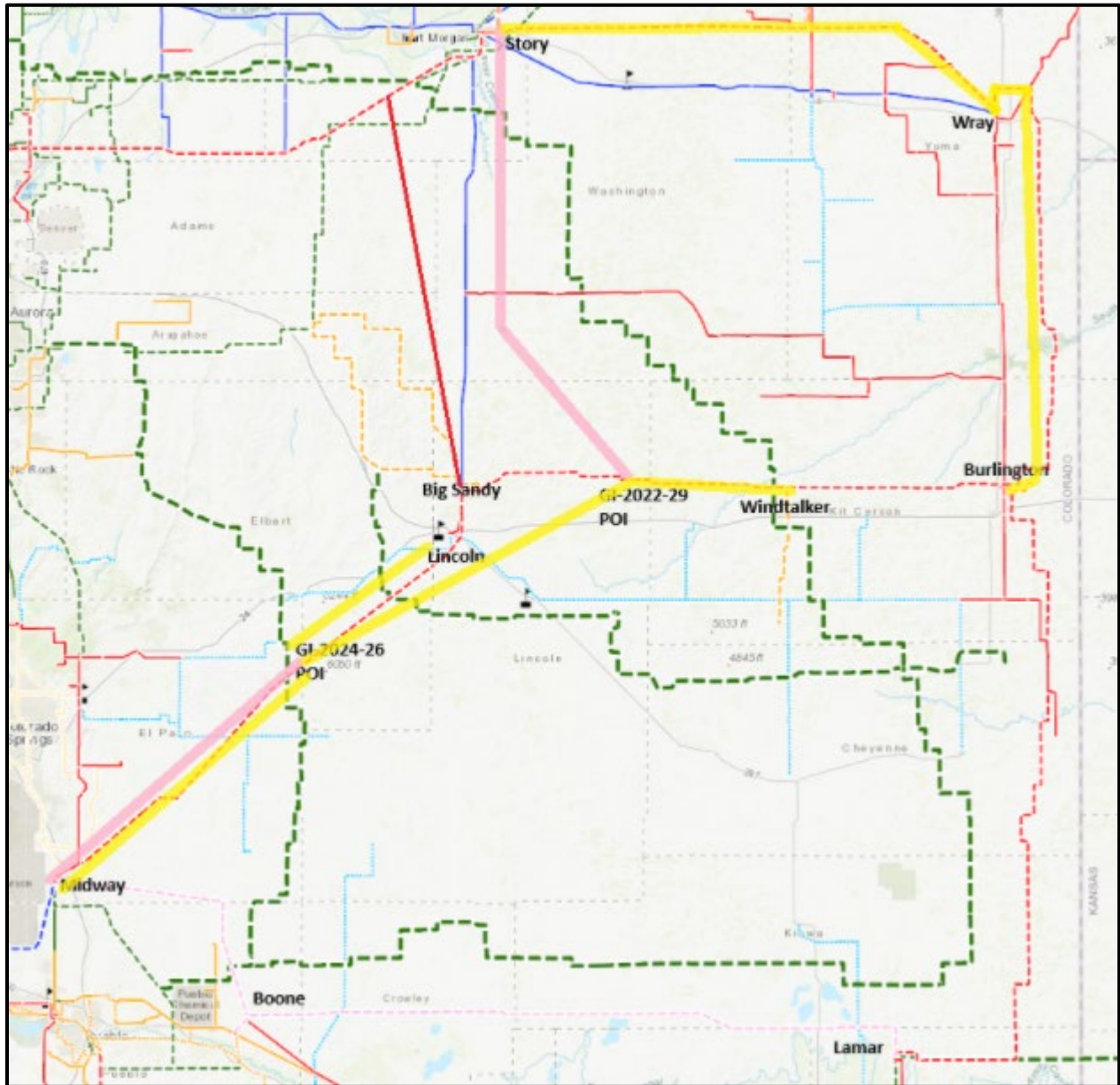


Figure 6-1: Eastern Colorado New 230kV Lines Map

Table 6-2: 2029 Heavy Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 1

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P0	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	None	576.0	92.2	112.8	TSGT
P1.2	--- Diverged ---	2022-29 Tap - Windtalker.230.1	---	---	---	---
P1.2	--- Diverged ---	Lamar - 2025-28_TAP.1	---	---	---	---
P1.2	Story_230.0-2022-29 tap_230.0 Ckt "1"	2022-29 Tap - Big Sandy.230.1	637.0	65.9	113.8	TSGT
P1.2	Bonny_ck_115.0-Burlngtn_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	239.0	89.1	121.6	TSGT
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	175.0	114.9	154.3	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.6	133.8	TSGT
P1.2	Idalia_115.0-Vernontp_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	94.1	131.5	TSGT
P1.2	Midway_ps_230.0-2024-26 tap_230.0 Ckt "2"	2024-26 Tap - Crosspoint.230.1	637.0	91.4	106.4	PSCo
P1.2	2025-24_lv1_34.50-2025-24_230.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	130.0	---	101.4	GI-2025-24
P1.2	2025-24_lv2_34.50-2025-24_230.0 Ckt "2"	2024-26 Tap - Lincoln.230.1	130.0	---	101.4	GI-2025-24
P1.2	B.sandy_115.0-Lschance_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	97.7	125.0	WAPA
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.5	140.2	WAPA
P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.7	138.1	WAPA
P1.2	Lschance_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	103.1	137.0	WAPA
P1.2	Story_230.0-Pawnee_230.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	699.0	79.1	113.3	PSCo
P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.2	136.7	WAPA
P1.2	Windtlkr_230.0-2022-29 tap_230.0 Ckt "1"	2025-29 - Wray	478.0	87.6	132.4	TSGT
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	114.0	139.8	TSGT
P1.2	Bijoutap_115.0-Kiowa ck_115.0 Ckt "1"	Beaver Creek-Adena-Hoyt.115.1	120.0	90.5	102.9	WAPA
P1.2	Lamso_115.0-Wilow_ck_115.0 Ckt "1"	Boone-Lamar.230.1	108.0	71.9	110.3	TSGT
P1.3	Burlngtn_115.0-Mid_96176_230.0 Ckt "1"	Burlington.230/115.T2	112.0	70.4	102.9	TSGT
P1.3	Burlngtn_230.0-Mid_96176_230.0 Ckt "1"	Burlington.230/115.T2	112.0	70.4	102.9	TSGT
P1.3	Comanche_230.0-Comanche_345.0 Ckt "T4"	Comanche.345/230.T3	560.0	95.5	110.8	PSCo

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P1.2	Gresham_115.0-Blkfortp_115.0 Ckt "1"	Daniels Park-Fuller.230.1	119.0	93.5	101.2	TSGT
P1.2	Vollmert_115.0-Fuller_115.0 Ckt "1"	Daniels Park-Fuller.230.1	173.0	105.3	110.8	TSGT
P1.2	Vollmert_115.0-Blk_sqmv_115.0 Ckt "1"	Daniels Park-Fuller.230.1	173.0	95.0	100.4	TSGT
P1.3	Fuller_230.0-Fuller_115.0 Ckt "1"	Fuller.230/115.T2	100.0	112.3	115.4	TSGT
P1.3	Midwaybr_115.0-Rancho_115.0 Ckt "1"	Fuller.230/115.T2	119.0	98.4	101.1	TSGT
P1.2	Crosspoint_230.0-2024-26 tap_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	101.9	116.6	TSGT
P1.2	Crosspoint_230.0-Midwaybr_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	97.7	115.9	TSGT
P1.2	Akron_115.0-Beaverck_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	87.5	114.1	WAPA
P1.2	Akron_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	92.9	118.1	WAPA
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	103.3	128.5	WAPA
P1.2	Alvin_115.0-Sandhill_115.0 Ckt "1"	North Yuma-Wray.230.1	97.0	75.3	104.7	TSGT
P1.2	Alvin_115.0-Wauneta_115.0 Ckt "1"	North Yuma-Wray.230.1	68.0	92.9	134.9	TSGT
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	104.9	161.9	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	113.1	170.1	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	96.2	134.6	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	138.9	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	138.9	TSGT
P1.2	Wray_tap_115.0-Sandhill_115.0 Ckt "1"	North Yuma-Wray.230.1	97.0	86.7	116.4	TSGT
P1.2	Wray_tap_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	97.0	86.9	116.6	TSGT
P1.2	2022-29 tap_230.0-B.sandy_230.0 Ckt "1"	Story-2022-29.230.1	478.0	80.1	147.7	TSGT
P1.2	N.yuma_230.0-Wray_230.0 Ckt "1"	Story-2022-29.230.1	292.0	68.2	113.1	TSGT
P1.2	Bethellm_115.0-Vernonlm_115.0 Ckt "1"	Vernon Switch-Olive Tap-Wray.115.1	68.0	71.3	100.6	TSGT
P1.2	Vernontp_115.0-Vernonlm_115.0 Ckt "1"	Vernon Switch-Olive Tap-Wray.115.1	68.0	82.8	112.5	TSGT
With All Identified Network Upgrades In Service						
P1.2	Gresham_115.0-Foxrun_115.0 Ckt "1"	Daniels Park-Fuller.230.1	119.0	87.4	114.1	TSGT
P1.2	Midway_ps_230.0-Fuller_230.0 Ckt "1"	Midway (WAPA)-RD Nixon.230.1	478	69.3	101.6	PSCo

Table 6-3: 2029 Light Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 1

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P0	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	None	576.0	78.8	101.2	TSGT
P1.2	--- Diverged ---	2022-29 Tap - Windtalker.230.1	---	---	---	---
P1.2	Story_230.0-2022-29 tap_230.0 Ckt "1"	2022-29 Tap - Big Sandy.230.1	637.0	66.1	112.4	TSGT
P1.2	Bonny_ck_115.0-Burlngtn_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	239.0	83.1	115.2	TSGT
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	175.0	109.1	151.6	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.0	133.5	TSGT
P1.2	Idalia_115.0-Vernontp_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	94.5	130.7	TSGT
P1.2	B.sandy_115.0-Lschance_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	91.3	118.7	WAPA
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	139.6	WAPA
P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	136.7	WAPA
P1.2	Lschance_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.0	134.5	WAPA
P1.2	Story_230.0-Pawnee_230.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	699.0	65.1	100.7	PSCo
P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.2	134.8	WAPA
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	102.2	130.4	TSGT
P1.2	Bijoutap_115.0-Kiowa ck_115.0 Ckt "1"	Beaver Creek-Adena-Hoyt.115.1	120.0	90.5	102.7	WAPA
P1.2	Lamso_115.0-Wilow_ck_115.0 Ckt "1"	Boone-Lamar.230.1	108.0	66.3	107.7	TSGT
P1.3	Burlngtn_115.0-Mid_96176_230.0 Ckt "1"	Burlington.230/115.T2	112.0	67.2	103.9	TSGT
P1.3	Burlngtn_230.0-Mid_96176_230.0 Ckt "1"	Burlington.230/115.T2	112.0	67.2	103.9	TSGT
P1.2	Windtlkr_230.0-2022-29 tap_230.0 Ckt "1"	Burlington-Landsman Creek.230.1	478.0	66.9	130.1	TSGT
P1.2	Gresham_115.0-Blkfortp_115.0 Ckt "1"	Daniels Park-Fuller.230.1	119.0	93.7	102.7	TSGT
P1.2	Prospval_115.0-Lostcktp_115.0 Ckt "1"	Kiowa Creek-Willoby.115.1	63.0	92.8	105.6	WAPA
P1.2	Chen_tap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	24.8	144.2	TSGT
P1.2	Chen_tap_69.00-T.buttles_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	22.1	163.1	TSGT
P1.2	Grantap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	28.6	132.8	TSGT

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P1.2	Grantap_69.00-Wilow_ck_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	41.0	39.8	175.5	TSGT
P1.2	Stoningt_69.00-Vilas_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	14.5	198.7	TSGT
P1.2	Stoningt_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	14.6	185.9	TSGT
P1.2	T.buttess_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	20.8	177.5	TSGT
P1.2	Vilas_69.00-Vilas_115.0 Ckt "T1"	Lamar - 2025-28_TAP.1	71.0	0.0	163.1	TSGT
P1.2	Buena_vst_t_115.0-Ray_lewi_115.0 Ckt "1"	Midway (WAPA)-Hambone-West Canon.230.1	91.4	91.6	106.2	PSCo
P1.2	Crosspoint_230.0-2024-26 tap_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	91.0	108.6	TSGT
P1.2	Crosspoint_230.0-Midwaybr_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	89.0	107.4	TSGT
P1.2	Akron_115.0-Beaverck_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	91.0	113.8	WAPA
P1.2	Akron_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	95.0	118.0	WAPA
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	101.6	125.1	WAPA
P1.2	Alvin_115.0-Wauneta_115.0 Ckt "1"	North Yuma-Wray.230.1	68.0	90.8	131.5	TSGT
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	124.6	179.0	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	130.5	185.5	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	100.1	137.4	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	131.0	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	131.0	TSGT
P1.2	Wray_tap_115.0-Sandhill_115.0 Ckt "1"	North Yuma-Wray.230.1	97.0	76.9	105.9	TSGT
P1.2	Wray_tap_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	97.0	77.0	106.1	TSGT
P1.2	2022-29 tap_230.0-B.sandy_230.0 Ckt "1"	Story-2022-29.230.1	478.0	76.9	142.5	TSGT
P1.2	N.yuma_230.0-Wray_230.0 Ckt "1"	Story-2022-29.230.1	292.0	80.1	120.4	TSGT
P1.2	Bethellm_115.0-Vernonlm_115.0 Ckt "1"	Vernon Switch-Olive Tap-Wray.115.1	68.0	73.5	103.8	TSGT
P1.2	Vernontp_115.0-Vernonlm_115.0 Ckt "1"	Vernon Switch-Olive Tap-Wray.115.1	68.0	80.5	111.5	TSGT

Table 6-4: 2029 Heavy Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 2

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P0	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	None	576.0	92.2	103.3	TSGT

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P0	Windtlkr_230.0-2022-29 tap_230.0 Ckt "1"	None	478.0	63.0	102.7	TSGT
P1.2	--- Diverged ---	2022-29 Tap - Windtalker.230.1	---	---	---	---
P1.2	Bonny_ck_115.0-Burlngtn_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	239.0	89.1	106.7	TSGT
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	175.0	114.9	136.9	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.6	116.9	TSGT
P1.2	Idalia_115.0-Vernontp_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	94.1	114.1	TSGT
P1.2	B.sandy_115.0-Lschance_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	97.7	109.9	WAPA
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.5	121.8	WAPA
P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.7	120.5	WAPA
P1.2	Lschance_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	103.1	119.7	WAPA
P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.2	119.6	WAPA
P1.2	Windtlkr_230.0-2022-29 tap_230.0 Ckt "1"	2025-29 - Wray	478.0	87.6	133.2	TSGT
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	114.0	128.0	TSGT
P1.2	Vollmert_115.0-Fuller_115.0 Ckt "1"	Daniels Park-Fuller.230.1	173.0	105.3	108.2	TSGT
P1.2	Vernontp_115.0-Vernonlm_115.0 Ckt "1"	Eckley-Wray.115.1	68.0	89.3	101.1	TSGT
P1.3	Fuller_230.0-Fuller_115.0 Ckt "1"	Fuller.230/115.T2	100.0	112.3	114.0	TSGT
P1.2	Crosspoint_230.0-2024-26 tap_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	101.9	110.1	TSGT
P1.2	Crosspoint_230.0-Midwaybr_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	97.7	106.7	TSGT
P1.2	Akron_115.0-Beaverck_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	87.5	101.7	WAPA
P1.2	Akron_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	92.9	107.0	WAPA
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	103.3	117.5	WAPA
P1.2	Alvin_115.0-Wauneta_115.0 Ckt "1"	North Yuma-Wray.230.1	68.0	92.9	115.5	TSGT
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	104.9	135.8	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	113.1	144.1	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	96.2	117.1	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	123.2	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	123.2	TSGT
P1.2	Wray_tap_115.0-Sandhill_115.0 Ckt "1"	North Yuma-Wray.230.1	97.0	86.7	102.7	TSGT

P1.2	Wray_tap_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	97.0	86.9	102.9	TSGT
P1.2	2022-29 tap_230.0-B.sandy_230.0 Ckt "1"	Story-2022-29.230.1	478.0	80.1	111.8	TSGT
With All Identified Network Upgrades In Service						
P1.2	Gresham_115.0-Blkfortp_115.0 Ckt "1"	Daniels Park-Fuller.230.1	119.0	93.5	114.7	TSGT
P1.2	Gresham_115.0-Foxrun_115.0 Ckt "1"	Daniels Park-Fuller.230.1	119.0	87.4	108.4	TSGT
P1.2	Vollmert_115.0-Blk_sqmv_115.0 Ckt "1"	Daniels Park-Fuller.230.1	173.0	95.0	110.0	TSGT
P1.3	Comanche_230.0-Comanche_345.0 Ckt "T4"	Comanche.345/230.T3	560.0	95.5	107.5	PSCo

Table 6-5: 2029 Light Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 2

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P1.2	2024-12_230.0-2025-29-tap_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	478.0	76.4	101.2	TSGT
P1.2	2024-17 tap_230.0-2024-12_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	478.0	78.9	109.8	TSGT
P1.2	2025-29-tap_230.0-Wray_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	478.0	76.0	101.4	TSGT
P1.2	Bonny_ck_115.0-Burlngtn_115.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	239.0	78.7	108.0	TSGT
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	175.0	102.9	137.5	TSGT
P1.2	Burlngtn_230.0-2024-17 tap_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	478.0	79.2	111.2	TSGT
P1.2	Hell_tap_115.0-Liberty_115.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	89.0	77.1	105.5	TSGT
P1.2	Hell_tap_115.0-So_fork_115.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	97.0	76.5	102.9	TSGT
P1.2	Landsmck_230.0-2024-29_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	533.0	51.2	110.9	TSGT
P1.2	Landsmck_230.0-Burlngtn_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	478.0	68.1	130.9	TSGT
P1.2	N.yuma_230.0-Wray_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	292.0	100.2	144.2	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.0	115.8	TSGT
P1.2	Idalia_115.0-Vernontp_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	94.5	114.4	TSGT
P1.2	B.sandy_115.0-Lschance_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	91.3	104.8	WAPA
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	120.6	WAPA
P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	119.5	WAPA
P1.2	Lschance_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.0	119.4	WAPA

P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.2	118.9	WAPA
P1.2	Windtlkr_230.0-2022-29 tap_230.0 Ckt "1"	2025-29 - Wray	478.0	85.1	130.6	TSGT
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	102.2	116.2	TSGT
P1.2	Crosspoint_230.0-2024-26 tap_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	91.0	100.3	TSGT
P1.2	Akron_115.0-Beaverck_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	91.0	104.9	WAPA
P1.2	Akron_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	95.0	108.8	WAPA
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	101.6	115.6	WAPA
P1.2	Alvin_115.0-Wauneta_115.0 Ckt "1"	North Yuma-Wray.230.1	68.0	90.8	113.6	TSGT
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	124.6	155.7	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	130.5	161.5	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	100.1	121.1	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	116.1	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	116.1	TSGT
P1.2	2022-29 tap_230.0-B.sandy_230.0 Ckt "1"	Story-2022-29.230.1	478.0	76.9	108.6	TSGT
With All Identified Network Upgrades In Service						
P1.2	Buena_vst_t_115-Ray_lewi_115.0 Ckt "1"	Midway (WAPA)-Hambone-West Canon.230.1	91.4	91.6	101.3	PSCo

Table 6-6: 2029 Heavy Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 3

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P0	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	None	576.0	92.2	102.3	TSGT
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	175.0	114.9	124.9	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.6	106.9	TSGT
P1.2	Idalia_115.0-Vernontp_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	94.1	104.3	TSGT
P1.2	B.sandy_115.0-Lschance_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	97.7	110.8	WAPA
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.5	114.9	WAPA
P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.7	114.4	WAPA
P1.2	Lschance_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	103.1	115.3	WAPA

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P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.2	114.3	WAPA
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	114.0	126.8	TSGT
P1.2	Vollmert_115.0-Fuller_115.0 Ckt "1"	Daniels Park-Fuller.230.1	173.0	105.3	107.5	TSGT
P1.3	Fuller_230.0-Fuller_115.0 Ckt "1"	Fuller.230/115.T2	100.0	112.3	113.7	TSGT
P1.2	Crosspoint_230.0-2024-26 tap_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	101.9	109.5	TSGT
P1.2	Crosspoint_230.0-Midwaybr_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	97.7	105.9	TSGT
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	103.3	108.2	WAPA
P1.2	Alvin_115.0-Wauneta_115.0 Ckt "1"	North Yuma-Wray.230.1	68.0	92.9	104.5	TSGT
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	104.9	120.2	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	113.1	128.5	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	96.2	106.6	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	113.6	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	113.6	TSGT
P1.2	2022-29 tap_230.0-B.sandy_230.0 Ckt "1"	Story-2022-29.230.1	478.0	80.1	109.7	TSGT
With All Identified Network Upgrades In Service						
P1.2	Gresham_115.0-Blkfortp_115.0 Ckt "1"	Daniels Park-Fuller.230.1	119.0	93.5	114.8	TSGT
P1.2	Gresham_115.0-Foxrun_115.0 Ckt "1"	Daniels Park-Fuller.230.1	119.0	87.4	108.5	TSGT
P1.2	Vollmert_115.0-Blk_sqmv_115.0 Ckt "1"	Daniels Park-Fuller.230.1	173.0	95.0	110.1	TSGT
P1.3	Comanche_230.0-Comanche_345.0 Ckt "T4"	Comanche.345/230.T3	560.0	95.5	110.0	PSCo

Table 6-7: 2029 Light Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 3

Contingency Type	Affected Element	Contiingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P1.2	N.yuma_230.0-Wray_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	292.0	100.2	100.5	TSGT
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	175.0	109.1	119.0	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.0	105.9	TSGT
P1.2	Idalia_115.0-Vernontp_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	94.5	104.2	TSGT

P1.2	B.sandy_115.0-Lschance_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	91.3	106.3	WAPA
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	116.6	WAPA
P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	115.9	WAPA
P1.2	Lschance_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.0	116.6	WAPA
P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.2	115.7	WAPA
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	102.2	115.2	TSGT
P1.2	Akron_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	95.0	101.0	WAPA
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	101.6	107.6	WAPA
P1.2	Alvin_115.0-Wauneta_115.0 Ckt "1"	North Yuma-Wray.230.1	68.0	90.8	102.3	TSGT
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	124.6	139.7	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	130.5	145.6	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	100.1	110.3	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	106.3	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	106.3	TSGT
P1.2	2022-29 tap_230.0-B.sandy_230.0 Ckt "1"	Story-2022-29.230.1	478.0	76.9	106.4	TSGT

Table 6-8: 2029 Heavy Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 4

Contingency Type	Affected Element	Con tingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	175.0	114.9	121.1	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.6	102.3	TSGT
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.5	104.2	WAPA
P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.7	104.3	WAPA
P1.2	Lschance_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	103.1	105.7	WAPA
P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.2	104.7	WAPA
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	114.0	115.2	TSGT
P1.3	Comanche_230.0-Comanche_345.0 Ckt "T4"	Comanche.345/230.T3	560.0	95.5	100.9	PSCo
P1.2	Vollmert_115.0-Fuller_115.0 Ckt "1"	Daniels Park-Fuller.230.1	173.0	105.3	106.7	TSGT

P1.3	Fuller_230.0-Fuller_115.0 Ckt "1"	Fuller.230/115.T2	100.0	112.3	113.0	TSGT
P1.2	Chen_tap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	43.3	253.7	TSGT
P1.2	Chen_tap_69.00-T.buttess_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	38.3	290.3	TSGT
P1.2	Grantap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	51.3	218.5	TSGT
P1.2	Grantap_69.00-Wilow_ck_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	41.0	72.1	274.5	TSGT
P1.2	Stoningt_69.00-Vilas_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	18.9	229.4	TSGT
P1.2	Stoningt_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	18.9	223.5	TSGT
P1.2	T.buttess_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	36.2	312.4	TSGT
P1.2	Vilas_69.00-Vilas_115.0 Ckt "T1"	Lamar - 2025-28_TAP.1	71.0	0.0	187.5	TSGT
P1.2	Wilow_ck_69.00-Wilow_ck_115.0 Ckt "T1"	Lamar - 2025-28_TAP.1	41.7	70.7	106.2	TSGT
P1.2	Wilow_ck_69.00-Wilow_ck_115.0 Ckt "T2"	Lamar - 2025-28_TAP.1	41.7	71.7	107.7	TSGT
P1.2	Crosspoint_230.0-2024-26 tap_230.0 Ckt "1"	Midway-2024-26.230.1	576.0	101.9	102.4	TSGT
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	103.3	107.0	WAPA
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	104.9	113.9	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	113.1	122.1	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	96.2	102.3	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	109.9	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	104.4	109.9	TSGT
With All Identified Network Upgrades In Service						
P1.2	Wilow_ck_115-.0-Lamso_115.0 Ckt "1"	Boone-Lamar.230.1	108.0	71.9	100.4	TSGT

Table 6-9: 2029 Light Summer - Thermal Analysis Eastern Colorado Cluster, Scenario 4

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P1.2	N.yuma_230.0-Wray_230.0 Ckt "1"	2022-29 Tap - Windtalker.230.1	292.0	100.2	107.8	TSGT
P1.2	Bonny_ck_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	175.0	109.1	115.0	TSGT
P1.2	Idalia_115.0-So_fork_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	96.0	101.3	TSGT
P1.2	Beaverck_115.0-Gary_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	103.3	WAPA

P1.2	Gary_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	100.7	103.2	WAPA
P1.2	Lschange_115.0-Swoodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	102.0	104.6	WAPA
P1.2	Swoodrow_115.0-Woodrow_115.0 Ckt "1"	2024-26 Tap - Lincoln.230.1	109.0	101.2	103.7	WAPA
P1.2	2024-26 tap_230.0-Lincolnt_230.0 Ckt "1"	Badger Creek-Big Sandy.230.1	576.0	102.2	103.3	TSGT
P1.2	Chen_tap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	24.8	144.0	TSGT
P1.2	Chen_tap_69.00-T.buttes_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	22.1	162.8	TSGT
P1.2	Grantap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	28.6	132.9	TSGT
P1.2	Grantap_69.00-Wilow_ck_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	41.0	39.8	176.5	TSGT
P1.2	Stoningt_69.00-Vilas_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	14.5	198.4	TSGT
P1.2	Stoningt_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	14.6	185.6	TSGT
P1.2	T.buttes_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	20.8	177.2	TSGT
P1.2	Vilas_69.00-Vilas_115.0 Ckt "T1"	Lamar - 2025-28_TAP.1	71.0	0.0	162.9	TSGT
P1.2	Deeringl_115.0-Otis_lm_115.0 Ckt "1"	North Yuma-Story.230.1	85.0	101.6	105.0	WAPA
P1.2	E yuma tap_115.0-Deeringl_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	124.6	133.0	WAPA
P1.2	E yuma tap_115.0-Eckley_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	130.5	138.9	WAPA
P1.2	Eckley_115.0-Wray_115.0 Ckt "1"	North Yuma-Wray.230.1	85.0	100.1	105.9	WAPA
P1.2	Wray_115.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	102.4	TSGT
P1.2	Wray_230.0-Mid_96162_230.0 Ckt "1"	North Yuma-Wray.230.1	167.0	97.1	102.4	TSGT
With All Identified Network Upgrades In Service						
P1.2	Idalia_115.0-Vernontp_115.0 Ckt "1"	2024-17 POI - Burlington.230.1	147.0	94.1	100.2	TSGT

Table 6-10: 2029 Heavy Summer - Thermal Analysis Eastern Colorado Cluster, GI-2025-28 ERIS

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P1.2	Chen_tap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	43.3	126.6	TSGT
P1.2	Chen_tap_69.00-T.buttes_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	38.3	145.0	TSGT
P1.2	Grantap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	51.3	116.2	TSGT
P1.2	Grantap_69.00-Wilow_ck_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	41.0	72.1	158.8	TSGT

P1.2	Stoningt_69.00-Vilas_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	18.9	185.7	TSGT
P1.2	Stoningt_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	18.9	173.3	TSGT
P1.2	T.buttes_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	36.2	159.6	TSGT
P1.2	Vilas_69.00-Vilas_115.0 Ckt "T1"	Lamar - 2025-28_TAP.1	71.0	0.0	158.0	TSGT

Table 6-11: 2029 Light Summer - Thermal Analysis Eastern Colorado Cluster, GI-2025-28 ERIS

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P1.2	Chen_tap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	24.8	146.7	TSGT
P1.2	Chen_tap_69.00-T.buttes_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	22.1	166.2	TSGT
P1.2	Grantap_69.00-Holl_tp_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	28.6	133.1	TSGT
P1.2	Grantap_69.00-Wilow_ck_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	41.0	39.8	171.7	TSGT
P1.2	Stoningt_69.00-Vilas_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	14.5	200.7	TSGT
P1.2	Stoningt_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	14.6	188.6	TSGT
P1.2	T.buttes_69.00-Walsh_69.00 Ckt "1"	Lamar - 2025-28_TAP.1	54.0	20.8	180.3	TSGT
P1.2	Vilas_69.00-Vilas_115.0 Ckt "T1"	Lamar - 2025-28_TAP.1	71.0	0.0	164.4	TSGT

6.2.3 Reactive Power Analysis

6.2.3.1 GI-2025-03

At the full 300 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 108.9 MVAR produced (0.940 p.f. lag) to -108.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.88 lag (producing) and 0.88 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-12 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 300 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 2 MVAR capacitor may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 2.5 MVAR reactor bank may be required.

Table 6-12: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-03, Project Size: 300 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.88 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	0.0	4.4	1.050	-----	0.0	-2.4
1.05	61.0	-33.0	1.036	60.8	-31.1	1.050	0.890	-22.1	None
1.05	122.0	-65.9	1.019	121.0	-71.9	1.050	0.860	-43.9	None
1.05	183.0	-98.9	1.000	180.7	-118.7	1.050	0.836	-65.6	None
1.05	244.0	-131.8	0.979	239.7	-172.4	1.050	0.812	-87.0	None
1.05	305.0	-164.8	0.955	297.9	-234.2	1.050	0.786	-108.1	None
0.950 POI Voltage at 0.88 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	3.6	0.950	-----	0.0	-1.6
0.95	61.0	33.0	0.973	60.7	33.7	0.950	0.874	22.0	None
0.95	122.0	65.9	0.993	120.9	58.6	0.950	0.900	43.9	None
0.95	183.0	98.9	1.011	180.7	78.8	0.950	0.917	65.6	None
0.95	244.0	131.8	1.028	240.0	94.7	0.950	0.930	87.1	None
0.95	305.0	164.8	1.043	299.0	106.6	0.950	0.942	108.5	1.9

6.2.3.2 GI-2025-07

At the full 199 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 72.2 MVAR produced (0.940 p.f. lag) to -72.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.892 lag (producing) and 0.892 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-13 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus. A 5 MVAR capacitor bank was included in the application data and is compared to the required reactive power.

At the full 199 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. An additional 6 MVAR capacitor may be required. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 6-13: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-07, Project Size: 199 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.892 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	0.0	1.3	1.050	-----	0.0	None
1.05	40.5	-20.5	1.033	40.4	-20.9	1.048	0.888	-14.7	None
1.05	81.0	-41.0	1.012	80.5	-46.8	1.045	0.864	-29.2	None
1.05	121.5	-61.4	0.989	120.3	-77.2	1.042	0.842	-43.7	None
1.05	162.0	-81.9	0.961	159.7	-112.7	1.038	0.817	-58.0	None
1.05	202.5	-102.4	0.928	198.7	-154.8	1.033	0.789	-72.1	None
0.950 POI Voltage at 0.892 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	1.1	0.950	-----	0.0	None
0.95	40.5	20.5	0.976	40.4	19.6	0.954	0.899	14.7	None
0.95	81.0	41.0	0.997	80.5	34.6	0.957	0.919	29.2	None
0.95	121.5	61.4	1.017	120.4	46.5	0.960	0.933	43.7	None
0.95	162.0	81.9	1.034	160.0	55.4	0.962	0.945	58.1	2.7
0.95	202.5	102.4	1.050	199.5	61.5	0.963	0.956	72.4	10.9

6.2.3.3 GI-2025-08

At the full 199 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 72.2 MVAR produced (0.940 p.f. lag) to -72.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.892 lag (producing) and 0.892 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-14 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus. A 5 MVAR capacitor bank was included in the application data and is compared to the required reactive power.

At the full 199 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. An additional 6 MVAR capacitor may be required. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 6-14: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-08, Project Size: 199 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.892 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	0.0	1.3	1.050	-----	0.0	None
1.05	40.5	-20.5	1.033	40.4	-20.9	1.048	0.888	-14.7	None
1.05	81.0	-41.0	1.012	80.5	-46.8	1.045	0.864	-29.2	None
1.05	121.5	-61.4	0.989	120.3	-77.2	1.042	0.842	-43.7	None
1.05	162.0	-81.9	0.961	159.7	-112.7	1.038	0.817	-58.0	None
1.05	202.5	-102.4	0.928	198.7	-154.8	1.033	0.789	-72.1	None
0.950 POI Voltage at 0.892 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	1.1	0.950	-----	0.0	None
0.95	40.5	20.5	0.976	40.4	19.6	0.954	0.899	14.7	None
0.95	81.0	41.0	0.997	80.5	34.6	0.957	0.919	29.2	None
0.95	121.5	61.4	1.017	120.4	46.5	0.960	0.933	43.7	None
0.95	162.0	81.9	1.034	160.0	55.4	0.962	0.945	58.1	2.7
0.95	202.5	102.4	1.050	199.5	61.5	0.963	0.956	72.4	10.9

6.2.3.4 GI-2025-11

At the full 199 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 72.2 MVAR produced (0.940 p.f. lag) to -72.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR

to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.894 lag (producing) and 0.894 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-15 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus. A 7.5 MVAR capacitor bank was included in the application data and is compared to the required reactive power.

At the full 199 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. An additional 2 MVAR capacitor may be required. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 6-15: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-11, Project Size: 199 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.894 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.052	0.0	1.4	1.051	-----	0.0	None
1.05	40.6	-20.4	1.033	40.5	-20.7	1.047	0.890	-14.7	None
1.05	81.2	-40.8	1.010	80.7	-46.5	1.042	0.867	-29.3	None
1.05	121.8	-61.1	0.984	120.6	-76.5	1.036	0.845	-43.8	None
1.05	162.4	-81.5	0.954	160.1	-111.7	1.028	0.820	-58.1	None
1.05	203.0	-101.9	0.917	199.1	-153.9	1.018	0.791	-72.3	None
0.950 POI Voltage at 0.894 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.952	0.0	1.1	0.951	-----	0.0	None
0.95	40.6	20.4	0.978	40.5	19.6	0.958	0.900	14.7	None
0.95	81.2	40.8	1.002	80.7	34.8	0.963	0.918	29.3	None
0.95	121.8	61.1	1.023	120.7	46.9	0.968	0.932	43.8	None
0.95	162.4	81.5	1.041	160.5	56.2	0.971	0.944	58.3	2.1
0.95	203.0	101.9	1.057	200.1	63.0	0.974	0.954	72.6	9.6

6.2.3.5 GI-2025-24

At the full 225 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 81.7 MVAR produced (0.940 p.f. lag) to -81.7 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.865 lag (producing) and 0.927 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-16 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus. Two 10 MVAR capacitor banks were included in the application data and are compared to the required reactive power.

At the full 225 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus with the inclusion of the two 10 MVAR capacitor banks. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 3 MVAR reactor bank may be required.

Table 6-16: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-24, Project Size: 225 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.927 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.053	0.0	4.8	1.050	-----	0.0	-2.8
1.05	45.8	-18.5	1.037	45.7	-15.9	1.050	0.945	-16.6	-0.7
1.05	91.6	-37.0	1.019	91.0	-41.2	1.050	0.911	-33.0	None
1.05	137.4	-55.5	0.999	136.1	-71.8	1.050	0.884	-49.4	None
1.05	183.2	-74.0	0.974	180.7	-108.7	1.049	0.857	-65.6	None
1.05	229.0	-92.5	0.945	224.8	-153.3	1.049	0.826	-81.6	None
0.950 POI Voltage at 0.865 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.952	0.0	3.9	0.950	-----	0.0	-1.9
0.95	45.8	26.5	0.981	45.6	27.7	0.950	0.855	16.6	None
0.95	91.6	53.0	1.006	90.9	46.3	0.951	0.891	33.0	None
0.95	137.4	79.6	1.028	135.9	60.6	0.951	0.913	49.3	None
0.95	183.2	106.1	1.048	180.7	70.8	0.951	0.931	65.6	None
0.95	229.0	132.6	1.066	225.2	77.3	0.951	0.946	81.7	4.4

6.2.3.6 GI-2025-26

At the full 199 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 72.2 MVAR produced (0.940 p.f. lag) to -72.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.867 lag (producing) and 0.94 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by

the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-17 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 199 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 4 MVAR reactor bank may be required.

Table 6-17: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-26, Project Size: 199 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.94 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.054	0.0	5.6	1.052	-----	0.0	-3.6
1.05	40.8	-14.8	1.045	40.6	-10.4	1.049	0.969	-14.7	-4.3
1.05	81.6	-29.5	1.034	80.9	-28.9	1.046	0.942	-29.4	-0.5
1.05	122.4	-44.2	1.021	120.7	-50.1	1.041	0.924	-43.8	None
1.05	163.2	-59.0	1.006	160.1	-74.3	1.035	0.907	-58.1	None
1.05	204.0	-73.8	0.989	198.9	-102.0	1.029	0.890	-72.2	None
0.950 POI Voltage at 0.867 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.953	0.0	4.6	0.952	-----	0.0	-2.6
0.95	40.8	23.5	0.981	40.5	26.5	0.959	0.837	14.7	None
0.95	81.6	46.9	1.007	80.6	45.5	0.966	0.871	29.3	None
0.95	122.4	70.4	1.030	120.4	62.0	0.971	0.889	43.7	None
0.95	163.2	93.8	1.051	159.7	76.3	0.975	0.902	58.0	None
0.95	204.0	117.3	1.070	198.8	88.4	0.979	0.914	72.2	None

6.2.3.7 GI-2025-28

At the full 110 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 39.9 MVAR produced (0.940 p.f. lag) to -39.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.869 lag (producing) and 0.869 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-18 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 110 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. An additional 7 MVAR capacitor may be required. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 6-18: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-28, Project Size: 110 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.869 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.052	0.0	1.1	1.050	-----	0.0	None
1.05	22.4	-12.8	1.027	22.3	-13.0	1.050	0.864	-8.1	None
1.05	44.8	-25.6	0.998	44.5	-30.2	1.050	0.828	-16.2	None
1.05	67.2	-38.3	0.963	66.5	-51.0	1.050	0.794	-24.1	None
1.05	89.6	-51.1	0.923	88.2	-76.6	1.050	0.755	-32.0	None
1.05	112.0	-54.8	0.900	109.9	-94.6	1.050	0.758	-39.9	None
0.950 POI Voltage at 0.869 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.952	0.0	0.9	0.950	-----	0.0	None
0.95	22.4	12.8	0.981	22.3	12.2	0.950	0.878	8.1	None
0.95	44.8	25.6	1.006	44.5	20.9	0.950	0.905	16.2	None
0.95	67.2	38.3	1.029	66.6	27.2	0.950	0.926	24.2	None
0.95	89.6	51.1	1.049	88.5	31.4	0.950	0.942	32.1	0.7
0.95	112.0	63.9	1.066	110.3	33.7	0.950	0.956	40.0	6.3

6.2.3.8 GI-2025-29 Solar

At the full 300 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 108.9 MVAR produced (0.940 p.f. lag) to -108.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.889 lag (producing) and 0.889 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-19 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 300 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 23 MVAR capacitor may be required. At 0 MW, the Project's collector system produced minimal reactive power, which meets the the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

**Table 6-19: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-2025-29 Solar, Project Size: 300 MW**

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.889 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.050	0.0	0.5	1.050	-----	0.0	None
1.05	61.0	-31.4	1.029	60.8	-33.9	1.048	0.873	-22.1	None
1.05	122.0	-62.9	1.004	121.2	-75.0	1.044	0.851	-44.0	None
1.05	183.0	-94.3	0.975	181.2	-123.9	1.040	0.826	-65.8	None
1.05	244.0	-125.8	0.940	240.6	-182.7	1.035	0.796	-87.3	None
1.05	305.0	-154.1	0.900	299.2	-250.6	1.029	0.767	-108.6	None
0.950 POI Voltage at 0.889 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.950	0.0	0.4	0.950	-----	0.0	None
0.95	61.0	31.4	0.978	60.8	28.5	0.954	0.905	22.1	None
0.95	122.0	62.9	1.001	121.3	50.7	0.957	0.923	44.0	None
0.95	183.0	94.3	1.022	181.4	67.4	0.960	0.937	65.8	None
0.95	244.0	125.8	1.040	241.2	79.3	0.962	0.950	87.5	8.2
0.95	305.0	157.2	1.057	300.8	86.6	0.963	0.961	109.2	22.6

6.2.3.9 GI-2025-29 Wind

At the full 300 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 108.9 MVAR produced (0.940 p.f. lag) to -108.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.863 lag (producing) and 0.939 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 6-20 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 300 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 2 MVAR capacitor may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 7 MVAR reactor bank may be required.

**Table 6-20: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-2025-29 Wind, Project Size: 300 MW**

P, Q, V at Gen Bus				Net P, Q, V, PF at XFMR HV Bus					
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Fixed Voltage at POI Bus	P.Gen (MW)	Q.Qen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.939 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.055	0.0	8.5	1.051	-----	0.0	-6.5
1.05	61.0	-22.4	1.039	60.8	-16.8	1.049	0.964	-22.1	-5.3
1.05	122.0	-44.8	1.020	121.3	-48.3	1.047	0.929	-44.0	None
1.05	183.0	-67.2	0.997	181.2	-87.1	1.044	0.901	-65.8	None
1.05	244.0	-89.6	0.969	240.7	-134.5	1.040	0.873	-87.4	None
1.05	305.0	-112.0	0.935	299.4	-193.1	1.035	0.840	-108.7	None
0.950 POI Voltage at 0.863 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.954	0.0	7.0	0.951	-----	0.0	-5.0
0.95	61.0	35.7	0.987	60.8	39.0	0.955	0.842	22.1	None
0.95	122.0	71.4	1.016	121.1	64.2	0.959	0.884	44.0	None
0.95	183.0	107.1	1.041	181.1	83.6	0.961	0.908	65.7	None
0.95	244.0	142.8	1.063	240.7	97.7	0.964	0.927	87.4	None
0.95	305.0	178.5	1.083	300.0	106.9	0.965	0.942	108.9	2.0

6.3 Transient Stability Analysis

6.3.1 Cluster Area Assumptions

1. The equivalent generators were modeled with data provided by the customer and in accordance with the WECC approved model list.
2. The collector systems, transformers, and generators were modeled with the same parameters as during steady-state analysis.

6.3.2 Methodology

Transient stability was evaluated as follows:

1. The 2029 HS and 2029 LS base cases were utilized. All analysis assumed the Network Upgrades identified for Scenario 1 are in service. The NRIS projects were all studied simultaneously. Each ERIS project was studied individually by adding that project to the NRIS transient stability case, redispatching to prevent steady-state overloads as necessary. Contingencies were also studied pre-project for comparison without the Network Upgrades.
2. System stability is observed by monitoring the voltage and relative rotor angles of local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Line faults were typically assumed to be at the midpoint of the line. The corresponding stability contingencies to evaluate the facility's compliance with NERC/WECC criteria for transient stability are listed in Appendix B.

- 4. Unstable contingencies were simulated with the GF out of service, to verify that the Project is the cause of the instability.

6.3.3 Transient Stability Results

Transient stability results identified that some projects do require additional mitigation and are not compliant with the NERC/WECC criteria.

Simulation results for Heavy Summer and Light Summer conditions show that:

- 1. Eight Heavy Summer contingencies cannot be solved by PowerWorld and cause the simulation to crash with the addition of the projects. Three of these contingencies crash pre-project as well, and none of the crashes appear to be driven by the study projects. The contingencies are re-simulated as single-line-to-ground faults, which have appropriate solutions. This is not considered a violation requiring specific action.
- 2. GI-2025-24 exhibits atypical behavior for many contingencies, where reactive power greatly increases after the fault, and then sharply decreases several seconds later well below the original output. While this does not result in a violation, improved dynamic models and EMT studies are recommended.
- 3. GI-2024-26 reactive power output experiences large oscillations for most contingencies, including minor or distant contingencies, demonstrating poor stability. These oscillations are usually but not always damped. In addition, the large voltage swing frequently triggers the 0.85 per unit voltage “freeze” parameter in the provided model, such that the generator maintains massive reactive power consumption for an extended period. Improved dynamic models and EMT studies will be required.
- 4. GI-2025-29 Solar’s vflag setting was set to “0” to enable voltage control,.
- 5. No other projects demonstrate instability.

6.4 Short-Circuit

Short-circuit analysis was performed by the Transmission Provider for three-phase and single-line-to-ground faults at the generating facilities’ points of interconnection. All pre-project and post-project short-circuit analysis includes the addition of all Contingent Facilities. Post-project analysis assumes all projects in this Cluster Area are in service simultaneously, and includes all Network Upgrades identified for Scenario 1.

Table 6-21 shows the results of the bus faults and the network grid Thevenin equivalent impedances. The resultant total fault currents are within planned and existing equipment ratings.

Table 6-21: Short-Circuit Results

	Without Transitional Cluster Area 4 Generation	With All Transitional Cluster Area 4 Generation
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System Condition	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance
GI-2025-03 POI 230 kV Bus Fault	6144	7561	Z1=0.00548+ j0.04149 Z2=0.00287+ j0.0181	9023	10463	Z1=0.00347+ j0.02803 Z2=0.00257+ j0.01639
GI-2025-07 POI 230 kV Bus Fault	6962	8926	Z1=0.00475+ j0.03665 Z2=0.00175+ j0.01244	9659	11800	Z1=0.00315+ j0.02645 Z2=0.00167+ j0.01203
GI-2025-08 POI 230 kV Bus Fault	6962	8926	Z1=0.00475+ j0.03665 Z2=0.00175+ j0.01244	9659	11800	Z1=0.00315+ j0.02645 Z2=0.00167+ j0.01203
GI-2025-11 POI 230 kV Bus Fault	9458	10323	Z1=0.00321+ j0.02661 Z2=0.00304+ j0.01985	10599	11126	Z1=0.00277+ j0.02266 Z2=0.00303+ j0.01936
GI-2025-24 POI 230 kV Bus Fault	7356	7874	Z1=0.00446+ j0.03417 Z2=0.00528+ j0.02721	10483	10921	Z1=0.00288+ j0.02345 Z2=0.0036+ j0.02048
GI-2025-26 POI 230 kV Bus Fault	3937	4734	Z1=0.00777+ j0.06565 Z2=0.00693+ j0.0321	5023	5727	Z1=0.00551+ j0.05093 Z2=0.00687+ j0.03173
GI-2025-28 POI 115 kV Bus Fault	2596	2926	Z1=0.0391+ j0.19082 Z2=0.01362+ j0.1288	3684	3915	Z1=0.02709+ j0.12685 Z2=0.01229+ j0.10633
GI-2025-29 POI 230 kV Bus Fault	4741	5648	Z1=0.00957+ j0.05291 Z2=0.00401+ j0.02761	6909	7676	Z1=0.00532+ j0.03587 Z2=0.00374+ j0.02512

6.5 Contingent Facilities

The following Interconnection Facilities and/or Network Upgrades to the transmission system are Contingent Facilities applicable to this Cluster Area. These are facilities not yet in service which the costs, timing, and study findings in this report are dependent upon, and if delayed or not built, could cause a need for re-studies of the interconnection request or a reassessment of the facilities, costs and timing.

Network Upgrades for higher queued projects are only considered Contingent Facilities if the Network Upgrade is still needed without the higher queued project in service. Network Upgrades identified for NRIS projects are only considered Contingent Facilities for ERIS projects if the Network Upgrade is still needed for the ERIS project alone.

1. Big Sandy – Badger Creek 230 kV Transmission Line

- a. Scope: Construct a 230 kV Badger Creek substation sectionalizing the Henry Lake – Story 230 kV line and construct a new Big Sandy – Badger Creek 230 kV transmission line.
 - b. Responsible Entity: Tri-State
 - c. Planned In-Service Date: March 7, 2028
 - d. Applicable Projects: All NRIS Projects in Scenario 1, 2, 3, or 4
2. Big Sandy – Windtalker – Landsman Creek – Burlington 230 kV Line Uprate
 - a. Scope: Structure replacements on Big Sandy – Windtalker – Landsman Creek – Burlington 230 kV transmission line to allow 100°C Maximum Operating Temperature
 - b. Responsible Entity: Tri-State
 - c. Planned In-Service Date: December 19, 2028
 - d. Applicable Projects: All NRIS Projects in Scenarios 1, 2, 3, or 4, project GI-2025-03 as ERIS
3. Bonny Creek Switch Replacement
 - a. Scope: Replace a 600A switch at Bonny Creek on the Burlington line with a 1200A switch.
 - b. Responsible Entity: Tri-State
 - c. Planned In-Service Date: December 12, 2026
 - d. Applicable Projects: All NRIS Projects in Scenarios 1, 2, 3, or 4
4. Story – GI-2022-29 POI 230 kV Transmission Line
 - a. Scope: Construct a new 230 kV line between Story and the GI-2022-29 POI (“Duck Creek”).
 - b. Responsible Entity: 2024 Transitional Cluster NRIS Projects
 - c. Planned In-Service Date: TBD
 - d. Applicable Projects: All NRIS Projects in Scenarios 1, 2, 3, or 4
5. Wray – North Yuma/Story 230 kV Transmission Line
 - a. Scope: Construct a second North Yuma – Wray or Story – Wray 230 kV line, as identified as a Network Upgrade for each NRIS scenario in this study.
 - b. Responsible Entity: All NRIS Projects in the selected scenario
 - c. Planned In-Service Date: TBD
 - d. Applicable Projects: ERIS project GI-2025-29
6. Note that the planned Boone – Huckleberry 230 kV line, the higher queued Burlington – Bonny Creek – South Fork 115 kV Line Uprate Network Upgrade, and the higher queued Midway – GI-2024-26 POI 230 kV Transmission Line #2 were specifically not identified as contingent facilities.

6.6 Scope, Cost, and Schedule

The cost estimate is broken out into two categories: 1) Interconnection Facilities, which include all equipment installed between the POI at the main bus and the Point of Change of Ownership (PCO) at the line dead-end structure⁹ just outside the POI substation fence, and 2) Network Upgrades

⁹ The Interconnection Customer’s Interconnection Facilities are required to end at a vertically configured full tension monopole deadend structure located outside of the substation fence and approximately 10 feet inside Tri-State’s property line. The vertically configured full tension monopole

consisting of the rest of the facilities installed in the existing POI substation or at other locations to accommodate the interconnection. The estimate includes all site work such as grounding and conduit installation inside the substation.

Note that the IC will be responsible for constructing the radial transmission line from the PCO to the GF site and for providing the primary protection (relaying and interrupting device) for the IC's step-up transformer. Equipment at the POI will only provide backup protection for the IC's main transformer in the event of equipment failure or malfunction at the IC's facility. To facilitate protective relaying and data acquisition, the IC will need to include fiber optic cables (OPGW) on its radial transmission line to provide communication channels for SCADA, metering (real time), and protective relaying.

The IC is responsible for all engineering, procurement and construction of all GF facilities, including any STATCOM type voltage regulation / reactive compensation devices.

All costs are good faith estimates based on assumptions as stated in this Cluster Study Report. All estimates are in 2026 dollars.

It is estimated that it will take approximately 60 months after receiving authorization to proceed to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work. It is also estimated that it may take approximately 84 months after receiving authorization to proceed for the permitting activities and ROW to be completed for transmission line construction, if applicable. It is possible that the Generating facility may be able to operate at some level of generation prior to the completion of the requisite Interconnection Facilities, Network Upgrades, Contingent Facilities, or System Protection Facilities. However, that level of generation is not known at this phase of the study and would be addressed through a Provisional Interconnection Service Request per 5.9.2 of the LGIA.

6.6.1 Network Upgrade Details

Detailed descriptions and costs for every Network Upgrade beyond the POI identified in any scenario are provided below. No single scenario requires every Network Upgrade listed.

Table 6-22: Summary Cost Estimate Details - Network Upgrades Story – Wray 230 kV Line

Element	Description	Cost Est. Millions
Story Substation New 230 kV Line Bay	Add two breaker bays to Story's 230 kV breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. - Two (2) 230 kV power circuit breakers. - Six (6) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$7.56 M

deadend structure shall create zero line angle with the Transmission Providers A-frame deadend structure, unless another location is mutually agreed upon by the parties in writing.

Element	Description	Cost Est. Millions
Wray POI Substation New 230 kV Line Bay	Add one breaker bay to Wray's 230 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M
Construct New Story – Wray 230 kV Line	- Construct 76 miles of 230 kV transmission line with 1272kcmil ACSR "Bittern" conductor - Wood H-Frame	\$104.63 M

Table 6-23: Summary Cost Estimate Details - Network Upgrades North Yuma – Wray 230 kV Line

Element	Description	Cost Est. Millions
North Yuma Substation New 230 kV Line Bay	Add five breaker bays to convert North Yuma's 230 kV 6-breaker ring bus to a 7-position breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. - Five (5) 230 kV power circuit breakers. - Fifteen (15) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$18.88 M
Wray POI Substation New 230 kV Line Bay	Add one breaker bay to Wray's 230 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M
Construct New North Yuma – Wray 230 kV Line	- Construct 31 miles of 230 kV transmission line with 1272kcmil ACSR "Bittern" conductor - Wood H-Frame	\$42.67 M

Table 6-24: Summary Cost Estimate Details - Network Upgrades Burlington – Wray 230 kV Line #2

Element	Description	Cost Est. Millions
Looft Substation New 230 kV Line Bay	Add one breaker bay to Burlington's 230 kV satellite yard's ("Looft") ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M
Wray Substation New 230 kV Line Bay	Add one breaker bay to Wray's 230 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M
Construct New Looft – Wray 230 kV Line	- Construct 72 miles of 230 kV transmission line with 1272kcmil ACSR "Bittern" conductor - Wood H-Frame	\$99.12 M

Table 6-25: Summary Cost Estimate Details - Network Upgrades GI-2024-26 POI – GI-2022-29 POI 230 kV Line

Element	Description	Cost Est. Millions
GI-2024-26 POI Substation New 230 kV Line Bay	Add seven breaker bays to convert GI-2024-26 POI's 230 kV 5-breaker ring bus to an 8-position breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. Cost is shared with the GI-2024-26 POI – Lincoln #2 and Midway – GI-2024-26 POI #3 230 kV lines: - Seven (7) 230 kV power circuit breakers. - Twenty-one (21) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$8.82 M
GI-2022-29 POI Substation New 230 kV Line Bay Scenarios 1 and 2	Add seven breaker bays to convert GI-2022-29 POI's 230 kV 4-breaker ring bus to a 7-position breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. Cost is shared with the GI-2022-29 POI – Windtalker 230 kV line and GI-2025-29: Seven (7) 230 kV power circuit breakers.	\$8.82 M

Element	Description	Cost Est. Millions
	- Twenty (20) 230 kV 3-ph gang disconnect switches and associated structures.. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	
GI-2022-29 POI Substation New 230 kV Line Bay Scenario 3	Add one breaker bay to GI-2022-29 POI's 230 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M
Construct New GI-2024-26 POI – GI-2022-29 POI 230 kV Line	- Construct 43 miles of 230 kV transmission line with 1272kcmil ACSR "Bittern" conductor - Wood H-Frame	\$59.20 M

Table 6-26: Summary Cost Estimate Details - Network Upgrades GI-2025-28 POI – Willow Creek 115 kV Line

Element	Description	Cost Est. Millions
GI-2025-28 POI Substation New 115 kV Line Bay	Add one breaker bay to GI-2025-28 POI's 115 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 115 kV power circuit breakers. - Three (3) 115 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$2.62 M
Willow Creek POI Substation New 115 kV Line Bay	Add two breaker bays to Willow Creek's 115 kV bus to convert it from a star bus to a 4-position ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 115 kV power circuit breakers. - Three (3) 115 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications.	\$4.20 M

Element	Description	Cost Est. Millions
	Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	
Construct New GI-2025-28 POI – Willow Creek 115 kV Line	- Construct 15 miles of 115 kV transmission line with 795kcmil ACSR “Drake” conductor - Wood H-Frame	\$26.81 M

Table 6-27: Summary Cost Estimate Details - Network Upgrades GI-2022-29 POI – Windtalker 230 kV Line #2

Element	Description	Cost Est. Millions
GI-2022-29 POI Substation New 230 kV Line Bay	Add seven breaker bays to convert GI-2022-29 POI’s 230 kV 4-breaker ring bus to a 7-position breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. Cost is shared with the GI-2024-26 – GI-2022-29 POI 230 kV line and GI-2025-29: - Seven (7) 230 kV power circuit breakers. - Twenty (20) 230 kV 3-ph gang disconnect switches and associated structures.. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$8.82 M
Windtalker Substation New 230 kV Line Bay	Add one breaker bay to Windtalker’s 230 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M
Construct New GI-2022-29 POI – Windtalker 230 kV Line	- Construct 20 miles of 230 kV transmission line with 1272kcmil ACSR “Bittern” conductor - Wood H-Frame	\$31.28 M

Table 6-28: Summary Cost Estimate Details - Network Upgrades Midway – GI-2024-26 POI 230 kV Line #3

Element	Description	Cost Est. Millions
Midway Substation New 230 kV Line Bay	Add two breaker bays to Midway’s 230 kV breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. - Two (2) 230 kV power circuit breakers. - Six (6) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel.	\$7.56 M

Element	Description	Cost Est. Millions
	- Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	
GI-2024-26 POI Substation New 230 kV Line Bay	Add seven breaker bays to convert GI-2024-26 POI's 230 kV 5-breaker ring bus to an 8-position breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. Cost is shared with the GI-2024-26 POI – Lincoln #2 and GI-2024-26 POI – GI-2022-29 230 kV lines: - Seven (7) 230 kV power circuit breakers. - Twenty-one (21) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$8.82 M
Construct New Midway – GI-2024-26 POI 230 kV Line	- Construct 52 miles of 230 kV transmission line with 1272kcmil ACSR “Bittern” conductor - Wood H-Frame	\$71.59 M

Table 6-29: Summary Cost Estimate Details - Network Upgrades
GI-2024-26 POI – Lincoln 230 kV Line #2

Element	Description	Cost Est. Millions
GI-2024-26 POI Substation New 230 kV Line Bay	Add seven breaker bays to convert GI-2024-26 POI's 230 kV 5-breaker ring bus to an 8-position breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. Cost is shared with the Midway – GI-2024-26 POI #3 and GI-2024-26 POI – GI-2022-29 230 kV lines: - Seven (7) 230 kV power circuit breakers. - Twenty-one (21) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$8.82 M
Lincoln Substation New 230 kV Line Bay	Add one breaker bay to Lincoln's 230 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (1) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications.	\$3.78 M

Element	Description	Cost Est. Millions
	Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	
Construct New GI-2024-26 POI – Lincoln 230 kV Line	- Construct 18 miles of 230 kV transmission line with 1272kcmil ACSR “Bittern” conductor - Wood H-Frame	\$34.69 M

**Table 6-30: Summary Cost Estimate Details - Network Upgrades
Fuller 230/115 kV Transformer #3**

Element	Description	Cost Est. Millions
Fuller Substation New 230 kV Line Bay	Add two circuit breakers to Fuller’s 230 kV breaker-and-a-half bus. Scope includes typical testing, checkout, and commissioning. - Two (2) 230 kV power circuit breakers. - Six (6) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$7.58 M
Fuller Substation New 115 kV Line Bay	Add one breaker bay to Fuller’s 115 kV ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 115 kV power circuit breakers. - Three (3) 115 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$2.10 M
New Fuller Transformer	One (1) 230/115 kV, 150 MVA transformer	\$8.75 M

Table 6-31: Summary Cost Estimate Details - Network Upgrades Other Network Upgrades

Element	Description	Cost Est. Millions
Reconductor Fuller – Vollmer Tap 115 kV	2.5 miles of 115 kV 795 kcmil ACSR “DRAKE” conductor transmission line - Wood H-Frame	\$5.27 M
Reconductor Vollmer Tap – Black Squirrel 115 kV	3 miles of 115 kV 795 kcmil ACSR “Drake” conductor transmission line - Wood H-Frame	\$6.33 M

Element	Description	Cost Est. Millions
Gresham 115 kV Switch Replacements	Replace three (3) 115 kV switches to improve the rating of Fox Run – Gresham – Vollmer Tap 115 kV	\$0.46 M
Reconductor Bonny Creek – South Fork 115 kV	5 miles of 115 kV 795 kcmil ACSR “Drake” conductor transmission line - Wood H-Frame	\$10.55 M
Improve South Fork – Idalia – Vernon Switch 115 kV	21 miles of 115 kV 477 kcmil ACSR “Hawk” conductor transmission line - Perform structure replacements and phase raising to increase Maximum Operating Temperature to 100°C - Cost of full line rebuild assumed - Wood H-Frame	\$22.16 M
Willow Creek Meter Upgrade	Replace metering equipment at Willow Creek to improve the rating of the Lamso – Willow Creek 115 kV line.	Minimal

6.6.2 NRIS Projects Cost Allocation

For Scenario 1, Network Upgrades beyond the POI are cost allocated to all NRIS projects based on their MW contribution to overloads mitigated by the project. Only a single contingency and overloaded element is considered for each Network Upgrade. The Light Summer case is used for all MW contributions. MW contributions for lines or transformers being upgraded assume all other Network Upgrades are in service. Cost allocation for each project and Network Upgrade is shown in the table below

For Scenarios 2, 3, and 4, there is only one project studied as NRIS, all identified Network Upgrades are assigned to that project. The specific Network Upgrades are listed in the cost estimate section for that project.

In addition to the Network Upgrades with identified costs, the customers will need to consult with several other entities to determine the mitigation for overloads on their equipment. The required consultations per scenario are listed below.

- Scenario 1:
 - Consult with WAPA to determine the mitigation for overloads on:
 - Prospect Valley – Lost Creek Tap 115 kV
 - Eckley – East Yuma Tap 115 kV
 - Consult with PSCO to determine the mitigation for overloads on:
 - Comanche 345/230 kV transformers #3 and #4
 - Midway – Fuller 230 kV
 - Ray Lewis – Buena Vista Tap 115 kV
- Scenario 2:
 - Consult with PSCO to determine the mitigation for overloads on:
 - Comanche 345/230 kV transformers #3 and #4
 - Ray Lewis – Buena Vista Tap 115 kV
- Scenario 3:

- Consult with PSCO to determine the mitigation for overloads on:
 - Comanche 345/230 kV transformers #3 and #4
- Consult with WAPA to determine the mitigation for overloads on:
 - Deering Lake – Otis 115 kV
- Scenario 4:
 - Consult with PSCO to determine the mitigation for overloads on:
 - Comanche 345/230 kV transformers #3 and #4
 - Consult with WAPA to determine the mitigation for overloads on:
 - Deering Lake – Otis 115 kV

Table 6-32: Eastern Colorado Cluster Area MW Contribution and Cost Allocation

Overloaded Element (Constraint)	Contingency	GI-2025- 03	GI-2025- 24	GI-2025- 28
Deering Lake – East Yuma 115 kV	North Yuma – Wray 230 kV	22.73	11.35	6.94
Percent Allocation		0.5543	0.2766	0.1691
Cost Allocation (Story – Wray 230 kV Line #2 = \$115.97 M)		\$64.28 M	\$32.08 M	\$19.61 M
Bonny Creek – South Fork 115 kV	Burlington – Wray 230 kV	39.58	19.29	13.12
Percent Allocation		0.5498	0.268	0.1822
Cost Allocation (Burlington – Wray 230 kV Line #2 = \$106.68 M)		\$58.65 M	\$28.59 M	\$19.44 M
GI-2022-29 POI – Big Sandy 230 kV	GI-2022-29 POI – Story 230 kV	142.54	130.96	17.66
Percent Allocation		0.4895	0.4498	0.0607
Cost Allocation (GI-2024-26 POI – GI-2022-29 POI 230 kV Line = \$76.84 M)		\$37.61 M	\$34.56 M	\$4.66 M
Vilas – Stonington 115 kV	GI-2025-28 POI – Lamar 115 kV	0	0	110
Percent Allocation		0.0	0.0	1
Cost Allocation (GI-2025-28 POI – Willow Creek 115 kV Line = \$33.63 M)		\$0 M	\$0 M	\$33.63 M
GI-2022-29 POI – Windtalker 230 kV Line #1	Burlington – Landsman Creek 230 kV	300.18	0	0
Percent Allocation		1.0	0.0	0.0
Cost Allocation (GI-2022-29 POI – Windtalker 230 kV Line #2 = \$43.88 M)		\$43.88 M	\$0 M	\$0 M
GI-2024-26 POI – Crosspoint 230 kV	Midway – GI-2024-26 POI 230 kV Line #2	45.35	41.33	2.65
Percent Allocation		0.5076	0.4627	0.0297
Cost Allocation (Midway – GI-2024-26 POI 230 kV Line #3 = \$87.97 M)		\$44.65 M	\$40.7 M	\$2.61 M
GI-2024-26 POI – Lincoln 230 kV Line #1	Badger Creek – Big Sandy 230 kV	75.05	68.49	7.0
Percent Allocation		0.4986	0.4549	0.0465
Cost Allocation (GI-2024-26 POI – Lincoln 230 kV Line #2 = \$47.29 M)		\$23.58 M	\$21.51 M	\$2.2 M
Fuller 230/115 kV T1	Fuller 230/115 kV T2	1.51	1.23	0.65
Percent Allocation		0.445	0.3641	0.1909
Cost Allocation (Fuller 230/115 kV Transformer #3 = \$18.41 M)		\$8.19 M	\$6.7 M	\$3.51 M
Black Squirrel – Vollmer Tap 115 kV	Daniels Park – Fuller 230 kV	6.53	5.32	2.62
Percent Allocation		0.4514	0.3678	0.1808
Cost Allocation (Rebuild Fuller – Vollmer Tap – Black Squirrel 115 kV Line = \$11.6 M)		\$5.24 M	\$4.27 M	\$2.1 M

Gresham – Fox Run 115 kV	Daniels Park – Fuller 230 kV	6.0	4.89	2.39
Percent Allocation		0.4518	0.3679	0.1803
Cost Allocation (Gresham Switch Replacement = \$0.46 M)		\$0.21 M	\$0.17 M	\$0.08 M
TOTAL NETWORK UPGRADE COST ALLOCATED		\$286.29 M	\$168.58 M	\$87.84 M

6.6.3 GI-2025-03 Costs

NRIS Scenario 1 Costs

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$286.29 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$291.37 M

NRIS Scenario 2 Costs

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	
• Story – Wray 230 kV #2	\$115.97 M
• Burlington – Wray 230 kV #2	\$106.68 M
• GI-2024-26 POI – GI-2022-29 POI 230 kV	\$76.84 M
• GI-2022-29 POI 230 kV – Windtalker 230 kV #2	\$43.88 M
• Midway – GI-2024-26 POI 230 kV #3	\$87.97 M
• GI-2024-26 POI – Lincoln 230 kV #2	\$47.29 M
• Fuller 230/115 kV #3 transformer	\$18.41 M
• Fuller – Vollmer Tap – Black Squirrel 115 kV Rebuild	\$11.60 M
• Gresham 115 kV Switch Replacements	\$0.46 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$514.18 M

ERIS Costs

Interconnection Facilities Costs:	\$1.30 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$5.08 M

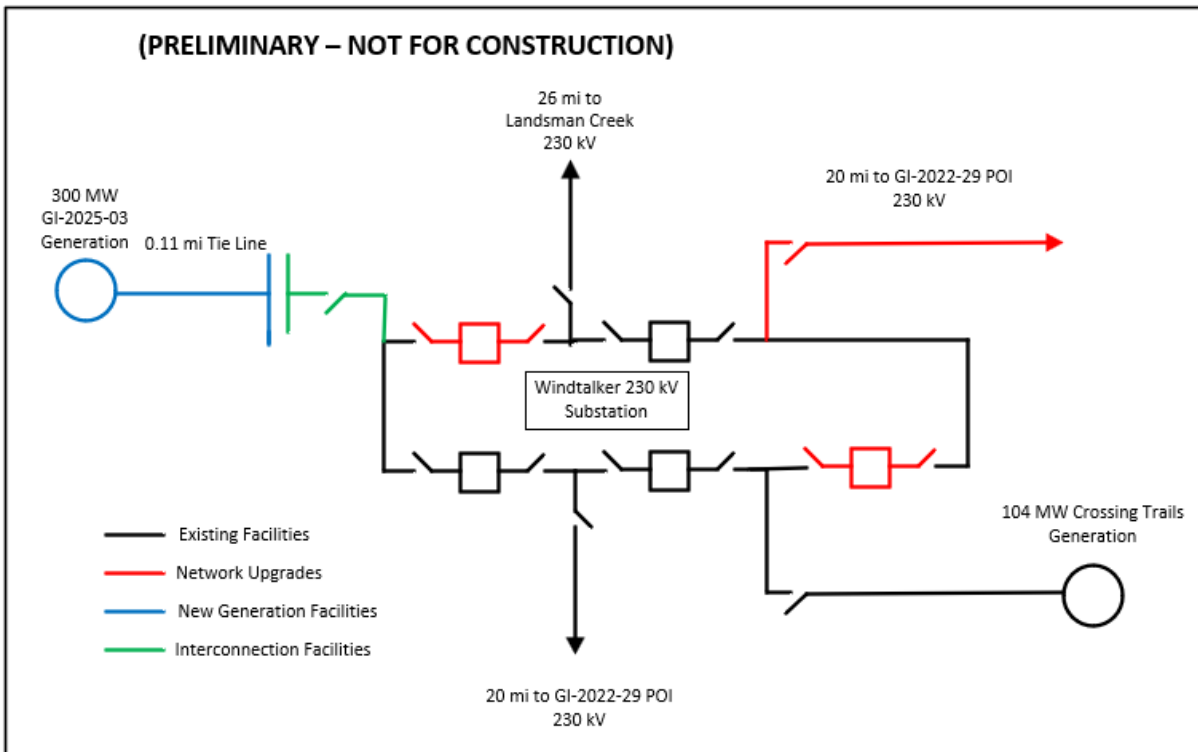


Figure 6-2: Windtalker 230 kV Substation One-Line Diagram

Table 6-33: Summary Cost Estimate Details - Interconnection Facilities GI-2025-03

Element	Description	Cost Est. Millions
Windtalker Substation 230 kV line termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 230 kV A-frame dead-end structure • One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the Lincoln 230 kV substation. • One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. • Three (3) 230 kV surge arresters (280 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU.	\$1.30 M

Element	Description	Cost Est. Millions
	Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	

Table 6-34: Summary Cost Estimate Details - Network Upgrades GI-2025-03

Element	Description	Cost Est. Millions
Windtalker Substation New 230 kV Line Bay	Add one additional breaker bay to Windtalker's 230 kV ring bus (see Figure 6-2, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. • One (1) 230 kV power circuit breakers. • Two (2) 230 kV 3-ph gang disconnect switches and associated structures. • Circuit breaker station control panel. • Digital Fault Recorder and associated panel. • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M

6.6.4 GI-2025-07 Costs

ERIS Scenario 1, 2, 3, and 4 Costs

Interconnection Facilities Costs:	\$0.00 M
Network Upgrade Costs, Interconnection	\$0.00 M
TOTAL Costs (2026 dollars) for Interconnection:	\$0.00 M

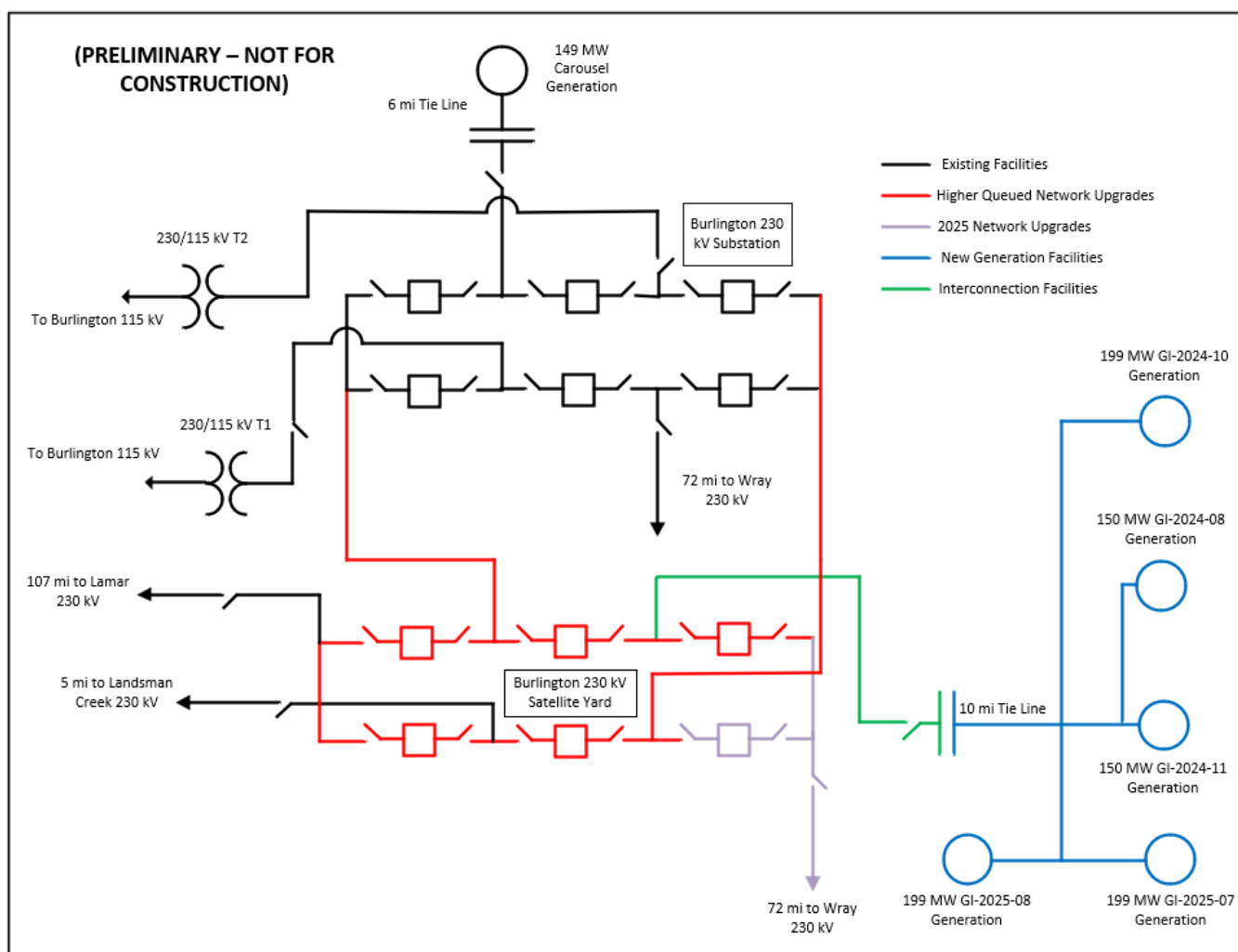


Figure 6-3: Burlington and Looff 230 kV Substations One-Line Diagram

Table 6-35: Summary Cost Estimate Details - Interconnection Facilities GI-2025-07

Element	Description	Cost Est. Millions
Looff Substation 230 kV line termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 230 kV A-frame dead-end structure • One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the Lincoln 230 kV substation. • One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. • Three (3) 230 kV surge arresters (280 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$0.00 M

Table 6-36: Summary Cost Estimate Details - Network Upgrades GI-2025-07

Element	Description	Cost Est. Millions
Looff Substation New 230 kV Line Bay	Add one breaker bay to Burlington's 230 kV satellite yard's ("Looff") ring bus (see Figure 6-3, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. The breaker bay is shared with GI-2025-08, GI-2024-08, GI-2024-10, and GI-2024-11, such that there is no additional cost: • One (1) 230 kV power circuit breaker. • Two (2) 230 kV 3-ph gang disconnect switches and associated structures. • Circuit breaker station control panel. • Digital Fault Recorder and associated panel. • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$0.00 M

6.6.5 GI-2025-08 Costs

ERIS Scenario 1, 2, 3, and 4 Costs

Interconnection Facilities Costs:	\$0.00 M
Network Upgrade Costs, Interconnection	\$0.00 M

TOTAL Costs (2026 dollars) for Interconnection:

\$0.00 M

Table 6-37: Summary Cost Estimate Details - Interconnection Facilities GI-2025-08

Element	Description	Cost Est. Millions
Looff Substation 230 kV line termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 230 kV A-frame dead-end structure • One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the Lincoln 230 kV substation. • One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. • Three (3) 230 kV surge arresters (280 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$0.00 M

Table 6-38: Summary Cost Estimate Details - Network Upgrades GI-2025-08

Element	Description	Cost Est. Millions
Loeff Substation New 230 kV Line Bay	Add one breaker bay to Burlington’s 230 kV satellite yard’s (“Loeff”) ring bus (see Figure 6-3, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. The breaker bay is shared with GI-2025-08, GI-2024-08, GI-2024-10, and GI-2024-11, such that there is no additional cost: • One (1) 230 kV power circuit breaker. • Two (2) 230 kV 3-ph gang disconnect switches and associated structures. • Circuit breaker station control panel. • Digital Fault Recorder and associated panel. • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$0.00 M

6.6.6 GI-2025-11 Costs

ERIS Costs

Interconnection Facilities Costs:	\$1.30 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$ 5.08 M

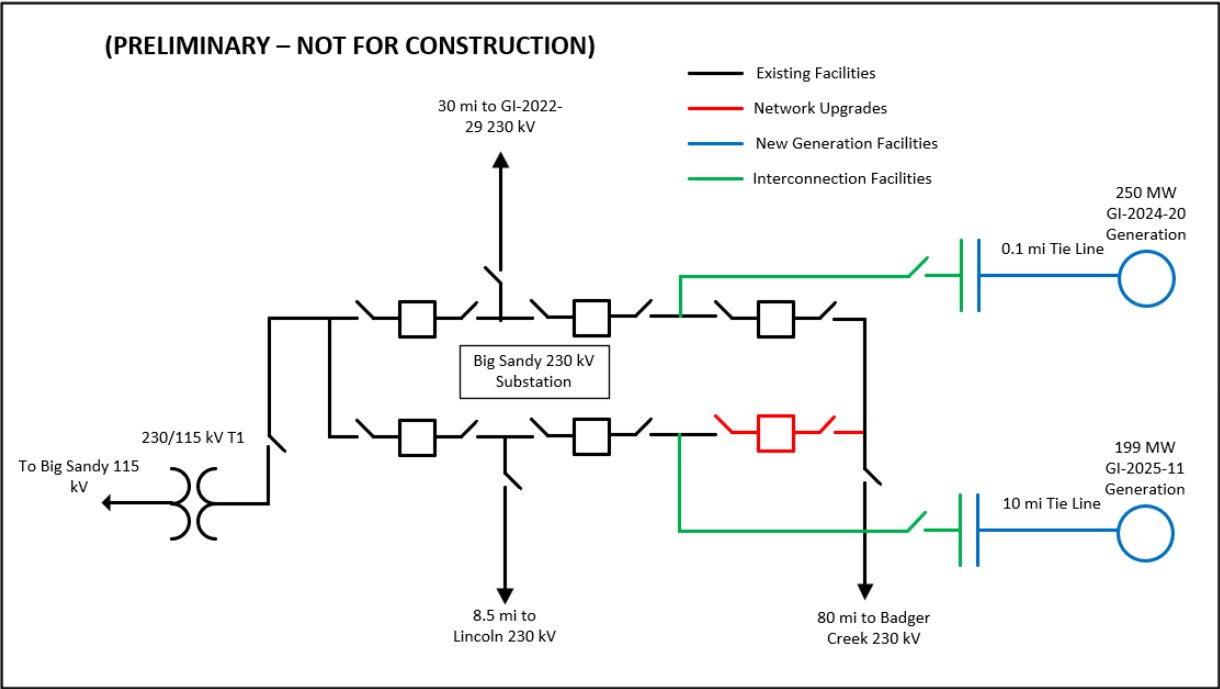


Figure 6-4: Big Sandy 230 kV Substation One-Line Diagram

Table 6-39: Summary Cost Estimate Details - Interconnection Facilities GI-2025-11

Element	Description	Cost Est. Millions
Big Sandy Substation 230 kV line termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 230 kV A-frame dead-end structure - One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the new substation. - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters.	\$1.30 M

Element	Description	Cost Est. Millions
	- Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. - Three (3) 230 kV surge arresters (280 kV MCOV or as required). - Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	

Table 6-40: Summary Cost Estimate Details - Network Upgrades GI-2025-11

Element	Description	Cost Est. Millions
Big Sandy Substation New 230 kV Line Bay	Add one additional breaker bay to Big Sandy's 230 kV ring bus (see Figure 6-4, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Two (2) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M

6.6.7 GI-2025-24 Costs

NRIS Scenario 1 Costs

Interconnection Facilities Costs:	\$1.30 M
Network Upgrade Costs, Cost Allocation	\$168.58 M
Network Upgrade Costs, Interconnection	\$8.82 M
TOTAL Costs (2026 dollars) for Interconnection:	\$178.70 M

ERIS Scenario 2 Costs

Interconnection Facilities Costs:	\$1.30 M
Network Upgrade Costs, Interconnection	\$8.82 M
TOTAL Costs (2026 dollars) for Interconnection:	\$10.12 M

NRIS Scenario 3 Costs

Interconnection Facilities Costs:	\$1.30 M
Network Upgrade Costs, Cost Allocation	
- North Yuma – Wray 230 kV #2 - GI-2024-26 POI – GI-2022-29 POI 230 kV - Midway – GI-2024-26 POI 230 kV #3 - GI-2024-26 POI – Lincoln 230 kV #2 - Fuller 230/115 kV #3 transformer - Fuller – Vollmer Tap – Black Squirrel 115 kV Rebuild	\$65.33 M \$71.80 M \$87.97 M \$47.29 M \$18.41 M \$11.60 M

• Gresham 115 kV Switch Replacements	\$0.46 M
• Bonny Creek – South Fork 115 kV Rebuild	\$10.55 M
Network Upgrade Costs, Interconnection	\$13.25 M
TOTAL Costs (2026 dollars) for Interconnection:	\$318.49 M

ERIS Scenario 4 Costs

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$ 5.08 M

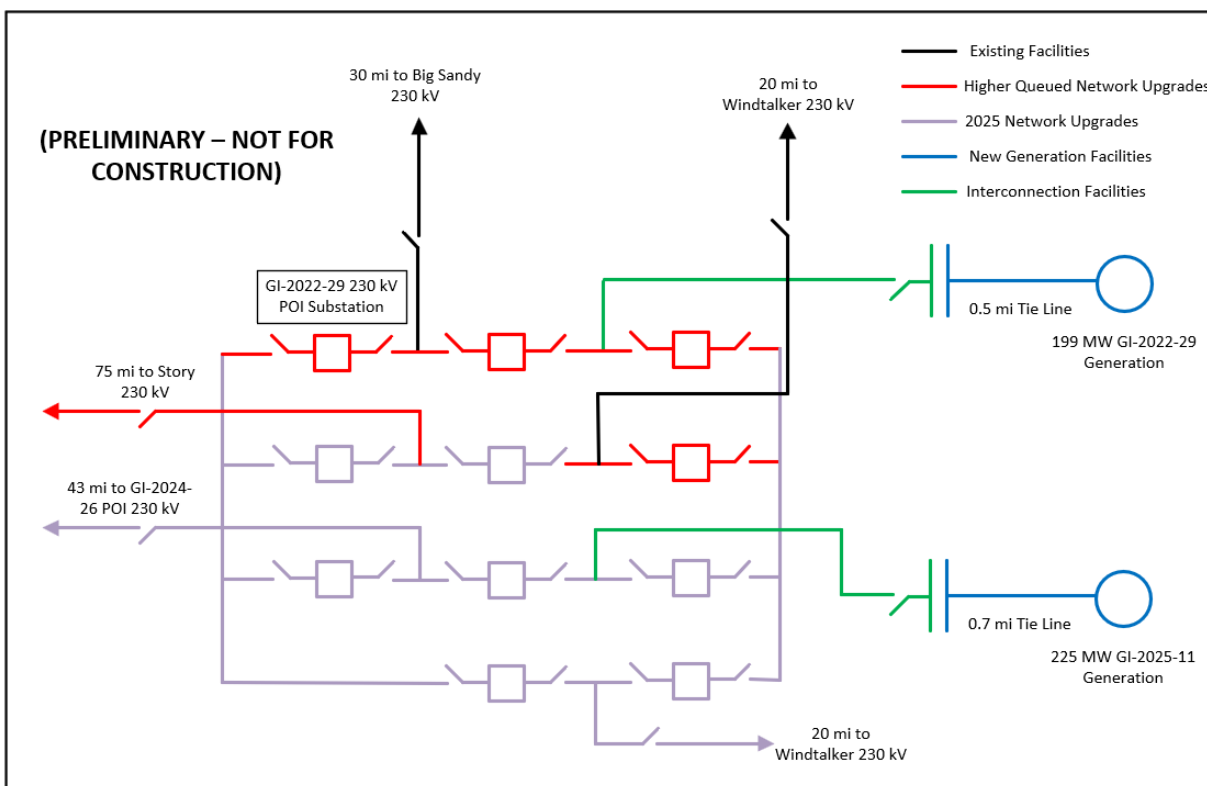


Figure 6-5: GI-2022-29 POI 230 kV Substation One-Line Diagram, Scenarios 1 and 2

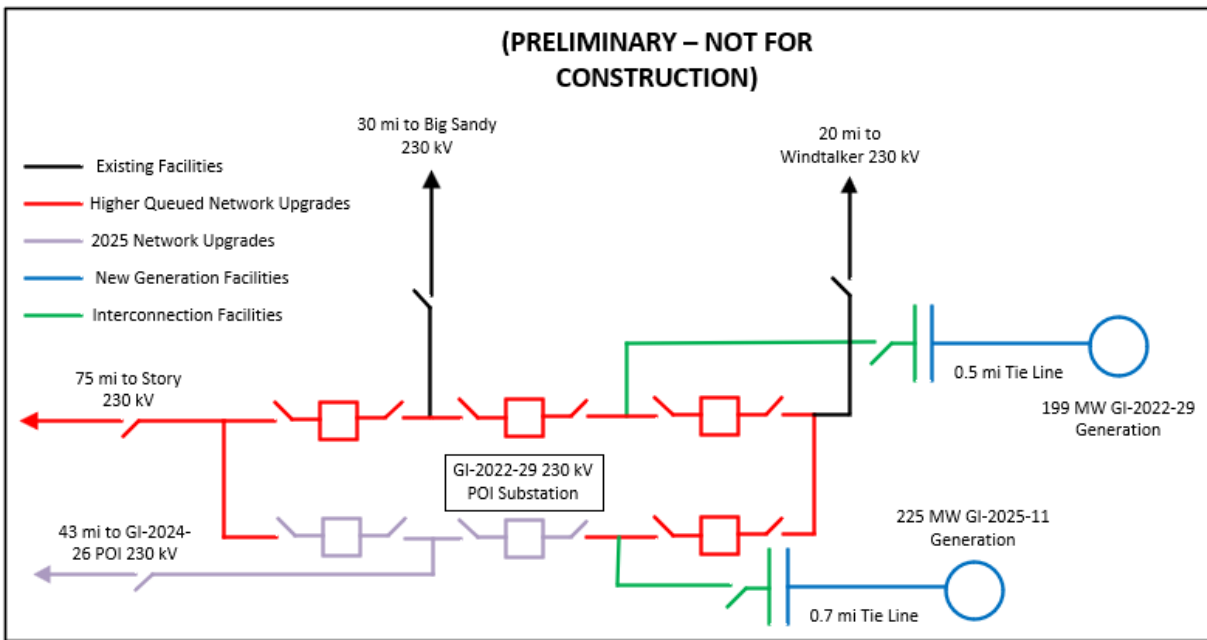


Figure 6-6: GI-2022-29 POI 230 kV Substation One-Line Diagram, Scenarios 3 and 4

Table 6-41: Summary Cost Estimate Details - Interconnection Facilities GI-2025-24

Element	Description	Cost Est. Millions
GI-2022-29 POI Substation 230 kV line termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 230 kV A-frame dead-end structure • One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the Burlington substation. • One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. • Three (3) 230 kV surge arresters (280 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$1.30 M

Table 6-42: Summary Cost Estimate Details - Network Upgrades GI-2025-24

Element	Description	Cost Est. Millions
GI-2022-29 POI Substation New 230 kV Line Bay Scenarios 1 and 2	Add seven breaker bays to convert GI-2022-29 POI's 230 kV 4-breaker ring bus to a 7-position breaker-and-a-half bus (see Figure 6-5, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. Cost is shared with the GI-2024-26 POI – GI-2022-29 POI and GI-2022-29 POI – Windtalker 230 kV lines: - Seven (7) 230 kV power circuit breakers. - Twenty (20) 230 kV 3-ph gang disconnect switches and associated structures.. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$8.82 M
GI-2022-29 POI Substation New 230 kV Line Bay Scenario 3 and 4	Add one breaker bay to GI-2022-29 POI's 230 kV ring bus (see Figure 6-6, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breakers. - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.78 M

6.6.8 GI-2025-26 Costs

ERIS Costs

This project shares the gen-tie with the existing Crossing Trails generation. As such, there are no associated interconnection facilities or POI Network Upgrades.

Interconnection Facilities Costs:	\$0.00 M
Network Upgrade Costs, Interconnection:	\$0.00 M
TOTAL Costs (2026 dollars) for Interconnection:	\$0.00 M

6.6.9 GI-2025-28 Costs

NRIS Scenario 1 Costs

Interconnection Facilities Costs:	\$0.90 M
Network Upgrade Costs, Cost Allocation	\$87.84 M
Network Upgrade Costs, Interconnection	\$13.25 M
TOTAL Costs (2026 dollars) for Interconnection:	\$ 101.99 M

NRIS Scenario 4 Costs

Interconnection Facilities Costs:	\$ 0.90 M
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Network Upgrade Costs, Cost Allocation

• North Yuma – Wray 230 kV #2	\$65.33 M
• GI-2025-28 POI – Willow Creek 115 kV	\$33.3 M
• Bonny Creek – South Fork 115 kV Rebuild	\$10.55 M
• South Fork – Idalia – Vernon Switch Structure Replacement	\$22.16 M
• Willow Creek Meter Replacement	\$0.00 M

Network Upgrade Costs, Interconnection \$13.25 M

TOTAL Costs (2026 dollars) for Interconnection: \$ 145.82 M

ERIS Costs

Interconnection Facilities Costs: \$ 0.90 M

Network Upgrade Costs, Cost Allocation

• GI-2025-28 POI – Willow Creek 115 kV	\$33.3 M
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Network Upgrade Costs, Interconnection \$13.25 M

TOTAL Costs (2026 dollars) for Interconnection: \$ 145.82 M

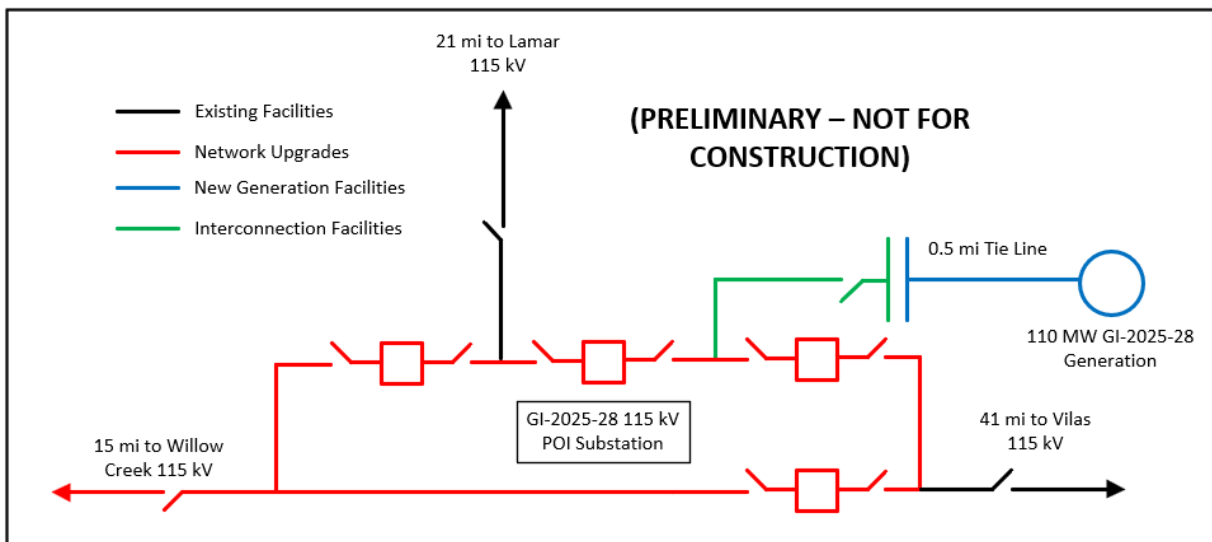


Figure 6-7: GI-2025-28 POI 115 kV Substation One-Line Diagram

Table 6-43: Summary Cost Estimate Details - Interconnection Facilities GI-2025-28

Element	Description	Cost Est. Millions
New 115 kV Substation on Lamar – Vilas Line 115 kV line termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 115 kV A-frame dead-end structure • One (1) 115 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the new substation. • One (1) 115 kV 3-ph gang line end disconnect switch and associated structure.	\$0.9 M

Element	Description	Cost Est. Millions
	• *Three (3) 115 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 115 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 115 kV line protection; primary, secondary, and breaker-failure. • Three (3) 115 kV surge arresters (140 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	

Table 6-44: Summary Cost Estimate Details - Network Upgrades GI-2025-28

Element	Description	Cost Est. Millions
New 115 kV Substation on Lamar – Vilas Line New 115 kV 3- Breaker Ring Bus	Build a new 3-breaker ring bus on the Lamar – Vilas 115 kV line (see Figure 6-7, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. • Three (3) 115 kV power circuit breakers • Eight (8) 115 kV 3-ph gang disconnect switches and associated structures. • Circuit breaker station control panel. • Digital Fault Recorder and associated panel • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$13.25 M

6.6.10 GI-2025-29 Costs

ERIS Costs

Interconnection Facilities Costs:	\$1.30 M
Network Upgrade Costs, Interconnection	\$17.34 M
TOTAL Costs (2026 dollars) for Interconnection:	\$ 18.64 M

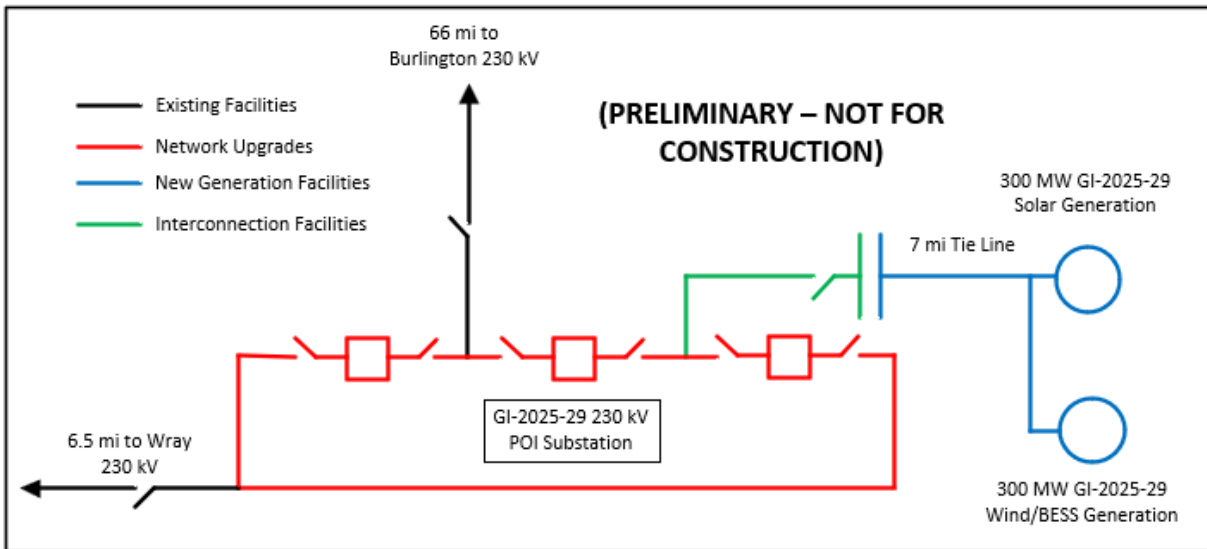


Figure 6-8: GI-2025-29 POI 230 kV Substation One-Line Diagram

Table 6-45: Summary Cost Estimate Details - Interconnection Facilities GI-2025-29

Element	Description	Cost Est. Millions
New 230 kV Substation on Burlington – Wray Line 230 kV line termination equipment	Design, purchase, construct / install and test all equipment installed inside the existing Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 230 kV A-frame dead-end structure • One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside the Burlington substation. • One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. • Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. • Three (3) 230 kV surge arresters (280 kV MCOV or as required). • Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$1.30 M

Table 6-46: Summary Cost Estimate Details - Network Upgrades GI-2025-29

Element	Description	Cost Est. Millions
New 230 kV Substation on Burlington – Wray Line New 230 kV 3- Breaker Ring Bus	Build a new 3-breaker ring bus on the Burlington – Wray 230 kV line (see Figure 6-8, One-Line Diagram). Scope includes typical testing, checkout, and commissioning. • Three (3) 230 kV power circuit breakers • Eight (8) 230 kV 3-ph gang disconnect switches and associated structures. • Circuit breaker station control panel. • Digital Fault Recorder and associated panel • SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$17.34 M

7.0 CLUSTER AREA 5 – SOUTHEASTERN COLORADO

The Western Colorado Cluster Area is made up of five (5) IRs:

- GI-CS-2025-10 (“GI-2025-10”)
- GI-CS-2025-12 (“GI-2025-12”)
- GI-CS-2025-21 (“GI-2025-21”)
- GI-CS-2025-22 (“GI-2025-22”)
- GI-CS-2025-23 (“GI-2025-23”)

7.1 Generator Modeling Data

For each project, model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation.

7.1.1 GI-2025-10

The project consists of twenty-nine (29) SMA SC 4200 UP-US solar inverters (one (1) 121.8 MW equivalent solar generator), one hundred-six (106) Tesla Megapack 2 XL P132 BESS inverters (one (1) 103.8 MW equivalent BESS generator), one (1) 34.5-115-13.8 kV transformer, and a 1.4-mile 115 kV generator tie line that will interconnect to a new 115kV POI Switching Station approximately 4 miles north of the existing La Junta Substation on the Boone – La Junta 115 kV Line. The IC has requested to be studied at 100 MW (injected at the POI) for Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

7.1.2 GI-2025-12

The project consists of forty-three (43) SMA SC 4200 UP-US solar inverters (one (1) 180.6 MW equivalent solar generator), one-hundred seventy-two (172) Tesla Megapack 2 XL P132 BESS inverters (one (1) 168.4 MW equivalent BESS generator), one (1) 34.5-230-13.8 kV transformer, and a 0.1-mile 230 kV generator tie line that will interconnect to a new 230kV POI Switching Station approximately 7 miles south of the existing Valent Switching Station on the Walsenburg – Gladstone 230 kV Line. The IC has requested to be studied at 165 MW (injected at the POI) for NRIS and ERIS.

7.1.3 GI-2025-21

The project consists of eighty-eight (88) Sungrow SG4400UD-MV-US solar inverters (one (1) 387.2 MW equivalent solar generator), one-hundred fifty-two (152) SUNGROW SC1375UD BESS inverters (one (1) 209 MW equivalent BESS generator), one (1) 34.5-230-13.8 kV transformer, and a 0.05-mile 230 kV generator tie line that will interconnect to a new 230kV POI Switching Station approximately 12 miles south of the existing Comanche Substation on the Walsenburg-Comanche 230 kV Line. The IC has requested to be studied at 325 MW (injected at the POI) for NRIS and ERIS.

7.1.4 GI-2025-22

The project consists of forty-one (41) Sungrow SG4400 UD-MV-US PV solar inverters (one (1) 180.4 MW equivalent solar generator), seventy-six (76) Sungrow SC1375UD BESS inverters (one (1) 104.5 MW equivalent BESS generator), one (1) 34.5-230-13.8 kV transformer, and a 0.05-mile 230 kV generator tie line that will interconnect to a new 230kV POI Switching Station approximately 32 miles south of the existing Comanche Substation on the Walsenburg – Huckleberry 230 kV Line. The IC has requested to be studied at 150 MW (injected at the POI) for NRIS and ERIS.

7.1.5 GI-2025-23

The project consists forty-one (41) Sungrow SG4400 UD-MV-US PV solar inverters (one (1) 180.4 MW equivalent solar generator), seventy-six (76) Sungrow SC1375UD BESS inverters (one (1) 104.5 MW equivalent BESS generator), one (1) 34.5-230-13.8 kV transformer and a 0.05-mile 230 kV generator tie line that will interconnect to a new 230kV POI Switching Station approximately 18 miles south of the existing Valent Switching Station on the Gladstone – Valent 230 kV Line. The IC has requested to be studied at 150 MW (injected at the POI) for NRIS and ERIS.

7.2 Steady State Power Flow Analysis

7.2.1 Cluster Area Criteria and Assumptions

1. The proposed Projects' outputs were accommodated by displacing generation resources at Craig and Laramie River Station.
2. Power flow across the Gladstone 230 kV Phase Shifting Transformer was set between 90-100 pre-project and post-project for both cases.

7.2.2 Steady-State Power Flow Results

In this Cluster area, all five (5) projects have requested to be studied as NRIS and ERIS. Six (6) scenarios are defined as shown in **Table 7-1**.

Table 7-1: Southeastern Colorado Cluster Area Scenarios

Scenario	GI-CS-2025-10 (100 MW)	GI-CS-2025-12 (165 MW)	GI-CS-2025-21 (325 MW)	GI-CS-2025-22 (150 MW)	GI-CS-2025-23 (150 MW)
1	NRIS	NRIS	NRIS	NRIS	NRIS
2	NRIS	ERIS	ERIS	ERIS	ERIS
3	ERIS	NRIS	ERIS	ERIS	ERIS
4	ERIS	ERIS	NRIS	ERIS	ERIS
5	ERIS	ERIS	ERIS	NRIS	ERIS
6	ERIS	ERIS	ERIS	ERIS	NRIS

The results below reflect **Scenario 1** and treat project GI-CS-2025-10, GI-CS-2025-12, GI-CS-2025-21, GI-CS-2025-22 and GI-CS-2025-23 as **NRIS**.

1. N-0 (System Intact, Category P0) Study Results:

2029 Heavy Summer Results:

- a. 2025-21-TAP – Huckleberry 230 kV line is overloaded to 189% of its 358 MVA rating.
Mitigation: Resolve terminal limitations at Huckleberry to achieve a 642 MVA line rating.
- b. Comanche – Huckleberry 230 kV line is overloaded to 160.5% of its 359 MVA rating.
Mitigation: Resolve terminal limitations at Huckleberry and Comanche to achieve a 642 MVA line rating. Contact PSCo for details about upgrading Comanche terminal ratings.
- c. Stem Beach – Walsenburg 115 kV line is overloaded to 119.2% of its 92 MVA rating.
Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche due to N-1 contingencies and alleviates this violation

2029 Light Summer Results:

- d. No violations occurred under 2029 Light Summer conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies are shown in **Table 7-2** below.

2029 Heavy Summer Results

- a. Loss of Stem Beach – Walsenburg 115 kV line overloads 2025-21 TAP - Huckleberry 230 kV line to 216.12% of its 358 MVA rating.
Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche and with a 3rd circuit of 230 kV between 2025-21 TAP and Huckleberry alleviates this overload
- b. Loss of Comanche - Huckleberry 230 kV line overloads Stem Beach – Walsenburg 115 kV line to 187.23% of its 92 MVA rating.
Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche which alleviates this overload
- c. Loss of Boone – Huckleberry 230 kV line overloads Comanche – Huckleberry 230 kV line to 185.6% of its 359 MVA rating.
Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche which alleviates this overload
- d. Loss of Comanche - Huckleberry 230 kV line overloads Stem Beach – Pueblo Tap 115 kV line to 160.02% of its 92 MVA rating.
Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche which alleviates this overload

- e. Loss of Commanche 345/230 T4 will overload Commanche 345/230 T3 to 140.96% of its 560 MVA rating.

Mitigation: Contact PSCo

- f. Loss of Commanche 345/230 T3 will overload Commanche 345/230 T4 to 140.96% of its 560 MVA rating.

Mitigation: Contact PSCo

- g. Loss of Stem Beach – Walsenburg 115 kV line overloads 2025-21 TAP - 2025-22 TAP 230 kV line to 130.13% of its 358 MVA rating.

Mitigation: Upgrade terminal equipment on 230 kV line to achieve conductor rating of 642 MVA

- h. Loss of Commanche – Huckleberry 230 kV line overloads Boone – Huckleberry 230 kV to 121.36% of its 478 MVA rating.

Mitigation: A 2nd 230 kV line is built spanning 2025-23 TAP – Comanche which alleviates this overload

- i. Loss of Fuller 230/115 kV T2 overloads Fuller 230/115 kV T1 Transformer to 103.6% of its 100 MVA rating.

Mitigation: Upgrade Fuller T1 to a 150 MVA rating.

- j. The following contingencies do not converge: 2025-12-TAP – Valent 230 kV, 2021-11-TAP – Valent 230 kV, 2021-11-TAP – Walsenburg 230 kV, 2025-22-TAP – Walsenburg 230 kV, 2025-21-TAP – 2025-22-TAP 230 kV and 2025-21-TAP – Huckleberry 230 kV line.

Mitigation: Construct a second circuit of 230 kV spanning 2025-23 TAP – Comanche and intersecting Walsenburg and 2025-22-TAP

2029 Light Summer Results:

- k. Loss of 2025-23-TAP - Gladstone 230 kV line overloads 2025-21-TAP – Huckleberry 230 kV line to 185.77% of its 358 MVA rating.

Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche and with a 3rd circuit of 230 kV between 2025-21 TAP and Huckleberry alleviates this overload

- l. Loss of 2025-23-TAP - Gladstone 230 kV line overloads Commanche – Huckleberry 230 kV line to 172.82% of its 359 MVA rating.

Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche

- m. Loss of Commanche – Huckleberry 230 kV line overloads Stem Beach – Walsenburg 115 kV line to 147.03% of its 92 MVA rating.

Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche

- n. Loss of 2025-12-TAP - Valent 230 kV line overloads Gladstone - Springer 115 kV line to 128.11% of its 184 MVA rating.

Mitigation: An additional 230 kV line is built spanning 2025-23-TAP – Comanche

- o. Loss of Comanche – Huckleberry 230 kV line overloads Stem Beach – Pueblo Tap 115 kV line to 126.47% of its 92 MVA rating.

Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche

- p. Loss of 2025-12-TAP - Valent 230 kV line overloads Gladstone PST to 105.36% of its 300 MVA rating.

Mitigation: An additional 230 kV line is built spanning 2025-23-TAP – Comanche

- q. Loss of Comanche – Huckleberry 230 kV line overloads Boone – Huckleberry 230 kV line to 103.09% of its 478 MVA rating.

Mitigation: An additional 230 kV line is built spanning 2025-23 TAP – Comanche

- r. The following contingencies do not converge: 2021-11-TAP – Valent 230 kV, 2021-11-TAP – Walsenburg 230 kV, 2025-22-TAP – Walsenburg 230 kV, 2025-21-TAP – 2025-22-TAP 230 kV and 2025-21-TAP – Huckleberry 230 kV line.

Mitigation: An additional 230 kV line spanning 2025-23 TAP – Comanche and intersecting Walsenburg and 2025-22-TAP is built

3. N-k (System Intact, Category P2-7) Study Results:

- s. None.

The below results study project GI-CS-2025-10 as **NRIS**.

1. N-0 (System Intact, Category P0) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
- b. No violations occurred under the 2029 Light Summer N-0 conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-1 conditions
- b. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-12 as **NRIS**.

1. N-0 (System Intact, Category P0) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
- b. No violations occurred under the 2029 Light Summer N-0 conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-1 conditions.

- b. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-21 as **NRIS**.

1. N-0 (System Intact, Category P0) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
- b. No violations occurred under the 2029 Light Summer N-0 conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

- a. No convergence for loss of 2025-21-TAP – Huckleberry under Heavy Summer.

Mitigation: An additional line spanning 2025-21-TAP – Huckleberry 230 kV is needed. Upgrade terminal facilities at Huckleberry and Comanche 230 kV to allow for 642 MVA thermal limit. Contact PSCO concerning Comanche 345/230 T3 and T4 overloads when the parallel unit is lost.

- b. No convergence for loss of 2025-21-TAP – Huckleberry under Light Summer.

Mitigation: An additional line spanning 2025-21-TAP – Huckleberry 230 kV is needed. Upgrade terminal facilities at Huckleberry and Comanche 230 kV to allow for 642 MVA thermal limit. Contact PSCO concerning Comanche 345/230 T3 and T4 overloads when the parallel unit is lost.

The below results study project GI-CS-2025-22 as **NRIS**.

1. N-0 (System Intact, Category P0) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
- b. No violations occurred under the 2029 Light Summer N-0 conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

Results for N-1 contingencies are shown in Table 7-3 below.

- a. No Convergence for loss of 2025-21-TAP – 2025-22-TAP under Heavy Summer Conditions.

Mitigation: Add 2nd 230 kV circuit from 2025-22-TAP to Huckleberry 230 kV substations

- b. Loss of 2025-21 TAP – Huckleberry overloads Pueblo Tap – Stem Beach 115 kV to 235.2% of its 92 MVA rating under Heavy Summer Conditions.

Mitigation: Add 2nd 230 kV circuit from 2025-22-TAP to Huckleberry 230 kV substations

- c. Loss of 2025-21 TAP – Huckleberry overloads Pueblo Tap – West Station 115 kV to 138.1% of its 145 MVA rating under Heavy Summer Conditions.

Mitigation: Add 2nd 230 kV circuit from 2025-22-TAP to Huckleberry 230 kV substations

- d. Loss of 2025-21 TAP – Huckleberry overloads Stem Beach – Walsenburg 115 kV to 262.7% of its 92 MVA rating under Heavy Summer Conditions.

Mitigation: Add 2nd 230 kV circuit from 2025-22-TAP to Huckleberry 230 kV substations

- e. Loss of 2025-21 TAP – Huckleberry overloads Walsenburg 230/115 kV T2 and T3 to 124% of its 100 MVA rating under Heavy Summer Conditions.

Mitigation: Add 2nd 230 kV circuit from 2025-22-TAP to Huckleberry 230 kV substations

- f. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-23 as **NRIS**.

1. N-0 (System Intact, Category P0) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
- b. No violations occurred under the 2029 Light Summer N-0 conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-1 conditions.
- b. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-10 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
- b. No violations occurred under the 2029 Light Summer N-0 conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-1 conditions
- b. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-12 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
- b. No violations occurred under the 2029 Light Summer N-0 conditions.

2. N-1 (Single Contingency, Category P1) Study Results:

- a. No violations occurred under the 2029 Heavy Summer N-1 conditions.
- b. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-21 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-1 conditions.
 - b. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-22 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-1 conditions.
 - b. No violations occurred under the 2029 Light Summer N-1 conditions.

The below results study project GI-CS-2025-23 as **ERIS**.

1. N-0 (System Intact, Category P0) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-0 conditions.
 - b. No violations occurred under the 2029 Light Summer N-0 conditions.
2. N-1 (Single Contingency, Category P1) Study Results:
 - a. No violations occurred under the 2029 Heavy Summer N-1 conditions.
 - b. No violations occurred under the 2029 Light Summer N-1 conditions.

7.2.2.1 Network Upgrades

1. The following Network Upgrades were identified for the Western Colorado Cluster Area in one or more scenarios.
 - a. Resolved terminal limitations at Huckleberry and Comanche to achieve a 642 MVA line rating. Contact PSCo for details in upgrades Comanche rating
 - b. An additional 230 kV line is built spanning 2025-23 TAP – Comanche with interconnections to Walsenburg 230 kV and 2025-22 230 kV substations
 - c. A third 230 kV line is built between 2025-21-TAP and Huckleberry
 - d. Contact Colorado Springs Utility concerning Fuller T1 overloads
 - e. Contact PSCo concerning Comanche 345/230 T3 and T4 overloads

Table 7-2: Thermal Analysis Southeastern Colorado Cluster - Scenario 1

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
	No Convergence	2025-12-TAP – Valent 230				
	No Convergence	2021-11-TAP – Valent 230				
	No Convergence	2021-11-TAP – Walsenburg 230				
	No Convergence	2025-22-TAP – Walsenburg 230				
	No Convergence	2025-21-TAP – 2025-22-TAP 230				
	No Convergence	2025-21-TAP – Huckleberry 230				
P0	2025-21-TAP – Huckleberry 230	None	358	5.2%	189%	
P0	Comanche – Huckleberry 230	None	358	19.1%	160.5%	
P0	Stem Beach – Walsenburg 115	None	92	32.1%	119.2%	
P1.2	2025-21-TAP – Huckleberry 230	Stem Beach – Walsenburg 115	358	9.5%	216.1%	
P1.2	Stem Beach – Walsenburg 115	Comanche – Huckleberry 230	92	26.9%	187.2%	
P1.2	Commanche – Huckleberry 230	Boone – Huckleberry 230	358	10.7%	185.6%	
P1.2	Stem Beach – Pueblo 115	Comanche – Huckleberry 230	92	3%	160.2%	
P1.2	Commanche 345/230 T3	Commanche 345/230 T4	560	67.9%	141%	
P1.2	Commanche 345/230 T4	Commanche 345/230 T3	560	67.9%	141%	
P1.2	2025-21 TAP – 2025-22 TAP	Stem Beach – Walsenburg 115	358	8.6%	130.1%	
P1.2	Boone – Huckleberry 230	Commanche – Huckleberry 230	478	6.6%	121.4%	
P1.2	Fuller 230/115 T1	Fuller 230/115 T2	100	99.8%	103.6%	
2029 Light Summer						
	No Convergence	2021-11-TAP – Valent 230				
	No Convergence	2021-11-TAP – Walsenburg 230				
	No Convergence	2025-22-TAP – Walsenburg 230				
	No Convergence	2025-21-TAP – 2025-22-TAP 230				
	No Convergence	2025-21-TAP – Huckleberry 230				
P1.2	2025-21-TAP - Huckleberry	2025-23-TAP – Gladstone 230	358	31.3%	185.7%	
P1.2	Commanche – Huckleberry 230	2025-23-TAP – Gladstone 230	358	29.5%	172.8%	
P1.2	Stem Beach – Walsenburg 115	Commanche – Huckleberry 230	92	24.6%	147.0%	
P1.2	Gladstone – Springer 115	2025-12-TAP – Valent 230	184	6.2%	128.1%	
P1.2	Stem Beach – Pueblo Tap 115	Commanche – Huckleberry 230	92	41.1%	126.5%	
P1.2	Gladstone PST 230/230	2025-12-TAP – Valent 230	300	31.8%	105.4%	
P1.2	Boone – Huckleberry 230	Commanche – Huckleberry 230	478	21.4%	103.1%	

Table 7-3: Thermal Analysis Southeastern Colorado Cluster - Scenario 2

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
	No Violations					
2029 Light Summer						
	No Violations					

Table 7-4: Thermal Analysis Southeastern Colorado Cluster - Scenario 3

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
	No Violations					
2029 Light Summer						
	No Violations					

Table 7-5: Thermal Analysis Southeastern Colorado Cluster - Scenario 4

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
P1.2	No Convergence	2025-21-TAP - Huckleberry				TSGT
2029 Light Summer						
P1.2	No Convergence	2025-21-TAP-Huckleberry				TSGT

Table 7-6: Thermal Analysis Southeastern Colorado Cluster - Scenario 5

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
	No Convergence	2025-21-TAP – 2025-22-TAP				TSGT
P1.2	Pueblo Tap – Stem Beach 115	2025-21-TAP – Huckleberry	92	41.4	235.2	
P1.2	Pueblo Tap – West Station 115	2025-21-TAP – Huckleberry	145	35.5	138.1	
P1.2	Stem Beach – Walsenburg 115	2025-21-TAP – Huckleberry	92	24.6	262.7	
P1.2	Walsenburg 230/115 T2/T3	2025-21-TAP – Huckleberry	100	14.2	124	
2029 Light Summer						
	No Violations					

Table 7-7: Thermal Analysis Southeastern Colorado Cluster - Scenario 6

Contingency Type	Affected Element	Contingency	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
2029 Heavy Summer						
	No Violations					
2029 Light Summer						
	No Violations					

7.2.3 Reactive Power Analysis

7.2.3.1 GI-CS-2025-10 Solar

At the full 100.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 36.3 MVAR produced (0.940 p.f. lag) to -36.3 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-8 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 100.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 7-8: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-10 PV, Project Size: 100.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	0.0	0.8	1.050	-----	0.0	None
1.05	20.0	-15.0	1.029	19.9	-15.1	1.049	0.797	-7.2	None
1.05	40.0	-30.0	1.004	39.7	-33.1	1.048	0.768	-14.4	None
1.05	60.0	-45.0	0.977	59.3	-53.5	1.047	0.742	-21.5	None
1.05	80.0	-60.0	0.947	78.6	-76.8	1.045	0.715	-28.5	None
1.05	100.0	-75.0	0.911	97.7	-103.9	1.044	0.685	-35.5	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	0.7	0.950	-----	0.0	None
0.95	20.0	15.0	0.979	19.9	14.6	0.952	0.806	7.2	None
0.95	40.0	30.0	1.004	39.7	26.8	0.953	0.829	14.4	None
0.95	60.0	45.0	1.027	59.4	37.2	0.954	0.847	21.6	None
0.95	80.0	60.0	1.049	78.9	46.3	0.955	0.862	28.6	None
0.95	100.0	75.0	1.069	98.3	54.1	0.956	0.876	35.7	None

7.2.3.2 GI-2025-10 BESS

At the full 100.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 36.3 MVAR produced (0.940 p.f. lag) to -36.3 MVAR absorbed (0.940 p.f. lead). This is the net MVAR

to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-9 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 100.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 7-9: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-10 BESS, Project Size: 100.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.050	0.0	0.2	1.050	-----	0.0	None
1.05	20.0	-15.0	1.033	20.0	-15.5	1.049	0.790	-7.3	None
1.05	40.0	-30.0	1.014	39.9	-32.7	1.048	0.773	-14.5	None
1.05	60.0	-45.0	0.993	59.7	-51.7	1.047	0.756	-21.7	None
1.05	80.0	-60.0	0.970	79.4	-72.6	1.046	0.738	-28.8	None
1.05	100.0	-75.0	0.946	99.1	-95.9	1.044	0.718	-36.0	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.950	0.0	0.2	0.950	-----	0.0	None
0.95	20.0	15.0	0.971	20.0	14.4	0.952	0.811	7.3	None
0.95	40.0	30.0	0.991	39.9	27.1	0.953	0.827	14.5	None
0.95	60.0	45.0	1.009	59.7	38.5	0.954	0.840	21.7	None
0.95	80.0	60.0	1.026	79.5	48.7	0.956	0.853	28.9	None
0.95	100.0	75.0	1.042	99.2	57.8	0.957	0.864	36.0	None

7.2.3.3 GI-2025-12 Solar

At the full 168.4 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 61.1 MVAR produced (0.940 p.f. lag) to -61.1 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-10 tabulates net VAR flow at several levels of GF

output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus. A 12 MVAR capacitor bank was included in the application data and is compared to the required reactive power.

At the full 168.4 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus with the inclusion of the 12 MVAR capacitor bank. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 7-10: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-12 Solar, Project Size: 168.4 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	0.0	1.1	1.050	-----	0.0	None
1.05	33.7	-25.3	1.024	33.6	-26.1	1.050	0.790	-12.2	None
1.05	67.4	-50.5	0.995	67.0	-57.5	1.050	0.759	-24.3	None
1.05	101.1	-75.8	0.961	100.2	-94.0	1.050	0.729	-36.4	None
1.05	134.7	-101.0	0.922	133.1	-137.3	1.050	0.696	-48.3	None
1.05	168.4	-110.9	0.900	166.0	-165.9	1.050	0.707	-60.2	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	0.9	0.950	-----	0.0	None
0.95	33.7	25.3	0.981	33.6	24.1	0.950	0.813	12.2	None
0.95	67.4	50.5	1.008	67.0	43.6	0.950	0.838	24.3	None
0.95	101.1	75.8	1.032	100.3	59.9	0.950	0.858	36.4	None
0.95	134.7	101.0	1.054	133.5	73.4	0.950	0.876	48.5	None
0.95	168.4	126.3	1.075	166.5	84.3	0.950	0.892	60.4	None

7.2.3.4 GI-2025-12 BESS

At the full 168.4 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 61.1 MVAR produced (0.940 p.f. lag) to -61.1 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-11 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus. A 12 MVAR capacitor bank was included in the application data and is compared to the required reactive power.

At the full 168.4 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus with the inclusion of the 10 MVAR capacitor bank. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 7-11: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-12 BESS, Project Size: 168.4 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	0.0	1.1	1.050	-----	0.0	None
1.05	33.7	-25.3	1.024	33.6	-26.1	1.050	0.790	-12.2	None
1.05	67.4	-50.5	0.995	67.0	-57.5	1.050	0.759	-24.3	None
1.05	101.1	-75.8	0.961	100.2	-94.0	1.050	0.729	-36.4	None
1.05	134.7	-101.0	0.922	133.1	-137.3	1.050	0.696	-48.3	None
1.05	168.4	-110.9	0.900	166.0	-165.9	1.050	0.707	-60.2	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	0.9	0.950	-----	0.0	None
0.95	33.7	25.3	0.981	33.6	24.1	0.950	0.813	12.2	None
0.95	67.4	50.5	1.008	67.0	43.6	0.950	0.838	24.3	None
0.95	101.1	75.8	1.032	100.3	59.9	0.950	0.858	36.4	None
0.95	134.7	101.0	1.054	133.5	73.4	0.950	0.876	48.5	None
0.95	168.4	126.3	1.075	166.5	84.3	0.950	0.892	60.4	None

7.2.3.5 GI-2025-21 Solar

At the full 193.6 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 70.3 MVAR produced (0.940 p.f. lag) to -70.3 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-12 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 193.6 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 10 MVAR capacitor may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 6 MVAR reactor bank may be required.

Table 7-12: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-21 Solar, Project Size: 193.6 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.024	-0.0	5.9	1.050	-----	-0.0	-5.9
1.05	38.7	-29.0	1.005	38.5	-27.1	1.050	0.818	-14.0	None
1.05	77.4	-58.1	0.990	76.7	-70.0	1.050	0.738	-27.8	None
1.05	116.2	-87.1	0.951	114.2	-128.7	1.050	0.664	-41.4	None
1.05	154.9	-93.2	0.900	151.5	-170.8	1.050	0.664	-55.0	None
1.05	193.6	-80.2	0.900	189.0	-187.0	1.050	0.711	-68.6	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	1.017	-0.0	5.8	0.950	-----	-0.0	-5.8
0.95	38.7	29.0	1.041	38.5	30.3	0.950	0.786	14.0	None
0.95	77.4	58.1	1.055	76.7	47.7	0.950	0.849	27.8	None
0.95	116.2	87.1	1.074	114.7	59.2	0.950	0.889	41.6	None
0.95	154.9	116.2	1.087	152.4	65.4	0.950	0.919	55.3	None
0.95	193.6	135.5	1.100	190.0	59.5	0.950	0.954	69.0	9.5

7.2.3.6 GI-2025-21 BESS

At the full 104.5 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 37.9 MVAR produced (0.940 p.f. lag) to -37.9 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 1.0 lag (producing) and 1.0 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-13 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 104.5 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 7-13: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-21 BESS, Project Size: 104.5 MW

P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
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Fixed Voltage at POI Bus	P.Gen (MW)	Q.Qen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.707 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.011	0.0	0.0	1.050	-----	0.0	None
1.05	20.9	-20.9	1.008	20.8	-22.4	1.050	0.680	-7.5	None
1.05	41.8	-41.8	0.993	41.4	-48.3	1.050	0.651	-15.0	None
1.05	62.7	-62.7	0.984	61.8	-78.5	1.050	0.619	-22.4	None
1.05	83.6	-83.6	0.972	82.0	-114.1	1.050	0.583	-29.8	None
1.05	104.5	-104.5	0.900	101.6	-160.1	1.050	0.536	-36.9	None
0.950 POI Voltage at 0.707 p.f. lead (producing MVAR)									
0.95	0.0	0.0	1.009	0.0	0.0	0.950	-----	0.0	None
0.95	20.9	20.9	1.026	20.8	19.3	0.950	0.733	7.5	None
0.95	41.8	41.8	1.037	41.5	35.9	0.950	0.756	15.1	None
0.95	62.7	62.7	1.051	62.0	50.0	0.950	0.778	22.5	None
0.95	83.6	83.6	1.062	82.4	62.1	0.950	0.799	29.9	None
0.95	104.5	104.5	1.077	102.6	72.4	0.950	0.817	37.2	None

7.2.3.7 GI-CS-2025-22 Solar

At the full 150.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 54.4 MVAR produced (0.940 p.f. lag) to -54.4 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-14 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 150.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 2 MVAR reactor bank may be required.

Table 7-14: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI- 2025-22 Solar, Project Size: 150.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Qen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									

1.05	0.0	0.0	1.034	0.0	2.8	1.050	-----	0.0	-2.8
1.05	30.0	-22.5	1.014	29.9	-22.2	1.050	0.803	-10.9	None
1.05	60.0	-45.0	1.011	59.5	-52.8	1.050	0.748	-21.6	None
1.05	90.0	-67.5	1.007	88.7	-91.2	1.050	0.697	-32.2	None
1.05	120.0	-90.0	0.925	117.3	-143.6	1.050	0.633	-42.6	None
1.05	150.0	-89.6	0.900	146.1	-168.1	1.050	0.656	-53.0	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	1.020	-0.0	2.7	0.950	-----	-0.0	-2.7
0.95	30.0	22.5	1.034	29.9	22.4	0.950	0.800	10.9	None
0.95	60.0	45.0	1.041	59.5	37.7	0.950	0.845	21.6	None
0.95	90.0	67.5	1.048	88.9	49.0	0.950	0.875	32.3	None
0.95	120.0	90.0	1.057	118.0	57.1	0.950	0.900	42.8	None
0.95	150.0	112.5	1.083	147.1	62.4	0.950	0.921	53.4	None

7.2.3.8 GI- 2025-22 BESS

At the full 75.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 27.2 MVAR produced (0.940 p.f. lag) to -27.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 1.0 lag (producing) and 1.0 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-15 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 75.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 7-15: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-22 BESS, Project Size: 75.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.707 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.011	0.0	0.0	1.050	-----	0.0	None
1.05	15.0	-15.0	1.005	15.0	-15.8	1.050	0.688	-5.4	None
1.05	30.0	-30.0	0.997	29.8	-33.3	1.050	0.667	-10.8	None
1.05	45.0	-45.0	0.993	44.6	-52.7	1.050	0.646	-16.2	None
1.05	60.0	-60.0	0.984	59.2	-74.4	1.050	0.623	-21.5	None
1.05	75.0	-75.0	0.977	73.7	-98.7	1.050	0.598	-26.7	None

0.950 POI Voltage at 0.707 p.f. lead (producing MVAR)									
0.95	0.0	0.0	1.009	0.0	0.0	0.950	-----	0.0	None
0.95	15.0	15.0	1.039	15.0	14.2	0.950	0.725	5.4	None
0.95	30.0	30.0	1.036	29.8	26.8	0.950	0.743	10.8	None
0.95	45.0	45.0	1.043	44.6	38.2	0.950	0.760	16.2	None
0.95	60.0	60.0	1.048	59.3	48.3	0.950	0.776	21.5	None
0.95	75.0	75.0	1.070	74.0	57.4	0.950	0.790	26.9	None

7.2.3.9 GI-2025-23 Solar

At the full 151.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 54.8 MVAR produced (0.940 p.f. lag) to -54.8 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-16 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 151.0 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 15 MVAR capacitor bank may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 3 MVAR reactor bank may be required.

Table 7-16: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-23 PV, Project Size: 151.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.875 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.054	-0.0	2.9	1.050	-----	-0.0	-2.9
1.05	30.2	-16.7	1.026	30.1	-15.9	1.050	0.884	-10.9	None
1.05	60.4	-33.4	0.992	59.9	-39.4	1.050	0.836	-21.7	None
1.05	90.6	-50.1	0.952	89.5	-68.8	1.050	0.793	-32.5	None
1.05	120.8	-66.8	0.901	118.5	-106.7	1.050	0.743	-43.0	None
1.05	151.0	-60.6	0.900	147.8	-117.4	1.050	0.783	-53.6	None
0.950 POI Voltage at 0.875 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.954	0.0	2.3	0.950	-----	0.0	-2.3
0.95	30.2	16.7	0.986	30.1	16.8	0.950	0.873	10.9	None
0.95	60.4	33.4	1.014	59.9	27.3	0.950	0.910	21.7	None

0.95	90.6	50.1	1.038	89.6	34.3	0.950	0.934	32.5	None
0.95	120.8	66.8	1.058	119.1	38.1	0.950	0.952	43.2	5.1
0.95	151.0	83.5	1.076	148.5	38.9	0.950	0.967	53.9	15.0

7.2.3.10 GI-2025-23 BESS

At the full 75.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 27.2 MVAR produced (0.940 p.f. lag) to -27.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.937 lag (producing) and 0.937 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, Table 7-17 tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 75.0 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. An 8 MVAR capacitor may be required. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 3 MVAR reactor bank may be required.

Table 7-17: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-23 BESS, Project Size: 75.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.937 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.054	0.0	2.9	1.050	-----	0.0	-2.9
1.05	15.0	-5.6	1.045	15.0	-3.2	1.050	0.978	-5.4	-2.2
1.05	30.0	-11.2	1.036	29.9	-10.1	1.050	0.947	-10.9	None
1.05	45.0	-16.8	1.025	44.8	-18.0	1.050	0.928	-16.3	None
1.05	60.0	-22.4	1.013	59.6	-26.9	1.050	0.912	-21.6	None
1.05	75.0	-28.0	1.001	74.4	-36.9	1.050	0.896	-27.0	None
0.950 POI Voltage at 0.937 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.954	0.0	2.3	0.950	-----	0.0	-2.3
0.95	15.0	5.6	0.965	15.0	7.4	0.950	0.896	5.4	None
0.95	30.0	11.2	0.976	29.9	11.6	0.950	0.933	10.9	None
0.95	45.0	16.8	0.986	44.8	14.8	0.950	0.950	16.3	None
0.95	60.0	22.4	0.995	59.6	17.1	0.950	0.961	21.6	4.5
0.95	75.0	28.0	1.003	74.4	18.6	0.950	0.970	27.0	8.4

7.3 Transient Stability Analysis

7.3.1 Cluster Area Assumptions

1. The equivalent generators were modeled with data provided by the customer and in accordance with the WECC approved model list.
2. The collector systems, transformers, and generators were modeled with the same parameters as during steady-state analysis.

7.3.2 Methodology

Transient stability was evaluated as follows:

1. The 2029 Heavy Summer and Light Summer base case was utilized with all GF in service and all previously identified network upgrades
2. System stability is observed by monitoring the voltage and relative rotor angles of local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Line faults were assumed to be at the midpoint of the line. The corresponding stability contingencies to evaluate the facility's compliance with NERC/WECC criteria for transient stability are listed in Appendix B.
4. Unstable contingencies were simulated with the GF out of service, to verify that the Project is the cause of the instability

7.3.3 Transient Stability Results

Transient stability results identified that some projects do require additional mitigation and are not compliant with the NERC/WECC criteria.

Simulation results for Heavy Summer conditions show that:

1. No adverse dynamic responses were observed

7.4 Short Circuit Analysis

Short circuit analysis was performed by the Transmission Provider for three phase and single line to ground faults at the generating facility's point of interconnection.

Table 7-18 shows detailed results of the bus faults, contributions from each of the sources into the faults, and the network grid Thevenin equivalent impedances. The resultant total fault currents are within planned and existing equipment ratings.

Table 7-18: Short Circuit Results

System Condition	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance (R + jX p.u. on 100 MVA)
2025-10 POI 115 kV Bus Fault (w/ IC Gen; all lines in service)	3083	1813	$Z_{3Ph} = 0.04517 + j0.16046$ $Z_{SLG} = 0.2096 + j0.8239$ MVA 3LG = 614.0 MVA SLG = 361.1

System Condition	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance (R + jX p.u. on 100 MVA)
2025-12 POI 230 kV Bus Fault (w/ IC Gen; all lines in service)	5197	5491	$Z_{3Ph} = 0.00614 + j0.04912$ $Z_{SLG} = 0.01572 + j0.13967$ MVA 3LG = 2070.3 MVA SLG = 2187.4
2025-21 POI 230 kV Bus Fault (w/ IC Gen; all lines in service)	16968	14450	$Z_{3Ph} = 0.0021 + j0.01487$ $Z_{SLG} = 0.00624 + j0.05254$ MVA 3LG = 6759.6 MVA SLG = 5756.5
2025-22 POI 230 kV Bus Fault (w/ IC Gen; all lines in service)	9986	8766	$Z_{3Ph} = 0.0035 + j0.02552$ $Z_{SLG} = 0.01049 + j0.08742$ MVA 3LG = 3978.1 MVA SLG = 3492.1
2025-23 POI 230 kV Bus Fault (w/ IC Gen; all lines in service)	4712	4627	$Z_{3Ph} = 0.00675 + j0.05418$ $Z_{SLG} = 0.01893 + j0.16574$ MVA 3LG = 1877.1 MVA SLG = 1843.3

7.5 Contingent Facilities

The following Interconnection Facilities and/or Network Upgrades to the transmission system are Contingent Facilities applicable to this Cluster Area. These are facilities not yet in service which the costs, timing, and study findings in this report are dependent upon, and if delayed or not built, could cause a need for re-studies of the interconnection request or a reassessment of the facilities, costs and timing.

1. Boone – Huckleberry 230 kV Transmission Line
 - a. Scope: Construct a 230 kV Huckleberry substation sectionalizing the Walsenburg – Comanche 230 kV line and construct a new Boone – Huckleberry 230 kV transmission line
 - b. Responsible Entity: Tri-State
 - c. Planned In-Service Date: 3Q/2026
 - d. Applicable Generation: All Projects
2. Colorado’s Power Pathway Project
 - a. Scope: Harvest Mile – May Valley – Goose Creek – Canal Crossing – Fort St. Vrain double-circuit 345 kV transmission system
 - b. Responsible Entity: PSCO
 - c. Planned In-Service Date: 2027
 - d. Applicable generation: All Projects

7.6 Scope, Cost, and Schedule

The cost estimate is broken out into two categories: 1) Interconnection Facilities, which include all equipment installed between the POI at the main bus and the Point of Change of Ownership (PCO) at

the line dead-end structure¹⁰ just outside the POI substation fence, and 2) Network Upgrades consisting of the rest of the facilities installed in the existing POI substation or at other locations to accommodate the interconnection. The estimate includes all site work such as grounding and conduit installation inside the substation.

Note that the IC will be responsible for constructing the radial transmission line from the PCO to the GF site and for providing the primary protection (relaying and interrupting device) for the IC’s step-up transformer. Equipment at the POI will only provide backup protection for the IC’s main transformer in the event of equipment failure or malfunction at the IC’s facility. To facilitate protective relaying and data acquisition, the IC will need to include fiber optic cables (OPGW) on its radial transmission line to provide communication channels for SCADA, metering (real time), and protective relaying.

The IC is responsible for all engineering, procurement and construction of all GF facilities, including any STATCOM type voltage regulation / reactive compensation devices.

All costs are good faith estimates based on assumptions as stated in this 2025 Cluster Study Report. All estimates are in 2026 dollars.

It is estimated that it will take approximately 60 months after receiving authorization to proceed to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work. It is also estimated that it may take approximately 84 months after receiving authorization to proceed for the permitting activities and ROW to be completed for transmission line construction, if applicable. It is possible that the Generating facility may be able to operate at some level of generation prior to the completion of the requisite Interconnection Facilities, Network Upgrades, Contingent Facilities, or System Protection Facilities. However, that level of generation is not known at this phase of the study and would be addressed through a Provisional Interconnection Service Request per 5.9.2 of the LGIA.

7.6.1 Cost Allocation

There are violations requiring Network Upgrades which one or more of the projects contribute to. The following cost estimates are provided for the identified network upgrades. **Cost estimates are not provided for the mitigations of constraints on Affected Systems.** It is the responsibility of the Interconnecting Customer(s) to coordinate with the applicable entities to determine these costs, **which Tri-State can help facilitate.**

Cost is allocated to each project **according to the Business Practice Manual.** The cost allocation is detailed below in Tables 4-12 to 4-18.

Table 7-19: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Huckleberry Substation Terminal Limit Uprate	Increase terminal equipment to allow for 642 MVA conductor limit	\$0.5 M

¹⁰ The Interconnection Customer’s Interconnection Facilities are required to end at a vertically configured full tension monopole deadend structure located outside of the substation fence and approximately 10 feet inside Tri-State’s property line. The vertically configured full tension monopole deadend structure shall create zero line angle with the Transmission Providers A-frame deadend structure, unless another location is mutually agreed upon by the parties in writing.

Table 7-20: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Commanche Substation Expansion	Contact PSCo concerning expanding Commanche Substation or utilizing an empty bay Increase terminal equipment to allow for 642 MVA conductor limit	Contact PSCo

Table 7-21: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Fuller 138/115 kV Transformer	Upgrade Fuller 230/115 kV Transformer to accommodate at least 150 MVA. Scope includes typical testing, checkout, and commissioning.	Contact CSU

Table 7-22: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
Comanche 345/230 kV Transformer	Upgrade Comanche 345/230 kV Transformer or add an additional 345/230 kV transformer. Scope includes typical testing, checkout, and commissioning.	Contact PSCo

Table 7-23: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
2025-23-TAP - Walsenburg 230 kV build	Construct a 230 kV line with 1272kcmil ACSR “Bittern” conductor. Scope includes typical testing, checkout, and commissioning. 45.7-mile 230 kV transmission line. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$62.9M
2025-23 230 kV Substation New 230 kV Line Bay	Add a fourth breaker bay position to 2025-23 230 kV to convert the 3-ring bus to a 4-ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M
Walsenburg 230 kV Substation New 230 kV Line Bay	Utilize open 5 th 230 kV bay position. Scope includes typical testing, checkout, and commissioning. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$0.5M

Table 7-24: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
2025-22-TAP - Walsenburg kV #2 build	Construct a 230 kV line with 1272kcmil ACSR “Bittern” conductor. Scope includes typical testing, checkout, and commissioning. 16.3-mile 230 kV transmission line.	\$31.4M

	- SCADA and telemetry RTU communication equipment modifications. - Add a 230 kV bay position to 2025-22 230 kV substation and Walsenburg 230 kV Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	
2025-22 230 kV Substation New 230 kV Line Bay	Add a fourth breaker bay position to 2025-22 230 kV to convert the 3-ring bus to a 4-ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M
Walsenburg 230 kV Substation New 230 kV Line Bay	Add a new breaker bay position to expand Walsenburg to a 6-position main and transfer 230 kV substation. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M

Table 7-25: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
2025-22-TAP - Comanche 230 kV build	Construct a 230 kV line with 1272kcmil ACSR “Bittern” conductor. Scope includes typical testing, checkout, and commissioning. 34.6-mile 230 kV transmission line. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$47.6M
2025-22 230 kV Substation New 230 kV Line Bay	Add a fourth breaker bay position to 2025-22 230 kV to convert the 4-ring bus to a 5-ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M
Comanche 230 kV Substation New 230 kV Line Bay	Contact PSCo for details concerning a new line bay at Comanche 230 kV	Contact PSCO

Table 7-26: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
2025-21-TAP - Huckleberry 230 kV #2 build	Construct a 230 kV line with 1272kcmil ACSR “Bittern” conductor. Scope includes typical testing, checkout, and commissioning. 12.05-mile 230 kV transmission line. - SCADA and telemetry RTU communication equipment modifications. - Add a 230 kV bay position to 2025-22 230 kV substation and Huckleberry Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$26.5M
2025-21 230 kV Substation New 230 kV Line Bay	Add a fourth breaker bay position to 2025-21 230 kV to convert the 3-ring bus to a 4-ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M
Huckleberry 230 kV Substation New 230 kV Line Bay	Add a fourth breaker bay position to Huckleberry 230 kV to convert the 3-ring bus to a 4-ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M

Table 7-27: Scenario 1 – Southeastern Colorado Cluster Area Cost Allocation

Overloaded Element	Contingency, Case	CS-2025-10	CS-2025-12	CS-2025-21	CS-2025-22	CS-2025-23
(Constraint)						
2025-21-TAP – Huckleberry 230 kV	Stem Beach –Walsenburg 115 kV, 2029 Heavy Summer					
Percent Cost Allocation		0.00	20.54	41.93	18.79	18.74
(2025-22-TAP – Comanche 230 kV line= \$51.4 M)		\$0.0 M	\$10.56 M	\$21.55 M	\$9.66 M	\$9.63 M
(2025-21-TAP – Huckleberry 230 kV line #2= \$34.1 M)		\$0.0 M	\$7.0 M	\$14.30 M	\$6.41 M	\$6.39 M
(Huckleberry Substation Terminal Equipment Uprate = \$0.5 M)		\$0.0 M	\$.12 M	\$.12 M	\$.12 M	\$.12 M
Stem Beach – Walsenburg 115 kV	2025-22-TAP – Walsenburg 230 kV line, 2029 Heavy Summer (RAS Disabled, NENM lower load)					
Percent Cost Allocation		0.00	51.62	0.00	0.00	48.38
(2025-23-TAP – Walsenburg 230 kV line = \$67.2 M)		\$0.0 M	\$34.68 M	\$0.0 M	\$0.0 M	\$32.51 M
Stem Beach – Walsenburg 115 kV	2025-22-TAP – 2025-21-TAP 230 kV line, 2029 Heavy Summer (RAS Disabled, NENM Lower Load)					
Percent Cost Allocation		0.00	35.41	0.00	32.33	32.27
(2025-22-TAP – Walsenburg 230 kV line= \$39 M)		\$0.0 M	\$13.81 M	\$0.0 M	\$12.61 M	\$12.58 M
TOTAL NETWORK UPGRADE COST ALLOCATED		\$0.0 M	\$66.17 M	\$35.97 M	\$28.80 M	\$61.23 M

7.6.2 GI-2025-10 Costs

Scenario 1 Costs:

Interconnection Facilities Costs:	\$ 0.90 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$8.48 M
TOTAL Costs (2026 dollars) for Interconnection:	\$9.38 M

Scenario 2 Costs:

Interconnection Facilities Costs:	\$ 0.90 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$8.48 M
TOTAL Costs (2026 dollars) for Interconnection:	\$9.38 M

ERIS Costs:

Interconnection Facilities Costs:	\$ 0.90 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$8.48 M
TOTAL Costs (2026 dollars) for Interconnection:	\$9.38 M

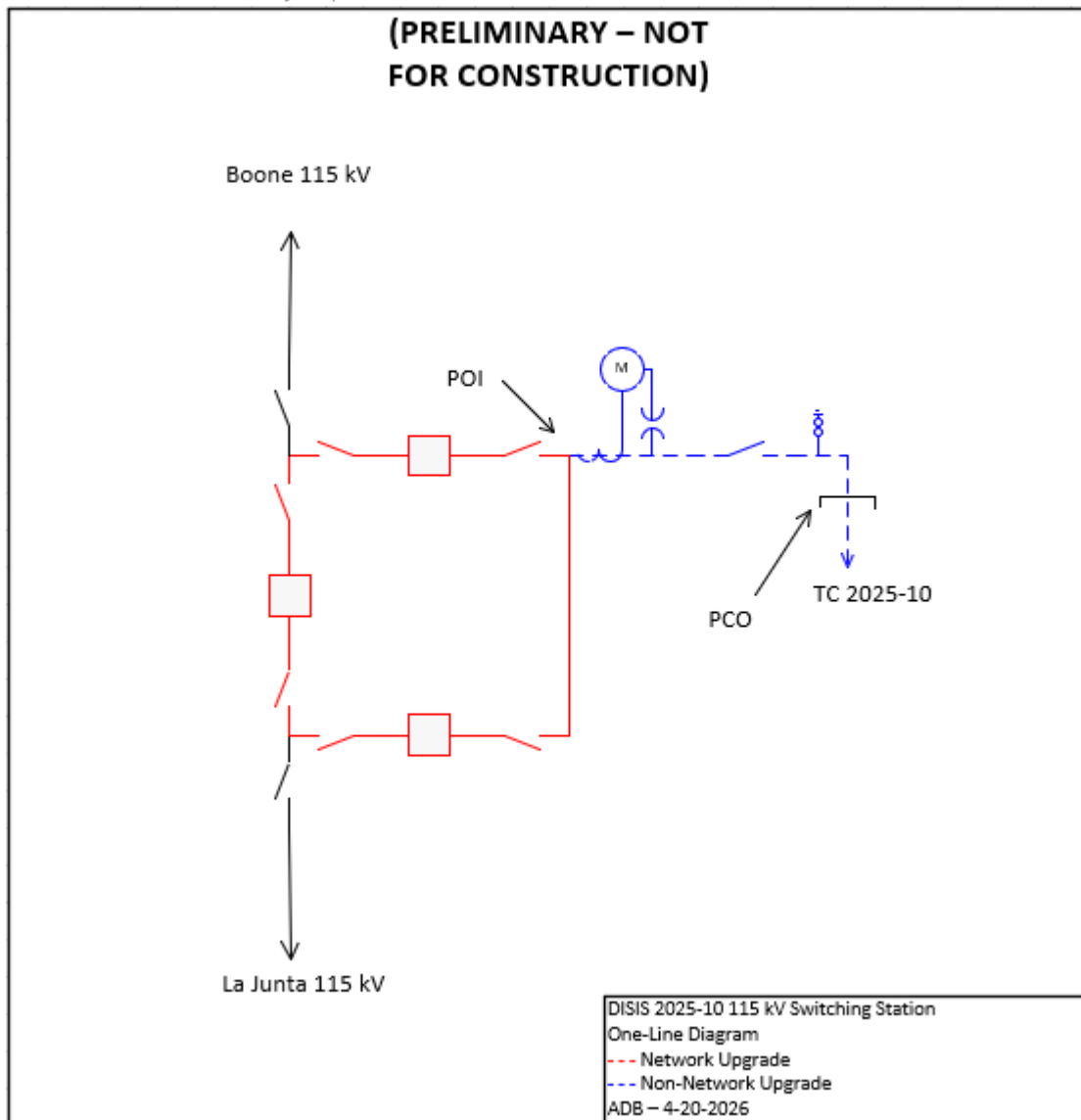


Figure 4-1, GI-2025-10 POI One-Line Diagram

Table 7-28: Summary Cost Estimate Details – Interconnection Facilities GI- 2025-10

Element	Description	Cost Est. Millions
115 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 115 kV line dead-end structure. • 115 kV slack span from to monopole deadend outside substation fence to new A-frame structure • One (1) 115 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 115 kV metering current transformers, high accuracy class, extended range. • *Three (3) 115 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units.	\$0.9 M

Element	Description	Cost Est. Millions
	- PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. - Relaying for the Interconnecting Customers radial 115 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). - Three (3) 115 kV surge arresters. - Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	

Table 7-29: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
GI-CS-2025-10 POI Substation	- Three (3) 115 kV power circuit breaker and associated switches. - Circuit breaker station control panels. - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$8.48 M

7.6.3 GI-2025-12 Costs

Scenario 1 Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$66.17 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$68.80 M

Scenario 3 Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$12.63 M

ERIS Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$12.63 M

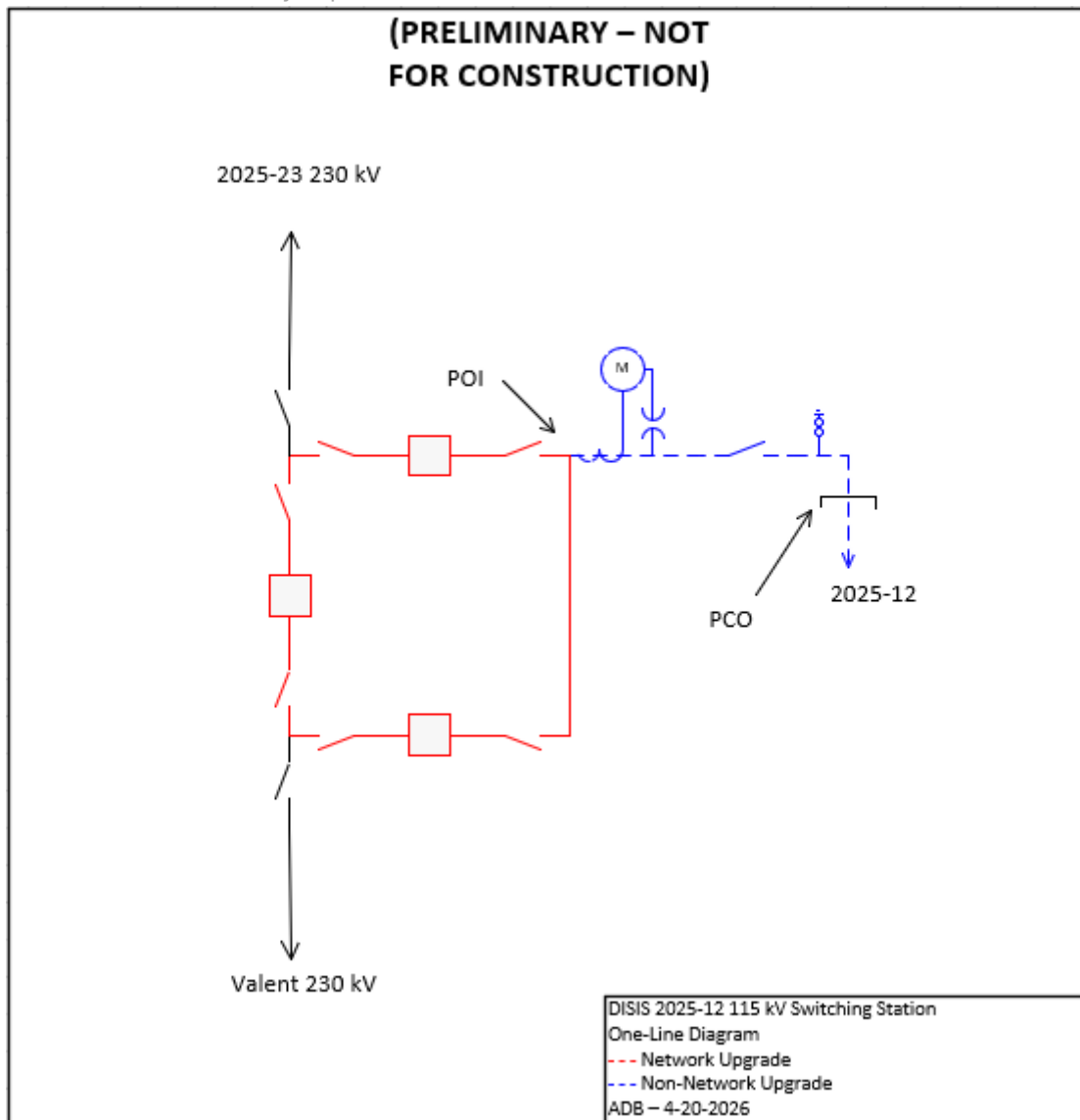


Figure 4-2, GI-CS-2025-12 POI One-Line Diagram

Table 7-30: Summary Cost Estimate Details – Interconnection Facilities GI-2025-12

Element	Description	Cost Est. Millions
230 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of POI Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 230 kV power circuit breaker and associated switches. - Circuit breaker station control panel. - One (1) 230 kV line dead-end structure. 230 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 230 kV metering current transformers, high accuracy class, extended range.	\$1.30 M

Element	Description	Cost Est. Millions
	*Three (3) 230 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. - Relaying for the Interconnecting Customers radial 230 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). - Three (3) 230 kV surge arresters. - Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	

Table 7-31: Summary Cost Estimate Details – Interconnection Facilities GI-2025-12

Element	Description	Cost Est. Millions
GI-2025-12 230 kV Substation	- Three (3) 230 kV power circuit breaker and associated switches. - Circuit breaker station control panels. - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$11.33 M

7.6.4 GI- 2024-21 Costs

All NRIS Scenario Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Cost, Cost Allocation	\$35.97 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$48.60 M

Scenario 4 Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$34.60 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$47.23 M

ERIS Costs:

Interconnection Facilities Costs:	\$ 3.07 M
Network Upgrade Costs, Cost Allocation	\$00.00 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$14.40 M

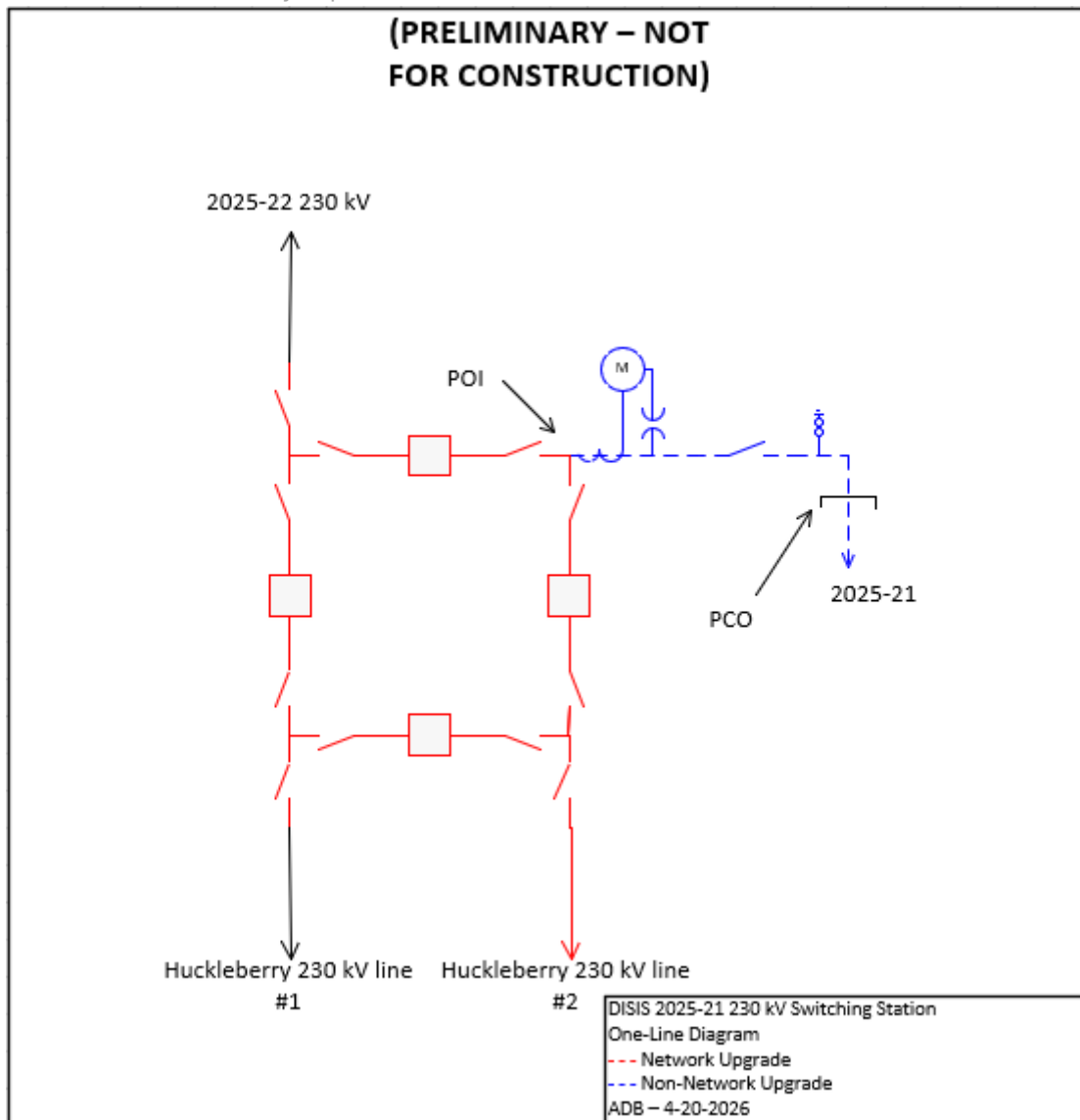


Figure 4-3, GI-2025-21 POI One-Line Diagram

Table 7-32: Summary Cost Estimate Details – Interconnection Facilities GI-2025-21

Element	Description	Cost Est. Millions
230 kV line termination equipment between PCO and POI	Design, purchase, construct / install and test all equipment installed inside the new Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: • One (1) 230 kV A-frame dead-end structure • One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside Hell Creek substation. • One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. • *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. • *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. • PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters.	\$ 1.30 M

Element	Description	Cost Est. Millions
	- Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. - Three (3) 230 kV surge arresters. - Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	

Table 7-33: Summary Cost Estimate Details – Interconnection Facilities GI-2025-21

Element	Description	Cost Est. Millions
GI-CS-2025-21 POI	- Three (3) 230 kV power circuit breakers and associated switches. - Circuit breaker station control panels. - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$ 11.33 M

7.6.5 GI-2025-22 Costs

All NRIS Scenario Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$28.80 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$41.43 M

Scenario 5 Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$51.80 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$64.43 M

ERIS Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$12.63 M

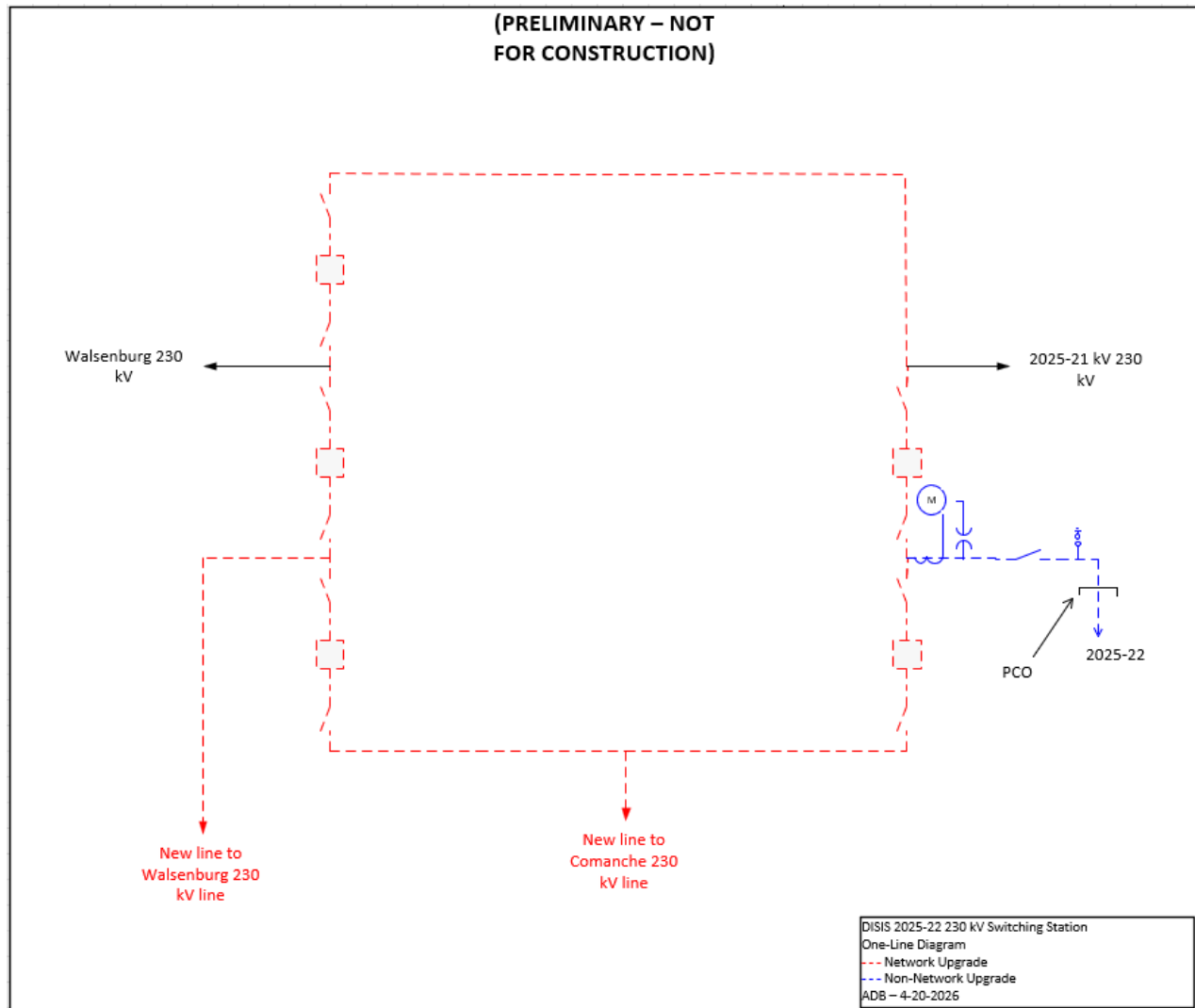


Figure 4-4, GI-CS-2025-22 POI One-Line Diagram

Table 7-34: Summary Cost Estimate Details – Interconnection Facilities GI-2025-22

Element	Description	Cost Est. Millions
230 kV line termination equipment between PCO and POI	Design, purchase, construct / install and test all equipment installed inside the new Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 230 kV A-frame dead-end structure - One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure inside Hell Creek substation. - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. - Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure.	\$1.30 M

Element	Description	Cost Est. Millions
	- Three (3) 230 kV surge arresters - Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	

Table 7-35: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
GI-CS-2025-22 POI	- Three (3) 230 kV power circuit breakers and associated switches. - Circuit breaker station control panels. - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$11.33 M

Table 7-36: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
2025-22-TAP - Huckleberry 230 kV #2 build	Construct a 230 kV line with 1272kcmil ACSR “Bittern” conductor. Scope includes typical testing, checkout, and commissioning. 32.11-mile 230 kV transmission line. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$44.2M
2025-22 230 kV Substation New 230 kV Line Bay	Add a fourth breaker bay position to 2025-22 230 kV to convert the 3 ring bus to a 4 ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M
Huckleberry 230 kV Substation New 230 kV Line Bay	Add a fourth breaker bay position to Huckleberry 230 kV to convert the 3 ring bus to a 4 ring bus. Scope includes typical testing, checkout, and commissioning. - One (1) 230 kV power circuit breaker - Three (3) 230 kV 3-ph gang disconnect switches and associated structures. - Circuit breaker station control panel. - Digital Fault Recorder and associated panel. - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$3.8M

7.6.6 GI-2025-23 Costs

All NRIS Scenario Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$61.23 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$73.86 M

Scenario 6 Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$12.63 M

ERIS Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Cost Allocation	\$0.00 M
Network Upgrade Costs, Interconnection	\$11.33 M
TOTAL Costs (2026 dollars) for Interconnection:	\$12.63 M

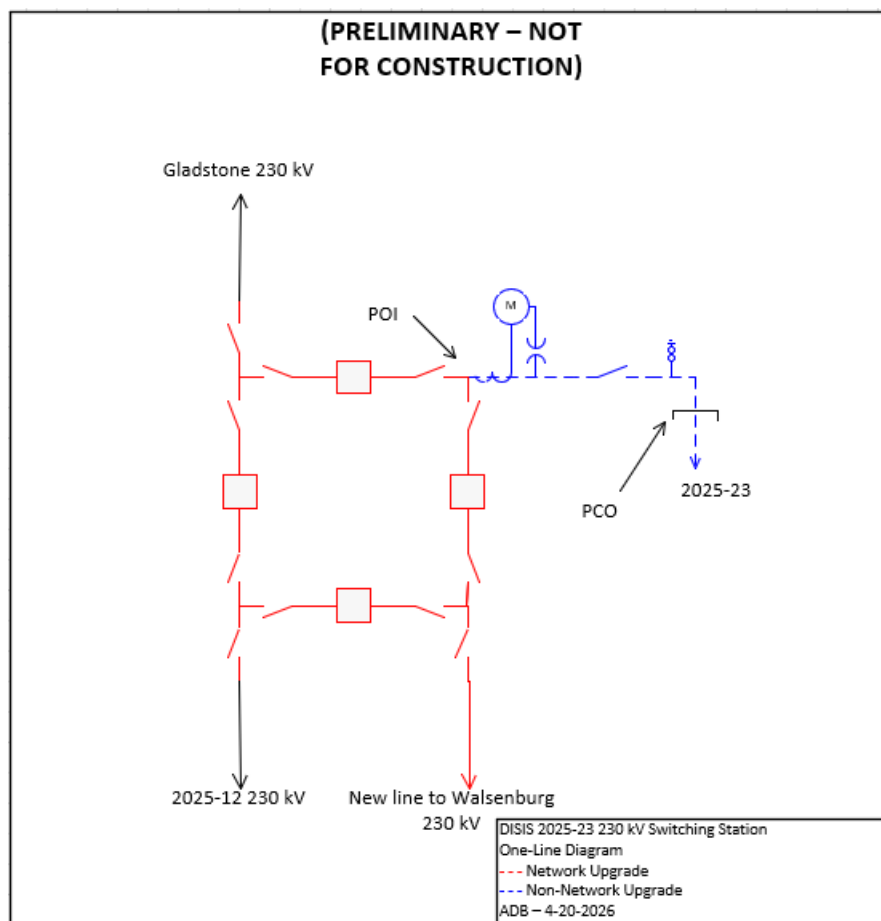


Figure 4-6, GI-CS-2025-23 POI One-Line Diagram

Table 7-37: Summary Cost Estimate Details – Interconnection Facilities GI-2025-23

Element	Description	Cost Est. Millions
230 kV line termination equipment between PCO and POI	Engineer, purchase, construct / install and test all equipment installed inside of Craig Substation that is located between the PCO (Interconnecting Customer line termination dead-end) and the POI (main bus tap point), consisting primarily of the following equipment:	\$1.30 M

Element	Description	Cost Est. Millions
	- One (1) 230 kV line dead-end structure. 230 kV slack span from to monopole deadend outside substation fence to new A-frame structure - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure. *Three (3) 230 kV metering current transformers, high accuracy class, extended range. *Three (3) 230 kV metering voltage transformers, high accuracy class. *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical), Bitronics (typical) line meters, testing / checkout / commissioning. - Relaying for the Interconnecting Customers radial 230 kV line protection (SEL-311C primary – pilot, SEL-311C secondary, and SEL-501 breaker-failure). - Three (3) 230 kV surge arresters - Line termination SCADA and telemetry communication equipment additions to substation RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding conductor, conduit, cable, insulators, foundations, support steel, bus, trenches, site prep, yard work, fencing, etc.	

Table 7-38: Summary Cost Estimate Details for Network Upgrades

Element	Description	Cost Est. Millions
GI-CS-2025-23 POI Substation	- Three (3) 230 kV power circuit breakers and associated switches. - Circuit breaker station control panels. - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$11.33 M

8.0 CLUSTER AREA 6 – NORTH DENVER METRO

The North Denver Metro Cluster Area is made up of two (2) IR:

- GI-CS-2025-02 (“GI-2025-02”)
- GI-CS-2025-16 (“GI-2025-16”)

8.1 Generator Modeling Data

For each project, model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation.

8.1.1 GI-2025-02

The project consists of sixty-one (61) SMA SC 4400 UP-US solar inverters (one (1) 268.4 MW equivalent solar generator), fifty-two (52) SMA SCS 4600 UP-US BESS inverters (one (1) 239.2 MW equivalent BESS generator), one (1) 34.5-230-13.8 kV transformer, and a 0.5-mile 230 kV generator tie line that will interconnect to the planned 230kV West Sand Creek Switching Station to accommodate GI-2022-07. The IC has requested to be studied at 199 MW (injected at the POI) for both Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

8.1.2 GI-2025-16

The project consists of forty-four (44) SMA SC 4000 UP-US solar inverters (one (1) 152.1 MW equivalent solar generator), one-hundred eight (108) Tesla Megapack 2 XL BESS inverters (one (1) 101.3 MW equivalent BESS generator), one (1) 34.5-230-13.8 kV transformer, and a 0.07-mile 230 kV generator tie line that will interconnect to the planned 230kV West Sand Creek Switching Station to accommodate GI-2022-07. The IC has requested to be studied at 150 MW (injected at the POI) for both Network Resource Interconnection Service (“NRIS”) and Energy Resource Interconnection Service (“ERIS”).

8.2 Steady State Power Flow Analysis

8.2.1 Cluster Area Criteria and Assumptions

1. The proposed Project output was accommodated by displacing generation resources at Craig, Larmie River Station, and exports at Lamar DC.

8.2.2 Steady-State Power Flow Results

Two projects in the Cluster Area requested to be studied as both NRIS and ERIS. Four scenarios are studied, representing these projects as NRIS or ERIS as shown below.

Table 8-1: North Denver Metro Cluster Area Scenarios

Scenario	GI-CS-2025-02 (199 MW)	GI-CS-2025-16 (150 MW)
1	NRIS	NRIS
2	NRIS	ERIS

3	ERIS	NRIS
4	ERIS	ERIS

For Scenario 1, all NRIS projects are studied as a group and Network Upgrades are determined to accommodate all projects. For Scenarios 2 and 3, Network Upgrades are determined for the project treated as NRIS. The ERIS project is then studied with Network Upgrades in place. When studying ERIS projects, other generators may be redispatched to avoid overloads, including NRIS generation or other generation at the POI.

The results below reflect **Scenario 1**:

Power flow results for Scenario 1 using the 2029 Heavy Summer and 2029 Light Summer cases are shown in **Table 8-2** and **Table 8-3**. Each violation is discussed in more detail below.

1. N-0 (System Intact, Category P0) Study Results:

2029 Heavy Summer Results

- a. None

2029 Light Summer Results:

- a. None

2. N-1 (Single Contingency, Category P1) Study Results:

2029 Heavy Summer Results:

- a. Loss of Cherokee – Riverdale – Henry Lake 230 kV line overloads Fort Lupton – JL Green 230 kV to 120.32% of its 487 MVA rating.

Mitigation: Consult with PSCo to determine the mitigation for overloads of this line.

- b. Loss of Cherokee – Riverdale – Henry Lake 230 kV line overloads Fort Lupton – J.M. Shafer 230 kV to 107.31% of its 508 MVA rating.

Mitigation: Consult with PSCo to determine the mitigation for overloads of this line.

- c. Loss of Fort Lupton – JL green 230 kV line overloads Riverdale – Henry Lake 230 kV to 102.51% of its 506 MVA rating.

Mitigation: Consult with PSCo to determine the mitigation for overloads of this line

2029 Light Summer Results:

- a. None

3. N-k (System Intact, Category P2-7) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

The results below reflect **Scenario 2**:

Power flow results for Scenario 2 using the 2029 Heavy Summer and 2029 Light Summer cases are shown in **Table 8-4** and **Table 8-5**. Each violation is discussed in more detail below.

1. N-0 (System Intact, Category P0) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

2. N-1 (Single Contingency, Category P1) Study Results:

2029 Heavy Summer Results:

- a. Loss of Cherokee – Riverdale – Henry Lake 230 kV line overloads Fort Lupton – JL Green 230 kV to 120.32% of its 487 MVA rating.

Mitigation: Consult with PSCo to determine the mitigation for overloads of this line.

2029 Light Summer Results:

- a. None

3. N-k (System Intact, Category P2-7) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

The results below reflect **Scenario 3**:

Power flow results for Scenario 3 using the 2029 Heavy Summer and 2029 Light Summer cases are shown in **Table 8-6** and **Table 8-7**. Each violation is discussed in more detail below.

1. N-0 (System Intact, Category P0) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

2. N-1 (Single Contingency, Category P1) Study Results:

2029 Heavy Summer Results:

- a. Loss of Cherokee – Riverdale – Henry Lake 230 kV line overloads Fort Lupton – JL Green 230 kV to 120.32% of its 487 MVA rating.

Mitigation: Consult with PSCo to determine the mitigation for overloads of this line.

2029 Light Summer Results:

- a. None

3. N-k (System Intact, Category P2-7) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

The results below reflect Scenario 4:

Power flow results for Scenario 4 using the 2029 Heavy Summer and 2029 Light Summer cases are shown in Table 8-8 and Table 8-9. Each violation is discussed in more detail below.

1. N-0 (System Intact, Category P0) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

2. N-1 (Single Contingency, Category P1) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

3. N-k (System Intact, Category P2-7) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

8.2.2.1 Network Upgrades

The following Network Upgrades and constraints on Affected Systems were identified for the North Denver Metro Cluster Area in one or more scenarios.

1. Consult with PSCO to determine the mitigation for overloads on:

- a. Henry Lake – Riverdale 230 kV
- b. Fort Lupton – J.M. Shafer 230 kV

c. Fort Lupton – James L. Green 230 kV line

Table 8-2: 2029 Heavy Summer – Thermal Analysis North Denver Metro Cluster (Scenario 1)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
PO: System Intact						
---	---	---	---	---	---	---
P1: N-1						
P1.2	Fort Lupton – James L. Green 230 kV Ckt 1	Cherokee – Riverdale – Henry Lake 230 kV Ckt 1	487.00	114.57	120.32	PSCO
P1.2	Fort Lupton – J.M. Shafer 230 kV Ckt 1	Cherokee – Riverdale – Henry Lake 230 kV Ckt 1	59.54	90.19	107.31	PSCO
P1.2	Riverdale – Henry Lake 230 kV Ckt 1	Fort Lupton – James L. Green 230 kV Ckt 1	506.00	94.43	102.51	PSCO
P2-P7: N-k						
---	---	---	---	---	---	---

Table 8-3: 2029 Light Summer – Thermal Analysis North Denver Metro Cluster (Scenario 1)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
PO: System Intact						
---	---	---	---	---	---	---
P1: N-1						
---	---	---	---	---	---	---
P2-P7: N-k						
---	---	---	---	---	---	---

Table 8-4: 2029 Heavy Summer – Thermal Analysis North Denver Metro Cluster (Scenario 2)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Per92 cent Loading	Owner
PO: System Intact						
---	---	---	---	---	---	---
P1: N-1						
P1.2	Fort Lupton – James L. Green 230 kV Ckt 1	Cherokee – Riverdale – Henry Lake 230 kV Ckt 1	487.00	114.57	117.92	PSCO
P2-P7: N-k						
---	---	---	---	---	---	---

Table 8-5: 2029 Light Summer – Thermal Analysis North Denver Metro Cluster (Scenario 2)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
PO: System Intact						
---	---	---	---	---	---	---

P1: N-1						
---	---	---	---	---	---	---
P2-P7: N-k						
---	---	---	---	---	---	---

Table 8-6: 2029 Heavy Summer – Thermal Analysis North Denver Metro Cluster (Scenario 3)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
---	---	---	---	---	---	---
P1.2	Fort Lupton – James L. Green 230 kV Ckt 1	Cherokee – Riverdale – Henry Lake 230 kV Ckt 1	487.00	114.57	116.80	PSCO
---	---	---	---	---	---	---

Table 8-7: 2029 Light Summer – Thermal Analysis North Denver Metro Cluster (Scenario 3)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
PO: System Intact						
---	---	---	---	---	---	---
P1: N-1						
---	---	---	---	---	---	---
P2-P7: N-k						
---	---	---	---	---	---	---

Table 8-8: 2029 Heavy Summer – Thermal Analysis North Denver Metro Cluster (Scenario 4)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
PO: System Intact						
---	---	---	---	---	---	---
P1: N-1						
---	---	---	---	---	---	---
P2-P7: N-k						
---	---	---	---	---	---	---

Table 8-9: 2029 Light Summer – Thermal Analysis North Denver Metro Cluster (Scenario 4)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
------------------	------------------	-------------	----------------------	-----------------------------	------------------------------	-------

PO: System Intact						
---	---	---	---	---	---	---
P1: N-1						
---	---	---	---	---	---	---
P2-P7: N-k						
---	---	---	---	---	---	---

8.2.3 Reactive Power Analysis

8.2.3.1 GI-2025-02 PV

At the full 199.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 72.2 MVAR produced (0.940 p.f. lag) to -72.2 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.8 lag (producing) and 0.8 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 8-10** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 199.0 MW output, results indicate the GF cannot meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. A 5 MVAR inductor bank may be required. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 8-10: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-02 PV, Project Size: 199.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.8 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.050	-0.0	0.0	1.050	-----	-0.0	None
1.05	39.8	-29.9	1.014	39.5	-33.0	1.050	0.767	-14.3	None
1.05	79.6	-59.7	0.972	78.4	-73.6	1.050	0.729	-28.5	None
1.05	119.4	-89.5	0.920	116.3	-124.4	1.049	0.683	-42.2	None
1.05	159.2	-95.6	0.900	154.2	-152.0	1.049	0.712	-56.0	None
1.05	199.0	-88.5	0.900	192.1	-166.0	1.049	0.757	-69.7	None
0.950 POI Voltage at 0.8 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.950	-0.0	0.0	0.950	-----	-0.0	None
0.95	39.8	29.9	0.993	39.5	26.5	0.950	0.830	14.3	None
0.95	79.6	59.7	1.031	78.5	47.4	0.950	0.856	28.5	None
0.95	119.4	89.5	1.065	117.1	63.5	0.950	0.879	42.5	None
0.95	159.2	119.4	1.095	155.3	75.6	0.950	0.899	56.4	None
0.95	199.0	129.2	1.100	193.6	67.6	0.950	0.944	70.3	2.7

8.2.3.2 GI-2025-16 PV

At the full 150.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 54.4 MVAR produced (0.940 p.f. lag) to -54.4 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.861 lag (producing) and 0.861 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 8-11** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus.

At the full 150.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus. At 0 MW, the Project's collector system produces excessive reactive power, which does not meet the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI), a 5 MVAR capacitor bank may be required.

Table 8-11: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus, GI-2025-16 PV, Project Size: 150.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.85 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.052	0.0	2.7	1.050	-----	0.0	-2.7
1.05	30.0	-17.7	1.033	29.9	-16.4	1.050	0.878	-10.9	None
1.05	60.0	-35.4	1.013	59.7	-38.3	1.050	0.842	-21.7	None
1.05	90.0	-53.1	0.989	89.2	-63.6	1.050	0.814	-32.4	None
1.05	120.0	-70.8	0.963	118.5	-92.8	1.050	0.787	-43.0	None
1.05	150.0	-88.5	0.933	147.5	-126.9	1.050	0.758	-53.5	None
0.950 POI Voltage at 0.85 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.952	0.0	2.2	0.950	-----	0.0	-2.2
0.95	30.0	17.7	0.975	29.9	18.4	0.950	0.852	10.9	None
0.95	60.0	35.4	0.996	59.6	31.8	0.950	0.882	21.6	None
0.95	90.0	53.1	1.015	89.2	42.8	0.950	0.902	32.4	None
0.95	120.0	70.8	1.032	118.7	51.5	0.950	0.917	43.1	None
0.95	150.0	88.5	1.048	148.0	58.1	0.950	0.931	53.7	None

8.3 Transient Stability Analysis

8.3.1 Cluster Area Assumptions

1. The equivalent generators were modeled with data provided by the customer and in accordance with the WECC approved model list.
2. The collector systems, transformers, and generators were modeled with the same parameters as during steady-state analysis.

8.3.2 Methodology

Transient stability was evaluated as follows:

1. The 2029 Heavy Summer and a 2029 Light Summer base case were utilized. The projects in this cluster area were simulated as NRIS, with all the network upgrades associated with the project in service.
2. System stability is observed by monitoring the voltage and relative rotor angles of local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Line faults were typically assumed to be at the midpoint of the line. The corresponding contingencies to evaluate the facility's compliance with NERC/WECC criteria for transient stability are listed in Appendix B.
4. Unstable contingencies were simulated with the GF out of service, to verify that the Project is the cause of the instability.

8.3.3 Transient Stability Results

Transient stability results identified that the Projects do not require additional mitigation and are compliant with the NERC/WECC criteria.

Simulation results for heavy summer conditions show that:

1. No adverse dynamic responses were observed.

8.4 Short Circuit Analysis

Short circuit analysis was performed by the Transmission Provider for three phase and single line to ground faults at the generating facilities' points of interconnection, with the addition of all Contingent Facilities and Network Upgrades. Fault current contribution from the Project inverters were considered negligible so the inverters were not included in the short circuit analysis. Scenarios with either or both projects treated as NRIS are considered.

Table 8-12 shows the results of the 230kV bus faults and the network grid Thevenin equivalent impedances. The resultant total fault currents are within planned and existing equipment ratings.

Table 8-12: Short Circuit Results

System Condition	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance ($R + jX$ p.u. on 100 MVA)
2022-07 230 kV Tap (POI) Bus Fault (w/o IC generation; all lines in service)	9832	6754	$Z1 = 0.00338 + j0.02545$ $Z0 = 0.00680 + j0.06044$ MVA 3LG = 3917 MVA SLG = 2691
2022-07 230 kV Tap (POI) Bus Fault (w/ 2025-02 IC generation; all lines in service)	10160	6904	$Z1 = 0.00326 + j0.02499$ $Z0 = 0.00704 + j0.06045$ MVA 3LG = 4047 MVA SLG = 2750
2022-07 230 kV Tap (POI) Bus Fault (w/ 2025-16 IC generation; all lines in service)	10308	6943	$Z1 = 0.00317 + j0.02463$ $Z0 = 0.00706 + j0.06045$ MVA 3LG = 4106 MVA SLG = 2766
2022-07 230 kV Tap (POI) Bus Fault (w/ 2025-02 IC and 2025-16 IC generation; all lines in service)	10510	7004	$Z1 = 0.00306 + j0.02417$ $Z0 = 0.00705 + j0.06054$ MVA 3LG = 4187 MVA SLG = 2790

8.5 Contingent Facilities

The following Interconnection Facilities and/or Network Upgrades to the transmission system are Contingent Facilities applicable to this Cluster Area. These are facilities not yet in service which the costs, timing, and study findings in this report are dependent upon, and if delayed or not built, could cause a need for re-studies of the interconnection request or a reassessment of the facilities, costs and timing.

1. GI-DISIS-2022-07
 - a. Scope: Higher queued 200 MW PV generator. The POI is set to sectionalize Henry Lake – Badger Creek 230 kV
 - b. Responsible Entity: GI-2022-07
 - c. Planned In-Service Date: February 27, 2029
 - d. Applicable Generation: All Projects

8.6 Scope, Cost, and Schedule

The cost estimate is broken out into two categories: 1) Interconnection Facilities, which include all equipment installed between the POI at the main bus and the Point of Change of Ownership (PCO) at the line dead-end structure¹¹ just outside the POI substation fence, and 2) Network Upgrades consisting of the rest of the facilities installed in the existing POI substation or at other locations to accommodate the interconnection. The estimate includes all site work such as grounding and conduit installation inside the substation.

Note that the IC will be responsible for constructing the radial transmission line from the PCO to the GF site and for providing the primary protection (relaying and interrupting device) for the IC's step-up transformer. Equipment at the POI will only provide backup protection for the IC's main transformer in the event of equipment failure or malfunction at the IC's facility. To facilitate protective relaying and data acquisition, the IC will need to include fiber optic cables (OPGW) on its radial transmission line to provide communication channels for SCADA, metering (real time), and protective relaying.

The IC is responsible for all engineering, procurement and construction of all GF facilities, including any STATCOM type voltage regulation / reactive compensation devices.

All costs are good faith estimates based on assumptions as stated in this 2025 Cluster Study Report. All estimates are in 2026 dollars.

It is estimated that it will take approximately 60 months after receiving authorization to proceed to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work. It is also estimated that it may take approximately 84 months after receiving authorization to proceed for the permitting activities and ROW to be completed for transmission line construction, if applicable. It is possible that the Generating facility may be able to operate at some level of generation prior to the completion of the requisite Interconnection Facilities, Network

¹¹ The Interconnection Customer's Interconnection Facilities are required to end at a vertically configured full tension monopole deadend structure located outside of the substation fence and approximately 10 feet inside Tri-State's property line. The vertically configured full tension monopole deadend structure shall create zero line angle with the Transmission Providers A-frame deadend structure, unless another location is mutually agreed upon by the parties in writing.

Upgrades, Contingent Facilities, or System Protection Facilities. However, that level of generation is not known at this phase of the study and would be addressed through a Provisional Interconnection Service Request per 5.9.2 of the LGIA.

8.6.1 Network Upgrade Details

No Network Upgrades beyond the POI were determined. The constraints that were identified in this study are owned by PSCO. The customers will need to consult with PSCO to determine the mitigation for overloads on their equipment.

- Scenario 1:
 - Fort Lupton – J.L. Green 230 kV
 - Fort Lupton – J.M. Shafer 230 kV
 - Riverdale – Henry Lake 230 kV
- Scenario 2:
 - Fort Lupton – J.L. Green 230 kV
- Scenario 3:
 - Fort Lupton – J.L. Green 230 kV

8.6.2 GI-2025-02 Costs

NRIS Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$5.03 M

ERIS Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$5.03 M

8.6.3 GI-2025-16 Costs

NRIS Costs:

Interconnection Facilities Costs:	\$ 1.30 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$5.03 M

ERIS Costs:

Interconnection Facilities Costs:	\$1.30 M
Network Upgrade Costs, Interconnection	\$3.78 M
TOTAL Costs (2026 dollars) for Interconnection:	\$5.03 M

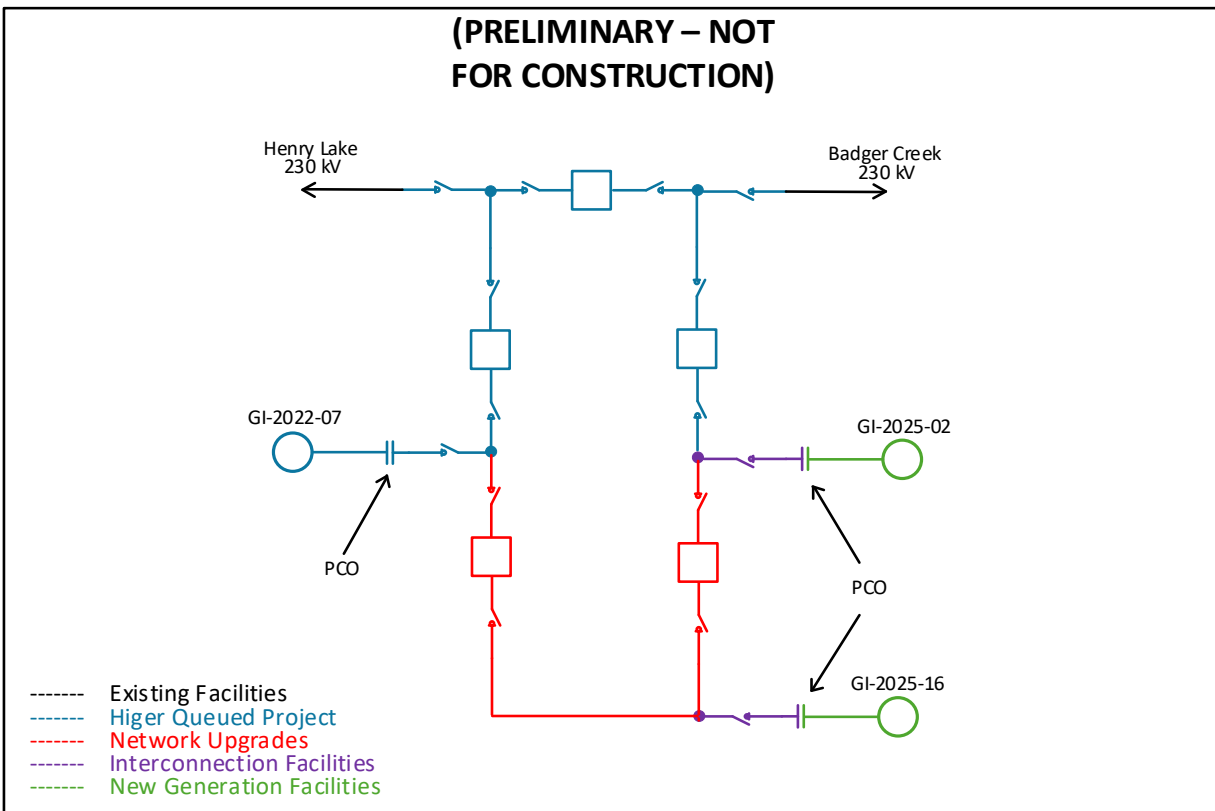


Figure 8-1: GI-2025-02 and GI-2025-16 One-Line Diagram

Table 8-13: Summary Cost Estimate Details – Interconnection Facilities GI-2025-02

Element	Description	Cost Est. Millions
2022-07 230 kV Substation Line Termination Equipment	Design, purchase, construct / install and test all equipment installed inside the New Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 230 kV A-frame dead-end structure - One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure. - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. - Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. - Three (3) 230 kV surge arresters (280 kV MCOV or as required). - Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$1.30 M

Table 8-14: Summary Cost Estimate Details – Network Upgrades GI-2025-02 NRIS

Element	Description	Cost Est. Millions
2022-07 230 kV Substation Additional 230 kV Line Bay	- One (1) 230 kV power circuit breaker and associated disconnect switches - Circuit breaker station control panels - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators	\$3.78 M

Table 8-15: Summary Cost Estimate Details – Interconnection Facilities GI-2025-16

Element	Description	Cost Est. Millions
2022-07 230 kV Substation Line Termination Equipment	Design, purchase, construct / install and test all equipment installed inside the New Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment: - One (1) 230 kV A-frame dead-end structure - One (1) 230 kV slack span from monopole dead-end outside substation fence to new A-frame structure. - One (1) 230 kV 3-ph gang line end disconnect switch and associated structure *Three (3) 230 kV metering current transformers (CTs), high accuracy class, extended range. *Three (3) 230 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. - Relaying for radial 230 kV line protection; primary, secondary, and breaker-failure. - Three (3) 230 kV surge arresters (280 kV MCOV or as required). - Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$1.30 M

Table 8-16: Summary Cost Estimate Details – Network Upgrades GI-2025-16 NRIS

Element	Description	Cost Est. Millions
2022-07 230 kV Substation Additional Line Bay	- One (1) 230 kV power circuit breaker and associated disconnect switches - Circuit breaker station control panels - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators	\$3.78 M

9.0 CLUSTER AREA 7 – NORTHEAST NEW MEXICO

The Northeast New Mexico Cluster Area is made up of one (1) IR:

- GI-CS-2025-18 (“GI-2025-18”)

9.1 Generator Modeling Data

9.1.1 GI-2025-18

The project consists of seventy-five (75) GE 2.82 Wind-Turbine Generators (WTG) (one (1) 211.5 MW equivalent wind generator), one (1) 34.5-115-13.8 kV transformer, and a 10-mile 115 kV generator tie line that will interconnect to a new 115kV POI Switching Station approximately 15 miles west of the existing Clapham Substation on the Gladstone – Clapham 115 kV Line. Model data is based upon information provided by the IC in the interconnection request. The IC must provide actual data and confirm actual reactive power operating capabilities prior to interconnecting the project, and ultimately prior to being deemed by Tri-State as suitable for commercial operation. The IC has requested to be studied at 199 MW (injected at the POI) for Energy Resource Interconnection Service (“ERIS”).

9.2 9.2 Steady State Power Flow Analysis

9.2.1 Cluster Area Criteria and Assumptions

1. The proposed Project output was accommodated by displacing generation resources at Escalante and Pyramid.
2. Gladstone PST is stressed to 180 MVA North to South in all study cases.

9.2.2 Steady-State Power Flow Results

GI-2025-18 has requested to be studied as **ERIS**. When studying ERIS projects, other generators may be redispatched to avoid overloads, including NRIS generation or other generation at the POI.

Power flow results for all contingencies using the 2029 Heavy Summer and 2029 Light Summer cases are shown in **Table 9-1** and **Table 9-2** below. Each violation is discussed in more detail below.

1. N-0 (System Intact, Category P0) Study Results:

Heavy Summer Results:

- a. Gladstone – Springer is overloaded to 129.49% of its 184 MVA capacity under P0.

Mitigation: Uprate Gladstone – GI-2025-CS-18 115 kV

- b. Gladstone – Springer is overloaded to 134.94% of its 184 MVA capacity under P0.

Mitigation: Uprate Gladstone – Springer 115 kV

Light Summer Results:

- c. None

2. N-1 (Single Contingency, Category P1) Study Results:

2029 Heavy Summer Results:

- a. Loss of GI-CS-2025-18 – Clapham 115 kV line overloads Gladstone – GI-CS-2025-18 115 kV to 139.96% of its 119 MVA rating.

Mitigation: *Uprate Gladstone – GI-2025-CS-18 115 kV*

- b. Loss of GI-CS-2025-18 – Clapham 115 kV line overloads Gladstone – Springer 115 kV to 152.22% of its 184 MVA rating.

Mitigation: *Uprate Gladstone – Springer 115 kV*

- c. Loss of Springer – Black Lake – Taos 115 kV line overloads Arriba Tap – Valencia 115 kV to 139.96% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- d. Loss of Springer – Black Lake – Taos 115 kV line overloads Valencia – Rowe Tap 115 kV to 140.61% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- e. Loss of Springer – Black Lake – Taos 115 kV line overloads Rowe Tap – Colinas 115 kV to 146.98% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- f. Loss of Springer – Black Lake – Taos 115 kV line overloads Colinas – El Dorado Tap 115 kV to 146.20% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- g. Loss of Springer – Black Lake – Taos 115 kV line overloads El Dorado Tap – ZIA 115 kV to 149.90% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

2029 Light Summer Results:

- h. Loss of GI-CS-2025-18 – Clapham 115 kV line overloads Gladstone – GI-CS-2025-18 115 kV to 165.26% of its 119 MVA rating.

Mitigation: *Uprate Gladstone – GI-2025-CS-18 115 kV*

- i. Loss of GI-CS-2025-18 – Clapham 115 kV line overloads Gladstone – Springer 115 kV to 156.94% of its 184 MVA rating.

Mitigation: *Uprate Gladstone – Springer 115 kV*

- j. Loss of Springer – Black Lake – Taos 115 kV line overloads Arriba Tap – Valencia 115 kV to 139.96% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- k. Loss of Springer – Black Lake – Taos 115 kV line overloads Valencia – Rowe Tap 115 kV to 125.70% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- l. Loss of Springer – Black Lake – Taos 115 kV line overloads Rowe Tap - Colinas 115 kV to 124.15% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- m. Loss of Springer – Black Lake – Taos 115 kV line overloads Colinas – El Dorado Tap 115 kV to 123.98% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

- n. Loss of Springer – Black Lake – Taos 115 kV line overloads El Dorado Tap - ZIA 115 kV to 124.95% of its 102 MVA rating.

Mitigation: Consult with PNM to determine mitigation.

3. N-k (System Intact, Category P2-7) Study Results:

2029 Heavy Summer Results:

- a. None

2029 Light Summer Results:

- a. None

9.2.2.1 Network Upgrades

The following Network Upgrades and constraints on Affected Systems were identified for the Northeast New Mexico Area.

1. Rebuild Gladstone – 2025-18 Tap 115 kV with 795 ACSR (244 MVA)
2. Rebuild Gladstone – Springer 115 kV with 1272 ACSR (324 MVA)
3. The following Network Upgrades and constraints on Affected Systems were identified for the Northeast New Mexico Cluster Area in one or more scenarios. Consult with PNM to determine the mitigation for overloads on:
 - a. Arriba Tap – Valencia 115 kV
 - b. Valencia – Rowe Tap 115 kV
 - c. Rowe Tap – Colinas 115 kV
 - d. Colinas – El Dorado Tap 115 kV

e. El Dorado Tap – ZIA 115 kV

Table 9-1: 2029 Heavy Summer – Thermal Analysis Northeast New Mexico– GI-2025-18 (ERIS)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P0: System Intact						
---	Gladstone – Springer 115 kV	---	184	36.51	129.49	TSGT
P1: N-1						
P1.2	2025-18 Tap – Gladstone 115 kV	2025-18 Tap – Clapham 115 kV	119	---	139.96	TSGT
P1.2	Gladstone – Springer 115 kV	2025-18 Tap – Clapham 115 kV	184	---	152.22	TSGT
P1.2	Arriba Tap – Valencia 115 kV	Springer – Black Lake – Taos 115 kV	102	58.73	139.96	PNM
P1.2	Valencia – Rowe Tap 115 kV	Springer – Black Lake – Taos 115 kV	102	54.33	140.61	PNM
P1.2	Rowe Tap –Colinas 115 kV	Springer – Black Lake – Taos 115 kV	102	47.54	146.98	PNM
P1.2	Colinas – El Dorado Tap 115 kV	Springer – Black Lake – Taos 115 kV	102	42.21	146.20	PNM
P1.2	El Dorado Tap – ZIA 115 kV	Springer – Black Lake – Taos 115 kV	102	38.58	149.90	PNM
P2-P7: N-k						
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Table 9-2: 2029 Light Summer – Thermal Analysis Northeast New Mexico–GI-2025-18 (ERIS)

Contingency Type	AFFECTED ELEMENT	CONTINGENCY	Thermal Rating (MVA)	Pre-Project Percent Loading	Post-Project Percent Loading	Owner
P0: System Intact						
---	Gladstone – Springer 115 kV	---	184	44.67	134.94	TSGT
P1: N-1						
P1.2	2025-18 Tap – Gladstone 115 kV	2025-18 Tap – Clapham 115 kV	119	---	165.26	TSGT
P1.2	Gladstone – Springer 115 kV	2025-18 Tap – Clapham 115 kV	184	---	156.94	TSGT
P1.2	Arriba Tap – Valencia 115 kV	Springer – Black Lake – Taos 115 kV	102	38.88	125.70	PNM
P1.2	Valencia – Rowe Tap 115 kV	Springer – Black Lake – Taos 115 kV	102	36.79	124.15	PNM
P1.2	Rowe Tap –Colinas 115 kV	Springer – Black Lake – Taos 115 kV	102	32.34	124.96	PNM
P1.2	Colinas – El Dorado Tap 115 kV	Springer – Black Lake – Taos 115 kV	102	29.50	123.98	PNM
P1.2	El Dorado Tap – ZIA 115 kV	Springer – Black Lake – Taos 115 kV	102	28.18	124.95	PNM
P2-P7: N-k						
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9.2.3 Reactive Power Analysis

9.2.3.1 GI-2025-18 PV

At the full 201.0 MW output, the VAR capability required at the XFMR High Voltage bus ranges from 73.0 MVAR produced (0.940 p.f. lag) to -73.0 MVAR absorbed (0.940 p.f. lead). This is the net MVAR to be produced or absorbed by the GF, depending upon the applicable range of voltage conditions at the POI.

The unit data provided by the IC shows a reactive capability of 0.892 lag (producing) and 0.892 lead (absorbing) power factor at maximum power output. Utilizing only the GF capability supplied by the IC, a steady-state analysis was performed for the POI voltage established by the dispatch in the power flow cases. For reference, **Table 9-3** tabulates net VAR flow at several levels of GF output and at fixed generator bus p.f. levels, based on the voltage at the lumped equivalent model generator terminals and the voltage at the XFMR HV bus. A 7.5 MVAR capacitor bank was included in the application data and is compared to the required reactive power.

At the full 201.0 MW output, results indicate the GF can meet Tri-State's 0.940 p.f. lag to lead criteria at the XFMR HV bus with the inclusion of the 7.5 MVAR capacitor bank. At 0 MW, the Project's collector system produced minimal reactive power, which meets the VAR neutral requirements (less than 2 MVAR flow at 0 MW output at the POI).

Table 9-3: Reactive Power Delivered to the Gen Equivalent Bus, and at XFMR HV Bus,
GI-2025-18 WIND, Project Size: 201.0 MW

Fixed Voltage at POI Bus	P, Q, V at Gen Bus			Net P, Q, V, PF at XFMR HV Bus					
	P.Gen (MW)	Q.Gen (MVAR)	V.Gen (pu)	P.HV (MW)	Q.HV (MVAR)	V.HV (pu)	PF.HV	MVAR to meet 0.94 PF at XFMR HV Bus	Reactive Needs: Capacitive (+) Inductive (-)
1.050 POI Voltage at 0.9 p.f. lag (absorbing MVAR)									
1.05	0.0	0.0	1.051	-0.0	1.3	1.051	-----	-0.0	None
1.05	40.2	-20.4	1.041	40.1	-19.8	1.047	0.896	-14.6	None
1.05	80.4	-40.8	1.030	80.0	-42.7	1.043	0.882	-29.0	None
1.05	120.6	-61.1	1.018	119.7	-67.3	1.038	0.872	-43.4	None
1.05	160.8	-81.5	1.004	159.1	-93.8	1.033	0.861	-57.7	None
1.05	201.0	-101.9	0.990	198.3	-122.5	1.026	0.851	-72.0	None
0.950 POI Voltage at 0.9 p.f. lead (producing MVAR)									
0.95	0.0	0.0	0.951	0.0	1.1	0.951	-----	0.0	None
0.95	40.2	20.4	0.969	40.1	20.6	0.958	0.890	14.6	None
0.95	80.4	40.8	0.985	80.0	38.4	0.964	0.902	29.0	None
0.95	120.6	61.1	1.001	119.7	54.6	0.970	0.910	43.4	None
0.95	160.8	81.5	1.015	159.2	69.4	0.975	0.917	57.8	None
0.95	201.0	101.9	1.028	198.5	82.8	0.979	0.923	72.0	None

9.3 Transient Stability Analysis

9.3.1 Cluster Area Assumptions

1. The equivalent generators were modeled with data provided by the customer and in accordance with the WECC approved model list.
2. The collector systems, transformers, and generators were modeled with the same parameters as during steady-state analysis.

9.3.2 Methodology

Transient stability was evaluated as follows:

1. The 2029 Heavy Summer and a 2029 Light Summer base case were utilized. The standalone project in this cluster area was simulated as NRIS, with all the network upgrades associated with the project in service.
2. System stability is observed by monitoring the voltage and relative rotor angles of local machines and system damping.
3. Three-phase faults were simulated for all contingencies. Line faults were typically assumed to be at the midpoint of the line. The corresponding stability contingencies to evaluate the facility's compliance with NERC/WECC criteria for transient stability are listed in Appendix B.
4. Unstable contingencies were simulated with the GF out of service, to verify that the Project is the cause of the instability.

9.3.3 Transient Stability Results

Transient stability results identified that the Projects do not require additional mitigation and are compliant with the NERC/WECC criteria.

Simulation results for heavy summer conditions show that:

1. No adverse dynamic responses were observed.

9.4 Short Circuit Analysis

Short circuit analysis was performed by the Transmission Provider for three phase and single line to ground faults at the generating facilities' points of interconnection, with the addition of all Contingent Facilities and Network Upgrades. Fault current contribution from the Project inverters were considered negligible so the inverters were not included in the short circuit analysis.

Table 6-4 shows the results of the 115 kV bus faults and the network grid Thevenin equivalent impedances. The resultant total fault currents are within planned and existing equipment ratings.

Table 9-4: Short Circuit Results

System Condition	POI Bus (Total) 3-Ph Fault Level (Amps)	POI Bus (Total) SLG Fault Level (Amps)	Thevenin System Equivalent Impedance ($R + jX$ p.u. on 100 MVA)
2025-18 115 kV Tap (POI) Bus Fault (w/o IC generation; all lines in service)	2927	2370	$Z1 = 0.03936 + j0.16934$ $Z0 = 0.06430 + j0.28591$ MVA 3LG = 583 MVA SLG = 472
2025-18 115 kV Tap (POI) Bus Fault (w/ 2025-18 generation; all lines in service)	3974	3425	$Z1 = 0.02342 + j0.12421$ $Z0 = 0.02912 + j0.18496$ MVA 3LG = 792 MVA SLG = 682

9.5 Contingent Facilities

The following Interconnection Facilities and/or Network Upgrades to the transmission system are Contingent Facilities applicable to this Cluster Area. These are facilities not yet in service which the costs, timing, and study findings in this report are dependent upon, and if delayed or not built, could cause a need for re-studies of the interconnection request or a reassessment of the facilities, costs and timing.

1. None

9.6 Scope, Cost, and Schedule

The cost estimate is broken out into two categories: 1) Interconnection Facilities, which include all equipment installed between the POI at the main bus and the Point of Change of Ownership (PCO) at the line dead-end structure¹² just outside the POI substation fence, and 2) Network Upgrades consisting of the rest of the facilities installed in the existing POI substation or at other locations to accommodate the interconnection. The estimate includes all site work such as grounding and conduit installation inside the substation.

Note that the IC will be responsible for constructing the radial transmission line from the PCO to the GF site and for providing the primary protection (relaying and interrupting device) for the IC's step-up transformer. Equipment at the POI will only provide backup protection for the IC's main transformer in the event of equipment failure or malfunction at the IC's facility. To facilitate protective relaying and data acquisition, the IC will need to include fiber optic cables (OPGW) on its radial transmission line to provide communication channels for SCADA, metering (real time), and protective relaying.

The IC is responsible for all engineering, procurement and construction of all GF facilities, including any STATCOM type voltage regulation / reactive compensation devices.

All costs are good faith estimates based on assumptions as stated in this 2025 Cluster Study Report. All estimates are in 2026 dollars.

¹² The Interconnection Customer's Interconnection Facilities are required to end at a vertically configured full tension monopole deadend structure located outside of the substation fence and approximately 10 feet inside Tri-State's property line. The vertically configured full tension monopole deadend structure shall create zero line angle with the Transmission Providers A-frame deadend structure, unless another location is mutually agreed upon by the parties in writing.

It is estimated that it will take approximately 60 months after receiving authorization to proceed to complete the engineering, design, procurement, construction, and testing activities identified in the scope of work. It is also estimated that it may take approximately 84 months after receiving authorization to proceed for the permitting activities and ROW to be completed for transmission line construction, if applicable. It is possible that the Generating facility may be able to operate at some level of generation prior to the completion of the requisite Interconnection Facilities, Network Upgrades, Contingent Facilities, or System Protection Facilities. However, that level of generation is not known at this phase of the study and would be addressed through a Provisional Interconnection Service Request per 5.9.2 of the LGIA.

9.6.1 GI-2025-18 Costs

All costs are good faith estimates based on assumptions as stated in this 2025 Cluster report.

ERIS Costs:

Interconnection Facilities Costs:	\$ 0.90 M
Network Upgrade Costs, Interconnection	\$99.27 M
TOTAL Costs (2026 dollars) for Interconnection:	\$100.17 M

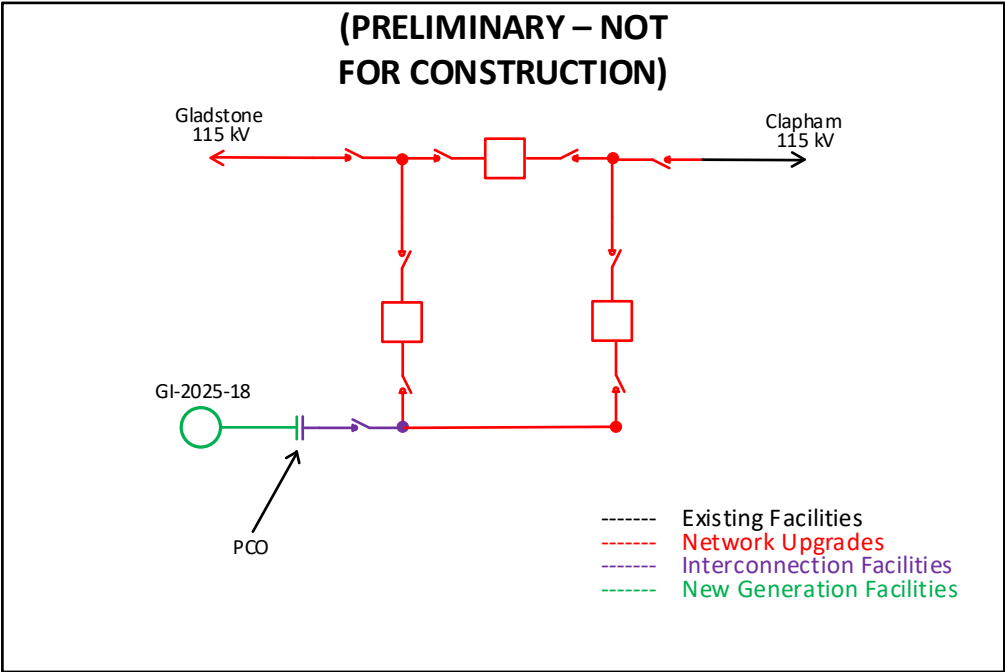


Table 9-5: Summary Cost Estimate Details – Interconnection Facilities GI-2025-18

Element	Description	Cost Est. Millions
GI-CS-2025-18 115 kV Line Termination Equipment	Design, purchase, construct / install and test all equipment installed inside the New Station that is located between the PCO (line dead-end) and the POI (main bus tap point), consisting primarily of the following equipment:	\$0.90 M

Element	Description	Cost Est. Millions
	- One (1) 115 kV A-frame dead-end structure - One (1) 115 kV slack span from monopole dead-end outside substation fence to new A-frame structure. - One (1) 115 kV 3-ph gang line end disconnect switch and associated structure *Three (3) 115 kV metering current transformers (CTs), high accuracy class, extended range. *Three (3) 115 kV metering voltage transformers (VTs, high accuracy class). *Or alternative CT/VT combination metering units. - PQ metering panel including SEL-735 Rev/PQ meter (typical) and line meters. - Relaying for radial 115 kV line protection; primary, secondary, and breaker-failure. - Three (3) 115 kV surge arresters. - Line termination SCADA and telecommunication additions to RTU, DFR, PMU. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	

Table 9-6: Summary Cost Estimate Details – Network Upgrades

Element	Description	Cost Est. Millions
GI-2025-18 POI Substation	- Three (3) 115 kV power circuit breaker and associated switches. - Circuit breaker station control panels. - Digital Fault Recorder and associated panel - SCADA and telemetry RTU communication equipment modifications. Other associated substation equipment including, but not limited to, grounding, conduit, cable, foundations, support steel, bus and insulators.	\$8.48 M
Reconductor Gladstone – GI- 2025-18 115 kV line	18 miles of 115 kV 795 kcmil ACSR “Drake” conductor transmission line - Wood H-Frame	\$35.53 M
Reconductor Gladstone – Springer 115 kV line	31.8 miles of 115 kV 1272 kcmil ACSR “Bittern” conductor transmission line - Wood H-Frame	\$55.26 M