Informational Interconnection Study Report for INFO-2024-5

6/26/2025

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1.0 Executive Summary

This report is an informational evaluation of a 146 MW of solar Photovoltaic (PV) Generating Facility at the Spring Canyon 230 kV switching station, in Logan County, Colorado. The Customer has requested the study to be conducted as Energy Resource Interconnection Service (ERIS) with the expected Commercial Operation Date (COD) of December 31st, 2029.

The 2030HS was selected as a Starting Case to reflect the requested COD. From the Starting case, a Benchmark case was created which included higher queued projects and stressed East study pocket with the full 4,050 MW of Native Load Priority dispatched on the Colorado's Power Pathway.

The study results have indicated the following:

- System Intact analysis: No voltage or thermal violation attributable to INFO-2024-5 was identified in this analysis.
- Single Contingency analysis: No voltage violation attributable to INFO-2024-5 was identified in this analysis. Thermal overload violations observed in this analysis were resolved via redispatch. No thermal violation attributable to INFO-2024-5 was identified in this analysis.
- Multiple Contingency analysis: No voltage violation attributable to INFO-2024-5 was identified in this analysis. Per TPL-001-5, thermal overload violations observed during this analysis are not attributable to INFO-2024-5.

No Affected System was identified in this analysis. Therefore, the study concludes that ERIS identified for INFO-2024-5 is 146 MW.

The Spring Canyon 230 kV switching station is currently configured as a 3-breaker ring bus and a position can be added to the ring to interconnect the developer's proposed 146 MW solar project.

Disclaimer: This informational study report does not grant any Interconnection Service or Transmission Service. The results are based on the modeling assumptions and study scope specified by the Customer, which may or may not reflect the standard modeling assumptions followed for Large Generator Interconnection Procedures (LGIP) studies.

2.0 Introduction

This report is an informational evaluation of a 146 MW solar PV Generating Facility at the Spring Canyon 230 kV switching station. The study included a Generating Facility model supplied by the Customer.

A summary and description of the Energy Resource Interconnection Service (ERIS) request for INFO-2024-5 is shown in Table 1.

Table 1 – Summary of Request for INFO-2024-5 as ERIS

INFO #	Resource Type	Requested Capacity (MW)	Service Type	COD	POI	Location
INFO-2024-5	PV	146	ERIS	12/31/2029	Spring Canyon 230 kV	Logan County, CO

The approximate geographical location of the transmission system at and near the POI is shown in Figure 1.

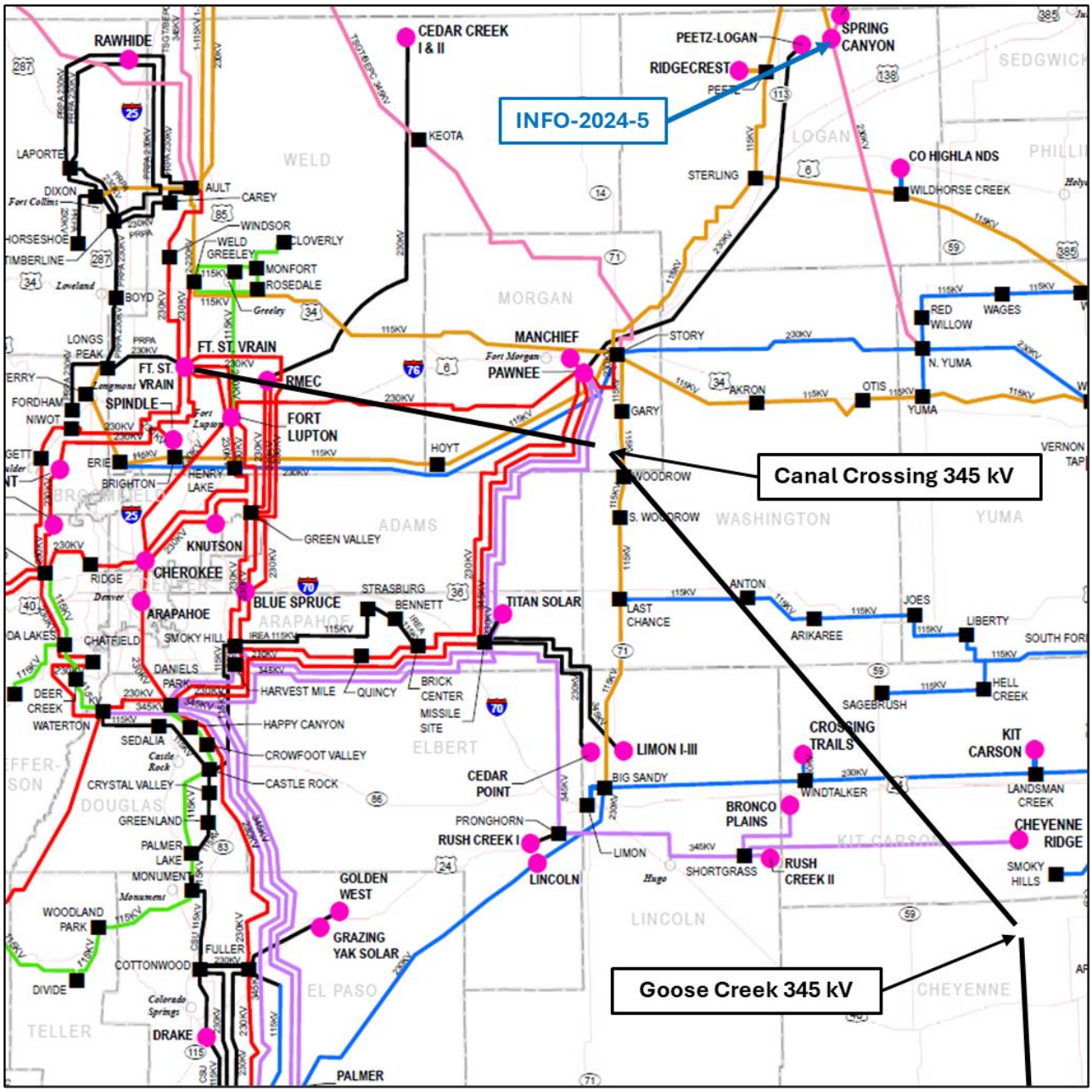

Figure 1: Point of Interconnection of INFO-2024-5

3.0 Study Scope

The study was performed using the modeling assumptions specified by the Customer as well as those outlined in the Business Practices Manual (BPM).

3.1 Study Criteria

The following Criteria are used for the reliability analysis of the PSCo system and Affected Systems:

P0—System Intact conditions:

Thermal Loading: <=100% of the normal facility rating

Voltage range: 0.95 to 1.05 per unit

P1 & P2-1—Single Contingencies:

Thermal Loading: <=100% Normal facility rating

Voltage range: 0.90 to 1.10 per unit

Voltage deviation: <=8% of pre-contingency voltage

P2 (except P2-1), P4, P5 & P7—Multiple Contingencies:

Thermal Loading: <=100% Emergency facility rating

Voltage range: 0.90 to 1.10 per unit

Voltage deviation: <=8% of pre-contingency voltage

3.2 Study Pocket

Based on the POI location of the Generating Facility, the East study pocket will be used. The East study pocket includes WECC designated zone 706. As described in Section 3.11 of the BPM, this study pocket is comprised of eastern Colorado transmission system with major generation injecting into Pawnee, Beaver Creek and Missile Site substations. Below is the current generation comprising study pocket East:

- Pawnee: Pawnee Coal, Manchief Gas, Peetz Logan Wind
- Beaver Creek: Brush Gas + Combined Cycle (CC)
- Missile Site: Cedar Point Wind, Limon Wind, Rush Creek Wind.

4.0 Base Case Modeling Assumptions

The 2029 Heavy Summer WECC base case, released on May 8, 2023, was selected as the Starting Case for this study. The 2030HS Base Case was created from the Starting Case by including modeling changes such as a complete build out of Colorado's Power Pathway with forecasted transmission projects, line uprate projects, substation rebuild project, new transformer additions, and the generation assumed to be part of the Native Load Priority to serve the PSCo Native Load.

The following is a list of modeling changes included in the 2030HS Base Case:

- Godfrey - Gilcrest - Anadarko 115 kV L9494 uprate to 239 MVA
- Greenwood Bus-Tie uprate to 956 MVA
- Daniels Park-Prairie-Greenwood uprate L5707 to 916 MVA
- Leetsdale-Monroe-Elati- Denver Terminal L5283 & L5625 uprate to 956 MVA
- Cherokee-Federal Heights-Broomfield L9558 uprate to 398 MVA
- Daniels Park-Prairie-Greenwood uprate L5111 to 916 MVA
- Arapahoe - Greenwood L5709 uprate to 956 MVA
- Arapahoe - South - Bancroft L9335 uprate to 239 MVA
- Arapahoe - ARLQ - South - Gray L9332 uprate to 159 MVA
- Arapahoe Bus-Tie uprate to 397 MVA
- Greenwood - Monaco Series Reactor L5717
- New Fort Lupton T4 230/115 kV 273/319 MVA
- New Arapahoe T6 230/115 kV 272/319 MVA
- Leetsdale-Harrison L9955 uprate to 378 MVA
- Cherokee - Mapleton L9546 uprate to 318 MVA
- Daniels Park - Santa Fe L5107 uprate to 637 MVA
- New South substation 230 kV bus and 230/115 kV 560 MVA transformer
- New Smoky Hill T6 & T7 345/230 kV 560 MVA
- Cherokee - Federal Heights - Semper L9055 uprate to 398 MVA
- New Daniels Park T4 345/230 kV 560 MVA
- Gray Street substation rebuild
- Smokey Hill - Buckley - Tollgate - Jewell - Leetsdale Lin 5285 uprate to 796 MVA
- Buckley - Smokey Hill L5167 uprate to 796 MVA

- New double circuit line from Cherokee-Sandown-Chambers-Harvest Mile 230 kV 1195 MVA (each circuit)
- New Sub_A 115 kV substation tying L9542, L9546, & L9549
- Cherokee - Conoco - Sub_A L9546 uprate to 318 MVA
- Daniels Park - Jackson Fuller L5119 uprate to 637 MVA
- Midway - Jackson Fuller L5129 uprate to 637 MVA
- New Fort St. Vrain T9 345/230 kV 560 MVA
- Gray Street - Lakewood L9000 & 9005 uprate to 128 MVA
- Palmer Lake - Fox Run L9605 uprate to 239 MVA
- Added May Valley Synchronous Condensers
- Added Goose Creek STATCOM

Additionally, the following segments of the Colorado's Power Pathway (CPP) were included in the 2030HS Base Case:

- Segment #1: Fort St. Vrain – Canal Crossing 345 kV Double Circuit.
- Segment #2: Canal Crossing – Goose Creek 345 kV Double Circuit.
- Segment #3: Goose Creek – May Valley 345 kV Double Circuit.
- Segment #4: May Valley – Sandstone – Tundra 345 kV Double Circuit.
- Segment #5: Sandstone – Harvest Mile 345 kV Double Circuit.

The 2030HS Base Case model includes the existing PSCo generation resources and all Affected Systems existing resources. While the higher-queued NRIS requests were dispatched at 100%, the higher-queued ERIS requests were modeled offline.

5.0 East Colorado Study Pocket Analysis

5.1 Benchmark Case Modeling

The Benchmark Case was created from the 2030HS Base Case described in Section 4.0 by modifying the study pocket generation dispatch to create stressed transmission flow conditions from Eastern Colorado into the load center of Denver Metro Area, as described in section 3.4.2 of the BPM. This was accomplished by adopting the stressed generation dispatch given in Table 2. Additionally, the Benchmark Case also includes 4,050 MW of Native Load Priority generation, modeled on the CPP, to serve the PSCo's Native Load. The list of generators modeled as part of the NLP is shown in Table 3. This generation represents the amount of firm transmission capacity set aside to reasonably meet PSCo's Native Load obligations using the assumptions about necessary transmission upgrades and generation resources that will be used to serve forecasted Native Load.

Table 2 – Generation Dispatch Used to Create the Southern Colorado Benchmark Case (MW is Gross Capacity)

Gen Bus Number	Name	ID	Status	Pgen (MW)	Pmax (MW)
70310	PAWNEE	C1	1	526.0	526.0
70314	MANCHEF1	G1	1	118.4	131.5
70315	MANCHEF2	G2	1	117.9	131.0
70767	RUSHCK1_W1	W1	1	161.6	202.0
70770	RUSHCK1_W2	W2	1	142.4	178.0
70771	RUSHCK2_W3	W3	1	176.0	220.0
70739	CHEYRGW_W1	W1	1	109.1	136.4
70742	CHEYRGW_W2	W2	1	105.6	132.0
70733	CHEYRGE_W1	W1	1	43.2	54.0
70736	CHEYRGE_W2	W2	1	88.0	110.0
70775	CHEYRGE_W3	W3	1	52.8	66.0
70818	MTNBRZ_W1	W1	1	126.3	157.9
70817	MTNBRZ_W2	W2	1	11.0	13.8
70670	CEDARPT_W1	W1	1	99.4	124.2
70671	CEDARPT_W2	W2	1	100.8	126.0
70635	LIMON1_W	W1	1	160.8	201.0
70636	LIMON2_W	W2	1	160.8	201.0
70637	LIMON3_W	W3	1	160.8	201.0

Gen Bus Number	Name	ID	Status	Pgen (MW)	Pmax (MW)
70753	BRONCO_W1	W1	1	117.3	146.6
70749	BRONCO_W2	W2	1	129.0	161.2
70710	PTZLOGN1	W1	1	160.8	201.0
70712	PTZLOGN2	W2	1	96.0	120.0
70713	PTZLOGN3	W3	1	63.6	79.5
70714	PTZLOGN4	W4	1	140.0	175.0
70498	QF_BCP2T	G3	1	30.7	34.1
70498	QF_BCP2T	ST	1	32.4	36.0
70499	QF_B4-4T	G4	1	21.6	24.0
70499	QF_B4-4T	G5	1	22.5	25.0
70500	QF_CPP1T	G1	1	21.6	24.0
70500	QF_CPP1T	G2	1	21.6	24.0
70501	QF_CPP3T	ST	1	24.3	27.0
70556	QF_B4D4T	ST	1	63.0	70.0
700164	GI_2023_14	W1	1	169.2	211.5
700165	GI_2023_14	W2	1	169.2	211.5
70721	SPRNGCAN1_W1	W1	1	51.8	64.8
70715	SPRNGCAN2_W2	W2	1	50.2	62.7
70723	RDGCREST	W1	1	23.8	29.7
70443	ARRIBA_W1	W1	1	80.0	100.1
70442	ARRIBA_W2	W2	1	80.0	100.1
Total (MW)				**4029.5**	

Table 3 – NLP Generation Included in Benchmark Case Dispatch

Generator Bus Number	Generator Name	Base kV	ID	Pgen (MW)	Pmax (MW)
700043	24_14_B	0.65	B	192.3	253.6
700057	24_13_W2	0.72	W2	143.3	189.0
700060	24_13_W3	0.72	W3	143.3	189.0
700063	24_13_W4	0.72	W4	122.9	162.0
700067	24_13_W1	0.72	W1	143.3	189.0
700076	24_12_W1	0.72	W1	109.2	144.0
700077	24_12_W2	0.72	W2	122.9	162.0
700078	24_12_W3	0.72	W3	109.2	144.0
700079	24_9_W1	0.72	W1	116.0	153.0
700082	24_9_W2	0.72	W2	122.9	162.0

Generator Bus Number	Generator Name	Base kV	ID	Pgen (MW)	Pmax (MW)
700085	24_9_W3	0.72	W3	102.4	135.0
700088	24_9_W4	0.72	W4	116.0	153.0
700095	24_18_W	0.72	W	235.8	310.9
700182	24_28_W	0.69	W	389.2	513.2
700196	24_19_W1	0.72	W1	419.8	553.5
700226	24_6_S	0.63	S	336.4	443.5
700232	24_22_S	0.63	S	384.9	507.5
700235	24_26_S1	0.66	S1	116.0	153.0
700237	24_26_B2	0.90	B1	76.6	101.0
700239	24_26_S2	0.66	S2	116.0	153.0
700241	24_26_B2	0.90	B2	76.6	101.0
700244	24_27_B1	0.90	B1	82.9	109.3
700245	24_27_B2	0.90	B2	79.3	104.5
700246	24_27_S1	34.50	S1	96.8	127.7
700247	24_27_S2	34.50	S2	96.8	127.7
Total (MW)				**4050.8**	

5.2 Study Case Modeling

The Study case was developed from the Benchmark case by modeling INFO-2024-5 generation at its POI. The additional 146 MW net output from INFO-2024-5 at the POI was balanced against PSCo generation outside of the East study pocket on a pro-rata basis.

5.3 Steady-State Analysis

Contingency analysis was performed on the East study pocket using the Study Case model. The results are summarized below:

- System Intact analysis: No thermal or voltage violation attributable to INFO-2024-5 was identified in this analysis.
- Single Contingency analysis: No voltage violation attributable to INFO-2024-5 was identified in this analysis. Table 4 lists the identified thermal overload violations. All identified thermal violations were alleviated via redispatch, as shown in the last column of Table 4. Please note that violations listed as Ref. Nos. 1 and 2 are considered resolved, as the post-redispatch loading levels are lower than those observed in the Benchmark Case. The redispatch used to resolve thermal violations is presented in Table 5. Moreover, three P1 contingencies were found to be divergent in both

Benchmark and Study Cases. The divergences are listed in Table 6. Note that divergence also occurs in the Benchmark Case and, therefore, it is not attributed to INFO-2024-5. The redispatch configuration presented in Table 5 was verified to resolve the divergence in all three contingencies for the Study Case.

- Multiple Contingency analysis: No voltage violation attributable to INFO-2024-5 was identified in this analysis. Table 7 lists the thermal overload violations identified in this analysis. Note three P4 and six P7 contingencies were divergent in this analysis, as shown in Table 8. Per TPL-001-5, multiple contingency issues were expected to be mitigated using system adjustments, including generation redispatch and/or operator actions. Therefore, the violations presented in the Multiple Contingency analysis as well as the divergent Multiple contingencies are not attributable to INFO-2024-5.

Table 4 – Single Contingency Thermal Overload Violations

Ref. No.	Monitored Facility	Contingency Name	kV	Area	Rate (MVA)	Benchmark Case Loading (%)	Study Case Loading (%)	Loading Difference (%)	Re-dispatched Study Case Loading (%)
1	MISS. SITE (70624) - NEW H. MILE (770597) 345 kV CKT 1	SMOKY HILL (70599) - MISS SITE (70624) 345 kV CKT 1	345	70	1449	118.17	119.26	1.09	110.48
2	BEAVER CK (73020) - ADENA (73464) 115 kV CKT 1	BEAVER CK (73020) - BRUSH TAP (73031) 115 kV CKT 1	115	73	114	115.55	118.14	2.59	110.16
3	SMOKY HILL (70599) - MISS SITE (70624) 345 kV CKT 1	MISS. SITE (70624) - NEW H. MILE (770597) 345 kV CKT 1	345	70	1686	106.42	107.42	1.00	99.95
4	VALMONT (70447) - SPINDLE (70592) 230 kV CKT 1	FT ST VRAIN (70410) - ISABELLE (70544) 230 kV CKT 1	230	70	478	99.35	102.14	2.79	89.82

Table 5 – Redispatch used to Resolve Single Contingency Thermal Violations

Gen Bus Number	Name	ID	Original Study		Redispatch Study	
			Status	Pgen (MW)	Status	Pgen (MW)
70310	PAWNEE	C1	1	526.0	1	230.0
70588	RMEC1	G1	1	145.0	1	90.0
70589	RMEC2	G2	1	150.0	1	85.0

Gen Bus Number	Name	ID	Original Study		Redispatch Study	
			Status	Pgen (MW)	Status	Pgen (MW)
70591	RMEC3	ST	1	300.0	1	60.0
70710	PTZLOGN1	W1	1	160.8	0	0.0
70714	PTZLOGN4	W4	1	140.0	0	0.0
70593	SPNDLE1	G1	1	98.0	0	0.0
70594	SPNDLE2	G2	1	98.0	0	0.0
70763	THNDWLF_S1	S1	0	0.0	1	200.0
70878	BIGHORN_S	S1	0	0.0	1	247.5
70950	ST.VR_5	G5	0	0.0	1	156.2
70951	ST.VR_6	G6	0	0.0	1	154.5
78053	RD_1_GEN	W1	1	50.0	1	226.6
70577	FTNVL1&2	G1	0	0.0	1	40.0
70577	FTNVL1&2	G2	0	0.0	1	40.0
70578	FTNVL3&4	G3	0	0.0	1	40.0
70578	FTNVL3&4	G4	0	0.0	1	40.0
70579	FTNVL5&6	G5	0	0.0	1	30.0

Table 6 – Diverged Single Contingencies

Ref. No.	Contingency Description	BM Case	Study Case
1	Loss of Missile Site - Pronghorn 345 kV CKT 1	Diverged	Diverged
2	Loss of Kiowa - Sandstone 345 kV CKT 1	Diverged	Diverged
3	Loss of Crow - Sandstone 345 kV CKT 1	Diverged	Diverged

Table 7 – Multiple Contingency Thermal Overload Violations

Ref. No.	Monitored Facility	Contingency Name	kVs	Areas	Rate (MVA)	Benchmark Case Loading (%)	Study Case Loading (%)	Loading Difference (%)
1	CLARK (70112) - JORDAN (70241) 230 kV CKT 1	P7_150	230	70	331	108.49	109.98	1.49
2	VALMONT (70447) - SPINDLE (70592) 230 kV CKT 1	BF_058c	230	70	478	100.85	103.58	2.73

Table 8 – Diverged Multiple Contingencies

Ref. No.	Diverged Contingency	Contingency Description	BM Case	Study Case
1	BF_101h	Missile Site 7106 Stuck	Diverged	Diverged
2	BF_116b	Pronghorn 7138 Stuck	Diverged	Diverged
3	BF_155b	Goose Creek 7254 Stuck	Diverged	Diverged
4	P7_55	Loss of Comanche - Tundra 345 kV CKT 1 Loss of Comanche - Tundra 345 kV CKT 2	Diverged	Diverged
5	P7_136	Loss of Pawnee - Brick CTR 230 kV CKT 1 Loss of Smoky Hill - Missile Site 345 kV CKT 1	Diverged	Diverged
6	P7_159	Loss of Canal Crossing - Goose Creek 345 kV CKT 1 Loss of Canal Crossing - Goose Creek 345 kV CKT 2	Diverged	Diverged
7	P7_160	Loss of Canal Crossing - Ft. St. Vrain 345 kV CKT 1 Loss of Canal Crossing - Ft. St. Vrain 345 kV CKT 2	Diverged	Diverged

Ref. No.	Diverged Contingency	Contingency Description	BM Case	Study Case
8	P7_163	Loss of Sandstone - May Valley 345 kV CKT 1 Loss of Sandstone - May Valley 345 kV CKT 2	Diverged	Diverged
9	P7_164	Loss of Tundra - Sandstone 345 kV CKT 1 Loss of Tundra - Sandstone 345 kV CKT 2	Diverged	Diverged

5.4 Affected Systems

No Affected Systems were identified in this analysis.

5.5 Summary of Steady-State Analysis

The study did not identify any System Network Upgrades attributed to INFO-2024-5 under single contingency when it is studied as an ERIS request.

No thermal or voltage violation attributable to INFO-2024-5 was identified in the System Intact analysis. No voltage violation attributable to INFO-2024-5 was identified in the Single Contingency analysis. All thermal overload violations identified in Single Contingency analysis were alleviated via redispatch. No voltage violation attributable to INFO-2024-5 was identified in the Multiple Contingency analysis. Per TPL-001-5, the thermal overload violations identified in the Multiple Contingency analysis are not attributable to INFO-2024-5.

Therefore, the study concludes that ERIS identified for INFO-2024-5 is 146 MW.

6.0 Summary of the Informational Study

This report is an informational evaluation of a 146 MW of solar Photovoltaic (PV) Generating Facility at the Spring Canyon 230 kV switching station, in Logan County, Colorado. The Customer has requested the study to be conducted as Energy Resource Interconnection Service with the expected Commercial Operation Date (COD) of December 31st, 2029.

The steady-state analysis has identified no voltage violations attributed to INFO-2024-5. Thermal overload violations observed in the Single Contingency analysis were resolved via redispatch. Per TPL-001-5, thermal overload violations observed in Multiple Contingency analysis are not attributable to INFO-2025-5. All non-convergence single contingencies were mitigated by inserting a second circuit in place of the contingency as a conceptual transmission plan. Furthermore, no Affected System was identified in the steady-state analysis.

The study concludes that ERIS identified for INFO-2024-5 is 146 MW.

The Spring Canyon 230 kV switching station is currently configured as a 3-breaker ring bus and a position can be added to the ring to interconnect the developer's proposed 146 MW solar project.

Disclaimer: This informational study report does not grant any Interconnection Service or Transmission Service. The results are based on the modeling assumptions and study scope specified by the Customer, which may or may not reflect the standard modeling assumptions followed for Large Generator Interconnection Procedures (LGIP) studies.