INTERCONNECTION FACILITIES STUDY REPORT

GEN-2024-GR3

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By SPP Generator Interconnections Dept.

REVISION HISTORY

DATE OR VERSION NUMBER	AUTHOR	CHANGE DESCRIPTION
11/25/2025	SPP	Initial draft report issued.

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SUMMARY

INTRODUCTION

This Interconnection Facilities Study (IFS) for Interconnection Request GEN-2024-GR3 is for a 196 MW generating facility located in Lea County, New Mexico. The Interconnection Request was studied in the GEN-2024-GR3 Replacement Impact Study for Energy Resource Interconnection Service (ERIS). The Interconnection Customer's requested in-service date is April 1, 2027.

The interconnecting Transmission Owner, Southwestern Public Service Co. (SPS), performed a detailed IFS at the request of SPP. The full report is included in Appendix A. SPP has determined that full Interconnection Service will be available after the assigned Transmission Owner Interconnection Facilities (TOIF), Non-Shared Network Upgrades, Shared Network Upgrades, Contingent Network Upgrades, and Affected System Upgrades that are required for full interconnection service are completed.

The primary objective of the IFS is to identify necessary Transmission Owner Interconnection Facilities, Network Upgrades, other direct assigned upgrades, cost estimates, and associated upgrade lead times needed to grant the requested Interconnection Service.

PHASE(S) OF INTERCONNECTION SERVICE

It is not expected that Interconnection Service will occur in phases. However, full Interconnection Service will not be available until all Interconnection Facilities and Network Upgrade(s) can be placed in service.

COMPENSATION FOR AMOUNTS ADVANCED FOR NETWORK UPGRADE(S)

FERC Order ER20-1687-000 eliminated the use of Attachment Z2 revenue crediting as an option for compensation. The Incremental Long-Term Congestion Right (ILTCR) process will be the sole process to compensate upgrade sponsors as of July 1st, 2020.

INTERCONNECTION CUSTOMER INTERCONNECTION FACILITIES

The Generating Facility is proposed to consist of fifty-four (54) PE FS4200M solar inverters operating at 3.63 MW with a reduced dispatch of 196 MW. The inverters are rated at 4.2 MW, thus the generating capability of the Replacement Generating Facility (RGF) of 226.8 MW, exceeds the requested Interconnection Service amount of 196 MW. The injection amount of the RGF must be limited to 196 MW at the Point of Interconnection (POI). As a result, the customer must install monitoring and control equipment as needed to ensure that the amount of power injected at the POI does not exceed the Interconnection Service amount.

The Interconnection Customer's Interconnection Facilities to be designed, procured, constructed, installed, maintained, and owned by the Interconnection Customer at its sole expense include:

- 34.5 kV underground cable collection circuits;
- 34.5 kV to 230 kV transformation substation with associated 34.5 kV and 230 kV switchgear;
- Two (2) 230 kV (75/100/125) MVA step-up transformer to be owned and maintained by the Interconnection Customer at the Interconnection Customer's substation;
- Seven (7) miles overhead kV line to connect the Interconnection Customer's substation to the Point of Interconnection ("POI") at the 230 kV bus at existing Transmission Owner substation ("Cunningham 230 kV") that is owned and maintained by Transmission Owner;
- All transmission facilities required to connect the Interconnection Customer's substation to the POI;
- Equipment at the Interconnection Customer's substation necessary to maintain a composite power delivery at continuous rated power output at the high side of the generator substation at a power factor within the range of 95% lagging and 95% leading in accordance with Federal Energy Regulatory Commission (FERC) Order 827. The Interconnection Customer may use inverter manufacturing options for providing reactive power under no/reduced generation conditions. The Interconnection Customer will be required to provide documentation and design specifications demonstrating how the requirements are met; and,
- All necessary relay, protection, control, and communication systems required to protect Interconnection Customer's Interconnection Facilities and Generating Facilities and coordinate with Transmission Owner's relay, protection, control, and communication systems.

TRANSMISSION OWNER INTERCONNECTION FACILITIES AND NON-SHARED NETWORK UPGRADE(S)

To facilitate interconnection, the interconnecting Transmission Owner will perform work as shown below necessary for the acceptance of the Interconnection Customer's Interconnection Facilities.

Table 1 and **Table 2** lists the Interconnection Customer's estimated cost responsibility for Transmission Owner Interconnection Facilities (TOIF) and Non-Shared Network Upgrade(s) and provides an estimated lead time for completion of construction. The estimated lead time begins when the Generator Interconnection Agreement has been fully executed.

Table 1: Transmission Owner Interconnection Facilities (TOIF)

Transmission Owner Interconnection Facilities (TOIF)	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Cunningham 230 kV GEN-2024-GR3 Interconnection (TOIF): Modify existing and replace a new 230 kV high-side switch, equipment foundations, CTs, arresters, underground line termination structure, jumpers, and bus work. **Estimated Lead Time: 18 Months**	$3,378,916	100%	$3,378,916
Cunningham 230 kV GEN-2024-GR3: Build new Gen-Tie Line. **Estimated Lead Time: 18 Months**	$8,153,730	100%	$8,153,730
Total	**$11,532,646**		**$11,532,646**

Table 2: Non-Shared Network Upgrade(s)

Non-Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
Cunningham 230 kV GEN-2024-GR3 Interconnection (NSU): Remove existing and replace a new 230 kV high-side switch, equipment foundations, CTs, arresters, underground line termination structure, jumpers, and bus work. **Estimated Lead Time: 18 Months**	Eligible	$456,037	100%	$456,037
Total		**$456,037**		**$456,037**

SHARED NETWORK UPGRADE(S)

The Interconnection Customer's share of costs for Shared Network Upgrades is estimated in **Table 3** below.

Table 3: Interconnection Customer Shared Network Upgrade(s)

Shared Network Upgrades Description	ILTCR	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)	Estimated Lead Time
None	Eligible	$0	%	$0	N/A
Total		**$0**		**$0**	

All studies have been conducted assuming that higher-queued Interconnection Request(s) and the associated Network Upgrade(s) will be placed into service. If higher-queued Interconnection Request(s) withdraw from the queue, suspend, or terminate service, the Interconnection Customer's share of costs may be revised. Restudies, conducted at the customer's expense, will determine the Interconnection Customer's revised allocation of Shared Network Upgrades.

CONTINGENT NETWORK UPGRADE(S)

Certain Contingent Network Upgrades are **currently not the cost responsibility** of the Interconnection Customer but will be required for full Interconnection Service.

Table 4: Interconnection Customer Contingent Network Upgrade(s)

Contingent Network Upgrade(s) Description	Current Cost Assignment	Estimated In-Service Date
None	$0	N/A

Depending upon the status of higher- or equally-queued customers, the Interconnection Request's in-service date is at risk of being delayed or Interconnection Service is at risk of being reduced until the in-service date of these Contingent Network Upgrades.

AFFECTED SYSTEM UPGRADE(S)

To facilitate interconnection, the Affected System Transmission Owner will be required to perform the facilities study work as shown below necessary for the acceptance of the Interconnection Customer's Interconnection Facilities. **Table 5** displays the current impact study costs provided by either MISO or AECI as part of the Affected System Impact review. The Affected System facilities study could provide revised costs and will provide each Interconnection Customer's allocation responsibilities for the upgrades.

Table 5: Interconnection Customer Affected System Upgrade(s)

Affected System Upgrades Description	Total Cost Estimate ($)	Allocated Percent (%)	Allocated Cost Estimate ($)
None	$0	%	$0
Total	$0		$0

CONCLUSION

After all Interconnection Facilities and Network Upgrades have been placed into service, Interconnection Service for 72 MW can be granted. Full Interconnection Service will be delayed until the TOIF, Non-Shared NU, Shared NU, Contingent NU, Affected System Upgrades that are required for full interconnection service are completed. The Interconnection Customer's estimated cost responsibility for full interconnection service is summarized in the table below.

Table 6: Cost Summary

Description	Allocated Cost Estimate
Transmission Owner Interconnection Facilities Upgrade(s)	$11,532,646
Non-Shared Network Upgrade(s)	$456,037
Shared Network Upgrade(s)	$0
Affected System Upgrade(s)	$0
Total	**$11,988,683**

Use the following link for Quarterly Updates on upgrades from this report: https://spp.org/spp-documents-filings/?id=18641

A draft Generator Interconnection Agreement will be provided to the Interconnection Customer consistent with the final results of this IFS report. The Transmission Owner and Interconnection Customer will have 30 days to negotiate the terms of the GIA consistent with the SPP Open Access Transmission Tariff (OATT).

APPENDICES

A: TRANSMISSION OWNER'S INTERCONNECTION FACILITIES STUDY REPORT AND NETWORK UPGRADES REPORT(S)

See next page for the Transmission Owner's Interconnection Facilities Study Report and Network Upgrades Report(s).

Facilities Study For Southwest Power Pool (SPP)

Group 5
GEN-2024-GR3

Xcel Energy Services, Inc.

Southwestern Public Service Co.
Transmission Planning South
Updated 11/20/2025

Executive Summary

The Southwest Power Pool (SPP or Transmission Provider) evaluated the generation facilities requesting to interconnect to the SPS transmission system in the Generation Replacement Study (GEN-2024-GR3), which was completed in February, 2024. The requests for interconnection were placed with SPP in accordance with the SPP Open Access Transmission Tariff, Attachment V Section 3.9 and SPP Business Practice 7800.

GEN-2024-GR3, the Replacement Generating Facility (RGF), will connect to the existing POI, at the Cunningham 230 kV Substation in the Southwest Power Service (SPS) area. To accommodate the Interconnection Customer's (IC) request, SPS will modify the existing Cunningham Substation 230 kV bus to a to meet the current Xcel Energy and SPS generation interconnection standards. After the modifications, the IC will connect to the SPS Cunningham 230 kV bus. The IC is required to build a 230 kV generation tie-line from their collector substation facility to the SPS Cunningham Substation, the Transmission Owner (SPS) has included the costs constructing the gen-tie line for the customer in the total costs listed below. The IC will be required to maintain a Power Factor between 0.95 lagging and 0.95 leading at the Point of Interconnection (POI).

The customer will refer to the Xcel Energy Interconnection Guidelines For Transmission Interconnected Producer-Owned Generation Greater Than 20 MW for additional requirements found at the following link: Salesforce (Xcel Energy ***Interconnection Guidelines for Transmission Producer-Owned Generation Greater Than 20 MW***).

The IC is required to report their generation off-nominal frequency tripping relay settings to SPP and SPS. SPS specifies that generators shall not trip at frequencies above 58.5 Hz unless exceptions in the Transmission Provider Criteria are met. The IC agrees that the energy generating units installed at this interconnection will not be tripped for under-frequency conditions above 58.5 Hz in compliance with Transmission Provider criteria. This means that the generation subject to this Interconnection Agreement may not trip for under-frequency conditions on the transmission system until all under-frequency load shedding relays have operated. SPS will also require that the IC follow all applicable criteria, guidelines, standards, requirements, regulations, and procedures issued by the North American Electric Reliability Corporation (NERC), SPP, and the Federal Energy Regulatory Commission (FERC) or their successor organizations.

The IC is responsible for all the cost of the Interconnection Facilities, installation of the direct assigned Transmission Owner Interconnection Facilities (TOIF) which are facilities paid for by the IC but are owned, operated, and maintained by SPS; inclusive of all construction required for the IC to interconnect at SPS' Cunningham Substation.

It is anticipated that the entire process of expanding the Cunningham Substation for the acceptance of the IC facility output and the network upgrades allocated to this project will require approximately 18 months to complete after an Interconnection Agreement is signed and an authorization to proceed is received. The IC's cost for the interconnection of this generation facility is shown below in Table 1.

Table 1: Cost Summary[1]

Unshared Network Upgrades:	**$ 456,037.00**
Transmission Owner Interconnection Facilities (TOIF):	**$ 3,378,916.00**
230 kV Gen-Tie Line:	**$ 8,153,730.00**
Total:	**$ 11,988,683.00**

[1] The cost estimates are 2025 dollars with an accuracy level of ±20%.

General Description of SPS Facilities[2]

1. **Construction at the SPS Cunningham Substation**: See Appendix A, Figure A-1 for general vicinity location map of the SPS facility.

   Location: SPS will build a new 230 kV generation tie-line for the customer from the customer's collector substation to SPS' 230 kV Cunningham Substation, in Lea County, New Mexico. SPS requires the IC to run OPGW conductors on their generation tie-line to provide redundant communication. The customer will terminate their generation tie-line to a transmission terminal structure installed and owned by SPS. The transmission terminal structure will be located outside of the Cunningham Substation. SPS will install transmission phase conductor jumpers at the transmission terminal structure along with fiber optics cable to the Point-Of-Interconnection terminal inside the Cunningham Substation. The transmission terminal structure will provide a clear change-of-ownership point for the IC and SPS.

   Bus Design: The bus configuration at the Cunningham 230 kV Substation will accommodate the output from the solar/battery storage energy facility.

   Revenue Metering: An individual billing meter will be installed at the SPS substation on the line terminal from the IC's substation, which meets the standards: ANSI C12.1 accuracy class 0.2 (3-PT's IEEE C57.13 accuracy class 0.3 and 3-CT's IEEE C57.13 accuracy class 0.15) for full 3-phase 4-wire metering. Pulses out of the billing meter will be sent via SCADA to the Transmission Owner's Control Center in Amarillo, Texas.

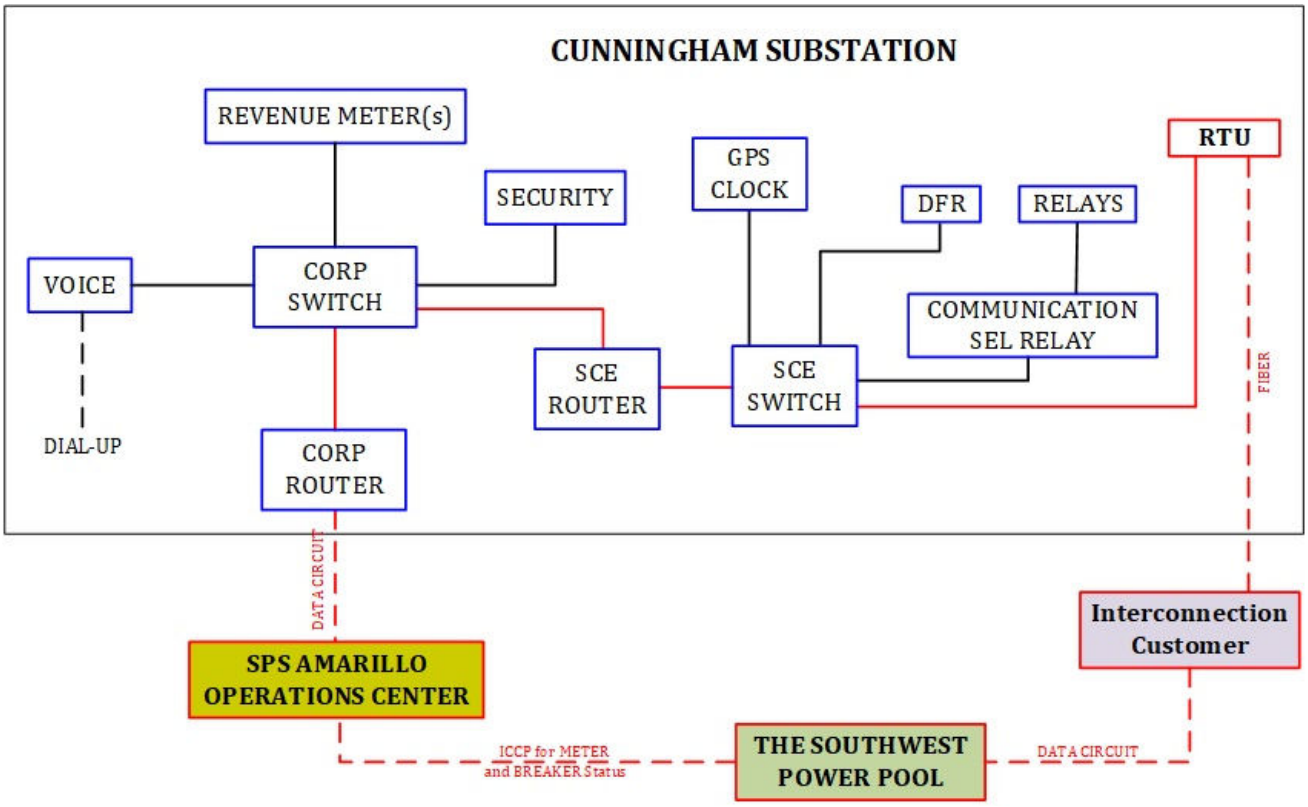
   Disturbance Monitoring Device: The existing Disturbance Fault Recorder (DFR), capable of recording faults, swings, and long-term trending, will be used to monitor and record conditions in the substation and on the generation tie-line. The disturbance equipment shall also be equipped with a GPS time synching clock. This equipment will have communication capability with a dedicated communication circuit. The disturbance equipment will have its own dedicated communications circuit.

   Remote Terminal Unit (RTU): The existing RTU will be utilized for communications with the new IC facilities. A Communication SEL Relay will be utilized for relay communications and other functions as required; these costs will be directly assigned to the IC. The IC will provide and install a RTU for metering and telemetry at the IC's facility as required by the latest Xcel Energy Interconnection Guidelines.

   Communications: To meet its Communications obligations, the IC shall be responsible for planning with the local phone company to provide a communication circuit as required by the Transmission Owner. Transmission Owner equipment may include but is not limited to the following: relay communication equipment, RTU, and disturbance monitoring equipment. Prior to any construction, the IC is required to contact the Transmission Owner substation-engineering department for all communication details and provide detail of the method to be used in communication.

   The following communications schematic diagram, which includes communication equipment information for the IC, Transmission Provider (Southwest Power Pool) and Transmission Owner (Southwestern Public Service), is provided to assist the Parties as a template.

   A schematic outlining the proposed communications is provided below:



IC shall be responsible for providing the dual fiber optic communication circuit installed in the overhead transmission line static wire from the customer substation to the SPS substation for protective relaying and for transmitting metering and status data to SPS. Utilizing this fiber optic connection, SPS will establish a direct connection to the IC's RTU.

SPS will not serve as a proxy for communication from the IC to SPP.

2. **Transmission Work – Engineering and Construction**

   a. **Coordination**: The Xcel Energy Transmission Engineering and Design groups require an engineering review of the customer's design prior to any construction by the IC or its contractor on any customer transmission lines, the proposed termination to the SPS substation, or doing work in close proximity to any SPS transmission line. It is the IC's responsibility to initiate the design review in a timely manner before construction of any transmission line begins. If the review has not been made or the design at any of the aforementioned locations is deemed inadequate, the crossing(s) and or termination into the interchange will be delayed until the matters are resolved. SPS will not be held responsible for these delays

   b. **Fault or Short Circuit Study**: The IC will coordinate with the System Protection Engineering department at SPS on the available fault current at the interconnection location following the acceptance of the Generator Interconnection Agreement (GIA) and prior to final design on the IC's facilities. The table below shows the approximate available fault current at the interconnection location. The fault data does not contain fault current contribution from the IC's facility.

Table 1: Available fault current at interconnection location

Short Circuit Information without contribution from new Generator Facilities (GEN 2024-GR3)				
Fault Location	Fault Current (Amps)		Impedance (Ω)	
	Line-to-Ground	3–Phase	Z^+	Z^0
Cunningham 230 kV Bus	3522.55	10,913.90	1.21775+j12.1060	2.08334+j13.1974

3. **Right-Of-Way**

   a. **Permitting**: The IC will be responsible for any permitting and right of way of their substation and their generation tie-line from their collector substation to Cunningham Substation. The customer will refer to the Xcel Energy *Right-of-Way, Easements, and Encroachments* web page for information concerning crossing of SPS transmission lines with customer generation tie-lines: *Right of Way | Transmission | Corporate | Xcel Energy*

4. **Construction Power and Retail Service**

   a. **Responsibility**: It is the sole responsibility of the IC to arrange for both construction and station power. The IC needs to plan for retail service from the local retail provider. The retail provider and the Customer will be responsible for making any necessary transmission service arrangements as required under the SPP OATT.

5. **Project and Operating Concerns:**

   a. **Collaboration**: Close work between the Transmission group, the IC's personnel and local operating groups will be imperative in order to meet any in-service date that has been established.

   b. **Reactive Power Requirements**: The IC will be required to maintain a power factor between 0.95 lagging and a 0.95 leading at the Point of Interconnection (POI). All capacitors required will be installed on the lower voltage bus at IC's substation. This is required to maintain acceptable dynamic voltage rise as per latest revision of the Xcel Energy Interconnection Guidelines for Transmission Interconnection Producer-Owned Generation Greater than 20 MW. If switched reactive devices are used on the IC's system, they need to be switched in stages where the voltage rise is less than 3%.

6. **Estimated Construction Costs and Schedule**
   a. **Schedule**: An engineering and construction schedule for this project is estimated at approximately 18 months. Other factors associated with clearances, equipment delays, and work schedules could cause additional delays. This is applicable after all required agreements are signed and internal approvals are granted.

   b. All additional cost for work not identified in this study is the sole responsibility of the IC unless other arrangements are made.

Appendix A

Figure A-1: General vicinity location map of the generation facility

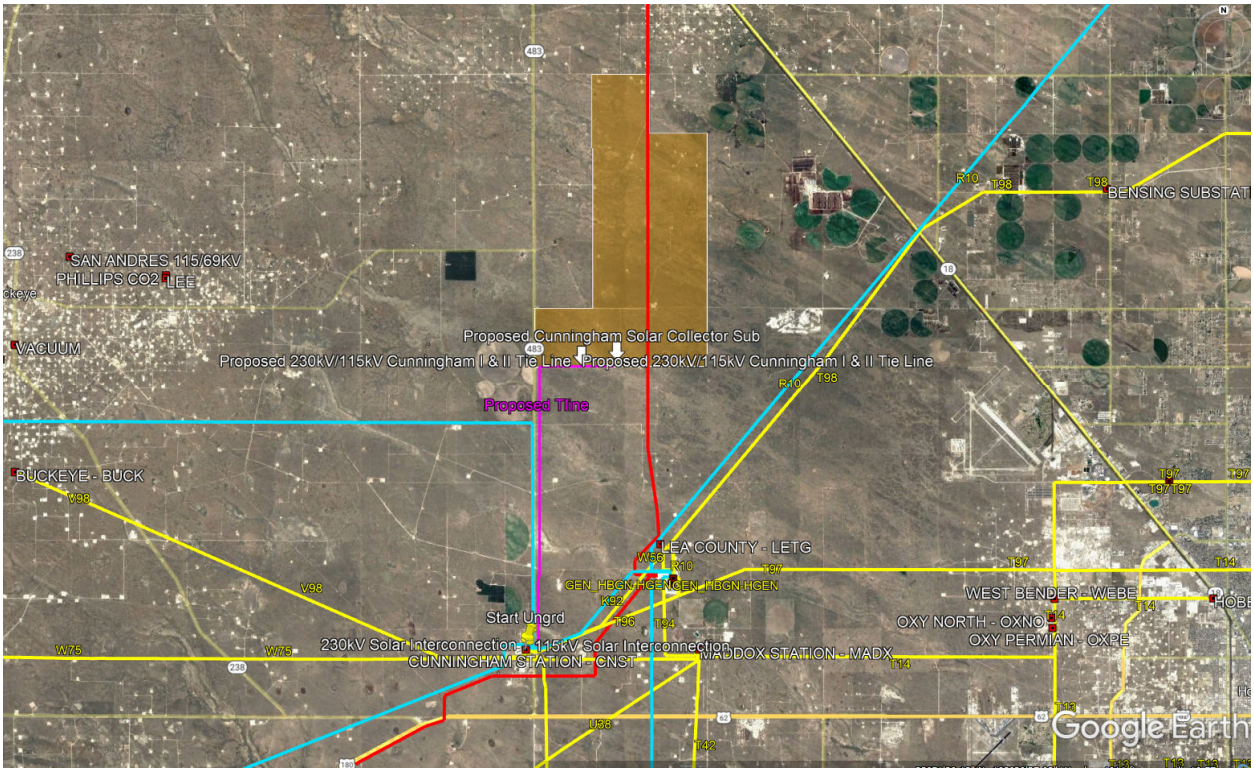


Figure A-2: Satellite Imagery of Cunningham Substation

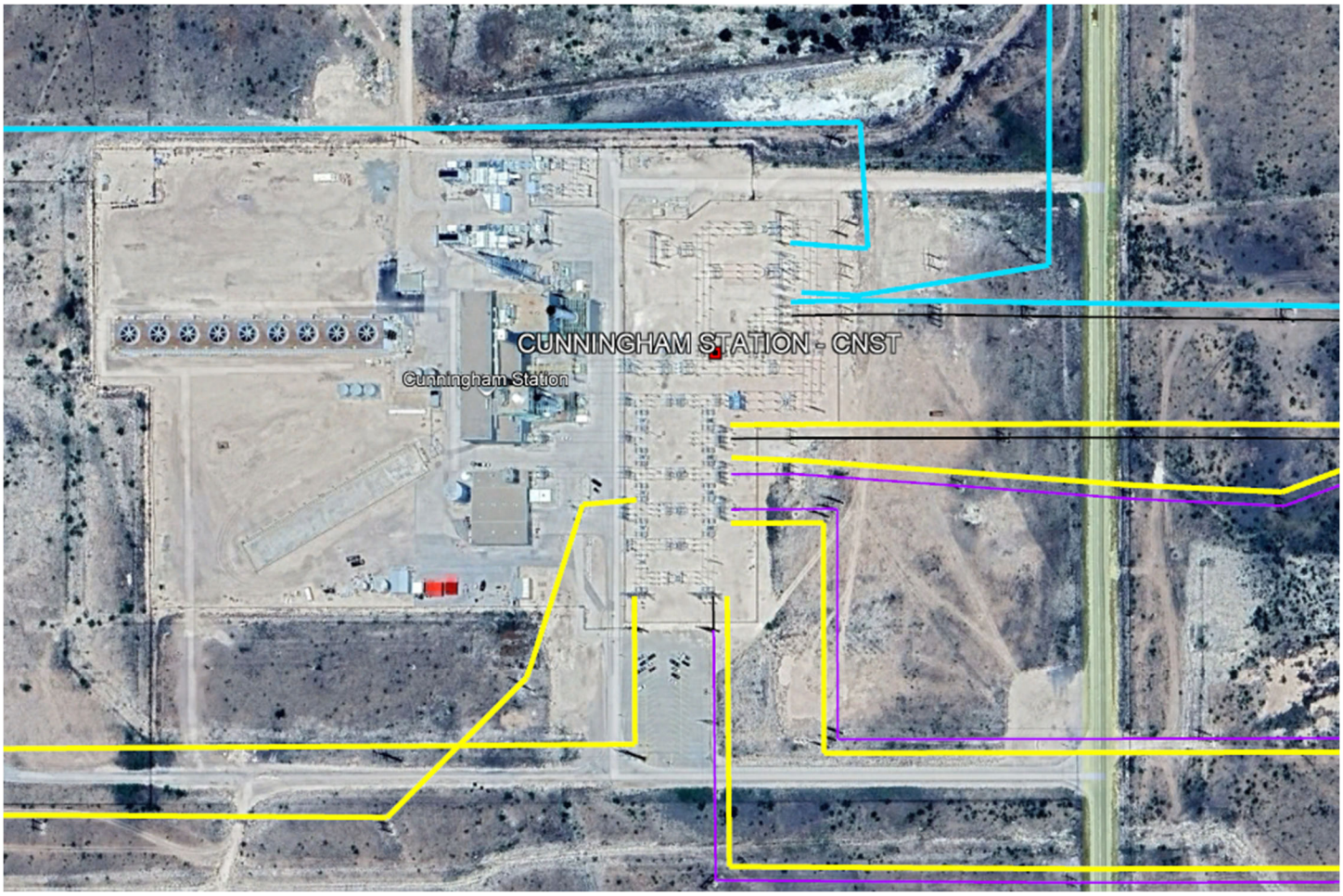
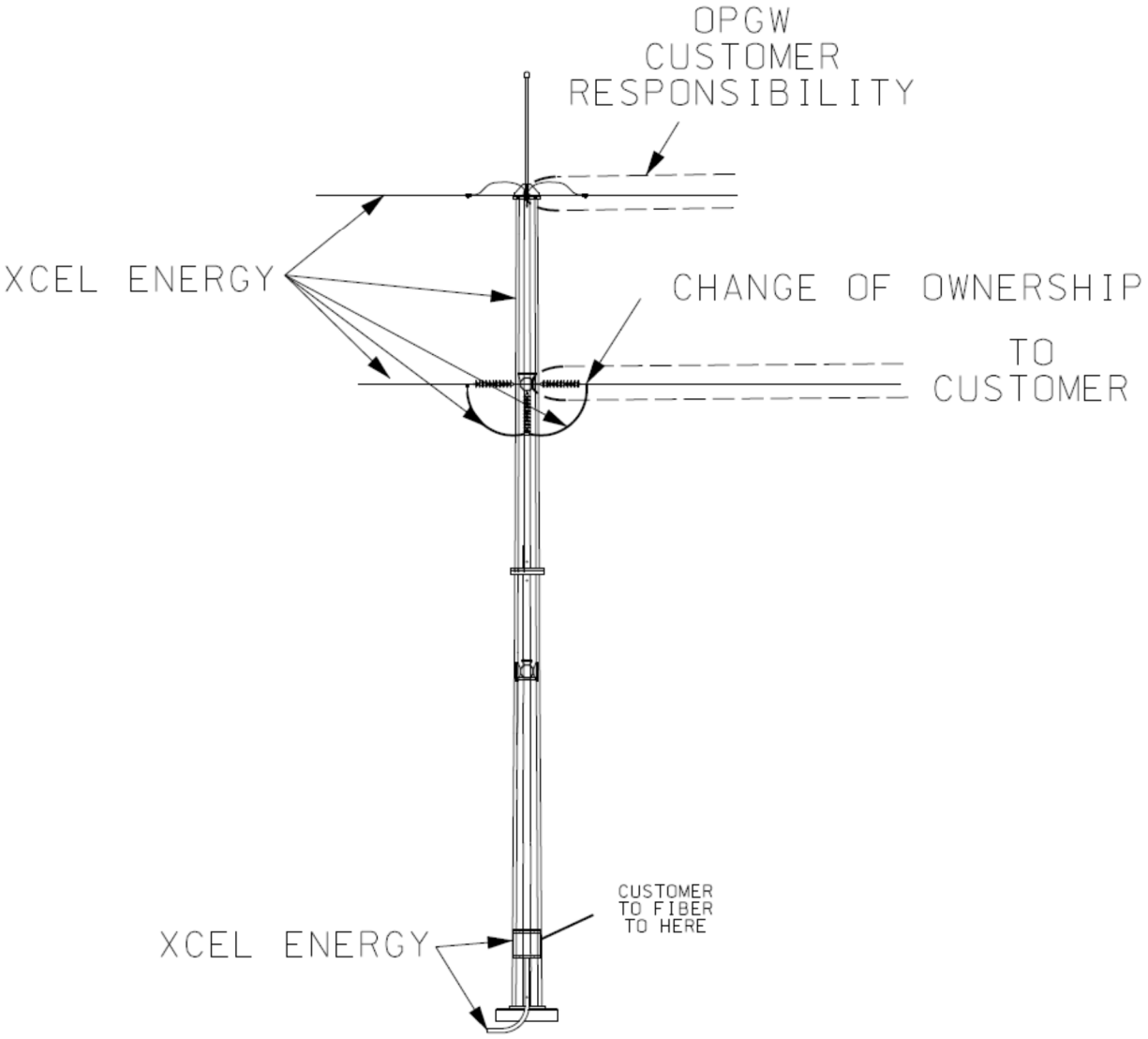


Figure A-3: Transmission Terminal Structure & Change of Ownership

DIAGRAMS ARE NOT FOR CONSTRUCTION PURPOSES



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