



INTERCONNECTION FACILITIES STUDY REPORT

GENERATOR INTERCONNECTION REQUEST # GI-2017-12

**170 MW Wind Generating Facility
Interconnecting at
Keenesburg Station 230kV Bus**

**Xcel Energy – Public Service Company of Colorado (PSCo)
January 30, 2019**

Executive Summary

This Interconnection Facilities Study Report summarizes the analysis performed by Public Service Company of Colorado (PSCo) to specify and estimate the cost of the siting, engineering, equipment procurement and construction needed to physically and electrically connect the GI-2017-12 Generating Facility (GF) that will be located in Weld County, Colorado.

The Point of Interconnection (POI) requested for GI-2017-12 is the 230 kV bus within the PSCo-owned Keenesburg station. The 170 MW rated gross electrical output of the GI-2017-12 wind generating facility will be delivered to the Keenesburg 230 kV bus via a new Customer-owned ~6.7 miles of 230kV line that will connect at the far end of the existing 76.4 miles of 230kV line (for the existing Cedar Creek I and Cedar Creek II generating facilities), resulting in a ~83 miles “gen-tie” from GI-2017-12 wind generating facility to the POI. A total of sixty-eight (68) GE 2.5-116 wind turbines rated 2.5 MW each will be connected to a 34.5kV collector system bus, which in turn will connect to the 230 kV “gen-tie” via one 34.5/230kV, 200 MVA Main Step-up Transformer (MST).

The original proposed Commercial Operation Date (COD¹) in the Interconnection Request was November 30, 2019. The Interconnection Customer and Transmission Provider have mutually agreed to a new earliest feasible COD of April 15, 2020. The new COD allows for the estimated time-frame of 12 months required to site, engineer, procure and construct the transmission facilities (noted in Tables 1 and 2 of this report) from the date the customer meets all applicable milestones as agreed to in any future Large Generator Interconnection Agreement (LGIA). An Engineering & Procurement Agreement can be executed to facilitate completion of the interconnection facilities.

The proposed one-line diagram for the GI-2017-12 interconnection station is shown in Figure 1 in the Appendix.

¹ **Commercial Operation Date** of a unit shall mean the date on which the Generating Facility commences Commercial Operation as agreed to by the Parties pursuant to Appendix E to the Standard Large Generator Interconnection Agreement.

This request was studied both as an Energy Resource Interconnection Service (ERIS)² and a Network Resource Interconnection Service (NRIS)³.

The estimated costs of the recommended transmission system upgrades to interconnect the GI-2017-12 project include:

- \$80,000 for Transmission Provider's Interconnection Facilities (cf. Table 1).
- \$202,170 for Network Upgrades required for either ERIS or NRIS (cf. Table 2).
- \$0 for additional Network Upgrades required for NRIS (cf. Table 3).

The total estimated cost of the transmission system improvements required for GI-2017-12 to qualify for:

- **ERIS is \$282,170 (Tables 1 and 2); and**
- **NRIS is \$282,170 (Tables 1, 2 and 3)**

This is contingent upon completion of any Network Upgrades identified for higher-queued Interconnection Requests (see footnotes to Table 2 and 3).

For GI-2017-12 interconnection:

NRIS (after required transmission system improvements) = 170 MW

ERIS (after required transmission system improvements) = 170 MW (output delivery assumes the use of existing firm or non-firm capacity of the PSCo Transmission System on an as-available basis.)

Note: NRIS or ERIS, in and of itself, does not convey transmission service.

² **Energy Resource Interconnection Service** shall mean an Interconnection Service that allows the Interconnection Customer to connect its Generating Facility to the Transmission Provider's Transmission System to be eligible to deliver the Generating Facility's electric output using the existing firm or non-firm capacity of the Transmission Provider's Transmission System on an as available basis. ERIS in and of itself does not convey transmission service

³ **Network Resource Interconnection Service** shall mean an Interconnection Service that allows the Interconnection Customer to integrate its Large Generating Facility with the Transmission Provider's Transmission System (1) in a manner comparable to that in which the Transmission Provider integrates its generating facilities to serve native load customers; or (2) in an RTO or ISO with market based congestion management, in the same manner as all other Network Resources. NRIS in and of itself does not convey transmission service.

Cost Estimates and Assumptions

Transmission Provider has specified and estimated the cost of the equipment, engineering, procurement and construction work needed to interconnect GI-2017-12. The results of the engineering analysis for facilities owned by the Transmission Provider are estimates and are summarized in Tables 1 and 2.

Table 1: “Transmission Provider’s Interconnection Facilities” includes the nature and estimated cost of the Transmission Provider's Interconnection Facilities and an estimate of the time required to complete the construction and installation of such facilities.

Table 2: “Network Upgrades required for Interconnection (applicable for either ERIS or NRIS)” includes the nature and estimated cost of the Transmission Provider's Network Upgrades necessary to accomplish the interconnection and an estimate of the time required to complete the construction and installation of such facilities.

Upgrades identified in Tables 1 and 2 are illustrated in Figure 1 in the Appendix which shows the physical and electrical connection of the Interconnection Customer’s Generating Facility to the Transmission Provider’s Transmission System. The one-line diagram also identifies the electrical switching configuration of the interconnection equipment, including, without limitation: the transformer, switchgear, meters, and other station equipment.

Transmission Provider has also specified and estimated the cost of the equipment, engineering, procurement and construction work of additional Network Upgrades required for NRIS. The results of the engineering analysis for facilities owned by the Transmission Provider are estimates and are summarized in Table 3.

Table 3: “Additional Network Upgrades required for NRIS” includes the nature and estimated cost of the Transmission Provider's additional Network Upgrades required for NRIS and an estimate of the time required to complete the construction and installation of such facilities.

The total estimated cost of the transmission system improvements required for GI-2017-12 to qualify for:

- ERIS is \$282,170 (Tables 1 and 2); and
- NRIS is \$282,170 (Tables 1, 2 and 3)

The following tables list the transmission system improvements required to accommodate the interconnection of GI-2017-12. The cost responsibilities associated with these transmission system improvements shall be handled as per current FERC guidelines.

Table 1 – Transmission Provider’s Interconnection Facilities

Element	Description	Cost Est. (Thousands)
PSCo’s Keenesburg 230kV Station	Interconnect Customer via the existing Gen-Tie (Line 5967) for the Cedar Creek Generating Facility. <ul style="list-style-type: none"> Associated transmission line communications, relaying and testing 	\$80.0
	Total Cost Estimate for Transmission Provider’s Interconnection Facilities	\$80.0
Time Frame	Site, design, procure and construct	12 months

Table 2 – Network Upgrades required for Interconnection (applicable for ERIS or NRIS)*

Element	Description	Cost Est. (Thousands)
PSCo’s Keenesburg 230kV Station	Interconnect Customer via the existing Gen-Tie (Line 5967) for the Cedar Creek Generating Facility. The new equipment includes: <ul style="list-style-type: none"> One (1) wave-trap on B-phase of L5967 rated 2000A 	\$202.17
	Total Cost Estimate for Network Upgrades required for Interconnection	\$202.17
Time Frame	Site, design, procure and construct	12 months

*** Not contingent on Network Upgrades required for any higher-queued Interconnection Request.**

Table 3: Additional Network Upgrades required for NRIS

Element	Description	Cost Est. (Millions)
N/A	N/A	\$0
	Total Cost Estimate for Network Upgrades for NRIS	\$0
Time Frame	Site, design, procure and construct	N/A

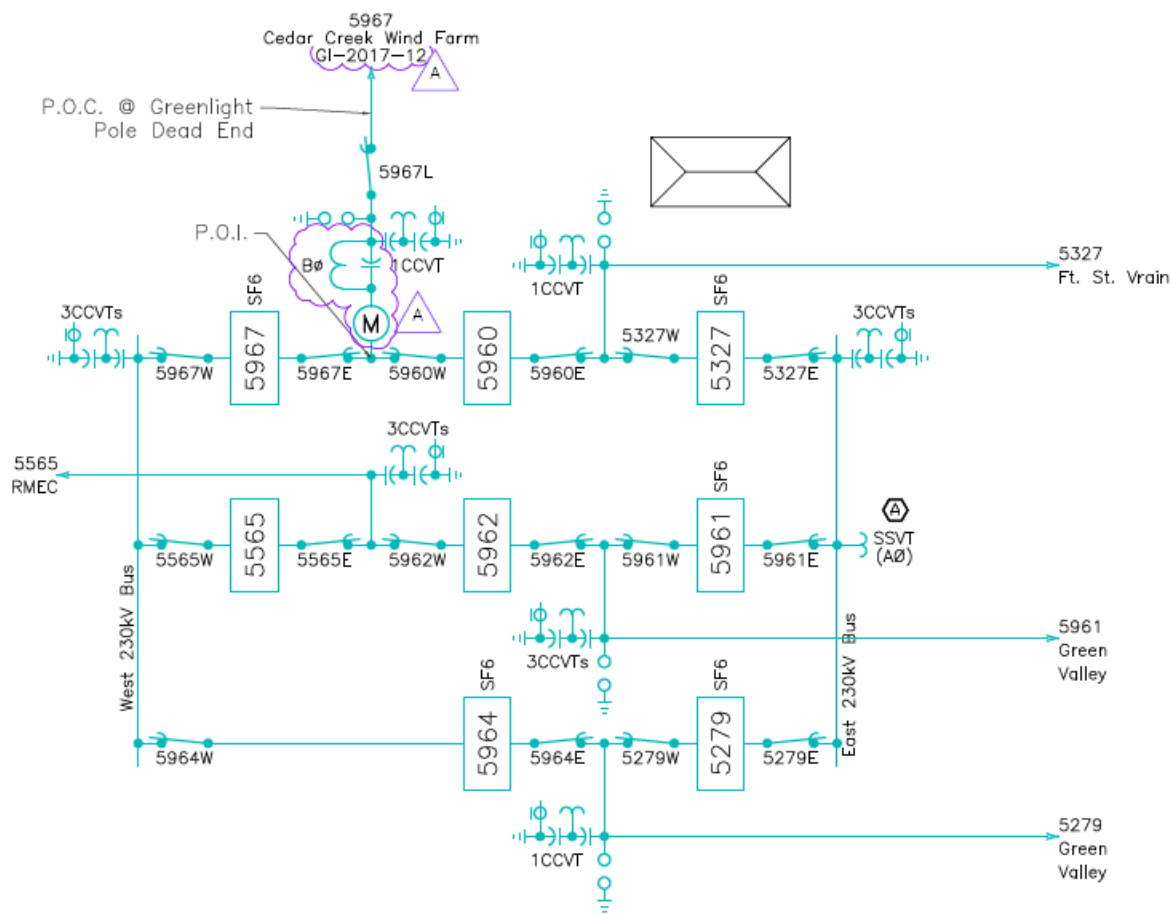
Cost Estimate Assumptions

- Appropriations level cost estimates for Interconnection Facilities and Network Upgrades have a specified accuracy of +/- 20%.
- Estimates are based on 2019 dollars with appropriate escalation and contingencies applied. AFUDC is not included.
- Labor is estimated for straight time only – no overtime included. Assumes contracted construction for the majority of the work.
- Lead times for materials were considered for the schedule.
- Estimates are developed assuming typical construction costs for previous completed projects. These estimates include all applicable labor and overheads associated with the siting support, engineering, design, material/equipment procurement, construction, testing and commissioning of these new substation and transmission line facilities.
- The Generating Facility is not in PSCo's retail service territory. Therefore, costs for retail load metering are not included in these estimates.
- PSCo (or it's Contractor) crews will perform all construction, wiring, and testing and commissioning for PSCo owned and maintained facilities.
- The estimated time to site, design, procure and construct the Transmission Provider's Interconnection Facilities and Network Upgrades required for Interconnection is approximately 18 months after authorization to proceed has been obtained.
- A CPCN will not be required for the construction of Transmission Provider's Interconnection Facilities and Network Upgrades required for Interconnection.
- Line and substation bus outages will be necessary during the construction period. Outage availability could potentially be problematic and necessitate delaying the in-service date.
- Estimates do not include the cost for any Customer owned equipment and associated design and engineering.
- The Customer will string optical ground wire (OPGW) cable into the substation as part of their 230 kV transmission line construction scope.

- The Customer will be required to design, procure, install, own, operate and maintain a Load Frequency/Automated Generation Control (LF/AGC) RTU at the Customer Substation. PSCo / Xcel will need indications, readings and data from the LFAGC RTU.

Appendix

Figure 1. GI-2017-12 Interconnection to Keenesburg Station via the existing Cedar Creek Wind Generating Facility's Gen-Tie (Transmission Line 5967)



(A) East 230kV Bus Is Primary Station Service Source. Back Up Is United Power Distribution Out Of Barr Lake.