



Generation Interconnection Facilities Study Report Request # GI-2013-5

200 MW Wind Generation
Near Limon, Colorado

Public Service Company of Colorado
Transmission Planning

May 20, 2014



I. 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 interconnect a 200 MW wind turbine generation farm near Limon, Colorado.

The new wind generation is proposed to interconnect to the Missile Site 345 kV Substation (see Figure 1). This facility will be an extension of the existing wind plant at Limon windpark located approximately 40 miles from the Missile Site Substation. GI-2013-5 will be located 9.5 miles east of the existing Limon II wind plant and connect to the Missile Site 345 kV Substation using the existing 345 kV tie line and the existing point of interconnection (POI). The requested commercial in-service date is December, 2014.

The total estimated cost for the facilities required for interconnection is **\$20,000¹** and includes changes to the relay settings at the Missile Site Substation and cost for revising drawings

- \$0.02 million for PSCo-Owned, Customer-Funded Interconnection Facilities
- \$0 million for PSCo-Owned, PSCo-Funded Network Upgrades for Interconnection

The estimated time required to site, engineer, procure and construct the facilities described is at least 6 months from the date the Customer meets all applicable Milestones as agreed to in any future LGIA. An Engineering & Procurement Agreement can be executed to facilitate completion of the interconnection facilities.

There are no PSCo Network Upgrades for Delivery required for this Interconnection.

¹ Appropriation estimates considered to have an accuracy of +/- 20%.

II. Introduction

PSCo received an interconnection request (GI-2013-5) for a 200MW wind facility on July 16, 2013. The new generating facility will consist of one hundred and eighteen GE 1.7MW wind turbine generators with Zero Voltage Ride Through capability. This facility will be an extension of the existing Limon wind farm and will interconnect to the Missile Site 345 kV Substation near Deer Trail, Colorado using the existing POI and 345 kV tie line. The final Feasibility Study report was issued on October 24, 2013, and the final System Impact Study was issued on March 31, 2014. An agreement for a Facility Study was executed on April 24, 2014. This report documents the results of PSCo's Facility Study efforts. The planned commercial operation date of GI-2013-5 is December 2014.

III. General Interconnection Facilities Description

A. Project Purpose & Scope

The scope of this project is to revise the relay settings for the 345kV tie line from the Limon wind farm to Missile Site 345 kV Substation (line # 7103) in order to accommodate GI-2013-5.

Background

GI-2013-5 will be interconnecting to the Missile Site 345 kV Substation at Deer Trail, Colorado using the existing 345 kV tie line from the Limon Wind farm to Missile Site Substation. The new wind plant is expected to accommodate one hundred and eighteen GE 1.7MW wind turbines. This will require relay setting changes at the Missile Site Substation.

Distribution vs. Transmission Asset Ownership

The substation primary function is presently defined as Transmission. This project will not change the primary function of the substation when complete assuming no other changes.

Interconnection / Customer Cost Responsibility

The project cost will be funded by the customer.

B. FERC and/or NERC Compliance Requirements

Critical Infrastructure Protection (CIP) Asset

The CIP status of this substation has not been verified at this time. This verification will take place during the Appropriation Estimate phase of the project.

Facility Ratings and Smart One-Lines

This substation does have Bulk Electric System facilities.

A smart one-line already exists for this substation. The existing smart one-line will be updated to include the changes made by this project. Facility ratings changes will be handled via the GIST2 system, and will be reviewed and approved per the Procedure for Review and Approval of GIST2-Created Facility Ratings.

C. Right of Way/Permitting

Right of way permitting will not be required as part of this project.

D. Electrical Features

Fault Current

<div style="text-align: center;">Type of Fault</div> <div style="text-align: left;">Location</div>	Three Phase (A)	Single-Line-to-Ground (A)
Missile Site 345kV Yard (Existing)	11346.9	10911.2
Missile Site 345kV Yard (After 200MW addition)	11881.0	11311.1

E. Protection Features

Transmission Line Protection (345 kV)

The existing 345kV 7103 line to the NextEra Limon wind farm is currently being protected by a SEL-421 (primary), an SEL-311L (secondary), and an RFL9785 (power line carrier). The settings for these relays will need to be changed in order to accommodate the new additional 200MW that will be put on this line.

Project Operating Concerns and Outages

Outages/Temporary Configurations

A two week line and breaker outage of the 345kV 7103 line the 345kV circuit breaker 7103 will be required in order to upload and test the new settings for the relays.

A half day outage of 345kV circuit breaker 7100 will be required on both ends of the line outage so that the disconnect switches in the 7103 line side can be opened and closed as needed for a visual clearance and placing the new relay settings in service.

F. Related Projects

No related Work Orders exist at this time.

G. Estimate Discussion and Risk Check List

The standard contingency factors for estimates are as follows:

- Scoping Est. Contingency Factors: Material: 10%; Labor and Equipment: 20%

The estimate for this project utilizes the standard contingency levels.

Risk factors identified at the time the Design Guide Package was prepared are indicated below. Explanations indicate the action taken, if any, in the estimate as a result, such as additional contingencies or multipliers that were applied.

- Survey information is not available. Explain:
- Soil boring results are not available. Explain:
- Unusual soils or environmental conditions exist. Explain:
- Key materials or items need decisions or approvals. Explain:
- Potential permitting delays or unusual requirements exist. Explain:
- There are difficult or seasonal outage requirements. Explain:
- There are conflicting outage requirements. Explain:
- There are risks due to who will construct the project and their availability.
Explain:
- Unusual construction techniques will be required. Explain:
- There are risks associated with plans to reuse existing material. Explain:

- There are potential alternatives still under consideration. Explain:
- Material prices are likely to change or volatile. Explain:
- Material lead times are likely to be longer than estimated. Explain:
- Labor prices are likely to change. Explain:
- There are existing erosion problems. Explain:
- The existing oil containment may not be adequate. Explain:
- The existing lightning protection may not be adequate. Explain:



The existing bus and equipment ampacity may not be adequate. Explain:

The existing drawings are incomplete and inaccurate. Explain:

Notes and Comments:



IV. Cost Estimates and Assumptions

GI-2013-5 (Facilities Study Report)

May 9, 2014

Appropriation level cost estimates for Interconnection Facilities and Network/Infrastructure Upgrades for Delivery (+/- 20% accuracy) were developed by Xcel Energy/PSCo Engineering. The cost estimates are in 2014 dollars with escalation and contingency applied (AFUDC is not included) and are based upon typical construction costs for previously performed similar construction. These estimated costs include all applicable labor and overheads associated with the siting support, engineering, design, material/equipment procurement and construction of these new PSCo facilities. This estimate does not include the cost for any other Customer owned equipment and associated design and engineering.

The estimated total cost for the required upgrades is **\$20,000**. These estimates do not include costs for any other Customer owned equipment and associated design and engineering. The following tables list the improvements required to accommodate the interconnection and the delivery of the Project generation output. The cost responsibilities associated with these facilities shall be handled as per current FERC guidelines. System improvements are subject to change upon a more detailed and refined design.

Table 1 – PSCo Owned; Customer Funded Transmission Provider Interconnection Facilities

Element	Description	Cost Est. (Millions)
PSCo's Missile Site 345kV Transmission Substation	Interconnect/Upgrade Customer to the 345kV bus (line 7103) at the Missile Site 345kV Substation. The new activities include: <ul style="list-style-type: none"> Relay settings changes Drawing revisions 	\$0.020
a) Time Frame	2. <u>Design and construct</u>	6 Months

Table 2: PSCo Owned; PSCo Funded Interconnection Network Facilities

	Description	Cost Estimate (Millions)
PSCo's Missile Site 345kV Transmission Substation	<ul style="list-style-type: none"> Not Applicable 	\$0
	3. <u>Total Cost Estimate for PSCo-Owned, PSCo-Funded Interconnection Facilities</u>	\$0
a) Time Frame	4. <u>Site, design, procure and construct</u>	

Table 3 – PSCo Network Upgrades for Delivery

Element	Description	Cost Est. (Millions)
	Not Applicable	
	Total Cost Estimate for PSCo Network Upgrades for Delivery	\$0
Time Frame	Site, design, procure and construct	
	Total Project Estimate	\$0.020

Cost Estimate Assumptions

- Appropriation level cost estimates for Interconnection Facilities and Network/Infrastructure Upgrades for Delivery (+/- 20% accuracy) were developed by Xcel Energy/PSCo Engineering.
- Estimates are based on 2014 dollars (appropriate contingency and escalation applied).
- AFUDC has been excluded.
- Engineering will be contracted out to a Design Consultant.
- Work scope is limited to Missile 345kV Substation and no evaluation of adequacy of proposed interconnection increase of 200 MW.
- No new substation facility upgrades required.
- Changes are limited to relay settings and drawing revisions.
- The Wind Generation Facility is not located in PSCo's retail service territory.
- PSCo (or its Contractor) crews will perform all construction, wiring, testing and commissioning for PSCo owned and maintained facilities.
- Labor is estimated for straight time only – no overtime included.
- The estimated time to design and construct the interconnection facilities is approximately 6 months after authorization to proceed has been obtained.
- This project is completely independent of other queued projects and their respective ISDs.
- A CPCN will not be required for the interconnection facilities construction.
- No line or substation outages will be required.
- The Customer will install a 20 MVAR capacitor bank unit on the 34.5kV bus at their Limon 1 Wind facility. No other reactive power or voltage control devices are required for this project.

V. Engineering, Procurement & Construction Schedule

A construction schedule has not been provided as the estimated time to design and construct the interconnection facility is only 6 months (approximately) after authorization to proceed has been obtained.