

1RSC-2020-1

**Interconnection Facilities Study Report
72MW Tapping Hartsel – Tarryall 230kV
Line**

5/24/2021



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1.0 Executive Summary

The total estimated cost of the transmission system improvements for 1RSC-2020-1 is \$18.907 Million (Tables 1 and 2).

Energy Resource Interconnection Service of 1RSC-2020-1 before Network Upgrades is: 72MW (after required transmission system improvements in Table 1 and 2).

Energy Resource Interconnection Service of 1RSC-2020-1 is: 72MW (after required transmission system improvements in Table 1 and 2).

A CPCN is needed for the construction of the 1RSC-2020-1 230kV Switching Station. The estimated time frame for regulatory activities (CPCN) and to site, design, procure and construct the interconnection facilities is approximately 36 months after authorization to proceed has been obtained, which makes the proposed December 2022 COD unachievable. Any delays in obtaining the CPCN may delay the COD of 1RSC-2020-1.

2.0 Introduction

1RSC-2020-1 is a 72MW_{ac} net rated Solar Photovoltaic (PV) Generating Facility that will be located in Park County, Colorado. The Solar PV Generating Facility will consist of twenty-three (23) TMEIC 3.36MW, ±0.95PF inverters, each with its own 630V/34.5kV, 3.7MVA, Z=8% pad-mounted step-up transformer. The 34.5kV collector system will connect to one (1) 63/80/100MVA, 34.5/230/13.8kV wye-wye-delta, Z=10% main step-up transformer which will connect to the PSCo transmission system via a 250 foot, 230kV transmission tie-line. The POI is a tap on PSCo's Hartsel – Tarryall 230kV line, at approximately mid length. The Generating Facility configuration also includes an 18Mvar capacitor bank on the 34.5kV bus.

The tap position on the Tarryall – Hartsel 230kV line will require building a new switching station referred to as “1RSC-2020-1 230kV Switching Station” in this report.

The proposed Commercial Operation Date (COD)¹ of 1RSC-2020-1 is December 31, 2022. For the study purpose, the back-feed date is assumed to be July 1, 2022, approximately six (6) months before the COD.

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

The updated Phase 2 report of 1RSC-2020 Definitive Interconnection System Impact Study cluster (RSC) is posted at https://www.rmao.com/public/wtpp/Final_Studies/1RSC-2020%20Phase%202%20Updated%20Study%20Report_final.pdf.

The request was studied for Energy Resource Interconnection Service (ERIS)².

3.0 Study Scope

The scope of the Interconnection Facilities Study which is Phase 4 of the Definitive Interconnection Study process includes standalone non-binding cost estimates and construction schedule of the Interconnection Facilities and Network Upgrades identified for 1RSC-2020-1 in the update Phase 2 report.

4.0 Cost Estimates and Assumptions

PSCo Engineering has developed cost estimates for Interconnection Facilities and Network/Infrastructure Upgrades required for the interconnection of the 1RSC-2020-1 on the Hartsel – Tarryall 230kV line. The cost estimates are in 2021 dollars with escalation and contingencies applied. Allowances for Funds Used During Construction (AFUDC) is not included. The estimated costs include all applicable labor and overheads associated with the siting, engineering, design, and construction of these new PSCo facilities. The estimate does not include the cost for any Customer owned equipment and associated design and engineering.

Tables 1 and 2 list the improvements required to accommodate the interconnection and the delivery of the customer's 72 MW solar generation facility generation output. The cost responsibilities associated with these facilities shall be handled as per current FERC guidelines.

The total cost of the required transmission improvement required for 1RSC-2020-1 to interconnect on PSCo's Tarryall – Hartsel 230kV line for ERIS of 72MW is \$18.907 Million.

- The cost of Transmission Provider's Interconnection Facilities is \$1.490 Million (Table 1)
- The cost of Station Network Upgrades is \$17.417 Million (Table 2)

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. Energy Resource Interconnection Service in and of itself does not convey transmission service



Figure 1 below is a conceptual one-line of the 1RSC-2020-1 POI at the 1RSC-2020-1 230kV Switching Station.

Table 1 – 1RSC-2020-1 Transmission Provider’s Interconnection Facilities

Element	Description	Cost Est. (Millions)
1RSC-2020-1 230kV Switching Station	Interconnect Customer to tap at the Hartsel-Tarryall switching station 230kV bus. The new equipment includes: <ul style="list-style-type: none"> • One (1) 230kV dead end • Three (3) 230kV arresters • One (1) 230kV 2000A Switch • One set (of three) high side metering units • Fiber communication equipment • Station controls • Associated electrical equipment, bus, wiring and grounding • Associated foundations and structures • Associated transmission line communications, fiber, relaying and testing. 	\$1.415
	Transmission line tap into substation:	\$0.055
	Siting and Land Rights support for siting studies, land and ROW acquisition and construction	\$0.020
	Total Cost Estimate for Transmission Providers Interconnection Facilities	\$1.490
Time Frame	Site, design, procure and construct	36 Months

Table 2– 1RSC-2020-1 Station Network Upgrades

Element	Description	Cost Est. (Millions)
1RSC-2020-1 230kV Switching Station	Install a new three position ring bus switching station on the Hartsel – Tarryall 230kV line. The new equipment includes: <ul style="list-style-type: none"> • Three (3) 230kV 3000A circuit breakers • Eight (8) 230kV 2000A disconnect switches • Six (6) 230kV CCVTs • Two (2) Line Traps • Six (6) 230kV Surge Arresters • Four (4) Deadends • One Electrical Equipment Enclosure • Station controls and wiring • Associated electrical equipment, bus, wiring and grounding 	\$14.925

	<ul style="list-style-type: none"> Associated foundations and structures 	
1RSC-2020-1 230kV Switching Station	Install required communications in the EEE at the new switching station	\$0.588
PSCo's Hartsel 230kV Bus	Update primary line relaying line to 1RSC 2020-1	\$0.331
PSCo's Tarryall 230kV Bus	Update primary and secondary line relaying and associated breaker fail to 1RSC 2020-1	\$0.616
1RSC-2020-1 230kV Switching Station	Terminate the transmission line into the new switching station	\$0.637
	Siting and Land Rights support for substation site acquisition, permitting, and construction	\$0.320
	Total Cost Estimate for Network Upgrades for Interconnection	\$17.417
Time Frame	Site, design, procure and construct	36 Months

- Labor is estimated for straight time only – no overtime included.
- Lead times for materials were considered for the schedule.
- The Generating Facility is not in PSCo’s retail service territory. Therefore, no costs for retail load metering are included in these estimates.
- PSCo (or it’s Contractor) crews will perform all construction, wiring, testing and commissioning for PSCo owned and maintained facilities.
- A CPCN will be required for the construction of the Interconnection Facilities and Station Network Upgrades. The estimated time to get a CPCN approval is expected to be 18 months. The estimated time to permit, design, procure and construct the interconnection facilities is approximately 18 months after authorization to proceed (including CPCN) has been obtained.
- Customer will install two (2) redundant fiber optics circuits into the Transmission provider’s substation as part of its interconnection facilities construction scope.
- Breaker duty study determined that no breaker replacements are needed in neighbouring substations.
- Power Quality Metering (PQM) will be required on the Customer’s generation tie-line terminating into the POI.

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

5.0 Conclusion

The total estimated cost of the transmission system improvements for 1RSC-2020-1: \$18.907 Million (Tables 1 and 2).

Energy Resource Interconnection Service of 1RSC-2020-1 before Network Upgrades is: 72MW (after required transmission system improvements in Table 1 and 2)

Energy Resource Interconnection Service of 1RSC-2020-1 is: 72MW (after required transmission system improvements in Table 1 and 2)

A CPCN is needed for the construction of the 1RSC-2020-1 230kV Switching Station. The estimated time frame for regulatory activities (CPCN) and to site, design, procure and construct the interconnection facilities is approximately 36 months after authorization to proceed has been obtained, which makes the proposed December 2022 COD unachievable. Any delays in obtaining the CPCN may delay the COD of 1RSC-2020-1.

6.0 Contingent Facilities

The following is the list of the unbuilt Interconnection Facilities and Network Upgrades upon which the costs, timing, and study findings of 1RSC-2020-1 is dependent, and if delayed or not built, could cause a need for re-studies of the Interconnection Request or a reassessment of the Interconnection Facilities and/or Network Upgrades and/or costs and timing. The maximum allowable output of 1RSC-2020-1 may be decreased if these Contingent Facilities are not in-service. The contingent facilities identified for 1RSC-2020-1 are as follows:

1. The following unbuilt transmission projects modeled in the Base Case
 - Gilman – Avon 115kV line – ISD 2022
2. Network Upgrades for Interconnection assigned to 1RSC-2020-1 (refer to Table 1 and 2 of this report)

Figure 1 – Preliminary One-line of the 1RSC-2020-1 POI at the 1RSC-2020-1 230kV Switching Station

