# 1RSC-2020 Phase 2

# Updated Study Report

**2/5/2021**

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## 1.0 Executive Summary

The withdrawal of 1RSC-2020-4 has no impact on the study results or costs identified for the remaining Generation Interconnection Requests in the 1RSC-2020 Phase 2 report.

**The total estimated cost of the transmission system improvements for 1RSC-2020-1: $19.499 Million** (Tables 1a and 1b)

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

**The total estimated cost of the transmission system improvements for 1RSC-2020-2 are: $0.05 Million** (Tables 2a and 2b)

**Energy Resource Interconnection Service of 1RSC-2020-2 is: 75MW** (after required transmission system improvements in Table 2a and 2b)

Interconnection Service identified in this report in and of itself does not convey transmission service.

## 2.0 Introduction

This report captures changes to costs and study results identified in the 1RSC-2020 Phase 2 Study Report following the withdrawal of 1RSC-2020-04 after publishing the Phase 2 study report.

The 1RSC-2020 Phase 2 report is posted at the following link.
https://www.rmao.com/public/wtpp/Final_Studies/1RSC-2020%20Phase%202%20study%20report_final.pdf

The remaining valid requests in the 1RSC-2020 Resource Solicitation Cluster, following the withdrawal of 1RSC-2020-04 are: 1RSC-2020-1 and 1RSC-2020-2.

1RSC-2020-1 is a 72$MW_{ac}$ net rated Solar Photovoltaic (PV) Generating Facility that will be located in Park County, Colorado. The POI is a tap on PSCo's Hartsel – Tarryall 230kV line, at approximately mid length.

The 1RSC-2020-2 is a 75$MW_{ac}$ increment in the output of GI-2018-24 hybrid Generating Facility received in the Transitional Cluster. The combined output of 1RSC-2020-2 and GI-2018-24 at the POI will be 325$MW_{ac}$.

For the following reasons, it was determined that the System Impact Study results, short circuit data and cost estimates identified for 1RSC-2020-1 and 1RSC-2020-2 identified in the Phase 2 report are not impacted by the withdrawal of 1RSC-2020-4.

- All the requests in the Phase 2 report were studied for Energy Resource Interconnection Service (ERIS) and the study did not identify any Network Upgrades per 4.2.4(b) of the LGIP.
- 1RSC-2020-1 was studied in Western Colorado study pocket whereas the POI of 1RSC-2020-4 was in Southern Colorado.
- 1RSC-2020-2 was studied in the Southern Colorado along with 1RSC-2020-4, the steady state impacts were mitigated using OPF and the transient stability analysis did not identify any impacts. Since the Southern Colorado study pocket has been studied for the higher total ERIS, it can be reasonably concluded that the system can accommodate the identified ERIS for 1RSC-2020-2.
- The TPIF and Station Network Upgrade costs identified for each interconnection request have no sharing among the requests, as shown in Tables 11, 12, 13 and 14 of the Phase 2 report
- The Short Circuit parameters given in Tables 5 and 10 of the Phase 2 report did not change due to the withdrawal of 1RSC-2020-4.

## 3.0 Summary of Generation Interconnection Service Results

The Customer is required to design and build the Generating Facility to mitigate for any potential inverter interactions with the neighboring inverter based Generating Facility(ies) and/or the inverters of the hybrid Generating Facility.

Interconnection Service in and itself does not convey transmission service.

### 3.1 1RSC-2020-1

**The total estimated cost of the transmission system improvements for 1RSC-2020-1: $19.499 Million** (Tables 1a and 1b)

- **The cost of Transmission Provider's Interconnection Facilities is $1.325 Million**
- **The cost of Station Network Upgrades is $18.174 Million**

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

Note: 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 (entire Project) is approximately 36 months after authorization to proceed has been obtained. Any delays in obtaining the CPCN may delay the COD of 1RSC-2020-1.

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

The list of improvements required to accommodate the interconnection of 1RSC-2020-1, the Customer's 72MW Solar PV Generating Facility are given in Tables 1a and 1b. System improvements are subject to revision as a more detailed and refined design is produced.

**Table 1a – 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:<br>• One 230kV dead end and one girder<br>• Three 230kV arresters<br>• One 230kV 2000A Switch<br>• One set (of three) high side metering units<br>• Fiber communication equipment<br>• Station controls<br>• Associated electrical equipment, bus, wiring and grounding<br>• Associated foundations and structures<br>• Associated transmission line communications, fiber, relaying and testing. | $1.250 |
| | 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** | **$1.325** |
| **Time Frame** | **Site, design, procure and construct** | **36 Months** |

**Table 1b – 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 230kV Hartsel - Tarryall line. The new equipment includes:<br>• Three 230kV 3000A circuit breakers<br>• Nine 230kV 2000A disconnect switches (assume all switch stands will be installed)<br>• Six 230kV CCVTs<br>• Two Line Traps<br>• Six 230kV Surge Arresters<br>• Four Deadends / 2 DE Girder<br>• One Electrical Equipment Enclosure<br>• Station controls and wiring<br>• Associated electrical equipment, bus, wiring and grounding<br>• Associated foundations and structures | $15.782 |
| 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 on line to RSC 2020-1 | $0.331 |
| PSCo's Tarryall 230kV Bus | Update primary and secondary line relaying and associated breaker fail on line to RSC 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 | $0.220 |
| | **Total Cost Estimate for Network Upgrades for Interconnection** | **$18.174** |
| **Time Frame** | **Site, design, procure and construct** | **36 Months** |

## 3.2 1RSC-2020-2

**The total estimated cost of the transmission system improvements for 1RSC-2020-2 are: $0.05 Million** (Tables 2a and 2b)

- **The cost of Transmission Provider's Interconnection Facilities is $0.05 Million**
- **The cost of Station Network Upgrades is 0**

**Energy Resource Interconnection Service of 1RSC-2020-2 is: 75MW** (after required transmission system improvements in Table 2a and 2b)

Note: the maximum combined output of GI-2018-24 and 1RSC-2020-2 shall not exceed 325MW at any time, which will be limited using the Plant Controller. The output will also be monitored by PSCo operations. Additional monitoring and control requirements will be added to the LGIA to ensure the Interconnection Service amount is not exceeded. The construction of the Tundra 345kV Switching Station for GI-2018-24 will require a CPCN and 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. Any delays in obtaining the CPCN may delay the COD of 1RSC-2020-2.

PSCo is in the process of identifying system mitigations which may include automatic generation adjustment schemes for the PSCo's multiple contingencies evaluated in Table 3 of the Phase 2 report. 1RSC-2020-2 may become part of the mitigations and included in automatic generation adjustments.

The list of improvements required to accommodate the interconnection of 1RSC-2020-2, the Customer's 75MW incremental output in GI-2018-24 hybrid Generating Facility output at the POI are given in Tables 2a and 2b. The work needed to interconnect 1RSC-2020-2 only includes testing of fibre, communication and relaying installed for GI-2018-24 to accommodate the incremental 75MW output. A CPCN will not be required to accommodate 1RSC-2020-2 interconnection, but a CPCN is required for the Tundra 345kV Switching Station construction as identified for GI-2018-24. System improvements are subject to revision as a more detailed and refined design is produced.

**Table 2a – 1RSC-2020-2 Transmission Provider's Interconnection Facilities**

| Element | Description | Cost Est. (Millions) |
|---|---|---|
| GI-2018-24's Tundra 345kV Switching Station | Interconnect 1RSC-2020-2 Generating Facility. The new equipment includes:<br>• testing of communications, relays | $0.05 |
| | Transmission line tap into substation: | 0 |
| | Siting and Land Rights support for siting studies, land and ROW acquisition and construction | 0 |

| | | |
|---|---|---|
| | **Total Cost Estimate for Transmission Providers Interconnection Facilities** | **$0.05** |
| **Time Frame** | **Site, design, procure and construct** | **12 Months** |

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

| Element | Description | Cost Est. (Millions) |
|---|---|---|
| N/A | N/A | 0 |
| | Siting and Land Rights support for substation construction | 0 |
| | **Total Cost Estimate for Network Upgrades for Interconnection** | **0** |
| **Time Frame** | **Site, design, procure and construct** | **N/A** |

## 3.3 Cost Estimate Assumptions

The PSCo Engineering has developed cost estimates (with no accuracy) for Interconnection Facilities and Network/Infrastructure Upgrades required for the interconnection of the RSC GIRs simultaneously on the transmission system. The cost estimates are in 2020 dollars with escalation and contingencies applied. Allowances for Funds Used During Construction (AFUDC) is not included. These estimated costs include all applicable labor and overheads associated with the siting, engineering, design, and construction of these new PSCo facilities. This estimate does not include the cost for any Customer owned equipment and associated design and engineering.

- There is no accuracy for estimates.
- Labor is estimated for straight time only – no overtime included.
- Lead times for materials were considered for the schedule.
- The 1RSC-2020-1 and 1RSC-2020-2 Generating Facilities are 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.
- 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 neighboring substations.
- Line outages will be necessary during the construction period. Outage availability could potentially be problematic and extend requested backfeed date.
- 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.

## 4.0 Contingent Facilities

The following is the list of the unbuilt Interconnection Facilities and Network Upgrades upon which the costs, timing, and study findings of the Resource Solicitation Cluster GIRs are 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 individual GIR's maximum allowable output 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 1a and 1b of this report)

The contingent facilities identified for 1RSC-2020-2 are as follows.

1. The following unbuilt transmission projects/planned facility rating uprates modeled in the Base Case:
    - PSCo's Monument – Flying Horse 115kV Series Reactor project
    - PSCo's terminal upgrade project to uprate the Daniels Park – Prairie3 230kV line to 576MVA
    - PSCo's terminal upgrade project to uprate the Daniels Park – Prairie1 230kV line to 576MVA

- TSGT's planned project to uprate the Fuller – Vollmer – Black Squirrel 115 kV line to 173 MVA
- CSU's project to close Tesla - Cottonwood 34.5kV line and open the Kettle Creek – Tesla 34.5kV line
- PSCo's upgrade to uprate Greenwood – Priarie1 230kV line to 576MVA
- PSCo's upgrade to uprate Greenwood – Priarie3 230kV line to 576MVA
- PSCo's upgrade to uprate Daniels Park 345/230kV # T4 to 560MVA
- PSCo's upgrade to uprate MidwayPS – GI-2014-9 230kV line to 478MVA
- Briargate S 115/230kV transformer project
- Fuller 230/115kV transformer project
- BCHE's West Station - Pueblo West - North Penrose planned project
- BCHE's Boone - South Fowler 115 kV planned project

2. Interconnection Facilities for each GIR identified in this report

   See Table 2a and 2b for Interconnection Facilities assigned to 1RSC-2020-2
3. Upgrades identified for higher-queued GIRs
   - 1RSC-2020-2 is dependent on the interconnection of GI-2018-24

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