Rocky Mountain Power
Exhibit RMP___(RAV-2SS)
Docket No. 20000-520-EA-17
Witness: Rick A. Vail

BEFORE THE WYOMING PUBLIC SERVICE COMMISSION

ROCKY MOUNTAIN POWER

Exhibit Accompanying Second Supplemental Direct Testimony of Rick A. Vail

System Impact Studies for Q0715 and Q0810

February 2018

PACIFICORP TRANSMISSION

Large Generator Interconnection

System Impact Restudy Report

Completed for

Invenergy Wind Development LLC
("Interconnection Customer")
Q0715
Uinta County

Proposed Point of Interconnection

Canyon Compression–Railroad 138 kV transmission line
(Near Whitney Canyon Inlet, near to Structure # 116)

February 8, 2018

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1.0 DESCRIPTION OF THE GENERATING FACILITY

Invenergy Wind Development LLC ("Interconnection Customer") proposed interconnecting 120 MW of new generation to PacifiCorp's ("Transmission Provider") Canyon Compression-Railroad 138 kV transmission line near Whitney Canyon Inlet (near to structure # 116) located in Uinta County, Wyoming. The Uinta County ("Project") will consist of 60 GE 2.0-116 turbines for a total output of 120 MW. The requested commercial operation date is October 1, 2020.

This restudy is being performed due to a change in the ratings of certain facilities that were used in the evaluation of this Project in the original system impact study.

Interconnection Customer will NOT operate this generator as a Qualified Facility as defined by the Public Utility Regulatory Policies Act of 1978 (PURPA).

The Transmission Provider has assigned the Project "Q0715."

2.0 SCOPE OF THE STUDY

The interconnection system impact restudy shall evaluate the impact of the proposed interconnection on the reliability of the transmission system. The interconnection system impact study will consider Base Case as well as all generating facilities (and with respect to (iii) below, any identified network upgrades associated with such higher queued interconnections) that, on the date the interconnection system impact study is commenced:

(i) are directly interconnected to the transmission system;
(ii) are interconnected to Affected Systems and may have an impact on the interconnection request;
(iii) have a pending higher queued interconnection request to interconnect to the transmission system; and
(iv) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

This interconnection system impact restudy will consist of a short circuit analysis, a stability analysis, and a power flow analysis. The study will state the assumptions upon which it is based; state the results of the analyses; and provide the requirements or potential impediments to providing the requested interconnection service, including preliminary indication of the cost and length of time that would be necessary to correct any problems identified in those analyses and implement the interconnection. The study will also provide a list of facilities that are required as a result of the Interconnection Request and a non-binding good faith estimate of the cost responsibility and a non-binding good faith estimated time to construct.

Based on the engineering judgement, the stability results for this project are not expected to change and hence the restudy of stability analysis was not performed.

3.0 TYPE OF INTERCONNECTION SERVICE

The Interconnection Customer has selected *Energy Resource (ER)* interconnection service.

4.0 DESCRIPTION OF PROPOSED INTERCONNECTION

The Interconnection Customer's proposed Generating Facility is to be interconnected through a new substation southwest of the Whitney Canyon Inlet point in Uinta County on the Canyon Compression – Railroad 138 kV transmission line. Figure 1 below, is a one-line diagram that illustrates the interconnection of the proposed Generating Facility to the Transmission Provider's system.

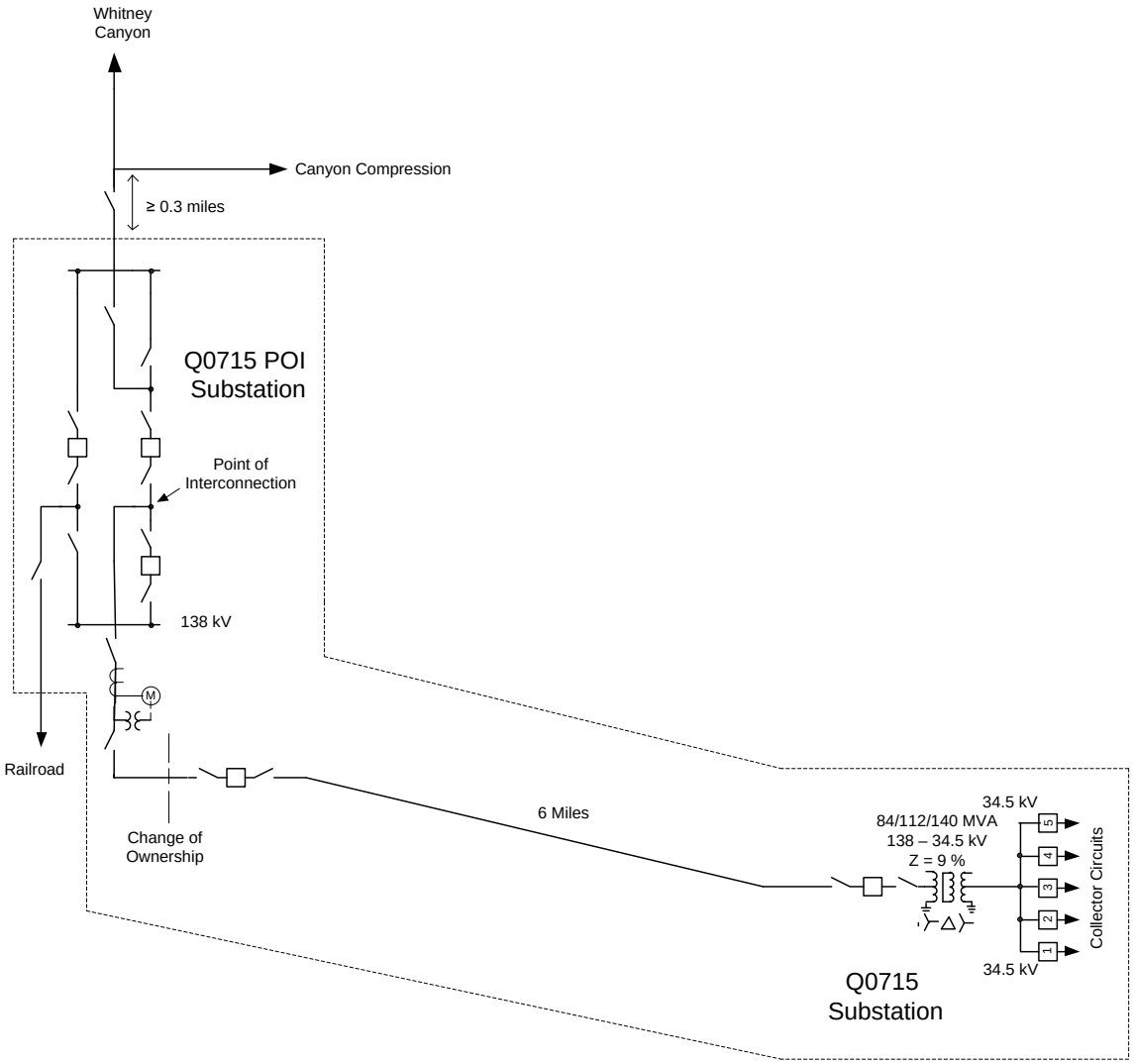

Figure 1: Simplified System One Line Diagram

4.1 Other Options Considered

The following alternative options were considered as potential Points of Interconnection ("POI") for this Project: None.

5.0 STUDY ASSUMPTIONS

- All active higher priority transmission service and/or generator interconnection requests will be considered in this study and are listed in Appendix 1. If any of these requests are materially modified or withdrawn, the Transmission Provider reserves the right to restudy this request, and the
  Results and conclusions could significantly change.
- For study purposes there are two separate queues:
  - Transmission Service Queue: to the extent practical, all network upgrades that are required to accommodate active transmission service requests will be modeled in this study.
  - Generation Interconnection Queue: Interconnection Facilities associated with higher queue interconnection requests with an in-service date of December 2020 or earlier will be modeled in this study.
- The Interconnection Customer's request for energy or network resource interconnection service in and of itself does not convey transmission service. Only a Network Customer may make a request to designate a generating resource as a Network Resource. The provision of transmission service may require additional studies and the construction of additional upgrades.
- Under normal conditions, the Transmission Provider does not dispatch or otherwise directly control or regulate the output of generating facilities. Therefore, the need for transmission modifications, if any, which are required to provide Network Resource Interconnection Service will be evaluated on the basis of 100 percent deliverability (i.e., no displacement of other resources in the same area).
- This study assumes the Project will be integrated into the Transmission Provider's system at agreed upon and/or proposed POI.
- The Interconnection Customer will construct and own any facilities required between the Point of Change of Ownership and the Project unless specifically identified by the Transmission Provider.
- Generator tripping may be required for certain outages.
- All facilities will meet or exceed the minimum Western Electricity Coordinating Council ("WECC"), North American Electric Reliability Corporation ("NERC"), and the Transmission Provider's performance and design standards.
- The Energy Gateway West, Aeolus-Bridger/Anticline D.2, is assumed to be in-service by year end 2020.
- All system improvements associated with relevant prior queued projects are in service before Q0715.
- The Midway – Jordanelle 138 kV line is assumed to be in service (2019).
- The Point of Interconnection for this Project is assumed to be approximately 0.3 miles from the Transmission Provider's Whitney Canyon Inlet point. Moving the Point of Interconnection further away from this point must be approved by the Transmission Provider as the study results could change.
- This report is based on information available at the time of the study. It is the Interconnection Customer's responsibility to check the Transmission Provider's web site regularly for Transmission System updates at http://www.pacificorp.com/tran.html

5.1 Energy Resource (ER) Interconnection Service

Energy Resource Interconnection Service allows the Interconnection Customer to connect its Generating Facility to the Transmission Provider's Transmission System and to be eligible to deliver electric output using firm or non-firm transmission capacity on an as-available basis.

5.1.1 Requirements

5.1.1.1 Generating Facility Modifications

Transmission Provider will require the facility to operate in voltage control mode with the ability to deliver power output to the POI within the range of +/- 0.95 power factor. (Please see Standard Large Generator Interconnection Agreement, article 9.6.1 and 9.6.2 in OATT.) Any additional reactive compensation must be designed such that the discrete switching of the reactive device, if required, does not cause step voltage changes greater than ± 3% at any load serving bus on the Transmission Provider's system.

As required by NERC standard VAR-001-1a, the Transmission Provider will provide a voltage schedule for the POI. In general, Generating Facilities should be operated so as to maintain the voltage at the POI, or other designated point as deemed appropriated by Transmission Provider. The Transmission Provider may also specify a voltage and/or reactive power bandwidth as needed to coordinate with upstream voltage control devices such as on-load tap changers. At the Transmission Provider's discretion, these values might be adjusted depending on operating conditions. The voltage control settings of the Generating Facility must be coordinated with the Transmission Provider prior to energization (or interconnection).

At low output levels, the Q0715 Project needs to ensure that it maintains the power factor within +/- 0.95 at the POI and minimize the reactive power flow towards the transmission system to prevent high voltages. PacifiCorp has experienced high voltages in the Wyoming area when the transmission system is lightly loaded with low wind conditions in the area. With low wind conditions the wind farms tend to supply reactive power into the transmission system increasing the voltage.

Generating Facilities capable of operating with a voltage droop are required to do so. Voltage droop control enables proportionate reactive power sharing among generation facilities. Studies will be required to coordinate voltage droop settings if there are other facilities in the area. It will be the Interconnection Customer's responsibility to ensure that a voltage coordination study is performed, in coordination with Transmission Provider, and implemented with appropriate coordination settings prior to unit testing.

For areas with multiple Generating Facilities, additional studies may be required to determine whether critical interactions, including but not limited to control systems, exist. These studies, to be coordinated with Transmission Provider, will be the responsibility of the Interconnection Customer.

To facilitate collection and validation of accurate modeling data to meet NERC modeling standards, PacifiCorp, as the Planning Coordinator, requires Phasor Measurement Units (PMUs) at all new Generating Facilities with an individual or aggregate nameplate capacity of 75 MVA or greater. In addition to owning and maintaining the PMU, the Generating Facility will be responsible for collecting, storing and retrieving data as requested by the Planning Coordinator. Data must be collected and be able to stream to Planning Coordinator for each of the Generator Facility's step-up transformers measured on the low side of the GSU at a sample rate of at least 30 samples per second and synchronized within +/- 2 milliseconds of the Coordinated Universal Time (UTC). Initially, the following data must be collected:

- Three phase voltage and voltage angle (analog)
- Three phase current (analog)

Data requirements are subject to change as deemed necessary to comply with local and federal regulations.

All wind turbines must meet the Federal Energy Regulatory Committee (FERC) and WECC low voltage ride-through requirements as specified in the interconnection agreement. Each of the Interconnection Customer's step-up transformers will need to be switched with a 138 kV circuit breaker.

As the Transmission Provider cannot submit a user written model to WECC for inclusion in base cases, a standard model from the WECC Approved Dynamic Model Library is required 180 days prior to trial operation. The list of approved generator models is continually updated and is available on the http://www.WECC.biz website.

The Interconnection Customer is responsible for the protection of the transmission line between the Generating Facility and the Point of Interconnection substation. In order to provide this protection the Interconnection Customer shall construct and own a tie-line substation to be located at the change of ownership (separate fenced facility adjacent to the Transmission Provider's Point of Interconnection substation) and include an Interconnection Customer owned protective device and associated transmission line relaying/communications. The ground grids of the Transmission Provider's Point of Interconnection substation and the Interconnection Customer's tie-line substation will be connected to support the use of a bus differential protection scheme which will protect the overhead bus connection between the two facilities.

5.1.1.2 Transmission System Modifications

- Construct a new three breaker 138 kV POI ring bus substation southwest of the Whitney Canyon Inlet (near to structure 116), with associated switches and line terminations. An additional 138 kV breaker (customer-owned) will be required at the Point of Change of Ownership (see Figure 1).
- Modify the existing Naughton West RAS to integrate the Q0715 Project. If the average of the flows on West of Naughton & West of Evanston is above 900 MW,

Q0715 will be armed to trip for the N-2 outages of either Ben Lomond – Birch Creek 230 kV line + Ben Lomond – Naughton or Naughton – Birch Creek 230 kV line + Ben Lomond – Naughton 230 kV line.

- Capability to trip the Q0715 Project if necessary under N-2 outages described above.
- Redundant communication from the RAS controller to the Project.

5.1.1.3 Transmission Requirements

Construct 300 ft Loop-In of the Canyon Compression- Railroad 138 kV Line to the Railroad side of the Q0715 POI sub near structure 116.

Replace one shield wire with OPGW between Canyon Compression and the Q0715 POI substation for a distance of 1.38 miles.
The Interconnection Customer shall construct the tie line from the collector substations to the tie-line substations.

The Interconnection Customer is required to build tie-line substations adjacent to the POI substation which will house the tie-line breaker. The Transmission Provider shall review the design of the tie-line span between the tie-line substation deadend tower and the POI substation deadend tower. The Interconnection Customer shall coil conductor, OPGW, shield wire, and line hardware with sufficient quantities to span between the tie-line substation tower and the POI substation tower.

The Transmission Provider will construct the span between the tie-line substation tower and the POI substation tower.

If any Transmission Provider lines are crossed by Interconnection Customer tie-line, the Interconnection Customer line will cross under Transmission Provider's line with at least NESC plus 3 foot clearance under all sag conditions of both lines.

5.1.1.4 Existing Circuit Breaker Upgrades – Short Circuit

The increase in the fault duty on the system as a result of the addition of the Generating Facility with 125 – GE 2.0-116 2 MW wind turbine generators fed through 60 – 2,222 kVA 34.5 kV – 690 V transformers with 5.75% impedance then fed through one 138 – 34.5kV 83/112/140 MVA step-up transformer with 9% impedance will not push the fault duty above the interrupting rating of any of the Transmission Provider's existing fault interrupting equipment. There is concern that the equipment of other customers of the Transmission Provider at Canyon Compression substation may need to be replaced due to the increase in fault duty at that location. Further analysis will be performed during detailed design if this Project moves forward.

5.1.1.5 Protection Requirements

The Interconnection Customer's tie line substation (having a sole 138kV circuit breaker and associated equipment) will be adjacent to the Q0715 POI substation with a common

fence between the two facilities. With this configuration the ground mats of the two substations will be tied together. The short line segment between the tie line substation and the Q0715 POI substation will be considered a bus section and will be protected with redundant bus differential relay systems. The bus differential relays will be located in the Q0715 POI substation. The Interconnection Customer will need to provide the output from two sets of current transformers to be fed into the bus differential relays with a maximum current transformer ratio matching the maximum CT ratio of the breakers at the Q0715 POI substation. If a fault is detected in the short conductor connection, both the 138kV breakers in the Q0715 POI substation and the 138kV breaker in the Interconnection Customer's tie line substation will be tripped.

The detection and clearing of faults on the tie line between the tie line and the collector substation will be the responsibility of the Interconnection Customer. Facilities must be installed to detect and isolate the line if it is faulted in five cycles or less.

A relay at the Q0715 POI substation will monitor the voltage magnitude and frequency. If the magnitude or frequency of the voltage is outside of normal range of operation a signal will be sent over the communication system to the collector substation. At the collector substation this signal is to trip open all of the 34.5 kV feeder breakers to disconnect the wind turbine generators. By tripping the 34.5 kV breakers instead of the 138kV breakers the station service to the plant is maintained to facilitate the restoration of the generation. This relay will also have phase and ground directional overcurrent elements set to operate for faults in the line between the Q0715 POI substation and the collector substation and serve as a backup to the main protection installed by the Interconnection Customer as indicated in the previous paragraph.

The installation of protective relays for line fault detection will be required at the Transmission Provider's Q0715 138kV POI substation for the protection of the lines to the Interconnection Customer's collector substation and the line to Railroad substation, where a two-terminal transmission line current differential will be implemented. The lines from the Q0715 POI substation to Compression substation will also be protected with a two-terminal transmission line current differential relay system. The connection to Whitney Canyon substation will be treated as a load for this line differential.

5.1.1.6 Data (RTU) Requirements

In addition to the need for operational data and control at the Q0715 POI substation, data for the operation of the power system will be needed from the collector substation. This data will be acquired by installing an Interconnection Customer owned data concentrator at the collector substation. The data will be transferred to the RTU in POI substation via Interconnection Customer owned fiber on the tie line from the collector substation.

Listed below is the data that will be acquired from the collector substation, tie line substation and Q0715 POI substation.

From the Q0715 POI substation:

Analogs:
- Net Generation real power
- Net Generator reactive power
- Interchange energy register

From tie line substation:

Status:
- 138kV breaker

From the Q0715 collector substation:

Analogs:
- Transformer # 1 real power
- Transformer # 1 reactive power
- Real power flow through 34.5 kV line feeder breaker 1
- Reactive power flow through 34.5 kV line feeder breaker 1
- Real power flow through 34.5 kV line feeder breaker 2
- Reactive power flow through 34.5 kV line feeder breaker 2
- Real power flow through 34.5 kV line feeder breaker 3
- Reactive power flow through 34.5 kV line feeder breaker 3
- Real power flow through 34.5 kV line feeder breaker 4
- Reactive power flow through 34.5 kV line feeder breaker 4
- Real power flow through 34.5 kV line feeder breaker 5
- Reactive power flow through 34.5 kV line feeder breaker 5
- A phase 138kV transmission voltage
- B phase 138kV transmission voltage
- C phase 138kV transmission voltage
- Average Wind speed
- Average Plant Atmospheric Pressure (Bar)
- Average Plant Temperature (Celsius)

Status:
- 138 kV breaker T1
- 34.5 kV collector circuit breaker 1
- 34.5 kV collector circuit breaker 2
- 34.5 kV collector circuit breaker 3
- 34.5 kV collector circuit breaker 4
- 34.5 kV collector circuit breaker 5

5.1.1.7 Substation Requirements

Q0715 POI Substation

The Project will require a new 138 kV three breaker ring bus POI substation. The substation will be approximately 170' x 300' (fence dimensions) based on the Interconnection Customer provided facility requirements. The POI substation will be located adjacent to the Interconnection Customer's tie line substation with a common fence between the facilities. The ground grids for the substations will be tied together and conduit will be installed between the substation to facilitate installation of protection, control, and indication cables. The following is a list of the major equipment required for this project:

3 – 138 kV Power Circuit Breakers
6 – 138 kV CCVTs
3 – 138 kV CT/VT Metering Units
11 – 138 kV Switches
9 – 138 kV Lightning Arresters
1 – 138 kV SSVT
1 – Control House

5.1.1.8 Communication Requirements

Installation of fiber is required on the existing line from Canyon Compression substation to the new Q0715 POI substation. The Interconnection Customer will need to install OPGW fiber on the line from Q0715 collector substation to the tie line substation where it will then connect to the Transmission Provider's communication equipment. Fiber nodes, multiplex and fiber termination panels are required at all three locations. At the Q0715 POI substation a 48 volt communication battery and charger is required for protection circuits. At Canyon Compression substation the communications are connected to the backbone via existing fiber and microwave. Substation network is to be installed at all three locations for metering and status.

With the Naughton RAS requirements for redundant communications, a leased T1 circuit is to be installed at the POI substation with the other end terminated at Naughton substation.

5.1.1.9 Metering Requirements

Interchange Metering

The interchange metering will be designed bidirectional and rated for the total net generation of the project including metering the retail load (per tariff) delivered to the customer. The Transmission Provider will specify and order all interconnection revenue metering, including the instrument transformers, metering panels, junction box and secondary metering wire. The primary metering transformers shall be combination 138 kV, 500/5, RF =2, CT/VT extended range for high accuracy metering.

The metering design package will include two revenue quality meters, test switch, with DNP real-time digital data terminated at a metering interposition block. One meter will be designated a primary SCADA meter and a second meter will be used designated as

backup with metering DNP data delivered to the alternate control center. The metering data will include bidirectional KWH KVARH, revenue quantities including instantaneous PF, MW, MVAR including per phase voltage and amps data.

An Ethernet connection is required for retail sales and generation accounting via the MV-90 translation system.

Station Service/Construction Power
Prior to construction, Interconnection Customer must arrange construction power with the Transmission Provider. The metering shall conform to the Six State Electric Service Requirements manual as the site is within the Transmission Provider's service territory.

For permanent station service load, bidirectional metering is required. Please note, prior to back feed Interconnection Customer must arrange distribution voltage retail meter service for electricity consumed by the Project and arrange backup station service for power that will be drawn from the transmission or distribution line when the Project is not generating. Interconnection Customer must call the PCCC Solution Center 1-800-640-2212 to arrange this service. Approval for back feed is contingent upon obtaining station service.

5.1.2 Cost Estimate

The following estimate represents only scopes of work that will be performed by the Transmission Provider. Costs for any work being performed by the Interconnection Customer are not included.

Direct Assigned	
Q0715 Tie Line Substation – Coordinate Relaying and Communications	$364,000
Q0715 Naughton substation – Modify RAS	$105,000
Q0715 POI Substation – Metering, Protection & Control and Line Termination	$1,414,000
Total Direct Assignment	**$1,883,000**
Network Upgrades	
Q0715 POI substation – Add 138 kV three-breaker ring bus	$6,187,000
Railroad substation – Add line relays	$62,000
Canyon Compression substation – Add line relays	$93,000
Canyon Compression-Railroad Loop In/Out	$515,000
Total Network Upgrade	**$6,857,000**

Total Cost **$8,740,000**

*Any distribution line modifications identified in this report will require a field visit analysis in order to obtain a more thorough understanding of the specific requirements. The estimate provided above for this work could change substantially based on the results of this analysis. Until this field analysis is performed the Transmission Provider must develop the project schedule using conservative assumptions. The Interconnection Customer may request that the Transmission Provider perform this field analysis, at the Interconnection Customer's expense, prior to the execution of an Interconnection Agreement in order to obtain more cost and schedule certainty.

Note: Costs for any excavation, duct installation and easements shall be borne by the Interconnection Customer and are not included in this estimate. This estimate is as accurate as possibly given the level of detailed study that has been completed to date and approximates the costs incurred by Transmission Provider to interconnect this Generator Facility to Transmission Provider's electrical distribution or transmission system. A more detailed estimate will be calculated during the Facilities Study. The Interconnection Customer will be responsible for all actual costs, regardless of the estimated costs communicated to or approved by the Interconnection Customer.

5.1.3 Schedule

The Transmission Provider estimates it will require approximately 24 months to design, procure and construct the facilities described in the Energy Resource sections of this report following the execution of an Interconnection Agreement. The schedule will be further developed and optimized during the Facilities Study.

Please note, the time required to perform the scope of work identified in this report appears to result in a timeframe that does support the Interconnection Customer's requested commercial operation date of October 1, 2020.

5.1.4 Maximum Amount of Power that can be delivered into Network Load, with No Transmission Modifications (for informational purposes only)

Zero (0) MW can be delivered on a firm basis to the Transmission Provider's network loads without system improvements.

5.1.5 Additional Transmission Modifications Required to Deliver 100% of the Power into Network Load (for informational purposes only)

In order to deliver 100% of the power into Network Load all improvements identified in this report must be in service.

6.0 Participation by Affected Systems

Transmission Provider has identified the following affected systems: None

7.0 Appendices

Appendix 1: Higher Priority Requests

Appendix 2: Property Requirements
Appendix 3: Study Results

7.1 Appendix 1: Higher Priority Requests

All active higher priority transmission service and/or generator interconnection requests will be considered in this study and are identified below. If any of these requests are withdrawn, the Transmission Provider reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

Transmission/Generation Interconnection Queue Requests considered:

Q0720* (TSR – Q2060)
*This project has been designated a network resource.

7.2 Appendix 2: Property Requirements

Property Requirements for Point of Interconnection Substation

Requirements for rights of way easements
Rights of way easements will be acquired by the Interconnection Customer in the Transmission Provider's name for the construction, reconstruction, operation, maintenance, repair, replacement and removal of Transmission Provider's Interconnection Facilities that will be owned and operated by PacifiCorp. Interconnection Customer will acquire all necessary permits for the project and will obtain rights of way easements for the project on Transmission Provider's easement form.

Real Property Requirements for Point of Interconnection Substation
Real property for a POI substation will be acquired by an Interconnection Customer to accommodate the Interconnection Customer's project. The real property must be acceptable to Transmission Provider. Interconnection Customer will acquire fee ownership for interconnection substation unless Transmission Provider determines that other than fee ownership is acceptable; however, the form and instrument of such rights will be at Transmission Provider's sole discretion. Any land rights that Interconnection Customer is planning to retain as part of a fee property conveyance will be identified in advance to Transmission Provider and are subject to the Transmission Provider's approval.

The Interconnection Customer must obtain all permits required by all relevant jurisdictions for the planned use including but not limited to conditional use permits, Certificates of Public Convenience and Necessity, California Environmental Quality Act, as well as all construction permits for the project.

Interconnection Customer will not be reimbursed through network upgrades for more than the market value of the property.

As a minimum, real property must be environmentally, physically, and operationally acceptable to Transmission Provider. The real property shall be a permitted or permittable use in all zoning districts. The Interconnection Customer shall provide Transmission Provider with a title report and shall transfer property without any material defects of title or other encumbrances that are not acceptable to Transmission Provider. Property lines shall be surveyed and show all encumbrances, encroachments, and roads.

Examples of potentially unacceptable environmental, physical, or operational conditions could include but are not limited to:

1. Environmental: known contamination of site; evidence of environmental contamination by any dangerous, hazardous or toxic materials as defined by any governmental agency; violation of building, health, safety, environmental, fire, land use, zoning or other such regulation; violation of ordinances or statutes of any governmental entities having jurisdiction over the property; underground or above ground storage tanks in area; known remediation sites on property; ongoing

mitigation activities or monitoring activities; asbestos; lead-based paint, etc. A phase I environmental study is required for land being acquired in fee by the Transmission Provider unless waived by Transmission Provider.

2. Physical: inadequate site drainage; proximity to flood zone; erosion issues; wetland overlays; threatened and endangered species; archeological or culturally sensitive areas; inadequate sub-surface elements, etc. Transmission Provider may require Interconnection Customer to procure various studies and surveys as determined necessary by Transmission Provider.

Operational: inadequate access for Transmission Provider's equipment and vehicles; existing structures on land that require removal prior to building of substation; ongoing maintenance for landscaping or extensive landscape requirements; ongoing homeowner's or other requirements or restrictions (e.g., Covenants, Codes and Restrictions, deed restrictions, etc.) on property which are not acceptable to the Transmission Provider.

7.3 Appendix 3: Study Results

A Western Electricity Coordinating Council (WECC) approved 2021-22 Heavy winter case was used to perform the power flow studies using PSS/E version 33.7. Power flow studies were performed on both peak and off-peak load cases. The off-peak load case was chosen to demonstrate the stress on the higher kV transmission system under light load conditions.

The local 345 kV, 230 kV, 138 kV and 115 kV transmission system outages were considered during the study. Some of the local area contingencies considered for this study are listed below.

(1) N-1: Outage of the Q0715 – Railroad 138 kV line
(2) N-1: Outage of Q0715 – Canyon Compression 138 kV line
(3) N-1: Outage of Canyon Compression – Muddy Creek 138 kV line
(4) N-1: Outage of the Long Hollow – Painter 138 kV line
(5) N-1: Outage of the Painter – Railroad 138 kV line
(6) N-1: Outage of the Railroad 230/138 kV auto transformer
(7) N-1: Outage of the Birch Creek – Ben Lomond 230 kV line
(8) N-1: Outage of the Ben Lomond – Naughton 230 kV line
(9) N-1: Outage of the Naughton – Birch Creek 230 kV line
(10) N-2: Outage of the Ben Lomond – Birch Creek 230 kV line & Ben Lomond – Naughton 230 kV line
(11) N-2: Outage of the Ben Lomond – Syracuse 345 kV line & Populus – Terminal 345 kV line
(12) N-2: Outage of the Ben Lomond – Terminal 345 kV # 2 line & Ben Lomond – Syracuse 345 kV line

N-0 Results: No N-0 thermal or voltage issues were observed in the studies.

N-1 Results: No N-1 thermal or voltage issues were observed in the studies.

N-2 Results: The following N-2 issue was observed in the studies.
The Evanston West path consists of three 230 kV lines:

Naughton – Treasureton
Naughton – Ben Lomond
Naughton – Birch Creek – Ben Lomond

For the N-2 outage of the Ben Lomond – Birch Creek 230 kV line and Ben Lomond – Naughton 230 kV line, and dependent on flow levels on the Evanston West path, an overload on the remaining Naughton – Treasureton 230 kV line can occur. There is an existing remedial action scheme (RAS), Naughton RAS, to drop generation for this N-2. The Q0715 Project must be incorporated into the Naughton RAS as it will affect area flows.

PACIFICORP

Large Generator Interconnection
System Impact Study Report

Completed for
Invenergy Wind Development, LLC
("Interconnection Customer")
Q0810
Uinta II

Proposed Point of Interconnection

Q0715 Point of Interconnection Substation (on Canyon Compression – Railroad 138 kV line)

February 8, 2018

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1.0 DESCRIPTION OF THE GENERATING FACILITY

Invenergy Wind Development, LLC ("Interconnection Customer") proposed interconnecting 101 MW of new generation to PacifiCorp's ("Transmission Provider") Canyon Compression – Railroad 138 kV line located in Uinta County, Wyoming. The Uinta project ("Project") will consist of 44 GE 2.3 inverters for a total output of 101 MW. The requested commercial operation date is July 1, 2019.

Interconnection Customer will NOT operate this generator as a Qualified Facility as defined by the Public Utility Regulatory Policies Act of 1978 (PURPA).

The Transmission Provider has assigned the Project "Q0810."

2.0 SCOPE OF THE STUDY

The interconnection system impact study shall evaluate the impact of the proposed interconnection on the reliability of the transmission system. The interconnection system impact study will consider Base Case as well as all generating facilities (and with respect to (iii) below, any identified network upgrades associated with such prior queued interconnections) that, on the date the interconnection system impact study is commenced:

(i) are directly interconnected to the transmission system;
(ii) are interconnected to Affected Systems and may have an impact on the interconnection request;
(iii) have a pending prior queued interconnection request to interconnect to the transmission system; and
(iv) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

This interconnection system impact study will consist of a short circuit analysis, a stability analysis, and a power flow analysis. The study will state the assumptions upon which it is based; state the results of the analyses; and provide the requirements or potential impediments to providing the requested interconnection service, including preliminary indication of the cost and length of time that would be necessary to correct any problems identified in those analyses and implement the interconnection. The study will also provide a list of facilities that are required as a result of the Interconnection Request and a non-binding good faith estimate of the cost responsibility and a non-binding good faith estimated time to construct.

3.0 TYPE OF INTERCONNECTION SERVICE

The Interconnection Customer has selected *Network Resource (NR)* Interconnection Service, but has also elected to have the interconnection studied as an *Energy Resource (ER).* The Interconnection Customer will select NR or ER prior to the facilities study.

4.0 DESCRIPTION OF PROPOSED INTERCONNECTION

The Interconnection Customer's proposed Generating Facility is to be interconnected through the Interconnection Customer Interconnection Facilities to be constructed for the Q0715 project.

Figure 1 below, is a one-line diagram that illustrates the interconnection of the proposed Generating Facility to the Transmission Provider's system.

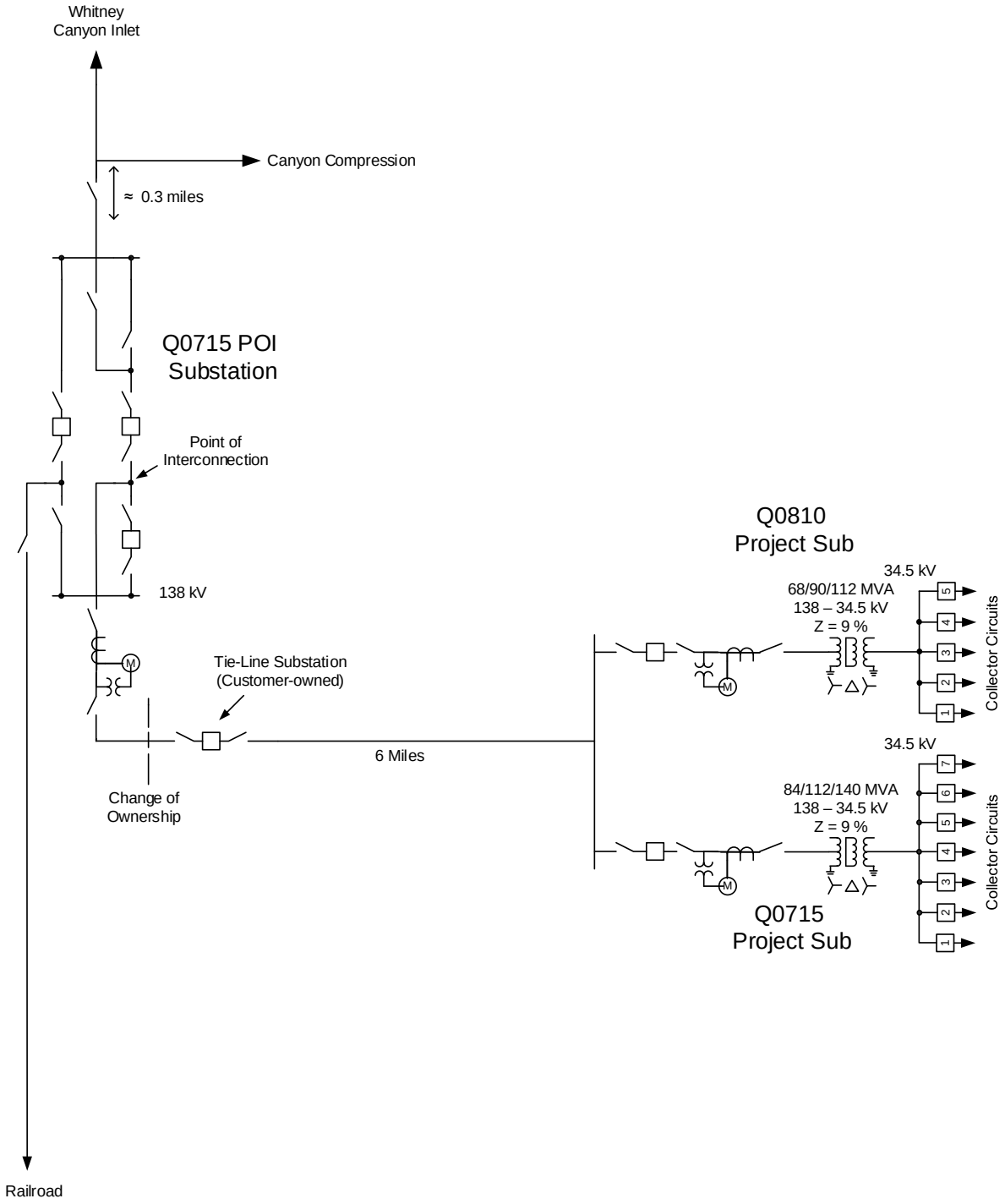

Figure 1: Simplified System One Line Diagram – Point of Interconnection

5.0 STUDY ASSUMPTIONS

- All active higher priority transmission service and/or generator interconnection requests will be considered in this study and are listed in Appendix 1. If any of these requests are materially modified or withdrawn, the Transmission Provider reserves the right to restudy this request, and the
  Results and conclusions could significantly change.
- For study purposes there are two separate queues:
  - Transmission Service Queue: to the extent practical, all network upgrades that are required to accommodate active transmission service requests will be modeled in this study.
  - Generation Interconnection Queue: Interconnection Facilities associated with prior queued interconnection requests will be modeled in this study.
- The Interconnection Customer's request for energy or network resource interconnection service in and of itself does not convey transmission service. Only a Network Customer may make a request to designate a generating resource as a Network Resource. The provision of transmission service may require additional studies and the construction of additional upgrades.
- Under normal conditions, the Transmission Provider does not dispatch or otherwise directly control or regulate the output of generating facilities. Therefore, the need for transmission modifications, if any, which are required to provide Network Resource Interconnection Service will be evaluated on the basis of 100 percent deliverability (i.e., no displacement of other resources in the same area).
- This study assumes the Project will be integrated into the Transmission Provider's system at agreed upon and/or proposed Point of Interconnection.
- The Interconnection Customer will construct and own any facilities required between the Point of Change of Ownership and the Project unless specifically identified by the Transmission Provider.
- Line reconductor or fiber underbuild required on existing poles will be assumed to follow the most direct path on the Transmission Provider's system. If during detailed design the path must be modified it may result in additional cost and timing delays for the Interconnection Customer's project.
- Generator tripping may be required for certain outages.
- All facilities will meet or exceed the minimum Western Electricity Coordinating Council ("WECC"), North American Electric Reliability Corporation ("NERC"), and the Transmission Provider's performance and design standards.
- The Q0715 project must be complete before or simultaneously with this Project.
- The Jordanelle – Midway 138 kV line is assumed to be in service (2019).
- The Energy Gateway West, Aeolus-Bridger/Anticline sub-segment D.2, is assumed to be in-service by year end 2020.
- This report is based on information available at the time of the study. It is the Interconnection Customer's responsibility to check the Transmission Provider's web site regularly for Transmission System updates at http://www.pacificorp.com/tran.html

6.0 ENERGY RESOURCE (ER) INTERCONNECTION SERVICE

Energy Resource Interconnection Service allows the Interconnection Customer to connect its Generating Facility to the Transmission Provider's Transmission System and to be eligible to deliver electric output using firm or non-firm transmission capacity on an as available basis.

6.1.1 Requirements

6.1.1.1 Generating Facility Modifications

All interconnecting synchronous and non-synchronous generators are required to design their Generating Facilities with reactive power capabilities necessary to operate within the full power factor range of 0.95 leading to 0.95 lagging. This power factor range shall be dynamic and can be met using a combination of the inherent dynamic reactive power capability of the generator or inverter, dynamic reactive power devices and static reactive power devices to make up for losses.

For synchronous generators, the power factor requirement is to be measured at the Point of Interconnection. For non-synchronous generators, the power factor requirement is to be measured at the high-side of the generator substation.

The generating facility must provide dynamic reactive power to the system in support of both voltage scheduling and contingency events that require transient voltage support, and must be able to provide reactive capability over the full range of real power output.

If the generating facility is not capable of providing positive reactive support (i.e., supplying reactive power to the system) immediately following the removal of a fault or other transient low voltage perturbations, the facility must be required to add dynamic voltage support equipment. These additional dynamic reactive devices shall have correct protection settings such that the devices will remain on line and active during and immediately following a fault event.

Generators shall be equipped with automatic voltage-control equipment and normally operated with the voltage regulation control mode enabled unless written authorization (or directive) from the Grid Operator is given to operate in another control mode (e.g. constant power factor control). The control mode of generating units shall be accurately represented in operating studies. The generators shall be capable of operating continuously at their maximum power output at its rated field current within +/- 5% of its rated terminal voltage.

As required by NERC standard VAR-001-1a, the Transmission Provider will provide a voltage schedule for the Point of Interconnection. In general, Generating Facilities should be operated so as to maintain the voltage at the Point of Interconnection, or other designated point as deemed appropriated by Transmission Provider. The Transmission Provider may also specify a voltage and/or reactive power bandwidth as needed to coordinate with upstream voltage control devices such as on-load tap changers. At the Transmission Provider's discretion, these values might be adjusted depending on operating conditions.

Generating Facilities capable of operating with a voltage droop are required to do so. Voltage droop control enables proportionate reactive power sharing among generation facilities. Studies will be required to coordinate voltage droop settings if there are other facilities in the area. It will be the Interconnection Customer's responsibility to ensure that a voltage coordination study is

performed, in coordination with Transmission Provider, and implemented with appropriate coordination settings prior to unit testing.

For areas with multiple generating facilities additional studies may be required to determine whether or not critical interactions, including but not limited to control systems, exist. These studies, to be coordinated with Transmission Provider, will be the responsibility of the Interconnection Customer. If the need for a master controller is identified, the cost and all related installation requirements will be the responsibility of the Interconnection Customer. Participation by the generation facility in subsequent interaction/coordination studies will be required pre- and post-commercial operation in order ensure system reliability.

To facilitate collection and validation of accurate modeling data to meet NERC modeling standards, PacifiCorp, as the Planning Coordinator, requires Phasor Measurement Units (PMUs) at all new Generating Facilities with an individual or aggregate nameplate capacity of 75 MVA or greater. In addition to owning and maintaining the PMU, the Generating Facility will be responsible for collecting, storing and retrieving data as requested by the Planning Coordinator. Data must be collected and be able to stream to Planning Coordinator for each of the Generator Facility's step-up transformers measured on the low side of the GSU at a sample rate of at least 30 samples per second and synchronized within +/- 2 milliseconds of the Coordinated Universal Time (UTC). Initially, the following data must be collected:

- Three phase voltage and voltage angle (analog)
- Three phase current (analog)

Data requirements are subject to change as deemed necessary to comply with local and federal regulations.

All generators must meet the Federal Energy Regulatory Committee (FERC) and WECC low voltage ride-through requirements as specified in the interconnection agreement.

As the Transmission Provider cannot submit a user written model to WECC for inclusion in base cases, a standard model from the WECC Approved Dynamic Model Library is required 180 days prior to trial operation. The list of approved generator models is continually updated and is available on the http://www.WECC.biz website.

6.1.1.2 Transmission System Modifications

Q0810 is responsible to eliminate the credible N-2 outage of the Transmission Provider's Ben Lomond-Birch Creek and Ben Lomond-Naughton 230 kV transmission lines, which share common structures for approximately eight miles as they exit Ben Lomond substation. This will require construction of a new approximately seven-mile 230 kV line (2-795 ACSR) in a separate right of way, in order for both 230 kV circuits to be on separate structures.

6.1.1.3 Transmission/Distribution Line Modifications

Construct a 230 kV single circuit transmission line beginning approximately one mile outside of Ben Lomond substation to structure 525 for the Ben Lomond-Naughton #1 line.

This line segment will replace the current Ben Lomond-Naughton #1 circuit which resides on the north side of the 7 mile long lattice tower double circuit with the Ben Lomond-Birch Creek 230

kV transmission line. This new line will require the procurement of additional rights-of-ways which the Interconnection Customer will be responsible to obtain on behalf of the Transmission Provider. The corridor near Ben Lomond substation where the new transmission line must be constructed is congested. The Transmission Provider anticipates that the procurement of the necessary rights-of-way could be difficult and may add significant cost and potential delays to the Project.

6.1.1.4 Existing Circuit Breaker Upgrades – Short Circuit

The increase in the fault duty on the system as a result of the addition of the Generating Facility with 44 – GE 2.3 MW wind turbine generators fed through 44 – 2.5 MVA 34.5 kV – 690 V transformers with 5.75% impedance then fed through one 138 – 34.5kV 68/90/112 MVA step-up transformer with 9% impedance will not push the fault duty above the interrupting rating of any of the Transmission Provider's existing fault interrupting equipment.

6.1.1.5 Protection Requirements

The Interconnection Customer's line relays at the collector substation will need to respond to the combination of the 138 kV fault current being contributed from both the Q0715 and the Q0810 generation projects for faults on the 138 kV tie line and trip both 138 kV breakers for the two projects.

As this Project will be interconnected through the same facilities planned to be constructed for the Q0715 project it will be included in the bus differential relay system that will trip the 138 kV breaker in the tie line substation to be installed as part of the Q0715 project.

The relay to be installed at the Q0715 POI substation as part of the Q0715 project will monitor the voltage magnitude and frequency of the Q0810 Project. If the magnitude or frequency of the voltage is outside of normal range of operation a signal will be sent to trip the tie line 138 kV breakers.

New line relay settings will be developed for the Naughton – Ben Lomond and Birch Creek – Ben Lomond 230 kV lines due to the rebuilding of the seven mile section of those lines.

6.1.1.6 Data (RTU) Requirements

Data for the operation of the power system will be needed from the Interconnection Customer's collector substation. Listed is the data that will be acquired from the collector substations.

From the Q0715 collector substation:
Analogs:

- Net Generation MW
- Net Generator MVAR
- Interchange metering kWH

From the Q0810 collector substation:
Analogs:

- Net Generation MW
- Net Generator MVAR

- Interchange metering kWH
- 34.5 kV Real power F1
- 34.5 kV Reactive power F1
- 34.5 kV Real power F2
- 34.5 kV Reactive power F2
- 34.5 kV Real power F3
- 34.5 kV Reactive power F3
- 34.5 kV Real power F4
- 34.5 kV Reactive power F4
- 34.5 kV Real power F5
- 34.5 kV Reactive power F5
- Average Wind Speed
- Average Plant Atmospheric Pressure (Bar)
    - Average Plant Temperature (Celsius)

Status:

- 138 kV line breaker
- 34.5 kV breaker F1
- 34.5 kV breaker F2
- 34.5 kV breaker F3
- 34.5 kV breaker F4
- 34.5 kV breaker F5

6.1.1.7 Substation Requirements

Q810 Collector Station

The following major equipment has been identified as being required and may change during detailed design:

3 – 138 kV CT/VT combination metering units
1 – Control house

The Interconnection Customer will provide a separate graded, grounded and fenced area along the perimeter of the Interconnection Customer's Generating Facility for the Transmission Provider to install a control house for metering equipment. This area will share a fence and ground grid with the Generating Facility and have separate, unencumbered access for the Transmission Provider. DC power for the control house will be supplied by the Transmission Provider. AC station service for the control house will be provided by the Interconnection Customer.

Q715 Collector Station

The following major equipment has been identified as being required and may change during detailed design:

3 – 138 kV CT/VT combination metering units

6.1.1.8 Communication Requirements

The Transmission Provider will need to make minor modifications at its primary and secondary control centers to account for the additional generation of this phase in addition to the Q0715 project.

6.1.1.9 Metering Requirements

Interchange Metering - Q0715 POI substation:
The Q0715 generation metering to be located at the Q0715 POI substation will be reassigned as an interconnection customer intertie with the Transmission provider for the combined Q0715 and Q0810 generation projects

Q0715 and Q0810 collector substations:
The generation and backfeed metering for both Q0715 and Q0810 projects will be located at the Interconnection Customers' respective collector substations. The generation metering will be located at the 138 kV high side of the Interconnection Customer's transformers and will be loss adjusted to the Transmission Provider's Q0715 POI substation.

The Transmission Provider will specify and order all interconnection revenue metering equipment, including the 138 kV instrument transformers, metering panels, junction boxes, and secondary metering wire. The current transformers shall be extended range for high accuracy metering with current ratio of 500/5 (0.15% extended range accuracy). The voltage transformers will have a voltage ratio of 700/1 (0.3% accuracy).

The metering design package will include four revenue quality meters and supporting hardware. The meters will output DNP real-time digital data terminated at a metering interposition block. The metering design package will include all SCADA metering data terminated at a metering interposition block. The metering data will include bidirectional KWH and KVARH revenue quantities. The metering data will also include PF, MW, MVAR, MVA, per phase voltages, and per phase amps. The interconnection customer may request data outputs from the meters, but the request must be made prior to final design.

An Ethernet phone line is required for retail sales and generation accounting via the MV-90 meter data management system.

Station Service/Construction Power
Prior to construction, Interconnection Customer must arrange construction power with the Transmission Provider. The metering shall conform to the Six State Electric Service Requirements manual as the site is within the Transmission Provider's service territory.

Please note that prior to back feed, Interconnection Customer must arrange transmission retail meter service for electricity consumed by the Project and arrange back-up station service for power that will be drawn from the transmission or distribution line when the Project is not generating.

Interconnection Customer must call the PCCC Solution Center at 1-800-625-6078 to arrange this service. Approval for back feed is contingent upon obtaining station service

6.1.2 Cost Estimate

The following estimate represents only scopes of work that will be performed by the Transmission Provider. Costs for any work being performed by the Interconnection Customer are not included.

Direct Assigned	
Q0810 Collector Substation *Metering and Control House*	$413,000
Q0715 Collector Substation *Metering and Control House*	$413,000
Q0715 Point of Interconnection Substation *Relay and Communication Modifications*	$30,000
Transmission Provider Control Centers *Communication Modifications*	$13,000
Total Direct Assigned	**$869,000**
Network Upgrades	
Ben Lomond-Naughton #1 Transmission Line *Remove from existing double circuit and construct new 7 mile line*	**$25,785,000**
Grand Total	**$26,654,000**

*Any distribution line modifications identified in this report will require a field visit analysis in order to obtain a more thorough understanding of the specific requirements. The estimate provided above for this work could change substantially based on the results of this analysis. Until this field analysis is performed the Transmission Provider must develop the project schedule using conservative assumptions. The Interconnection Customer may request that the Transmission Provider perform this field analysis, at the Interconnection Customer's expense, prior to the execution of an Interconnection Agreement in order to obtain more cost and schedule certainty.

Note: Costs for any excavation, duct installation and easements shall be borne by the Interconnection Customer and are not included in this estimate. This estimate is as accurate as possibly given the level of detailed study that has been completed to date and approximates the costs incurred by Transmission Provider to interconnect this Generator Facility to Transmission Provider's electrical distribution or transmission system. A more detailed estimate will be calculated during the Facilities Study. The Interconnection Customer will be responsible for all actual costs, regardless of the estimated costs communicated to or approved by the Interconnection Customer.

6.1.3 Schedule

The Transmission Provider estimates it will require approximately 24-30 months to permit, design, procure and construct the facilities described in the Energy Resource sections of this report following the execution of an Interconnection Agreement. The schedule will be further developed and optimized during the Facilities Study.

Please note, the time required to perform the scope of work identified in this report appears to result in a timeframe that does not support the Interconnection Customer's requested Commercial Operation date of July 1, 2019.

6.1.4 Maximum Amount of Power that can be delivered into Network Load, with No Transmission Modifications (for informational purposes only)

One hundred one (101) MW can be delivered on a firm basis to the Transmission Provider's network loads assuming all requirements outlined in this report are complete and all requirements of Q0786 are complete.

6.1.5 Additional Transmission Modifications Required to Deliver 100% of the Power into Network Load (for informational purposes only)

See section 6.1.1.2.

7.0 NETWORK RESOURCE (NR) INTERCONNECTION SERVICE

Network Resource Interconnection Service allows the Interconnection Customer to integrate its Generating Facility with the Transmission Provider's Transmission System in a manner comparable to that in which the Transmission Provider integrates its generating facilities to serve native load customers. The transmission system is studied under a variety of severely stressed conditions in order to determine the transmission modifications which are necessary in order to deliver the aggregate generation in the area of the Point of Interconnection to the Transmission Provider's aggregate load. Network Resource Interconnection Service in and of itself does not convey transmission service.

7.1.1 Requirements

7.1.1.1 Generating Facility Modifications

See Section 6.1.1.1

7.1.1.2 Transmission System Modifications

See Section 6.1.1.2

7.1.2 Cost Estimate

No additional costs are anticipated other than those listed in section 6.1.2.

7.1.3 Schedule

See section 6.1.3.

8.0 PARTICIPATION BY AFFECTED SYSTEMS

Transmission Provider has identified the following affected systems: None.

9.0 APPENDICES

Appendix 1: Higher Priority (Prior Queued) Requests
Appendix 2: Property Requirements
Appendix 3: Study Results

9.1 Appendix 1: Higher Priority (Prior Queued) Requests

All active higher priority transmission service and/or generator interconnection requests will be considered in this study and are identified below. If any of these requests are materially modified or withdrawn, the Transmission Provider reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

Transmission/Generation Interconnection Queue Requests considered:

Q0715 (120 MW)
Q0720 (80 MW) – QF
Q0786 (100 MW) – ER/NR

9.2 Appendix 2: Property Requirements

Property Requirements for Point of Interconnection Substation

Requirements for rights of way easements
Rights of way easements will be acquired by the Interconnection Customer in the Transmission Provider's name for the construction, reconstruction, operation, maintenance, repair, replacement and removal of Transmission Provider's Interconnection Facilities that will be owned and operated by PacifiCorp. Interconnection Customer will acquire all necessary permits for the project and will obtain rights of way easements for the project on Transmission Provider's easement form.

Real Property Requirements for Point of Interconnection Substation
Real property for a point of interconnection substation will be acquired by an Interconnection Customer to accommodate the Interconnection Customer's project. The real property must be acceptable to Transmission Provider. Interconnection Customer will acquire fee ownership for interconnection substation unless Transmission Provider determines that other than fee ownership is acceptable; however, the form and instrument of such rights will be at Transmission Provider's sole discretion. Any land rights that Interconnection Customer is planning to retain as part of a fee property conveyance will be identified in advance to Transmission Provider and are subject to the Transmission Provider's approval.

The Interconnection Customer must obtain all permits required by all relevant jurisdictions for the planned use including but not limited to conditional use permits, Certificates of Public Convenience and Necessity, California Environmental Quality Act, as well as all construction permits for the project.

Interconnection Customer will not be reimbursed through network upgrades for more than the market value of the property.

As a minimum, real property must be environmentally, physically, and operationally acceptable to Transmission Provider. The real property shall be a permitted or permittable use in all zoning districts. The Interconnection Customer shall provide Transmission Provider with a title report and shall transfer property without any material defects of title or other encumbrances that are not acceptable to Transmission Provider. Property lines shall be surveyed and show all encumbrances, encroachments, and roads.

Examples of potentially unacceptable environmental, physical, or operational conditions could include but are not limited to:

1. Environmental: known contamination of site; evidence of environmental contamination by any dangerous, hazardous or toxic materials as defined by any governmental agency; violation of building, health, safety, environmental, fire, land use, zoning or other such regulation; violation of ordinances or statutes of any governmental entities having jurisdiction over the property; underground or above ground storage tanks in area; known remediation sites on property; ongoing mitigation activities or monitoring activities; asbestos; lead-based paint, etc. A

phase I environmental study is required for land being acquired in fee by the Transmission Provider unless waived by Transmission Provider.

2. Physical: inadequate site drainage; proximity to flood zone; erosion issues; wetland overlays; threatened and endangered species; archeological or culturally sensitive areas; inadequate sub-surface elements, etc. Transmission Provider may require Interconnection Customer to procure various studies and surveys as determined necessary by Transmission Provider.

Operational: inadequate access for Transmission Provider's equipment and vehicles; existing structures on land that require removal prior to building of substation; ongoing maintenance for landscaping or extensive landscape requirements; ongoing homeowner's or other requirements or restrictions (e.g., Covenants, Codes and Restrictions, deed restrictions, etc.) on property which are not acceptable to the Transmission Provider.

9.3 Appendix 3: Study Results

Power Flow Study Results

A Western Electricity Coordinating Council (WECC) approved 2021-22 Heavy winter and 2022 Heavy summer cases were used to perform the power flow studies using PSS/E version 33.7. Power flow studies were performed on both peak and off-peak load cases. The off-peak load case was chosen to demonstrate the stress on the higher kV transmission system under light load conditions. The Rock Springs/Firehole West path was stressed to 640 MW. The local 230 kV and 138 kV transmission system outages were considered during the study.

N-0 Results: No N-0 thermal or voltage issues were observed in the studies.

N-1 Results: Assuming the 2.35 miles of the Railroad – Croydon 138 kV line is rebuilt and the jumpers at Canyon Creek and Carter Creek are upgraded by the prior Q0786 project, no additional issues were observed.

N-2 Results:
The credible N-2 of the Ben Lomond – Birch Creek and Ben Lomond – Naughton 230 kV lines can overload the Naughton – Treasureton 230 kV line and/or the Railroad – Croydon – Coalville – Silver Creek – Synderville – Cottonwood 138 kV lines. The Ben Lomond – Birch Creek and Ben Lomond – Naughton 230 kV circuits share common structures for approximately eight miles. The project cannot be integrated into the Naughton Remedial Action Scheme (RAS) as it exceeds the maximum amount of generation tripping (600-700 MW) to be dropped as a part of RAS. Therefore, elimination of the specific 230 kV N-2 is required. As there is a double circuit 138 line that runs parallel to the 230 kV double circuit in the area, one of the 230 kV circuits can be swapped with one of the 138 kV circuits, reducing the impact of this outage. Approximately seven miles of structures on the 138 kV segment would need to be replaced to accommodate the weight of the 230 kV circuit.