Rocky Mountain Power
Exhibit RMP___(RAV-3SS)
Docket No. 17-035-40
Witness: Rick A. Vail

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF UTAH

ROCKY MOUNTAIN POWER

Exhibit Accompanying Second Supplemental Direct Testimony of Rick A. Vail

Q0707 SIS Report and Q0708 SIS Report

February 2018

Large Generator Interconnection
System Impact Restudy Report

Completed for
Invenergy Wind Development LLC
("Interconnection Customer")
Q0707
Carbon County 2

Proposed Point of Interconnection

Existing Shirley Basin 230 kV Substation

February 8, 2018

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1.0 DESCRIPTION OF THE GENERATING FACILITY

Invenergy Wind Development LLC ("Interconnection Customer") proposed interconnecting 250 MW of new generation to PacifiCorp's ("Transmission Provider") Shirley Basin 230 kV substation located in Carbon County, WY. The Carbon County 2 project ("Project") will consist of 14 Vestas V110 2.0 and 53 Vestas V136 4.2 turbines for a total output of 250 MW at the Point of Interconnection. The requested commercial operation date is November 1, 2020.

The restudy of this Project is performed due to the staging of the Energy Gateway West project. Specifically, while the entire Gateway West project has a longer development timeline, the Aeolus-Bridger/Anticline D.2 segment of the project (500 kV segment from the planned Aeolus substation to the planned Anticline substation) now has an expected 2020 in-service date. The earlier availability of the D.2 segment materially changes certain modeling assumptions that could impact the cost or timing of the interconnection of certain projects whose previous studies depended on Gateway West in its entirety.

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 "Q0707."

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 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 have a planned in-service date of December 2020 or earlier; 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 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 elected to have the interconnection studied as an *Energy Resource (ER).*

4.0 DESCRIPTION OF PROPOSED INTERCONNECTION

The Interconnection Customer's proposed Generating Facility is to be interconnected to the existing Shirley Basin 230 kV substation. Figure 1 below, is a one-line diagram that illustrates the interconnection of the proposed Generating Facility to the Transmission Provider's Shirley Basin substation.

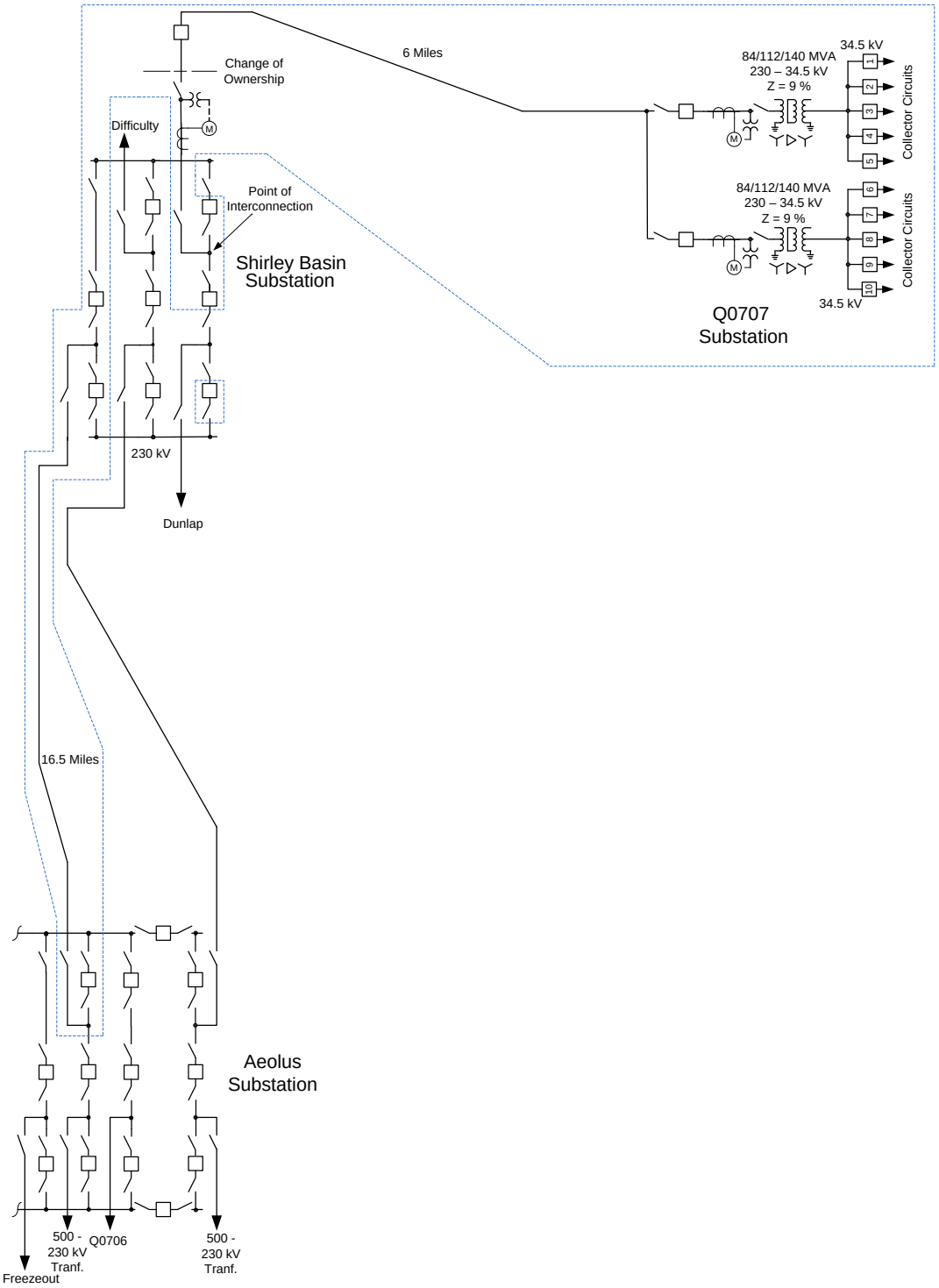

Figure 1: Simplified System One Line Diagram

4.1 Other Options Considered

The following alternative options were considered as potential points of interconnection for this Project: None per Interconnection Customer.

5.0 STUDY ASSUMPTIONS

- All active higher priority transmission service and/or generator interconnection requests with an in-service date as of December 2020 or earlier 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 queued 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.
- This study assumes the Project will be integrated into the Transmission Provider's system at the Shirley Basin 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.
- 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.2 500 kV line from the proposed Aeolus substation to the proposed Anticline substation and ancillary projects are assumed in service in 2020.
- Remedial Action Scheme (RAS) that will arm approximately 640 MW of generation for the following outages is assumed to be in-service.
  - Aeolus – Bridger/Anticline 500 kV line
  - Aeolus 230/500 kV transformer
  - Anticline 345/500 kV transformer
  - Future Anticline – Populus 500 kV line
  - Future Populus 500/345 kV auto transformer
  - Future Aeolus – Clover 500 kV line

- Future Clover 500/345 kV auto transformer

- PacifiCorp reserves the right to restudy the Project if any of the mentioned assumptions are changed or any of the required mitigations are not in-service at the time of interconnection.
- 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 Point of Interconnection 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 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. While study

costs of subsequent interconnection projects nearby will be the responsibility of the new project, participation by the Q0707 Project may be required post commercial operation to ensure Bulk Electric System reliability is maintained.

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 Generating 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. At low or zero output levels, the Project must not have reactive power interchange outside of the +/- 0.95 power factor requirement at the POI. 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.

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.

5.1.1.2 Transmission System Modifications

Figure 1 above is a one-line diagram that illustrates the interconnection of the proposed generating facility and the system improvements required.

- A new bay and three new breakers along with associated switches at the existing Shirley Basin 230 kV substation.
- Two new line terminations at Shirley Basin substation, one to interconnect the this Project and the other to connect the new Shirley Basin – Aeolus 230 kV line required by the Project.
- Addition of two new breakers along with associated switches on the existing bay that connects Dunlap wind farm to Shirley Basin in order to convert Shirley Basin to full breaker and half scheme.

- Construction of a new approximately 16.5-mile Shirley Basin – Aeolus 230 kV line with 2-1557 ACSR Potomac. It is noted that the requirement for this Project is a 2-1272 ACSR conductor; however, the Transmission Provider's master plan identifies 2-1557 ACSR and therefore the Transmission Provider will be responsible for the incremental betterment cost of the larger conductor.
- Addition of one new 230 kV circuit breaker at the proposed Aeolus substation
- New line termination at Aeolus substation.
- A RAS that will drop the Q0707 Project for the 500 kV outages related to Gateway West, Segment D.2:
    - Aeolus – Bridger/Anticline 500 kV line
    - Aeolus 230/500 kV transformer
    - Anticline 345/500 kV transformer
    - Future Anticline – Populus 500 kV line
    - Future Populus 500/345 kV auto transformer
    - Future Aeolus – Clover 500 kV line
    - Future Clover 500/345 kV auto transformer

5.1.1.3 Transmission/Distribution Line Modifications

Construct a new 230 kV transmission line from Aeolus to Shirley Basin. The line will be constructed using double bundled 1557 ACSR conductor and will be approximately 16.5 miles long. There will be an additional 0.12 miles of line constructed to allow a swap of line positions at Aeolus substation.

Install ½" OPGW in place of one of the shield wire positions on H-frame and Three Pole structures for the entire 16.5 mile line length.

The Transmission Provider shall review the design of the span between the Interconnection Customer's tie line substation deadend tower and the Shirley Basin substation deadend tower. The Interconnection Customer shall coil conductor, OPGW and shield wire and line hardware with sufficient quantities to span between the tie line substation tower and the Shirley Basin substation tower. The Transmission Provider will construct the span between the tie line substation tower and the Shirley Basin tower.

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 generation facility with 14 Vestas V110 2.0 and 53 Vestas V136 4.2 wind turbine generators fed through 14 – 2,222 kVA and 53 4,700 kVA 34.5 kV – 690 V transformers with 5.75 % impedance then fed through two 230 – 34.5kV 83/112/140 MVA step up transformers with 9 % impedance will not push the fault duty above the interrupting rating of any of the existing fault interrupting equipment.

5.1.1.5 Protection Requirements

The ground mats of the tie line substation and Shirley Basin substation must be tied together so that metallic control cables can be used between the two facilities. Bus differential relays will be applied to detect faults on this connection. With this arrangement the Interconnection Customer must install line relays systems that will detect and clear all faults on the tie lines in 5 cycles or less. A set of non-pilot step distance line relays that will detect faults on the tie line will also be applied at Shirley Basin substation. The Interconnection Customer will need to supply and maintain sets of line relays to be installed at Q0707 collector substation that will detect faults on the 230 kV line back to Shirley Basin substation. These line relays can be time coordinated with the relays detecting faults on the transmission network and will not communicate with the line relays to be installed at Shirley Basin substation for the tie line.

Should the Interconnection Customer desire a potential alternative to the tie line substation in order to provide adequate protection to its tie line, the Interconnection Customer may petition the Transmission Provider for an exemption to this arrangement. The Transmission Provider must review and approve the Interconnection Customer's proposed alternative. Without approval of the proposed alternative the tie line substation configuration will be required.

Protective relay elements in the line relays at Shirley Basin substation will monitor voltage and frequency. If the voltage, magnitude or frequency is outside of the normal operation range, this relay will trip the 230 kV breaker in the tie line substation.

The existing line relays installed for the Dunlap line will continued to be used for that line. The relays will be reconnected to the new 230 kV breakers.

This Generating Facility will need to be controlled by the Aeolus RAS. For the loss of any one of a number of electrical elements that will be part of the Gateway Transmission projects this Project will need to be tripped. The Aeolus RAS master will be located at Aeolus Substation. The trip signal will need to be communicated from Aeolus to Shirley Basin substation.

Line current differential relays will be installed at Shirley Basin and Aeolus substations for the new Shirley Basin – Aeolus transmission line.

5.1.1.6 Data (RTU) Requirements

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

From Shirley Basin Substation:

Analogs:

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

From the Q0707 Collector substation:

Analogs:

- Transformer # 1 real power
- Transformer # 1 reactive power
- Real power flow through 34.5 kV line feeder breaker T1-1
- Reactive power flow through 34.5 kV line feeder breaker T1-1
- Real power flow through 34.5 kV line feeder breaker T1-2
- Reactive power flow through 34.5 kV line feeder breaker T1-2
- Real power flow through 34.5 kV line feeder breaker T1-3
- Reactive power flow through 34.5 kV line feeder breaker T1-3
- Real power flow through 34.5 kV line feeder breaker T1-4
- Reactive power flow through 34.5 kV line feeder breaker T1-4
- Real power flow through 34.5 kV line feeder breaker T1-5
- Reactive power flow through 34.5 kV line feeder breaker T1-5
- Transformer # 2 real power
- Transformer # 2 reactive power
- Real power flow through 34.5 kV line feeder breaker T2-1
- Reactive power flow through 34.5 kV line feeder breaker T2-1
- Real power flow through 34.5 kV line feeder breaker T2-2
- Reactive power flow through 34.5 kV line feeder breaker T2-2
- Real power flow through 34.5 kV line feeder breaker T2-3
- Reactive power flow through 34.5 kV line feeder breaker T2-3
- Real power flow through 34.5 kV line feeder breaker T2-4
- Reactive power flow through 34.5 kV line feeder breaker T2-4
- Real power flow through 34.5 kV line feeder breaker T2-5
- Reactive power flow through 34.5 kV line feeder breaker T2-5
- Average Plant Wind speed
- Average Plant Atmospheric Pressure (Bar)
- Average Plant Temperature (Celsius)

Status:

- 230 kV breaker T1
- 34.5 kV collector circuit breaker T1-1
- 34.5 kV collector circuit breaker T1-2
- 34.5 kV collector circuit breaker T1-3
- 34.5 kV collector circuit breaker T1-4
- 34.5 kV collector circuit breaker T1-5
- 230 kV breaker T2

- 34.5 kV collector circuit breaker T2-1
- 34.5 kV collector circuit breaker T2-2
- 34.5 kV collector circuit breaker T2-3
- 34.5 kV collector circuit breaker T2-4
- 34.5 kV collector circuit breaker T2-5

From the tie line substation:

Status:

- 230 kV breaker

5.1.1.7 Substation Requirements

The Project will require new 230kV breaker-and-a-half bays at Shirley Basin substation, a Transmission Provider owned control house at the Interconnection Customer's collector substation, and a new 230kV line position at Aeolus substation. The ground grids of the tie line substation and Shirley Basin substation must be connected. The following major equipment has been preliminarily identified for this Project:

Shirley Basin Substation:

- 5 – 230kV circuit breakers
- 8 – 230kV CCVT's
- 13 – 230kV disconnect switches
- 9 – 230kV surge arresters

Aeolus Substation:

- 1 – 230kV circuit breaker
- 3 – 230kV CCVT's
- 3 – 230kV disconnect switches
- 3 – 230kV surge arresters

Collector Station:

- 1 – Control house
- 1 – 125 VDC battery system

The Interconnection Customer will provide a separate graded, grounded and fenced area along the perimeter of the Interconnection Customer's collector substation 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. AC station service shall be provided by the Interconnection Customer. DC power for the control house will be supplied by the Transmission Provider.

5.1.1.8 Communication Requirements

OPGW fiber will need to be installed on the new transmission line from Aeolus substation to Shirley Basin substation. This is a redundant path for the Aeolus RAS. The existing line contains OPGW which is the primary communication feed. At both Shirley Basin substation and Aeolus substation a second DMX fiber node and channel bank will be installed for redundancy. At Shirley Basin substation the existing network router needs to be upgraded with additional ports. The router at Shirley Basin substation will have ports for the commercial meters.

From Shirley Basin substation, single mode fiber is to be run to the tie line substation. All communications at the tie line substation and collector substation including the OPGW fiber on the line between the two is the responsibility of the Interconnection Customer. The Interconnection Customer is to supply 1 DNP3 SCADA circuit from the collector substation to the Shirley Basin substation with all the required SCADA points. Four Mirrored bit channels will be installed on the two fiber paths to Aeolus substation and feed the Aeolus RAS controller.

The Interconnection Customer shall install a data concentrator (SEL-2411 or Transmission Provider approved device) to transfer data between the collector substation and the Transmission Provider's RTU located in Shirley Basin substation. The Transmission Provider will input and hold the second level passwords for the SEL-2411 or Transmission Provider approved device. Password control ensures the Transmission Provider is aware of and is accepting of the changes being requested by the Interconnection Customer.

5.1.1.9 Metering Requirements

Interchange Metering - Shirley Basin substation:
The Point of Interconnection metering will be located at Shirley Basin substation and rated for the total net generation of the Project. The metering will be designed to include back-feed metering. 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 230kV, 1000/5, 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, MVA, including per phase voltage and amps data.

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

Collector Substation Q0707:

Revenue metering is required for each of the two customer power transformers and will be located on the high side of each of the step-up transformers. The primary metering transformers shall be combination 230kV, 500/5, CT/VT extended range for high accuracy metering.

The Transmission Provider will design and procure the collector revenue metering panels. The panels shall be located inside the collector substation control house. The collector substation metering panel shall include two revenue quality meters, test switches, and all SCADA metering data terminated at a metering interposition block.

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

Station Service/Construction Power

The Project is outside the Transmission Provider retail service territory. Prior to construction the Interconnection Customer must arrange with Carbon Power & Light permanent station service load. The Interconnection Customer will need to coordinate with Carbon Power & Light to submit a transmission service request to the Transmission Provider for power that will backfeed through the Transmission Provider's system when the Project is not generating. The Transmission Provider shall provide a Modbus or DNP output from the bidirectional meters to Carbon Power & Light for back-feed metering. At Shirley Basin substation the data output shall be trenched from the meter panel to outside the substation fence. Obtaining all necessary retail service arrangements are contingent for backfeed approval of the Project.

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.

Energy Resource	
Interconnection – Direct Assignment Facilities	
Q0707 Collector Substation – Metering and Control House	$952,000
Q0707 Tie Line and Collector Substation – Coordinate Communications and Protection & Control	$142,000
Shirley Basin Substation – Q0707 Line Position and Metering	$784,000
Sub-total Direct Assignment Costs	**$1,878,000**
Interconnection – Network Upgrade Costs	
Shirley Basin Substation – Expand to Breaker and a Half	$5,472,000
Shirley Basin-Aeolus – Construct 16.5 Mile 230 kV Transmission Line	$19,764,000

Aeolus Substation – New Line Position	$2,330,000
Sub-total Network Upgrade Costs	**$25,236,000**
Total Cost – ER Interconnection Service – Interconnection Only	**$27,114,000**

*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 24-30 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 Transmission Provider's estimated time to perform the scope of work outlined in this report may support the Interconnection Customer's requested Commercial Operation date of November 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 with additional transmission modifications.

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, in addition to the mitigation identified in section 5.1.1.2, the completion of additional Transmission Provider Energy Gateway projects and other system improvements would also be required.

6.0 PARTICIPATION BY AFFECTED SYSTEMS

Transmission Provider has identified the following affected systems: Tri-State Generation and Transmission, WAPA

A copy of this report will be shared the each Affected System.

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 with an in-service date of December 2020 or earlier were considered in this study and are identified below. If any of these requests are materially modified, 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:
Q0542 (240 MW) – QF/NR
Q0706 (250 MW) – ER
Q0720* (80 MW – 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 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.

7.3 Appendix 3: Study Results

Power Flow 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. The study was performed assuming the Energy Gateway, D.2 500 kV segment from the planned Aeolus substation to the planned Anticline substation was in-service. The local 500 kV, 345 kV, 230 kV, and 115 kV transmission system outages were considered during the study.

N-0 Results: Assuming the Energy Gateway West D.2 segment is in service the following N-0 thermal or voltage issues were observed in the studies.

The Aeolus – Shirley Basin 230 kV line is overloaded to 102% of its continuous rating under normal condition. As a result a new 230 kV line from Aeolus – Shirley Basin constructed with 2-1557 ACSR Potomac/TW is required. (Note: the Q0707 Project identified the need for 2-1272 ACSR; however, the master plan for this area requires 2-1557 ACSR. Therefore, the incremental betterment cost will be borne by Transmission Provider. The existing 230 kV line cannot be rebuilt as the existing transmission line cannot be taken out of service.

Injection of approximately 9.0 MVAr into the transmission system was observed if the collector system was connected with no generation from the Project. The Project shall control the voltage at the POI within the required voltage range provided by the Transmission Operator.

N-1 Results: Assuming Energy Gateway, Segment D.2 and associated system improvements are in service, the Platte – Latham 230 kV line overloads above its emergency rating for loss of the following elements:

- Aeolus – Bridger/Anticline 500 kV line
- Aeolus 230/500 kV transformer
- Anticline 345/500 kV transformer
- Future Anticline – Populus 500 kV line
- Future Populus 500/345 kV auto transformer
- Future Aeolus – Clover 500 kV line
- Future Clover 500/345 kV auto transformer

As such, the Q0707 Project will need to be incorporated into the Aeolus RAS and may be tripped for the outage of the elements indicated.

N-2 Results: Assuming Energy Gateway, Segment D.2 and associated improvements are in service, no N-2 thermal or voltage issues were observed in the studies.

PACIFICORP TRANSMISSION

Large Generator Interconnection

System Impact Restudy Report

Completed for

Invenergy Wind Development, LLC
("Interconnection Customer")
Q0708
Carbon County 3

Proposed Point of Interconnection

Shirley Basin substation at 230 kV

February 8, 2018

TABLE OF CONTENTS

1.0 DESCRIPTION OF THE GENERATING FACILITY

Invenergy Wind Development, LLC ("Interconnection Customer") proposed interconnecting 250 MW of new generation to PacifiCorp's ("Transmission Provider") Shirley Basin substation at 230 kV located in Carbon County, Wyoming. The Carbon County 3 project ("Project") will consist of 14 Vestas V110 2.0 and 53 Vestas V136 4.2 turbines for a total output of 250 MW at the Point of Interconnection. The requested commercial operation date is November 1, 2020.

The restudy of this Project is performed due to the staging of the Energy Gateway West project. Specifically, while the entire Gateway West project has a longer development timeline, the Aeolus-Bridger/Anticline D.2 segment of the project (500 kV segment from the planned Aeolus substation to the planned Anticline substation) now has an expected 2020 in-service date. The earlier availability of the D.2 segment materially changes certain modeling assumptions that could impact the cost or timing of the interconnection of certain projects whose previous studies depended on Gateway West in its entirety.

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 "Q0708."

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 elected to have the interconnection studied as an *Energy Resource (ER).*

4.0 DESCRIPTION OF PROPOSED INTERCONNECTION

The Interconnection Customer's proposed Generating Facility is to be interconnected through the existing Shirley Basin 230 kV substation. Figure 1 below, is a one-line diagram that illustrates the interconnection of the proposed Generating Facility to the Transmission Provider's system.

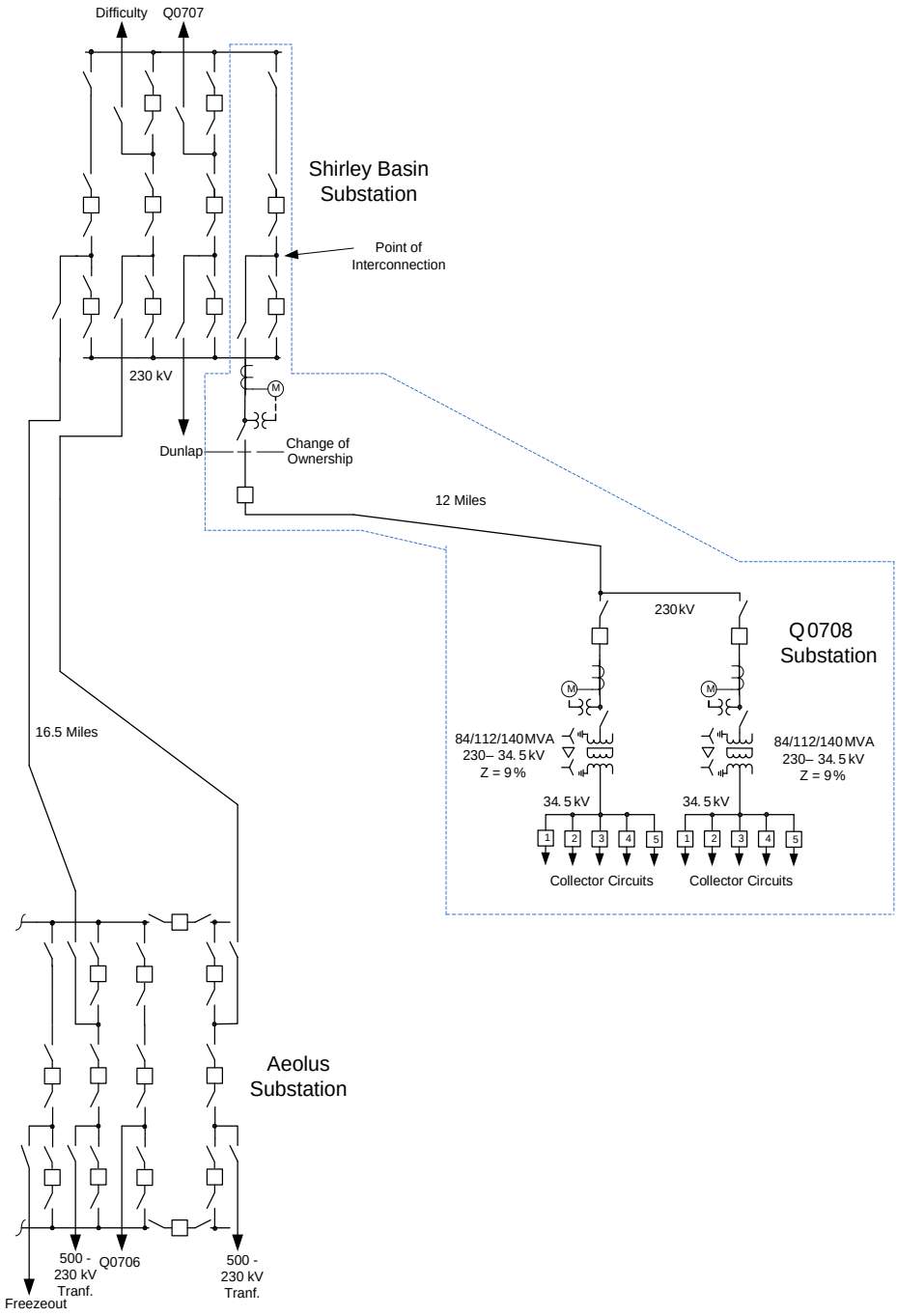

Figure 1: Simplified System One Line Diagram

4.1 Other Options Considered

The following alternative options were considered as potential points of interconnection for this Project: None per Interconnection Customer.

5.0 STUDY ASSUMPTIONS

- All active higher priority transmission service and/or generator interconnection requests with an in-service date of December 2020 or earlier 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 queued 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 the Shirley Basin 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.
- 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.2 500 kV line from the proposed Aeolus substation to the proposed Anticline substation and ancillary projects are assumed in service in 2020.
- It is assumed that a new 230 kV line from Shirley Basin – Aeolus with 2*1557 ACSR, as identified as mitigation for the Q0707 Project is in-service.
- A Remedial Action Scheme (RAS) that will arm approximately 640 MW of generation for

the following outages is assumed to be in-service:

- Aeolus – Bridger/Anticline 500 kV line
- Aeolus 230/500 kV transformer
- Anticline 345/500 kV transformer
- Future Anticline – Populus 500 kV line
- Future Populus 500/345 kV auto transformer
- Future Aeolus – Clover 500 kV line
- Future Clover 500/345 kV auto transformer

· 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 Point of Interconnection 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 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. While study costs of subsequent interconnection projects nearby will be the responsibility of the new project, participation by the Q708 project may be required post commercial operation to ensure Bulk Electric System reliability is maintained.

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 Generating 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. At low or zero output levels, the Project must not have reactive power interchange outside of the +/- 0.95 power factor requirement at the POI. 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.

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

Figure 1 above is a one-line diagram that illustrates the interconnection of the proposed generating facility and the system improvement required.

- Expansion of the Shirley Basin 230 kV switchyard on the east side of the substation.
- Two new 230 kV breakers and associated switches and a line termination to interconnect the Q0708 Project.
- A RAS to drop the Q0708 Project for the following outages:
  - Aeolus – Bridger/Anticline 500 kV line
  - Aeolus 230/500 kV transformer
  - Anticline 345/500 kV transformer
  - Future Anticline – Populus 500 kV line
  - Future Populus 500/345 kV auto transformer
  - Future Aeolus – Clover 500 kV line
  - Future Clover 500/345 kV auto transformer
- A RAS to drop the Q0708 Project for the outage of new Aeolus – Shirley Basin #2 230 kV line.

5.1.1.3 Transmission/Distribution Line Modifications

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 Windstar substation which will house the tie-line breakers. The Transmission Provider shall review the design of the tie-line spans between the tie-line substation deadend towers and the Windstar substation deadend towers. The Interconnection Customer shall coil conductor, OPGW, shield wire, and line hardware with sufficient quantities to span between the tie-line substation towers and the Windstar substation towers.

The Transmission Provider will construct the span between the tie-line substation towers and the Windstar substation towers.

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 14 Vestas V110 2.0 and 53 Vestas V136 4.2 wind turbine generators fed through 14 – 2,222 kVA and 53 4,700 kVA 34.5 kV – 690 V transformers with 5.75 % impedance then fed through

two 230 – 34.5kV 83/112/140 MVA step up transformers with 9 % impedance will not push the fault duty above the interrupting rating of any of the existing fault interrupting equipment.

5.1.1.5 Protection Requirements

The ground mats of the tie line substation and Shirley Basin substation must be tied together so that metallic control cables can be used between the two facilities. A bus differential relay will be applied to detect faults on this connection. With this arrangement the Interconnection Customer must install line relay systems that will detect and clear all faults on the tie line in 5 cycles or less. A set of non-pilot step distance line relays that will detect faults on the tie line will also be applied at Shirley Basin substation. The step distance line relays can be set to operate with no delay for most potential faults on the tie line. These relays will be set to time coordinate with the transformer relays for fault conditions in the transformers at the Q0708 collector substation.

The Interconnection Customer will need to supply and maintain a set of line relays to be installed at Q0708 collector substation that will detect faults on the 230 kV line back to Shirley Basin substation. These line relays can be time coordinated with the relays detecting faults on the transmission network and will not communicate with the line relays to be installed at Shirley Basin substation for the tie line.

Should the Interconnection Customer desire a potential alternative to the tie line substation in order to provide adequate protection to its tie line, the Interconnection Customer may petition the Transmission Provider for an exemption to this arrangement. The Transmission Provider must review and approve the Interconnection Customer's proposed alternative. Without approval of the proposed alternative the tie line substation configuration will be required.

Protective relay elements in the line relays at Shirley Basin substation will monitor voltage and frequency. If the voltage, magnitude or frequency is outside of the normal operation range, this relay will trip the 230 kV breaker at the tie line substation.

This Generating Facility will need to be controlled by the Wyoming RAS. For the loss of any one of a number of electrical elements that will be part of the Gateway Transmission projects or for the loss of the Aeolus – Shirley Basin line the project will be disconnected. The Wyoming RAS master will be located at Aeolus substation. The trip signal will need to be communicated from Aeolus substation to Shirley Basin substation.

5.1.1.6 Data (RTU) Requirements

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

From Shirley Basin Substation:

Analogs:

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

From the Q0708 Collector substation:

Analogs:

- Transformer # 1 real power
- Transformer # 1 reactive power
- Real power flow through 34.5 kV line feeder breaker T1-1
- Reactive power flow through 34.5 kV line feeder breaker T1-1
- Real power flow through 34.5 kV line feeder breaker T1-2
- Reactive power flow through 34.5 kV line feeder breaker T1-2
- Real power flow through 34.5 kV line feeder breaker T1-3
- Reactive power flow through 34.5 kV line feeder breaker T1-3
- Real power flow through 34.5 kV line feeder breaker T1-4
- Reactive power flow through 34.5 kV line feeder breaker T1-4
- Real power flow through 34.5 kV line feeder breaker T1-5
- Reactive power flow through 34.5 kV line feeder breaker T1-5
- Transformer # 2 real power
- Transformer # 2 reactive power
- Real power flow through 34.5 kV line feeder breaker T2-1
- Reactive power flow through 34.5 kV line feeder breaker T2-1
- Real power flow through 34.5 kV line feeder breaker T2-2
- Reactive power flow through 34.5 kV line feeder breaker T2-2
- Real power flow through 34.5 kV line feeder breaker T2-3
- Reactive power flow through 34.5 kV line feeder breaker T2-3
- Real power flow through 34.5 kV line feeder breaker T2-4
- Reactive power flow through 34.5 kV line feeder breaker T2-4
- Real power flow through 34.5 kV line feeder breaker T2-5
- Reactive power flow through 34.5 kV line feeder breaker T2-5
- A phase 230 kV transmission voltage
- B phase 230 kV transmission voltage
- C phase 230 kV transmission voltage
- Average Wind speed
- Average Plant Atmospheric Pressure (Bar)
- Average Plant Temperature (Celsius)

Status:

- 230 kV breaker T1

- 34.5 kV collector circuit breaker T1-1
- 34.5 kV collector circuit breaker T1-2
- 34.5 kV collector circuit breaker T1-3
- 34.5 kV collector circuit breaker T1-4
- 34.5 kV collector circuit breaker T1-5
- 230 kV breaker T2
- 34.5 kV collector circuit breaker T2-1
- 34.5 kV collector circuit breaker T2-2
- 34.5 kV collector circuit breaker T2-3
- 34.5 kV collector circuit breaker T2-4
- 34.5 kV collector circuit breaker T2-5

From the tie line substation:

Status:

- 230 kV breaker

5.1.1.7 Substation Requirements

This project will require a new 230 kV bay position at Shirley Basin substation and a Transmission Provider owned control house at the Interconnection Customer's collector substation.

The following major equipment has been preliminarily identified as necessary for this Project.

Shirley Basin:

- 2 – 230kV circuit breaker
- 5 – 230kV bay switches
- 1 – 230 kV meter isolation switch
- 1 – 230 kV motor operated line disconnect switch
- 3 – 230 kV CTVT combo units
- 3 – 230 kV lightning arresters

Collector Station:

- 1 – Control House
- 1 – 125VDC battery system

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

5.1.1.8 Communication Requirements

Installation of OPGW fiber on the new line from Aeolus substation to Shirley Basin substation assigned to Q0707 is required to be in service. This is a redundant path for the Wyoming RAS.

From Shirley Basin substation, single mode fiber is to be run to the tie line substation. All communications at the tie line substation and collector substation including the OPGW fiber on the line between the two is the responsibility of the Interconnection Customer. The customer is to supply 1 DNP3 SCADA circuit from the collector to the Shirley Basin substation with all the required SCADA points.

The Interconnection Customer shall install a data concentrator (SEL-2411 or Transmission Provider approved device) to transfer data between the collector substation and the Transmission Provider's RTU located in Shirley Basin substation. The Transmission Provider will input and hold the second level passwords for the SEL-2411 or Transmission Provider approved device. Password control ensures the Transmission Provider is aware of and is accepting of the changes being requested by the Interconnection Customer.

5.1.1.9 Metering Requirements

Interchange Metering

Shirley Basin substation:

The Point of Interconnection metering will be located at Shirley Basin substation and rated for the total net generation of the Project. The metering will be designed to include back-feed metering. 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 230 kV, 1000/5, 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, MVA, including per phase voltage and amps data.

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

Collector Substation Q0708:

Revenue metering is required for each of the two customer power transformers and will be located on the high side of each of the step-up transformers. The primary metering transformers shall be combination 230kV, 500/5, CT/VT extended range for high accuracy metering.

The Transmission Provider will design and procure the collector revenue metering panels. The panels shall be located inside the collector control house. The collector substation metering panel shall include two revenue quality meters, test switches, and all SCADA metering data terminated at a metering interposition block.

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

Station Service/Construction Power

The Project is outside the Transmission Provider service territory. Prior to construction the Interconnection Customer must arrange with Carbon Power & Light permanent station service load. The Transmission Provider shall provide a Modbus or DNP output from the bidirectional meters to Carbon Power & Light for back-feed metering. At Shirley Basin substation the data output shall be trenched from the meter panel to outside the substation fence.

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.

Energy Resource	
Interconnection – Direct Assignment Facilities	
Q0708 Collector Substation – Metering and Control House	$889,000
Q0708 Collector and Tie Line Substations – Coordinate Communications and Protection & Control	$6,000
Shirley Basin Substation – Q0708 Line Position and Metering	$810,000
Aeolus Substation – Modify Communications for RAS	$13,000
Sub-total Direct Assignment Costs	**$1,718,000**
Interconnection – Network Upgrade Costs	
Shirley Basin – Expand substation	$3,340,000
Total Cost – ER Interconnection Service – Interconnection Only	**$5,058,000**

*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 Transmission Provider's estimated time to perform the scope of work outlined in this report as well as contingent requirements by higher queued projects may support the Interconnection Customer's requested Commercial Operation date of November 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 with additional transmission modifications.

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, in addition to the mitigation identified in section 5.1.1.2, the completion of additional Transmission Provider Energy Gateway projects and other system improvements would also be required.

6.0 Participation by Affected Systems

Transmission Provider has identified the following affected systems: WAPA & Tri State

A copy of this report will be shared the each Affected System.

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 with an in-service date of December 2020 or earlier were considered in this study and are identified below. If any of these requests are materially modified, the Transmission Provider reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

Generation Interconnection Queue Requests considered:

Q0542 (240 MW) – QF/NR
Q0706 (250 MW) – ER/NR
Q0707 (250 MW) – ER/NR
Q0720* (80 MW 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 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.

7.3 Appendix 3: Study Results

Power Flow 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. The study was performed assuming the Energy Gateway, D.2 500 kV segment from the planned Aeolus substation to the planned Anticline substation was in-service. The local 500 kV, 345 kV, 230 kV, and 115 kV transmission system outages were considered during the study.

N-0 Results:
Assuming the Energy Gateway West D.2 segment is in service and the improvements identified in the Q0707 study, no N-0 thermal or voltage issues were observed. Injection of approximately 9.0 MVAr into the transmission system was observed if the collector system was connected with no generation from the Project.

N-1 Results:
Assuming the Energy Gateway West Aeolus-Bridger/Anticline D.2 segment is in service and the improvements identified in the Q0707 study, the addition of the Q0708 Project identified several Wyoming 230 kV line overloads for the following outages:

- Aeolus – Bridger/Anticline 500 kV line
- Aeolus 230/500 kV transformer
- Anticline 345/500 kV transformer
- Future Anticline – Populus 500 kV line
- Future Populus 500/345 kV auto transformer
- Future Aeolus – Clover 500 kV line
- Future Clover 500/345 kV auto transformer

As such, the Q0708 Project will need to be incorporated into the Aeolus RAS and may be tripped for the outage of the elements indicated.

In addition, the outage of the new larger conductor Aeolus – Shirley Basin #2 230 kV line causes thermal overload on the existing smaller conductor Aeolus – Shirley Basin #1 230 kV line (114% of its emergency rating). A RAS that will trip the Q0708 Project for the outage of the new Aeolus – Shirley Basin #2 230 kV line will be required.

N-2 Results:
Assuming the Energy Gateway West D.2 segment is in service and the improvements identified in the Q0707 study, no N-2 thermal or voltage issues were observed in the studies.