Large Generator Interconnection
System Impact Restudy Report

Completed for

(“Interconnection Customer”)
Q0712

Proposed Point of Interconnection
Windstar substation at 230 kV

January 1, 2019

TABLE OF CONTENTS

1.0 DESCRIPTION OF THE GENERATING FACILITY 2
2.0 SCOPE OF THE STUDY 2
3.0 TYPE OF INTERCONNECTION SERVICE 2
4.0 DESCRIPTION OF PROPOSED INTERCONNECTION 3
4.1 Other Options Considered 4
5.0 STUDY ASSUMPTIONS 4
6.0 ENERGY RESOURCE (ER) INTERCONNECTION SERVICE 5
6.1 Requirements 5
6.1.1 Generating Facility Modifications 5
6.1.2 Transmission System Modifications 8
6.1.3 Transmission/Distribution Line Modifications 10
6.1.4 Existing Circuit Breaker Upgrades – Short Circuit 10
6.1.5 Protection Requirements 10
6.1.6 Data (RTU) Requirements 11
6.1.7 Substation Requirements 13
6.1.8 Communication Requirements 14
6.1.9 Metering Requirements 14
7.0 COST ESTIMATE (ER) 16
8.0 SCHEDULE 17
9.0 PARTICIPATION BY AFFECTED SYSTEMS 17
10.0 APPENDICES 17
10.1 Appendix 1: Higher Priority Requests 18
10.2 Appendix 2: Property Requirements 19
10.3 Appendix 3: Study Results 21

1.0 DESCRIPTION OF THE GENERATING FACILITY

("Interconnection Customer") proposed interconnecting 520 MW of new generation to PacifiCorp's ("Transmission Provider") Windstar substation at 230 kV located in Converse County, Wyoming. The project ("Project") will consist of one hundred ninety-six (196) 2.52 GE wind turbines and a total of fourteen (14) 2.3 GE wind turbines for a total output of 520 MW. The requested commercial operation date is December 31, 2020.

The restudy of this Project is performed due to technical changes proposed by the Interconnection Customer.

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

Transmission Provider has assigned the Project "Q0712."

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 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 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.

Prior studies indicate that performance of the GE machines identified are nearly identical to the previous GE machines studied. Therefore, stability results for this Project are not expected to change and hence a restudy of stability analysis was not performed.

3.0 TYPE OF INTERCONNECTION SERVICE

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

4.0 DESCRIPTION OF PROPOSED INTERCONNECTION

Interconnection Customer's proposed Generating Facility is to be interconnected through one new bay position on the southeast corner of the existing Windstar substation. Based on the data provided by Interconnection Customer, the Project consists of two collector substations which will be connected by an approximately 6.1 mile 230 kV transmission line. The entire Project will interconnect to Windstar substation through an approximately 21.6-mile 230 kV transmission line. Figure 1 below, is a one-line diagram that illustrates the interconnection of the proposed Generating Facility to Transmission Provider's system.

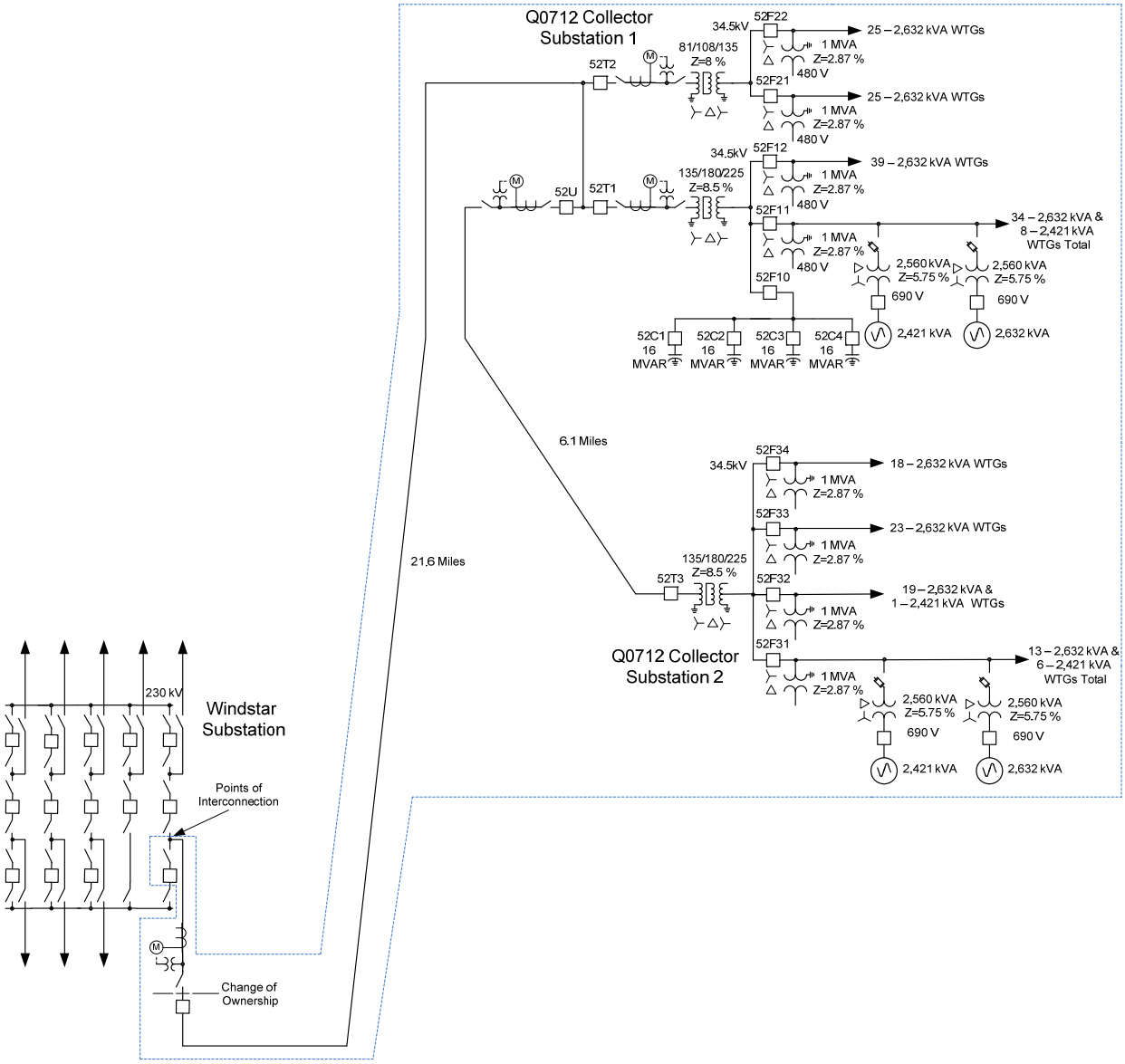


Figure 1: Simplified System One Line Diagram

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, Transmission Provider reserves the right to restudy this request, and the results and conclusions could significantly change.
- Transmission Provider reserves the right to restudy this Project should Interconnection Customer request a change in status to a Qualifying Facility, there is a change in system topology, or assumed facility improvements are not in-service.
- 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.
- 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, 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 Transmission Provider's system at the Windstar substation Point of Interconnection ("POI").
- Interconnection Customer will construct and own any facilities required between the Point of Change of Ownership and the Project unless specifically identified by Transmission Provider.
- Generator tripping will 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 Transmission Provider's performance and design standards (Policy 139).
- The following upgrades are assumed to be in service and are contingent for this Project:
  - Portions of the Transmission Provider's Energy Gateway Transmission Projects
    - Gateway West segment D2 (Aeolus-Anticline/Bridger) 500 kV transmission line. (2020)
    - A Remedial Action Scheme ("RAS") that will drop approximately 600 MW of generation for various 500 kV outages. (2020)
  - A new 230 kV transmission line between Shirley Basin and Aeolus substations assigned to a higher queued project. (2020)

- All existing and proposed Remedial Action Schemes ("RAS") are assumed to be in service for this study.
- All system improvements associated with prior queued projects are assumed to be in service before Q0712.
- Power flow analysis requires WECC base cases to reliably balance under peak load conditions the aggregate of generation in the local area, with the Generating Facility at full output, to the aggregate of the load in the Transmission Provider's Transmission System. As the PacifiCorp East ("PACE") balancing authority area ("BAA") has more existing and proposed generation than load, it is necessary to assume some portion of other resources are displaced by this Project's output in order to assess the impact of interconnecting this Project's generation to transmission system operations. For the purposes of this study, generation in the Transmission Provider's southern Utah area was assumed to be displaced.
- This report is based on information available at the time of the study. It is Interconnection Customer's responsibility to check 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 Interconnection Customer to connect its Generating Facility to 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. Energy resource interconnection service in and of itself does not convey transmission service.

6.1 Requirements

6.1.1 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 POI. 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 Generating 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 Transmission Provider 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.

All generators are required to ensure the primary frequency capability of their facility by installing, maintaining, and operating a functioning governor or equivalent controls as indicated in FERC Order 842.

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. Generating Facilities capable of operating with a voltage droop are required to do so. Voltage droop control enables proportionate reactive power sharing among Generating 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 Generating Facility in subsequent interaction/coordination studies will be required pre- and post-commercial operation in order ensure system reliability.

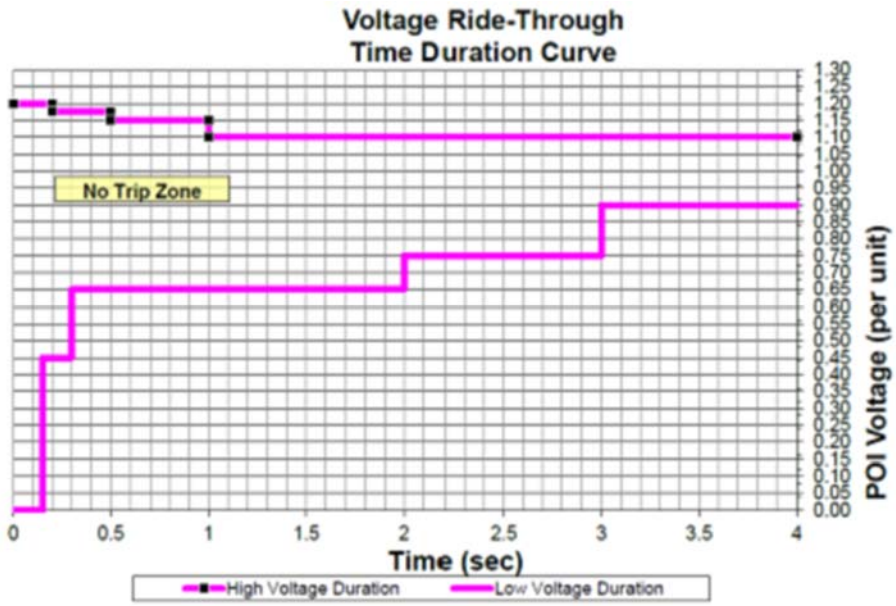
To facilitate collection and validation of accurate modeling data to meet NERC modeling standards, Transmission Provider, as the Planning Coordinator, requires Phasor Measurement Units ("PMUs") at all new Generating Facilities with an individual or aggregate nameplate capacity of 75 MVA or greater. In 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 stored for at least 90 days. 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.

Transmission Provider's preliminary Subsynchronous Resonance ("SSR")/ Subsynchronous Control Interaction ("SSCI") analysis performed by GE (2017) showed that the addition of series compensated 500 kV lines from Aeolus – Anticline – Populus and Aeolus – Clover may introduce the risk of SSCI under several operating conditions for wind facilities interconnecting near these lines. While the initial Aeolus – Anticline 500 kV line will not include series compensation, the ultimate buildout of Energy Gateway does include series capacitors. Projects interconnecting near the Aeolus substation will be especially prone to the SSCI interaction due to its proximity to the series compensated lines. The study showed that the impacts of SSCI on the wind turbine controls are exacerbated under radial operating conditions where the wind farm is radially connected to these series compensated lines. Therefore, the Interconnection Customer is advised to perform special studies and provide documentation that the turbines have been equipped with SSCI functionality.

All generators must meet the Federal Energy Regulatory Commission ("FERC") and WECC low voltage ride-through requirements as specified in the interconnection agreement. Inverters must be designed to stay connected to the grid in the case of severe faults and may not momentarily cease output within the no-trip area of the voltage curves. Figure 2 illustrates the voltage ride-through capability as per NERC PRC-024.



At low output levels, the Project needs to ensure that it maintains the power factor within +/- 0.95 at the POI and if the Project is offline, the Interconnection Customer will be required to maintain a unity power factor at the POI in order to minimize the reactive power flow towards the transmission system to prevent high voltages. Transmission Provider 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 POI 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 POI substation) and include an Interconnection Customer owned protective device and associated transmission line relaying/communications. The ground grids of the Transmission Provider's POI 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.

6.1.2 Transmission System Modifications

Interconnection Customer will be responsible for the installation of one (1) new 230 kV circuit breaker and associated switches at the Windstar 230 kV substation to interconnect the Generating Facility.

The following transmission system modifications are required:

- Rebuild the Standpipe-Freezeout 230 kV line with bundled 2-1272 ACSR conductor, approximately 11.5 miles.
- Rebuild the Freezeout-Aeolus 230 kV line with bundled 1158.4 ACSS/TW conductor, approximately 3.5 miles.
- Rebuild the 230 kV breaker bay at Freezeout substation with 4000 A equipment.
- Rebuild the existing Aeolus-Shirley Basin #1 line with 2-1158.4 ACSS/TW (Hudson), approximately 16 miles.

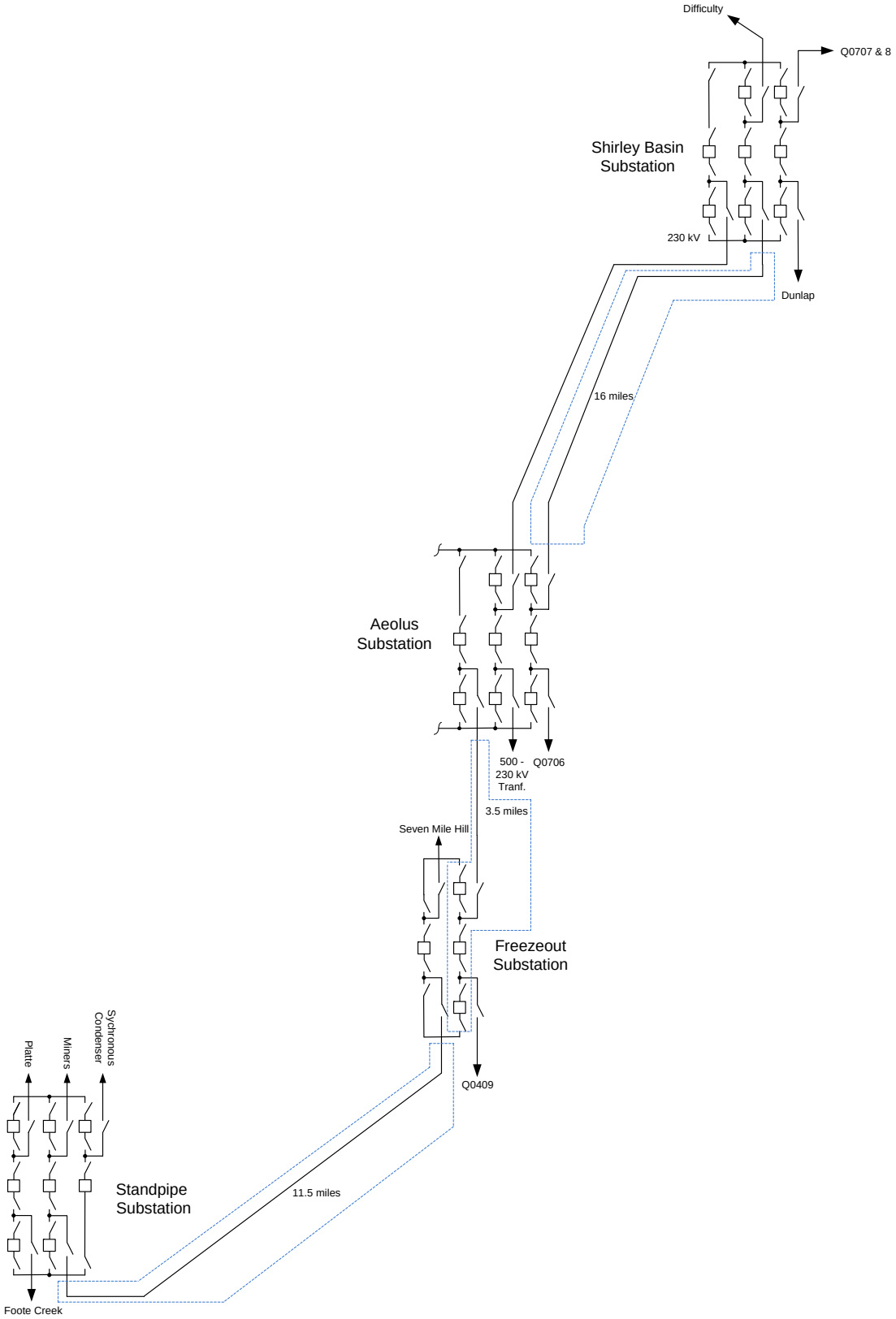


Figure 2: Transmission System One Line Diagram

6.1.3 Transmission/Distribution Line Modifications

Rebuild the existing 230 kV transmission line from Aeolus to Shirley Basin #1 230 kV transmission line using double bundled 1158.4 ACSS/TW (Hudson) conductor. The line will be approximately 16.23 miles long. Of this mileage, 1.88 miles (Loop-in to Shirley Basin) is existing double bundled 1272 ACSR Conductor which will be re-conductored with 1158.4 ACSS/TW (Hudson) conductor.

Rebuild the approximately 11.5 mile 230 kV transmission line between Standpipe and Freezeout substation with bundled 2-1272 ACSR conductor. Rebuild the approximately 3.5 mile transmission line between Freezeout and Aeolus substation with bundled 1158.4 ACSS/TW conductor.

The Interconnection Customer shall construct the tie line from the collector substations to the tie-line substation.

The Interconnection Customer is required to build a tie line substation adjacent to the Windstar 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 Windstar 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 Windstar substation tower.

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

6.1.4 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 196 GE 2,632 kVA wind turbine generators and 15 GE 2,421 kVA wind turbine generator fed through 211 – 2,560 kVA 34.5 kV – 690 V transformers with 5.75% impedance then fed through two 230 – 34.5kV 135/180/225 MVA step up transformers with 8.5% impedance and one 230 – 34.5 kV 81/108/135 MVA step up transformer with 8% impedance will not push the fault duty above the interrupting rating of any of the existing fault interrupting equipment.

6.1.5 Protection Requirements

The ground mats of the tie line substation and Windstar 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 these connections. 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. Sets of non-pilot step distance line relays that will detect faults on the tie line will also be applied at Windstar substation. 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. The Interconnection Customer will need to supply and maintain sets of line relays to be installed at Q0712 collector substation 1 that will detect faults on the 230 kV line back to Windstar 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 Windstar substation for the tie line.

The Interconnection Customer will be required to install and maintain line relay equipment that will detect faults on the 230 kV transmission line running between the two collector substations. These relays will need to detect all faults on this line section and trigger breakers to clear the faults in 5 cycles or less.

Protective relay elements in the line relays at Windstar 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.

New line relay settings will need to be developed for the Shirley Basin–Aeolus, Standpipe–Freezeout, and Freezeout–Aeolus 230 kV lines to adjust for the new phase conductors.

6.1.6 Data (RTU) Requirements

Data for the operation of the power system will be needed from the Generating Facility. This data can be acquired by installing an Interconnection Customer owned data concentrator at the collector substations. The data will be transferred to the RTU in Windstar substation via Interconnection Customer owned fiber on the tie from the collector substations.

In addition to the control and indication of the new 230 kV breaker in Windstar substation, the following data will be acquired through the substation RTU. Also listed is the data that will be acquired from the collector substations.

From Windstar substation:
Analogs:

- Q0712 Net Generation MW
- Q0712 Net Generator MVAr
- Q0712 Energy Register

From the Q0712 collector 1 substation:
Analogs:

- Transformer 1 Real power
- Transformer 1 Reactive power
- Transformer 2 Real power
- Transformer 2 Reactive power

- Line to collector substation 2 Real power
- Line to collector substation 2 Reactive power
- 34.5 kV Real power 52F10
- 34.5 kV Reactive power 52F10
- 34.5 kV Real power 52F11
- 34.5 kV Reactive power 52F11
- 34.5 kV Real power 52F12
- 34.5 kV Reactive power 52F12
- 34.5 kV Real power 52F21
- 34.5 kV Reactive power 52F21
- 34.5 kV Real power 52F22
- 34.5 kV Reactive power 52F22
- 34.5 kV Reactive power 52F10
- 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 Transformer Breaker 52T1
- 230 kV Transformer Breaker 52T2
- 230 kV Line Breaker 52U
- 34.5 kV breaker 52F10
- 34.5 kV breaker 52F11
- 34.5 kV breaker 52F12
- 34.5 kV breaker 52F21
- 34.5 kV breaker 52F22
- 34.5 kV breaker 52C1
- 34.5 kV breaker 52C2
- 34.5 kV breaker 52C3
- 34.5 kV breaker 52C4

From the Q0712 collector 2 substation:
Analogs:

- 34.5 kV Real power 52F31
- 34.5 kV Reactive power 52F31
- 34.5 kV Real power 52F32
- 34.5 kV Reactive power 52F32
- 34.5 kV Real power 52F33
- 34.5 kV Reactive power 52F33
- 34.5 kV Real power 52F34
- 34.5 kV Reactive power 52F34
- 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 Transformer Breaker 52T3
- 34.5 kV breaker 52F31
- 34.5 kV breaker 52F32
- 34.5 kV breaker 52F33
- 34.5 kV breaker 52F34

6.1.7 Substation Requirements

Q0712 Collector Substation 1

Interconnection Customer will provide a separate graded, grounded and fenced area along the perimeter of Interconnection Customer's Generating Facility for Transmission Provider to install a control house for any required metering, protection or communication equipment. This area will share a fence and ground grid with the Generating Facility and have separate, unencumbered access for Transmission Provider. DC power for the control house will be supplied by Transmission Provider. AC station service power for the control house will be provided by Interconnection Customer. A CDEGS grounding analysis is required by Interconnection Customer. Nine 230 kV CT/VT combined metering units will be installed. The Interconnection Customer shall provide a meter disconnect switch on each side of each metering unit.

Windstar substation

The substation yard and fence will need to be expanded to allow for an outboard substation dead end to be installed. New ground grid and conduit will be installed. The ground grid at Windstar will be connected to the ground grid at the Interconnection Customer owned tie line substations. A CDEGS grounding analysis will be required. A CDEGS grounding analysis of the tie line substation will be required by the Interconnection Customer. New relay panels will be installed in the control house and relay settings will be modified. The following station equipment has been identified as being required and may change during detailed design:

1 – 230 kV, circuit breaker
3 – 230 kV, combined CT/VT metering unit
1 – 230 kV, group operated switch, breaker disconnect
1 – 230 kV, group operated switch, line disconnect
1 – 230 kV, group operated switch, meter disconnect
3 – 230 kV, surge arrester

Freezeout substation

The equipment at Freezeout substation will be upgraded to a higher rated ampacity. A CDEGS grounding analysis will be performed. Relay settings will be modified. The

following equipment has been identified as being required and may change during detailed design.

3 – 230 kV, circuit breaker
8 – 230 kV, group operated switch, breaker disconnect
2 – 230 kV, group operated switch, line disconnect

Shirley Basin substation
Relay settings will be modified. Conduit will be installed.

Aeolus substation
Relay settings will be modified. Conduit will be installed.

Standpipe substation
Relay settings will be modified. Conduit will be installed.

6.1.8 Communication Requirements

6.1.8.1 Interconnection of Q0712 (A-B) substations

Interconnection Customer is to install OPGW fiber on the new 20 mile line from the tie line substation near Windstar to the Q0712A and Q0715B collector substations. ADSS fiber is to be installed from the tie line substation into Windstar substation's building. Interconnection Customer is to supply 2 SCADA circuits with the required points using DNP3 protocol over the fiber to the Windstar substation control building where it will be routed over the Transmission Provider's existing network to the control centers. Cisco Routers and switches are required at both collectors for meters. They are to communicate over the Interconnection Customer's OPGW on the new line.

6.1.8.2 Transmission Lines

OPGW fiber optic cable will be installed in the static wire position on both the rebuilt lines from Shirley Basin to Aeolus and from Freezeout to Aeolus. On the last structure inside the substation bring the OPGW down the structure and splice with ADSS fiber and run into the control building. Ciena fiber nodes are required at Shirley Basin, Freezeout and Aeolus substation.

6.1.9 Metering Requirements

Interchange Metering
The POI will be at Transmission Provider's Windstar substation. Metering will be designed bidirectional and rated for the total net generation of the Project. The bidirectional metering will also include the retail load (per tariff) delivered to Interconnection Customer. 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 2000:5 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.

Q0712 Substation 1 metering:
Revenue metering is required for each of the two Interconnection 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, 1000:5 CT/VT extended range for high accuracy metering.

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.

A second, independent communication path from that used for the Q0712 substation A is required for retail sales and generation accounting via the MV-90 translation system.

Q0712 Substation 2 metering:
The revenue metering for Q0712 B substation will be located 6 miles distance away at the Interconnection Customer owned Q0712 A substation. The primary metering transformers shall be combination 230kV, 500:5 current ratio, CT/VT extended range for high accuracy metering.

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 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 1-800-625-6078 to arrange this service. Approval for back feed is contingent upon obtaining station service.

7.0 COST ESTIMATE (ER)

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

Direct Assigned	
Q0712 Collector substations *Metering, control house*	$918,000
Windstar substation *Project line termination and metering*	$840,000
Tie line substation *Add communications*	$124,000
Total Direct Assigned	**$1,882,000**
Network Upgrades	
Windstar substation *Expansion, line position, breaker*	$3,018,000
Shirley Basin substation *Update protection & control and communications*	$250,000
Aeolus substation *Update protection & control and communications*	$250,000
Standpipe substation *Develop new line relay settings*	$233,000
Aeolus-Shirley Basin #1 Transmission Line *Reconductor 16 miles of 230kV line*	$19,501,000
Aeolus-Freezeout Transmission Line *Reconductor 3.5 miles of 230 kV line*	$4,337,000
Freezeout-Standpipe Transmission Line *Reconductor 11.5 miles of 230 kV line*	$15,451,000
Freezeout substation *Replace circuit breakers and switches*	$4,758,000
Total Network Upgrade	**$47,798,000**
Grand Total	**$49,680,000**

*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 Transmission Provider must develop the Project schedule using conservative assumptions. Interconnection Customer may request that Transmission Provider perform this field analysis, at 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 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 Generating Facility to Transmission Provider's electrical distribution or transmission system. A more detailed estimate will be calculated during the Facilities Study. Interconnection Customer will be responsible for all actual costs, regardless of the estimated costs communicated to or approved by Interconnection Customer.

8.0 SCHEDULE

Transmission Provider estimates it will require approximately 24-36 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 as well as the contingent requirements for higher queued projects results in a timeframe that may support Interconnection Customer's requested Commercial Operation date of December 31, 2020.

9.0 PARTICIPATION BY AFFECTED SYSTEMS

Transmission Provider has identified the following affected systems: Western Area Power Administration, Black Hills Energy, Tri-State Generation and Transmission, Basin Electric

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

10.0 APPENDICES

Appendix 1: Higher Priority Requests
Appendix 2: Property Requirements
Appendix 3: Study Results

10.1 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, Transmission Provider reserves the right to restudy this request, as the results and conclusions contained within this study could significantly change.

The Generation Interconnection Requests considered:

Q0542 (240 MW)
Q0706 (250 MW)
Q0707 (250 MW)
Q0708 (250 MW)

10.2 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 Interconnection Customer in 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 Transmission Provider. 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 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 Transmission Provider's approval.

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 able to be permitted use in all zoning districts. 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 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 Transmission Provider.

10.3 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. 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, Segment D.2 projects are in service, along with the mitigation required by Q0707 and Q0708, the study did not indicate any thermal overload or voltage issues.

N-1 Results:
Assuming the Energy Gateway D.2 projects are in service, along with the mitigation identified for senior queue projects, an outage of the Aeolus – Shirley Basin #2 230 kV line resulted in an overload on the Aeolus – Shirley Basin 230 kV #1 line of 152%. The mitigation for this issue is to rebuild the existing Shirley Basin #1 230 kV line, approximately 16 miles, with 2-1158.4 ACSS (Hudson).

An outage of the Aeolus – Anticline 500 kV line, Aeolus 230/500 kV transformer or Anticline 345/500 kV transformer results in an overload on the Standpipe-Freezeout 230 kV line (109%), the Freezeout -Aeolus 230 kV line (102%) 230 kV and the Standpipe-Platte 230 kV line (106%). The mitigation for this overload is to rebuild the existing lines, approximately 15 miles, from Standpipe to Freezeout (bundled 2x1272 ACSR) and from Freezeout to Aeolus with bundled 2x1158.4ACSS/TW.

Interconnecting the Q0712 Project and aforementioned mitigation increases the amount of power flowing through the Shirley Basin and Freezeout substations and in turn the fault duty requirements. . The existing bay at the Shirley Basin substation will need to be rebuilt to 4000A. Replace two (2) 3000A circuit breakers and switches with two (2) 4000A circuit breakers and switches.

N-1-1 Results:
Based on operating conditions in real time, generation curtailment may be required for certain N-1-1 conditions that may limit the transmission capacity in the Wyoming area. No mitigation is identified for N-1-1 outages as manual curtailment of the Project would be performed post first contingency such that no thermal overload would occur for the second contingency.

N-2 Results:
Assuming Energy Gateway, Segment D.2 and mitigation required by Q0707 and Q0708 projects are in service, no N-2 thermal overloads or voltage issues were observed in the study.