

TRANSMISSION PLANNING

GENERATION INTERCONNECTION REPORT

INTERCONNECTION SYSTEM IMPACT STUDY (ISIS)

G0618

8/21/2019

PREPARED BY:

ABEBE MASHO – TPPC ZACH BEUS – TPPB
KEN OWEN – TPMC

Table of Contents

1 Introduction 1
2 Conclusions 1
3 Impacted Parties 2
4 Facilities 2
4.1 High Voltage Plan of Service 2
4.2 Contingent Facilities 2
4.3 Communications Plan of Service (TPMC) 2
4.3.1 Interconnection Station 2
4.3.2 Collector Station 2
4.3.3 Control Centers 2
4.3.4 Network Communications Expansion 2
4.4 Remedial Action Schemes 2
4.5 Plant Reactive Requirements 3
4.6 Generator Low Voltage Ride through Capability 3
4.7 Protection, Control, and Monitoring Requirements 3
4.7.1 Relaying, Transfer Trip, and Auto-reclosing 3
4.7.2 Limit Generation to Schedule 4
4.7.3 Revenue or Interchange Metering and SCADA 4
4.7.4 Phasor Measurement Unit 4
5 Project Requirements Diagram 4
6 Estimates 4
6.1 Estimated Cost 4
6.2 Estimated Schedule 4
7 Technical Analysis 4
7.1 Methodology and Assumptions 4
7.2 Queue Priority 4
7.3 Powerflow Results 4
7.4 Voltage Stability Results 5
7.5 Transient Stability Studies 5
7.6 Short Circuit analysis 5
7.7 NRIS Analysis 5
7.8 ERIS 5
8 Communications Detailed Requirements 6
9 Project Team 6

1 Introduction

This ISIS examines the System Impacts of interconnecting the proposed generation project to the Bonneville Power Administration Transmission Service's (BPA-TS) transmission system. The Developer has requested interconnection near the John Day – Klondike Schoolhouse No 1 230kV line. This request was entered into the BPA-TS Interconnection queue as Request G0618. The project is a replacement of the G096 wind turbine generators resulting in a 5 MW increase to the nameplate generating capacity of the G096 project proposed for Sherman County, OR. The request indicated that power injection into John Day 230kV would be limited to the existing 76 MW of G096 by plant control. The requested commercial operation date is 12/31/20.

The ISIS consists of powerflow, voltage stability, short circuit and transient stability analysis (if applicable) and provides a list of facilities and non-binding good faith estimates of cost and a non-binding good faith estimated time to construct. The purpose is to identify any potential adverse system impacts resulting from the requested interconnection.

Interconnection of this project is not contingent on the completion of any other projects.

In accordance with the BPA Open Access Transmission Tariff, requests impacting the affected system were studied in queue order. Because this request is not an increase in power injection from G096, no preceding requests were included in the study.

The Developer requested this project be considered for Energy Resource Interconnection Service (ERIS). The ERIS impacts were evaluated in this study.

2 Conclusions

The ISIS evaluated an interconnection near the John Day – Klondike Schoolhouse No 1 230kV line. The ISIS concluded that the requested 5 MW generation addition could be provided the reactive compensation and voltage control requirements are met. This interconnection is subject to the following requirements:

(1) Developer to implement plant control to limit the output of the combined G096 and G0618 plant to 76 MW.

With the requirements listed above, the full 5 MW of additional wind generation can be interconnected.

A non-binding good faith estimated cost to build the facilities associated with interconnection of G0618 is $0. These costs are associated with necessary upgrades detailed in section 3. Facilities and include 40% contingency and applicable overhead costs.

The technical study results included in this document are for generator interconnection only. Technical studies for transmission service for delivery of output beyond the point of interconnection are not included. Any transmission service for delivery beyond the point of interconnection must be requested and arranged for separately. In addition, the technical

studies included in this document only address generator interconnection capacity and do not address generator balancing services.

These studies were conducted using the best available information at the time of the study. Findings and recommendations are based on assumptions, which could change. BPA-TS reserves the right to add, delete, or modify any content in this report.

3 Impacted Parties

No affected systems were identified in this study.

4 Facilities

4.1 High Voltage Plan of Service

Developer will be required to implement plant control to limit the output of the combined G096 and G0618 plant to 76 MW.

No modifications to the BPA-TS transmission system are required.

4.2 Contingent Facilities

Interconnection of this project is not contingent on the completion of any other projects.

4.3 Communications Plan of Service (TPMC)

This project has no impact on existing infrastructure which will remain in its current configuration.

4.3.1 Interconnection Station

There will be no changes to the existing telecommunications for this project.

4.3.2 Collector Station

There will be no changes to the existing telecommunications for this project.

4.3.3 Control Centers

There will be no changes to the existing Control Center communication systems for this project.

-

4.3.4 Network Communications Expansion

There will be no Network Communication expansion for this project.

4.4 Remedial Action Schemes

Remedial Action Schemes (RAS) take quick, automatic action to protect the reliability of the transmission system and prevent cascading outages or other adverse impacts related to system events. Actions include, but are not limited to, generator tripping, switching of shunt reactive compensation devices, and/or system configuration changes.

Remedial Action Scheme requirements, if any, will be identified in Supporting Documentation for G0618 System Impact Study and are not available for wide distribution.

4.5 Plant Reactive Requirements

Reactive support is required at the Developer site as outlined in Section 6 of BPA's Technical Requirements for Interconnection to the BPA Transmission Grid.

To maintain voltage stability and existing transfer capabilities across the main grid transmission system BPA-TS will require a dynamic compensation level of 0.95 lead / lag power factor at the POI. The dynamic reactive power capability can be provided by inverters capable of voltage control through internal reactive power capability. The reactive compensation will be on voltage control using line drop compensation (LDC) with BPA-TS providing voltage schedules.

These reactive power support requirements are dictated by voltage stability issues caused by contingencies across the main grid system outside the local area. The voltage stability problem is caused by high real power flows across the system causing an exponential increase in transmission line reactive power losses. When transmission line reactive power losses increase due to a transmission contingency, the voltage collapses very quickly requiring dynamic reactive power sources to respond in a similar time frame.

4.6 Generator Low Voltage Ride through Capability

All generator installations shall meet NERC and WECC requirements for low voltage ride through (LVRT). The generator(s) shall be capable of staying on-line for nearby faults, except for faults on the line or bus the generator is connected to. This includes traditional thermal, hydro, wind, solar PV, and solar thermal resources. Inverter-based resources will not be allowed to use momentary cessation as a form of LVRT for voltages outside the continuous operating range. Inverter-based LVRT solutions shall include some form of current injection, which accounts for Active Power (current-based frequency controls) and Reactive power (current-based voltage controls).

In addition to the NERC and WECC LVRT requirements, all generators must meet the BPA under/over voltage and under/over frequency requirements for operation in the BPA system listed in the Technical Requirements for Interconnection, unless this report determines otherwise.

4.7 Protection, Control, and Monitoring Requirements

4.7.1 Relaying, Transfer Trip, and Auto-reclosing

The developer is responsible for control and relaying for the line and terminal at the G0618 project site.

Auto-reclosing will be allowed at the G0618 line terminal, provided the generation has been tripped prior to reclosing the line side PCB. For the case where a temporary fault reclosed successfully and the generation has shut down, auto-restoration will be permitted. All other outages will require permission from BPA-TS Dispatch to resume generation operation.

4.7.2 Limit Generation to Schedule

Limit Generation to Schedule will remain as currently configured.

4.7.3 Revenue or Interchange Metering and SCADA

Existing metering for G096 will be used for the combined G096 and G0618 plant.

4.7.4 Phasor Measurement Unit

Not applicable.

5 Project Requirements Diagram

Not applicable.

6 Estimates

6.1 Estimated Cost

The following are non-binding good faith estimates of cost based on previous estimates for similar projects. They represent only scopes of work that will be performed by BPA. Costs for any work being performed by the Developer are not included. These costs include overhead rates of 57% for BPA Labor and 26% for contracts and materials. The costs also include a 40% contingency to try to allocate for scope creep. Not included in these estimates are costs for land acquisition, permitting and environmental mitigations. More accurate estimates based on in-depth scoping for the project will be available at the Facilities Study Phase.

A non-binding good faith estimated cost to build the facilities associated with interconnection of G0618 is $0.

6.2 Estimated Schedule

No modifications to the BPA-TS transmission system are required for this project.

7 Technical Analysis

7.1 Methodology and Assumptions

This study will address the generation interconnection in queue order. As the requests were added to the case, generation across the northwest system was displaced.

7.2 Queue Priority

No higher priority generation interconnection requests were considered in this study.

BPA-TS reserves the right to add, delete, or modify any content in this report should the queue in the area change.

7.3 Powerflow Results

Since the combined output of G0618 and G096 will be limited to the 76 MW of G096, this project adds no incremental flow over what was studied for G096.

7.4 Voltage Stability Results

To maintain voltage stability during main grid COI and local outages, the proposed project will be required to have the capability of +/- 0.95 power factor dynamic reactive support at the POI in order to maintain system voltage performance. The dynamic reactive power capability can be provided by traditional thermal units, external dynamic reactive devices (i.e. SVC or DVAR), or by inverters capable of voltage control through internal reactive power capability, provided the inverters are available to provide the reactive compensation needed at all times, regardless of the projects generation output. A combination of external devices and plant capability can also be used. The reactive compensation will be on voltage control using line drop compensation (LDC) with BPA-TS providing voltage schedules.

It was concluded that no additional voltage stability studies were required for G0618.

7.5 Transient Stability Studies

It was concluded that no additional transient stability studies were required for G0618.

7.6 Short Circuit analysis

In general, short circuit studies are calculated for single-phase and three phase bus fault currents.

To determine the circuit breaker interrupting requirements, the maximum short-circuit current duty must be determined. The maximum short-circuit current is higher than the symmetrical short-circuit current calculated by sequence networks (i.e., Aspen program) due to the AC and DC component offsets which are defined by the inductance of the network at the node of interest. BPA-TS determines the maximum values by applying ANSI/IEEE Standard C37.010, section 5.3. Based on a symmetrical short-circuit study the Standard specifies that when the short-circuit current reaches 80% of a breaker short-circuit rating (70% within two transformations of a generator), a more exact method such as the E/X Method with Adjustment for AC and DC Decrements should be used. BPA-TS applies this method based on X/R ratio and adjusts the short-circuit current accordingly.

The ISIS concluded that the proposed interconnection of the Project would not cause any circuit breaker short circuit capability limits to be exceeded. The results are summarized in the attached Project Requirements Diagram. These fault study results are symmetrical (not corrected for X/R ratio), but still are not expected to exceed any short circuit capability limits.

7.7 NRIS Analysis

Not applicable.

7.8 ERIS

In general, main grid flowgates are congested across the BPA transmissions system. Until such a time as long-term firm transmission service is acquired, it is recommended this generation project interconnecting to the BPA-TS transmission system participate in any Curtailment Calculator(s) or any other tools that may be implemented now or in the future to provide congestion relief across appropriate main grid flowgates.

If congestion occurs or is anticipated to occur and the preceding tools are not available or sufficient congestion relief cannot be achieved by using them, then access to the various forms of Hourly Transmission Products by the generation project can expect to be denied. Historical path flows are available electronically at http://transmission.bpa.gov/Business/Operations/Paths/default.aspx. Historical data is not a good indication of future performance. Also, times of maximum path stress do not always coincide with times of maximum path flow.

The ISIS results in this report include ERIS.

8 Communications Detailed Requirements

This project has no impact on existing infrastructure which will remain in its current configuration.

9 Project Team

The project team for this request is as follows:

Role	Person
Account Executive	Kimberly Gilliland
GI Administrator	Anna Cosola
Customer Service Engineer	Kevlyn Baker
Transmission Infrastructure Development Planning Supervisor	Hamody Hindi
Transmission Planning Engineer	Zach Beus
Communications Planning Engineer	Ken Owen
Coordinating Engineer	Abebe Masho