

**GENERATOR INTERCONNECTION  
SYSTEM IMPACT STUDY REPORT**

for integration of the proposed

**325 MW XXXX XXXX  
(GI PROJECT #655)**

to the

**IDAHO POWER COMPANY ELECTRICAL SYSTEM**

in

**XXXX XXXX, ID**

for

**XXXX XXXX**

**Report v.1**

**January 9<sup>th</sup>, 2023**

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## 1.0 Introduction

XXXX XXXXhas contracted with Idaho Power Company (“Transmission Provider”) to perform a Generator Interconnection System Impact Study (SIS) for the integration of the proposed 325 MW XXXX XXXX (the Project). The Project location is in Bear Lake County, ID at approximately XXXX XXXX. The project is Generation Interconnect (GI) queue number 655 (GI #655). The Project has chosen in the System Impact Study to be studied for Energy Resource Interconnection Service (ERIS) only.

Energy Resource Interconnection Service and/or Network Resource Interconnection Service in and of themselves do not convey transmission service. In addition to Network Upgrades identified in the Interconnection System Impact Study:

- For Energy Resource Interconnection Service, the Interconnection Customer's ability to inject its Large Generating Facility output beyond the Point of Interconnection will depend on the existing capacity of Transmission Provider's Transmission System at such time as a transmission service request is made that would accommodate such delivery. The provision of firm Point-to-Point Transmission Service or Network Integration Transmission Service may require the construction of additional Network Upgrades.
- For Network Resource Interconnection Service, additional studies to reduce or eliminate congestion may be required and these studies may identify the need for additional upgrades. To the extent Interconnection Customer enters an arrangement for long term transmission service for deliveries from the Large Generating Facility outside Transmission Provider's Transmission System, such request may require additional studies and upgrades in order for Transmission Provider to grant such request.

The Project has applied to connect to the jointly owned Idaho Power and PacifiCorp Bridger to Populus 345 kV transmission line for an injection of 325 MW at a single Point of Interconnection (POI).

This report documents the basis for and the results of this System Impact Study for the GI #655 Generation Interconnection Customer. The report describes the proposed Project, the determination of the Project interconnection requirements, and estimated costs for integration of the Project to the Transmission Provider transmission system. This report satisfies the SIS requirements of the Idaho Power Tariff.

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## 2.0 Summary

The impact to the Idaho Power transmission system of interconnecting the Project to the jointly owned Bridger to Populus 345 kV transmission line was evaluated.

The Project will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations. The Project will be required to manage the real power output of their generation project at the POI. Also, it may be beneficial for XXXX XXXX, for their own modeling compliance requirements, to install additional PMU devices at their facilities to monitor the generation source.

All estimated interconnection facility and Network Upgrade costs will be identified in PacifiCorp's Affected System Studies for this Project. The schedule for designing, procuring, and constructing facilities will be developed and optimized during the Facility Study should the generation interconnection customer choose to move to that study phase of the interconnection process.

## 3.0 Scope of Interconnection System Impact Study

The Interconnection System Impact Study was done and prepared in accordance with the Transmission Provider's Standard Generator Interconnection Procedures to provide an evaluation of the system impact of the interconnection of the proposed generating project to the Idaho Power system. As listed in the Interconnection System Impact Study Agreement, the Interconnection System Impact Study report provides the following information:

- identification of any circuit breaker short circuit capability limits exceeded as a result of the interconnection;
- identification of any thermal overload or voltage limit violations resulting from the interconnection;
- identification of any instability or inadequately damped response to system disturbances resulting from the interconnection and
- description and non-binding, good faith estimated cost of facilities required to interconnect the Large Generating Facility to the Transmission System and to address the identified short circuit, instability, and power flow issues.

All other proposed Generation projects prior to this Project in the Generator Interconnect queue were considered in this study. A current list of these projects can be found in the Generation Interconnection folder located on the Idaho Power web site at the link shown below:

<http://www.oatioasis.com/ipco/index.html>.

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## 4.0 Contingent Facilities

Idaho Power generation interconnection projects GI #558, GI#573, GI#580, GI#623, GI#633, GI#641, GI#647, GI#648, and GI#652 are senior queued projects in the affected area of Idaho Power's transmission system. Idaho Power studied GI #655 with all Network Upgrades identified for senior queued projects as in-service. Changes to senior queued projects including withdrawal from the queue, may trigger a restudy associated with GI #655.

GI #655 Energy Resource Interconnection Service is not contingent upon any senior queued generation interconnection projects. Changes to senior queued projects including in-service date and withdrawal from the queue, may trigger a restudy associated with GI #655.

## 5.0 Description of Proposed Generating Project

The primary POI for the Project is the jointly owned Bridger to Populus 345 kV transmission line with a maximum injection of 325 MW. The Project's Commercial Operation Date (COD) is XXXX XXXX.

XXXX XXXX

**Table 1.** GI #655 Project Specifications

## 6.0 Energy Resource Interconnection Service (ERIS)

ERIS allows the 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. As an ERIS, a Transmission Service Request will be required to determine the specific Network Upgrades required to deliver the Project output to a designated point of delivery.

The Project has applied to connect to the jointly owned Idaho Power and PacifiCorp Bridger to Populus 345 kV transmission line transmission system for an injection of 325 MW. All generation projects in the area ahead of this Project in the IPC generation queue and their associated transmission system improvements were modeled in a power flow analysis to evaluate the system impact of interconnecting the Project. Power flow analysis indicates that the Project's full output of 325 MW can be interconnected at the POI.

### 6.1 Description of Substation/Transmission Facilities

The Project's POI is located on a series capacitor compensated line and it is anticipated that the series compensation will need to be resized and moved to support the interconnection. Therefore, it is recommended that a Subsynchronous Resonance study be conducted during the Facility Study due to the proximity of the Jim Bridger Power Plant to the series capacitor. Note because the Project's requested Point of Interconnection is on a transmission line jointly

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owned by Idaho Power and PacifiCorp but fully operated by PacifiCorp at the requested location, the interconnection facility requirements will be determined by PacifiCorp in separate Affected System Studies. The Interconnection Facilities will be jointly owned by Idaho Power and PacifiCorp and fully operated by PacifiCorp.

It is anticipated that PacifiCorp may request IPC to provide scope and cost estimates for Network Upgrades of IPC's communication and protection systems as related to the scope and design of the interconnection station that PacifiCorp will detail in its Affected System studies. Unless and until PacifiCorp determines the scope, design and integration of the required interconnection station IPC is unable to provide any scope or cost estimation as of the date of this System Impact Study.

The actual station layout and detailed equipment requirements will be determined by PacifiCorp in separate Affected System Studies.

## **6.2 Description of Distribution Facilities**

No distribution facilities are directly impacted by this Project.

## **6.3 Short Circuit Study Results**

Studies indicate that there is adequate load and short circuit interrupting capability on the Transmission Provider's existing 345 kV breakers after this Project is interconnected.

## **6.4 Electric System Protection Results and Grounding Requirements**

For 345 kV line protection, the Transmission Provider's System Protection Department utilizes permissive and line differential protection schemes integrated with digital communication infrastructure. Communication infrastructure between the interconnection's customer's 345kV collector substation and Idaho Power will be the responsibility of said interconnection customer.

The proposed 345 kV Wye-Grounded/Delta tertiary transformer specified in the Project should provide an adequate ground return path for transmission line protection/relaying. Grounding requirements and acceptability criteria are found in Appendix A.

## **6.5 Energy Resource Interconnection Service Cost Estimate**

All estimated interconnection facility and Network Upgrade costs will be identified in PacifiCorp's Affected System Studies for this Project.

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## **7.0 Network Resource Interconnection Service (NRIS)**

GI 655 was only studied as ERIS in accordance with the System Impact Study Application.

## **8.0 Voltage Stability Analysis**

A Voltage Stability study was performed using the WECC 2025 Heavy Summer case with Borah West West-to-East flows at 105% of the path rating and the WECC 2022 Light Winter case with Borah West East-to-West flows at 105% of the path rating. All contingencies solved successfully, there were no voltage stability issues found for the Project.

## **9.0 Transient Stability Analysis**

The WECC 2021 Light Winter operating case and PowerWorld Simulator version 22 analysis tool were used to perform the transient stability analysis.

The results showed no transient stability violations. It is the responsibility (per NERC Standards) of the Generator Owner to ensure the modeling data utilized accurately reflects inverter operations, and to provide updates to Idaho Power if testing or real-time observations indicate a need.

## **10.0 Description of Operating Requirements**

GI #655 will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations. The Project will be required to manage the real power output of their generation project at the POI. The Project will be required to operate at .95 leading/lagging measured at the high side of the main power transformer to maintain voltage within limits at the POI over the range of real power output.

The Project is required to comply with the applicable Voltage and Current Distortion Limits found in IEEE Standard 519-1992 *IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems*.

Installation of phasor measurement unit devices at the POI and maintenance costs associated with communication circuits needed to stream PMU data will also be required to be provided to interconnect the Project. The specific costs associated with the IPC requirements for interconnection customers with aggregate facilities larger than 20 MW to provide PMU data to IPC will be identified in the Facility Study should the generation interconnection customer choose to proceed to that phase of the interconnection process. Also, it may be beneficial for XXXX XXXX, for their own modeling compliance requirements, to install additional PMU devices at their facilities to monitor the generations sources separately.

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## **11.0 Conclusion**

GI #655 can be interconnected at the proposed POI. All estimated interconnection facility and Network Upgrade costs will be identified in PacifiCorp's Affected System Studies for this Project. It is recommended that a Subsynchronous Resonance study be conducted during the Facility Study due to the proximity of the Jim Bridger Power Plant to a relocated series capacitor to facilitate the interconnection of GI #655.

Energy Resource Interconnection Service or Network Resource Interconnection Service does not in any way convey any right to deliver electricity to any specific customer or point of delivery. A Transmission Service Request will be required to study the Transmission System Impacts.

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## APPENDIX A

### A-1.0 Method of Study

The System Impact Study plan inserts the Project up to the maximum requested injection into the selected Western Electricity Coordinating Council (WECC) power flow case and then, using Power World Simulator or GE's Positive Sequence Load Flow (PSLF) analysis tool, examines the impacts of the new resource on Idaho Power's transmission system (lines, transformers, etc.) within the study area under various operating and outage scenarios. The WECC and Idaho Power reliability criteria and Idaho Power operating procedures were used to determine the acceptability of the configurations considered. The WECC case is a recent case modified to simulate stressed but reasonable pre-contingency energy transfers utilizing the IPC system. For distribution feeder analysis, Idaho Power utilizes DNV·GL's Synergi Electric software and EPRI's OpenDSS software.

### A-2.0 Acceptability Criteria

The following acceptability criteria were used in the power flow analysis to determine under which system configuration modifications may be required:

The continuous rating of equipment is assumed to be the normal thermal rating of the equipment. This rating will be as determined by the manufacturer of the equipment or as determined by Idaho Power. Less than or equal to 100% of continuous rating is acceptable.

Idaho Power's Voltage Operating Guidelines were used to determine voltage requirements on the system. These state, in part, that distribution voltages under normal operating conditions are to be maintained within plus or minus 5% (0.05 per unit) of nominal everywhere on the feeder. Therefore, voltages greater than or equal to 0.95 pu voltage and less than or equal to 1.05 pu voltage are acceptable.

Voltage flicker during starting or stopping the generator is limited to 5% as measured at the point of interconnection, per Idaho Power's T&D Advisory Information Manual.

Idaho Power's Reliability Criteria for System Planning was used to determine proper transmission system operation.

All customer generation must meet IEEE 519 and ANSI C84.1 Standards.

All other applicable national and Idaho Power standards and prudent utility practices were used to determine the acceptability of the configurations considered.

The stable operation of the system requires an adequate supply of volt-amperes reactive (VAr or VARs) to maintain a stable voltage profile under both steady-state and dynamic system conditions. An inadequate supply of VARs will result in voltage decay or even collapse under the worst conditions.

Equipment/line/path ratings used will be those that are in use at the time of the study or that

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are represented by IPC upgrade projects that are either currently under construction or whose budgets have been approved for construction in the near future. All other potential future ratings are outside the scope of this study. Future transmission changes may, however, affect current facility ratings used in the study.

### **A-3.0 Grounding Guidance**

IPC requires interconnected transformers on the distribution system to limit their ground fault current to 20 amps at the Point of Interconnection.

### **A-4.0 Electrical System Protection Guidance**

IPC requires electrical system protection per Facility Connection Requirements found on the Idaho Power Web site,

<https://docs.idahopower.com/pdfs/BusinessToBusiness/FacConnReq.pdf>

### **A-5.0 WECC Coordinated Off-Nominal Frequency Load Shedding and Restoration Requirements**

IPC requires frequency operational limits to adhere to WECC Under-frequency and Over-frequency Limits per the WECC Coordinated Off-Nominal Frequency Load Shedding and Restoration Requirements available upon request.

### **A-5.0 Grid Charging**

The energy storage system (ESS) component of the Project was studied charging from the grid in steady state under N-0 (no contingencies) conditions. The charging of the ESS was assumed to be interruptible. No network upgrades were identified to support charging the ESS. There may be times during the year where system load in the local area will prevent charging of the ESS at full capacity; for example, a forced outage that would require Idaho Power to curtail charging. Should the Project require non-curtailable charging from their energy source then Point-to-Point firm transmission service from the energy market to the battery and from the Project to the point of delivery would be needed.

## **Revision History**

<b>Date</b>	<b>Revision</b>	<b>Initials</b>	<b>Summary of Changes</b>
01/09/2023	1	PTP	Initial Report

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