

**GENERATOR INTERCONNECTION  
FEASIBILITY STUDY REPORT**

for integration of the proposed

**1500 kW** [REDACTED]

**IPC PROJECT QUEUE #747**

to the

**IDAHO POWER COMPANY ELECTRICAL SYSTEM**

for

[REDACTED]  
**REPORT v.0**

**August 22, 2024**

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## Revision History

Date	Revision	Initials	Summary of Changes
8/22/24	0	AEF	FeSR GI #747 – Original Draft

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## 1.0 Introduction

██████████ has contracted with Idaho Power Company (IPC) to perform a Generator Interconnection Feasibility Study for the integration of the proposed 1500 kW ██████████ project (the Project). The Project is located in IPC's Southern Region at ██████████ in ██████████ in Twin Falls County, Idaho (See Figure 2: POI of ██████████ – GI # 747).

The Project has applied to connect to the IPC distribution system for an injection of 1500 kW at a single Point of Interconnection (POI) at a 12.5 kV distribution voltage level. The POI is located 3.5 miles from the ██████████ substation at ██████████ ██████████.

This report documents the basis for and the results of this feasibility study for the GI #747 Generation Interconnection Customer. The report describes the proposed project, the determination of project interconnection feasibility and estimated costs for integration of the Project to the Idaho Power System. This report satisfies the feasibility study requirements of the Idaho Power Tariff.

## 2.0 Summary

The feasibility of interconnecting the 1500 kW ██████████ project to IPC's ██████████ substation was evaluated.

The proposed POI provided is in ██████████ feeder service territory.

██████████ already hosts 400 kW of customer generation at various locations on the feeder. The addition of 1500 kW ██████████ GI#747 will require the installation of a deadline check at the the distribution recloser ██████████.

The POI ██████████ is currently served by three phase 12.47 kV distribution.

The preliminary power flow analysis indicated that interconnecting the ██████████ project ██████████ is feasible.

The Project will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations.

Additionally, a Distribution System Impact Study will be required. Additional information is required to demonstrate the Project's ability to meet the reactive power requirements.

The total preliminary cost estimate to interconnect the ██████████ project to the POI at ██████████ on the ██████████ distribution feeder is \$304,980 and includes the following tasks:

- Install a four-pole 12.5 kV generation interconnection package at the POI
  - This includes an SEL-421 protective relay, which requires 3-phase PTs, 3-phase CTs, and remote connectivity
  - Additionally, a single-phase PT shall be installed on the line side of the ██████████'s distribution recloser, ██████████

1500 kW ██████████  
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The cost estimate includes direct equipment and installation labor costs, indirect labor costs and general overheads, and a 20% contingency allowance. These are cost estimates only and final charges to the customer will be based on the actual construction costs incurred. It should be noted that the preliminary cost estimates do not include the cost of the customer's owned equipment to construct the generation site or required communication circuits.

### **3.0 Scope of Interconnection Feasibility Study**

The Interconnection Feasibility Study was done and prepared in accordance with Idaho Power Company Standard Generator Interconnection Procedures to provide a preliminary evaluation of the feasibility of the interconnection of the proposed generating project to the Idaho Power system. As listed in the Interconnection Feasibility Study agreement, the Interconnection Feasibility Study report provides the following information:

- preliminary identification of any circuit breaker short circuit capability limits exceeded as a result of the interconnection;
- preliminary identification of any thermal overload or voltage limit violations resulting from the interconnection; and
- preliminary description and non-binding estimated cost of facilities required to interconnect the Small Generating Facility to the IPC system and to address the identified short circuit and power flow issues.

All other proposed generation projects prior to the 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>.

### **4.0 Description of Proposed Generating Project**

██████████, GI #747, consists of a single POI with ██████████. ██████████ has requested to connect to Idaho Power's 12.5 kV distribution system. ██████████ requested that 1500 kW injection at the POI be studied.

### **5.0 Description of Transmission Facilities**

Preliminary power flow analysis indicated that interconnection of a 1500 kW injection at the POI considered in this study is feasible.

### **6.0 Description of Substation Facilities**

Idaho Power's ██████████ station is located in ██████████ Idaho. ██████████ station is fed by a 138 kV transmission line. The substation transformer feeding ██████████, is a three-phase 138-12.5/7.2 kV delta wye-grounded transformer rated for ██████████. ██████████ currently serves ██████████ 12.5 kV distribution feeders: ██████████ and ██████████.

## 7.0 Description of Distribution Facilities

The Project was studied with a 12.5 kV connection to [REDACTED]. This is a grounded-wye feeder operating at 12.5 kV. The Project must have a grounded-wye transformer connection on the IPC side, as well as a wye connection on the Project side of the transformer.

Refer to Appendix A, Section 3, for additional grounding requirements.

## 8.0 Short Circuit Study Results

### Fault Duty at [REDACTED] 12.5kV Generator POI:

SLG Fault (A) 717.6

LL Fault (A) 1020.5

3PH Fault (A) 1193.2

### Fault Duty at [REDACTED] 12.5kV Generator POI Without Generator Online:

SLG Fault (A) 646.5

LL Fault (A) 753.2

3PH Fault (A) 871.5

### Fault Duty at [REDACTED] Substation:

SLG Fault (A) 12943.1

LL Fault (A) 11166.1

3PH Fault (A) 13579.8

### Fault Duty at [REDACTED] Substation Without Generator Online:

SLG Fault (A) 12726.3

LL Fault (A) 10889.4

3PH Fault (A) 13269.4

The fault current contribution from the synchronous generators does not exceed any circuit breaker rating.

## 9.0 Description of Required Facility Upgrades

A Distribution System Impact Study will be required to evaluate distribution operational concerns, mitigation options, and costs if the Project chooses to continue to the next phase of the study process.

The following upgrades will be required to IPC-owned facilities to facilitate the interconnection of GI #747:

- Install a four-pole 12.5 kV generation interconnection package at the POI

- This includes an SEL-421 protective relay, which requires 3-phase PTs, 3-phase CTs, and remote connectivity
- Additionally, a single-phase PT shall be installed on the line side of the [REDACTED] recloser at the [REDACTED] substation for deadline check

See the conceptual-level cost estimate in Table 1 and Table 2.

Table 1 Conceptual-level POI Cost Estimate for GI #747

<b>Item of Work</b>	<b>Estimate</b>
Generation interconnection and protection package	\$ 200,000
Substation upgrades	\$ 0
Distribution upgrades	\$ 30,000
Transmission upgrades	\$ 0
Unloaded costs	\$ 230,000
20% Contingency (1)	\$ 46,000
Total unloaded costs	\$ 276,000
Overheads (2)	\$ 28,980
<b>Total Conceptual-level Cost Estimate in 2024 dollars (3)</b>	<b>\$ 304,980</b>

(1) Contingency is added to cover the unforeseen costs in the estimate. These costs can include unidentified design components, material cost increases, labor estimate shortfalls, etc.

(2) Overhead costs cover the indirect costs associated with the Project.

(3) This cost estimate includes direct equipment, material, labor, overheads, and contingency as shown.

- Note that these estimates do not include the cost of the customer’s equipment/facilities.
- Note that the overhead rates are subject to change during the year.
- These are estimated costs only and final charges to the customer will be based on the actual construction costs incurred.
- These are non-binding conceptual level cost estimates that will be further refined upon the request and completion of Transmission and Distribution Facility Studies.

## 10.0 Description of Operating Requirements

The Project shall be capable of injecting reactive power (over-excited) equal to 660 kVAR and absorbing reactive power (under-excited) equal to 375 kVAR at all active power output between 20% and 100% of nameplate active power rating as defined in IEEE 1547-2018 Category A reactive power capability and shown in Figure 1.



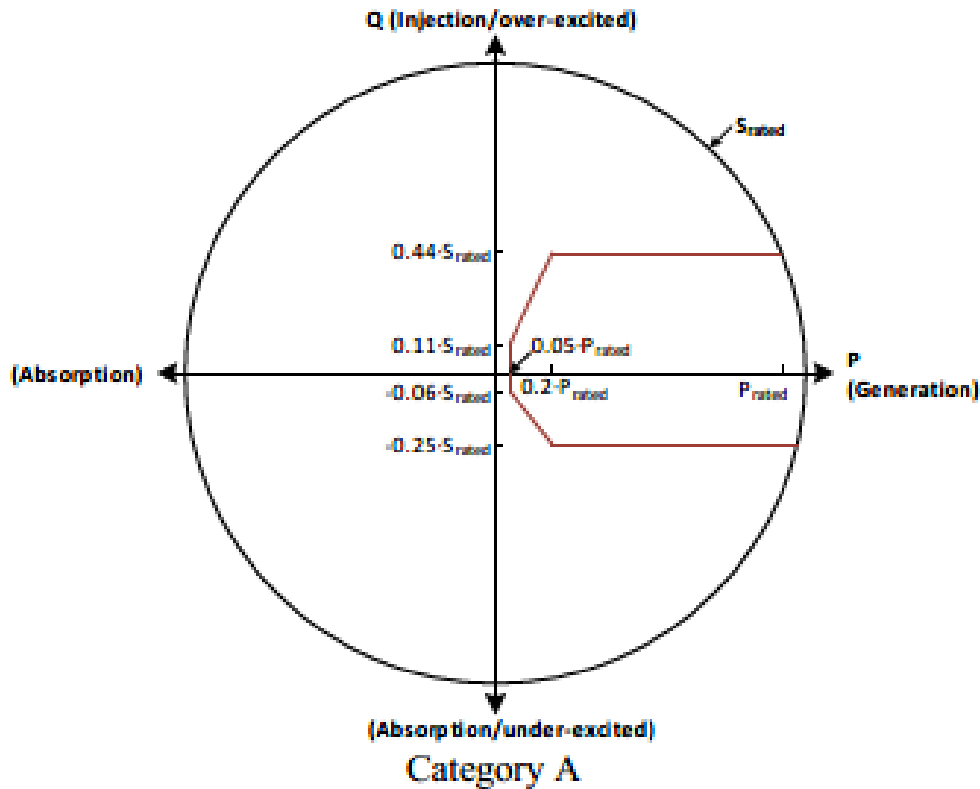


Figure 1 Operating requirements (IEEE 1547-2018)

Idaho Power has determined that the generation equipment selected does not meet the reactive power capability requirements provided in Figure 1 according to the information provided in the generator interconnection application. Additional information will need to be provided to demonstrate the Project's ability to meet these requirements. The distribution system impact study will be needed to assess the Project's ability to meet these requirements.

The Project will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations.

Voltage flicker at startup and during operation will be limited to less than 5% as measured at the POI. The allowable voltage flicker limit is further reduced during operation due to multiple voltage fluctuations per hour or minute, per Idaho Power's T&D Advisory Information Manual.

The Project is required to comply with the applicable voltage fluctuation limits found in IEEE Standard 1453-2004 *IEEE Recommended Practice for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems*.

The project is required to comply with the applicable Voltage and Current Distortion Limits found in IEEE Standard 519-2014 *IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems*.

## **11.0 Conclusion**

The requested interconnection of the [REDACTED] project, GI #747, to Idaho Power's system was studied. The project will interconnect to [REDACTED] feeder at the 12.5 kV distribution voltage level.

The results of this study confirm that it is feasible to interconnect the [REDACTED] project, GI #747, to the Idaho Power system with the identified upgrades. A four-pole generation interconnect package at the POI and deadline check at the [REDACTED] substation and distribution recloser are required to integrate the 1500 kW project. Additional information regarding the Project's ability to meet the reactive power requirements is required to be provided. A Distribution System Impact Study is required to determine the specific system impacts from the Project such reactive margin.

The estimated cost to interconnect GI #747 to the IPC system at the [REDACTED] feeder at the 12.5 kV point of interconnection considered in this study is approximately \$304,980 at the POI.

## APPENDIX A

### A-1.0 Method of Study

For distribution feeder analysis, Idaho Power utilizes DNV GL's Synergi 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. This states, in part, that distribution voltages, under normal operating conditions, are to be maintained within plus or minus 5% (0.05 per unit) of nominal at each meter or POI 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 the starting or stopping of the generator will be limited to less than 5% as measured at the POI. Allowable voltage flicker limit is further reduced during operation due to multiple voltage fluctuations per hour or minute, 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, IEEE1453, IEEE1547, 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) to maintain a stable voltage profile under both steady-state and dynamic system conditions. An inadequate supply of VAr 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 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 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 Requirements for Generation Interconnections 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.

**APPENDIX B**

**B-1.0 [REDACTED] GI Project #747 Site Location**

**Figure 2 POI of [REDACTED] - GI #747**

1500 kW [REDACTED]  
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