

**GENERATOR INTERCONNECTION
FEASIBILITY STUDY REPORT**

for integration of the proposed

**149 MW [REDACTED] PROJECT
(GI #636)**

to the

IDAHO POWER ELECTRICAL SYSTEM

in

ELMORE COUNTY, IDAHO

for

[REDACTED]

REPORT v.0

May 2022

149 MW [REDACTED] Project
Feasibility Study Report

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This report contains Idaho Power Company Critical Energy Infrastructure Information (CEII). Distribution of this report must be limited to parties that have entered into a non-disclosure agreement with Idaho Power Company and have a need to know.

Revision History

Date	Revision	Initials	Summary of Changes
4/28/2022	1	AVD	Feasibility Study Report GI #636 – Original issue

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1.0 INTRODUCTION

██████████ signed a study agreement with Idaho Power Company to perform a Generator Interconnection Feasibility Study (FeS) for the integration of the proposed 149 MW ██████████ Project. The project is located in Idaho Power's Central service territory in Elmore County, Idaho. Reference number GI #636 has been assigned to the Project in the Idaho Power GI queue.

The specific Point of Interconnection (POI) studied is at the 230 kV line ██████████ ██████████.

This report documents the basis for and the results of this FeS for the Generation Interconnection Customer. It describes the Project, the determination of interconnection feasibility and estimated costs for integrating the Project into the Idaho Power transmission system at 230 kV.

2.0 SUMMARY

The feasibility of interconnecting the 149 MW [REDACTED], GI #636, to the existing [REDACTED] 230 k V line was evaluated.

Power flow analysis indicated that interconnecting the Project is feasible with the required network upgrades. The Project will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power's Grid Operations.

An Interconnection System Impact Study (SIS) is required to determine if any additional Interconnection Facilities or Network Upgrades are required to mitigate adverse impacts to the electrical grid such as, but not limited to, thermal violations.

- 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 into 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 total preliminary cost estimate to interconnect [REDACTED], GI #636 is \$54,033,000.

The cost estimate will include direct equipment and installation labor costs, indirect labor costs and general overheads, and a contingency allowance. It should be noted that the preliminary cost estimate does not include the cost of the customer's equipment to construct the generation facility.

3.0 SCOPE OF INTERCONNECTION FEASIBILITY STUDY

The Interconnection FeS was performed and prepared in accordance with Idaho Power Standard Generator Interconnection Procedures, to provide a preliminary evaluation of the feasibility of the interconnection of the proposed generating project to the local transmission system. As listed in the Interconnection FeS agreement, the Interconnection FeS 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 Large Generating Facility to the transmission system and to address the identified short circuit and power flow issues.

Generation projects in the Generator Interconnect queue prior to this project could impact the cost of interconnection. A current list of projects in Idaho Power's queue can be found in the Generation Interconnection folder located on the Idaho Power OASIS web site at the link shown below:

<http://www.oasis.oati.com/ipco/index.html>

4.0 DESCRIPTION OF PROPOSED GENERATING PROJECT

[REDACTED], GI #636, proposes to interconnect 149 MW to the existing [REDACTED] 230 kV line. The POI is the 230 kV line with coordinates [REDACTED]. This project's requested in-service date is December 2025.

5.0 DESCRIPTION OF EXISTING TRANSMISSION FACILITIES

[REDACTED] GI #636, interconnection to the [REDACTED] 230 kV line was studied in this FeS.

Preliminary power flow analysis indicated that interconnection of 149 MW injection at the POI considered in this study is feasible with the identified network upgrades.

5.1 Transmission Line Facilities

The Project will be connected to existing [REDACTED] 230 kV line.

5.2 Substation Facilities

The project will connect to the existing [REDACTED] 230 kV line via a new substation with a three-position ring bus.

5.3 Grounding Requirements

The proposed transformer to connect to the [REDACTED] 230 kV line should provide an adequate ground source for transmission line protection/relaying.

Grounding requirements and acceptability criteria are found in Appendix A.

5.4 System Protection Assessment

The fault duty at each of the breakers of interest will be determined during the system impact study.

6.0 DESCRIPTION OF POWER FLOW CASES

For the study, three power flow cases were used to study the transmission system with westbound and eastbound transmission flows to determine the required Network Transmission Upgrades.

The first case used was the WECC 2025 Heavy Summer case. The second case used was the WECC 2023 Light Winter case. The case was modified to represent a summer month with high east to west (westbound) transfers across Borah-West. The third case was a WECC 2025 Heavy Summer case. The case was modified to represent a summer month with high west to east (eastbound) transfers across Midpoint - West. The cases were modified to incorporate senior projects in the Idaho Power queue in the area.

7.0 POWER FLOW STUDY RESULTS

Power Flow Analysis was performed on the cases described above. The case were used to simulate the impact of the proposed [REDACTED], GI #636, 149 MW Project interconnection during normal and contingency operating conditions (TPL-001). Mitigation of any adverse changes in loading or voltage from pre- to post-Project was identified.

The contingencies simulated include:

- All transformers and transmission lines in the local area of the proposed Project.
- Breaker Failures
- The proposed project.

The results of the power flow studies were evaluated using WECC/NERC planning standards and Idaho Power planning standards. The power flow analysis evaluation criteria that were used are summarized below:

- All transmission facilities must remain within their thermal limits.
- Pre-contingency bus voltages within the study area must be between 0.95 per unit and 1.05 per unit.
- Maximum voltage deviation allowed at all buses under contingency conditions will be 5% for N-1 (NERC Category B).

Power flow solution was achieved for all the N-1 and credible N-2 outages simulated. Key findings from the power flow analysis are as follows:

- Overloading
 - The N-0 results in the overload of the [REDACTED].
 - The [REDACTED] Breaker Failure at [REDACTED] results in the overload of the [REDACTED].
 - The N-1 [REDACTED] 500 kV results in the overload of the [REDACTED] 230 kV line.
 - The [REDACTED] Breaker Failures at [REDACTED] result in the overload of the [REDACTED] 230 kV line.
 - The [REDACTED] and [REDACTED] Breaker Failures at [REDACTED] result in the overload of the [REDACTED] 230 kV line.
 - The N-1 [REDACTED] 230 kV, results in the overload of the [REDACTED] 230 kV line and the [REDACTED] 230 kV line.
 - The [REDACTED], [REDACTED], and [REDACTED] Breaker Failures at [REDACTED], result in the overload of the [REDACTED] 230 kV line.
- Voltage Deviation. There were no significant voltage deviations in the power flow analysis.
- Voltage Violations. There were no significant voltage violations in the power flow analysis.

To alleviate the overloads the following upgrades have been identified for GI 636:

- Increase the capacity of the [REDACTED]
- Reconfigure [REDACTED] substation by adding [REDACTED] and moving the [REDACTED] terminal to the new bay
- Reconductor the [REDACTED] line with [REDACTED] conductor
- Reconductor the [REDACTED] 230 kV line with [REDACTED] conductor

8.0 DESCRIPTION OF OPERATING REQUIREMENTS

The installed reactive power capability of the Project must have a power factor operating range of 0.95 leading to 0.95 lagging at the POI over the range of real power output. At full output of 149 MW, [REDACTED] would need to be able to provide approximately +/- 48.9 MVAR reactive support plus the reactive energy consumed by the customer's own facilities.

Identification of any additional equipment required at the Project to meet reactive power capability interconnection requirements will be provided in the SIS.

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

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*.

9.0 COST ESTIMATE

The following section describes the cost estimate for the Project.

9.1 Cost Estimate

The following upgrades will be required to facilitate the interconnection [REDACTED], GI #636:

- Interconnection three-position ring substation
- Increase capacity of 230-kV [REDACTED]
- Reconfigure [REDACTED] substation by adding [REDACTED] and moving the [REDACTED] terminal to the new bay
- Reconductor the [REDACTED] line with [REDACTED] conductor
- Reconductor the [REDACTED] 230 kV line with [REDACTED] conductor

Table 1: Conceptual Cost Estimate

Item of Work	Estimate
Substation construction and Generation interconnection and protection package	\$9,021,600
Transmission upgrades	\$33,357,205
Unloaded costs	\$42,378,805
Contingency 20% (1)	\$8,475,761
Total unloaded costs	\$50,854,566
Overheads (2)	\$3,178,434
Total Conceptual-level Cost Estimate in 2021 dollars (3)	\$54,033,000

(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.

These are non-binding conceptual level cost estimates that will be further refined upon the request and completion of Transmission and Distribution System Impact Studies.

10.0 CONCLUSIONS

The requested interconnection of [REDACTED], GI #636, to the [REDACTED] 230 kV line in Idaho Power's Capital operating area was studied.

The results of this study work confirm that it is feasible to interconnect the Project to the existing [REDACTED] 230 kV line with the identified upgrades.

APPENDIX A

A-1.0 Method of Study

The FeS plan inserts the Project up to the maximum requested injection into the selected Western Electric Coordinating Council (WECC) power flow case and then, using Power World Simulator or GE's Positive Sequence Load Flow (PSLF) analysis tool, the impacts of the new resource on Idaho Power's transmission system (lines, transformers, etc.) within the study area are analyzed. The WECC and Idaho Power reliability criteria and Idaho Power operating procedures were used to determine the acceptability of the configurations considered. For distribution feeder analysis, Idaho Power utilizes Advantica's SynerGEE 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 specifies, 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 POI, 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) 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 are represented by Idaho Power 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

Idaho Power requires interconnected transformers to limit their ground fault current to 20 amps at the POI.

A-4.0 Electrical System Protection Guidance

Idaho Power requires electrical system protection per Requirements for Generation Interconnections found on the Idaho Power Web site,

<http://www.idahopower.com/pdfs/BusinessToBusiness/facilityRequirements.pdf>

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

Idaho Power 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.

<http://www.idahopower.com/pdfs/BusinessToBusiness/facilityRequirements.pdf>

APPENDIX B. PROJECT LOCATION

[REDACTED] was studied with a POI at [REDACTED] 230 kV line



Figure 1 - Project Location

