

**GENERATOR INTERCONNECTION
FEASIBILITY STUDY**

For integration of the proposed



In

JEROME COUNTY, IDAHO

To the

IDAHO POWER COMPANY ELECTRICAL SYSTEM

For



The

INTERCONNECTION CUSTOMER

FINAL REPORT

JULY 1, 2010

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1.0 Introduction

██████████ has contracted with Idaho Power Company (IPCo) to perform a Generator Interconnection Feasibility Study for the integration of their new 1.25 MW hydroelectric project (project #330 in queue). The proposed location of the project is in Idaho Power's southern Idaho service territory ██████████
██████████

This report documents the basis for and the results of this Feasibility Study for the ██████████ ██████████. It describes the proposed project, the study cases used, the impact of associated projects, and results of all work in the areas of concern.

2.0 Summary

The proposed project is a 1.25 MW hydroelectric project ██████████ ██████████. The Point of Interconnection (POI) for this project with the IPCo system is ██████████ in Jerome County, Idaho.

The substation serving this area is Idaho Power's ██████████ substation. Currently, there is adequate capacity in this substation to serve this project. ██████████
██████████ Upgrades to the feeder will not be necessary to serve this project. However, the generation facility will be required to run at a 99% power factor (absorbing VARs) to limit voltage flicker below 5%.

Since the project will be located along with Idaho Power customer loads, a generation interconnection package will be required at the point of interconnection.

The estimated cost of all known required upgrades and interconnection equipment is **\$200,000**.

This project's Feasibility Study only addresses the ability of the project to interconnect to the system, there are no transmission rights secured for the project until a transmission system request is submitted by the corresponding transmission customer. The required transmission facilities, if any, to support energy transfers will then be determined based on first come first serve basis (queue order).

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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 Distribution System and to address the identified short circuit 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 on the Idaho Power web site as follows:

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

4.0 Description of Proposed Generating Project

The [REDACTED] Project proposes to connect to the Idaho Power distribution system for an injection of 1.25 MW (maximum project output) [REDACTED].

5.0 Description of Existing Transmission Facilities

The transmission line serving this area is Idaho Power's [REDACTED] line. [REDACTED]. After considering the other proposed generation projects in the queue ahead of this project, there is adequate capacity available on this particular line to serve the proposed project.

6.0 Description of Existing Substation Facilities

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The substation serving this area is Idaho Power's [REDACTED] substation, which is located [REDACTED] in Jerome County. The existing substation transformer is a 138:34.5 kV transformer [REDACTED]. There is adequate capacity [REDACTED] to interconnect the proposed generation project.

7.0 Description of Existing Distribution Facilities

The point of interconnection is one half mile north of the intersection of [REDACTED]. The distribution feeder serving this area is the [REDACTED] 34.5 kV feeder. This is a grounded wye feeder operating at 34.5 kV and 12.5 kV. The point of interconnection will occur at the 12.5 kV voltage level. The conductors from the substation to the generator include [REDACTED]. The continuous thermal operating ratings are [REDACTED], respectively. There is adequate conductor ampacity on this feeder to serve this proposed project.

However, with the existing distribution facilities and the generation project at unity power factor the voltage flicker cannot be contained to 5% when the generation starts up or is tripped off. As a result, the generating facility will have to run at a 99% power factor. That is, the facility will have to absorb 180 kVAR when generating. Because [REDACTED] has the ability to provide those VARs no additional VAR support is needed on the feeder to help meet that required power factor.

The POI will be to the existing 12.5 kV grounded wye feeder [REDACTED] in Jerome County, Idaho. Refer to Appendix A section 3 for additional grounding requirements.

8.0 Circuit Breaker Short Circuit Limits

The feeder breakers at [REDACTED] Substation [REDACTED] are each Square D type "SF6" breakers designed for [REDACTED] continuous load current and each have a maximum fault current interrupting rating of [REDACTED]. These breakers are operating on 34.5 kV feeders.

The maximum available fault current with the 1.25 MW [REDACTED] project connected is approximately [REDACTED]. [REDACTED], the proposed generator will contribute about [REDACTED] of fault current. This study indicates that there is adequate short circuit interrupting capability on these breakers for the addition of the generators.

9.0 Description and Cost Estimate of Required Facility Upgrades

There are no upgrades to the IPCo system for the connection of this project.

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Since the generation will be located along with Idaho Power customer loads, a generation interconnection package will be required at the point of interconnection. The generator interconnection protection package will include four distribution poles to mount a local service transformer, solid blade disconnects, primary metering package, recloser, relays, fuses and riser per Idaho Power’s standard for generators connected to the distribution system.

The estimated cost to interconnect the 1.25 MW hydroelectric generation project is shown in Table 1. The estimated costs below include installation labor costs, IPC overheads and Idaho State sales tax. Tax Gross Up has not been included presuming construction of interconnection facilities will not qualify under IRS rules as a taxable event.

Description	Estimated Cost
Generation Interconnection Protection Package	\$200,000
Total Estimated Cost	\$200,000

Table 1: Estimated Costs for Generator Interconnect

10.0 Description of Operating Requirements

In addition to the upgrades listed in section 9.0 of this report, the proposed project must meet several operating requirements. Voltage flicker at startup and during operation will be limited to less than 5% as measured at the point of interconnection. In order to meet this, the project must be controlled to operate at a 99% power factor (underexcited) or meet the voltage schedule provided by Idaho Power. If this requirement cannot be met, further voltage studies will be necessary.

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*. The project must also limit the ground fault current at the point of interconnection to 20 Amps. See Appendix A for more details.

11.0 Conclusions

The requested interconnection of the 1.25 MW [REDACTED] Project to Idaho Power's system was studied. The results of this study confirm that the existing Idaho Power system can handle this project. No Transmission System Impact Study will be required but transmission rights still need to be secured.

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APPENDIX A

A-1.0 Method of Study

The Feasibility Study 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 Version 12, examines the impacts of the new resource on Idaho Power's transmission system (lines, transformers, etc.) within the study area under various operating/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 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 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 everywhere on the feeder. Therefore, voltages greater than or equal to 0.95 p.u. voltage and less than or equal to 1.05 p.u. 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.

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The stable operation of the system requires an adequate supply of volt-amperes reactive (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 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 Requirements

Idaho Power Company (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, <http://www.idahopower.com/aboutus/business/generationInterconnect/>.

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.

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