GENERATOR INTERCONNECTION
FEASIBILITY STUDY

For integration of the proposed

PROJECT #256

In

To the

IDAHO POWER COMPANY ELECTRICAL SYSTEM

For

The

INTERCONNECTION CUSTOMER

FINAL REPORT

AUGUST 12, 2008

EM

1.0 Introduction

, has contracted with Idaho Power Company (IPC) to perform a Generator Interconnection Feasibility Study for the integration of their new 18.0 MW (project #256 in queue). The proposed location of the project is in Idaho Power's Capital Region service territory in . This location is near the , and is approximately 1.0 miles north and 7.5 miles east of Idaho Power's existing .

This report documents the basis for and the results of this Feasibility Study for the Project. 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 an 18 MW consisting of generators. These generators will interconnect with the IPC system in , near County, Idaho. At the request of the interconnection customer, a maximum 15 MW generation was also considered at the proposed interconnection site; the results of the study remained the same for the two different generation amounts.

Two IPC transmission lines are each located approximately 10 miles away from the proposed interconnection site: the 138kV line and the 138kV line . After considering the other proposed generation projects in the queue ahead of this project, there is adequate capacity available in this area to serve this project. However, a System Impact Study will be required to determine the transmission upgrades needed to serve the generation.

The substation serving this area is IPC's substation. Currently, there is adequate capacity at this substation to serve the proposed 18 MW . The distribution feeder serving this area is . Upgrades to the feeder will be necessary to serve this project if the generator operates at 18 MW. Approximately 3/4 miles of the existing feeder will need to be reconductored with 397 ACSR from the station along . Generation operation at 15 MW would cause no circuit remediation work.

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 $345,000 at 18 MW operation and $225,000 at 15 MW operation.

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 at the following URL:

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

4.0 Description of Proposed Generating Project

The Project proposes to connect to the Idaho Power approximately 18 MW of generation (maximum project output) using generators, each rated

5.0 Description of Existing Transmission Facilities

Two IPC transmission lines are located approximately 10 miles away from the proposed interconnection site: the 138kV line and the 138kV line

The 138kV wood-pole line is constructed with 397.5 kcmil ACSR conductor on its east side and 795 AAC on its west side. The continuous thermal operating ratings of the conductors are 141 MVA for 397.5 ACSR and 218 MVA for 795 AAC.

The 138kV wood-pole line is constructed with 715 AAC conductor. The continuous thermal operating rating of 715 AAC conductor is 203 MVA.

After considering the other proposed generation projects in the queue ahead of this project, there is adequate capacity available in this area to serve this project. However, a System Impact Study will be required to determine the transmission upgrades needed to serve the generation. The System Impact Study will detail existing transmission system limitations and describe the improvements necessary to increase the capacity of this system. The proposed study will determine the additional work necessary to integrate this project into the IPC 138kV system.

6.0 Description of Existing Substation Facilities

The IPC substation serving this area is substation, which is located south of in . The existing substation transformer is a 138-36.2/20.9 kV transformer rated at 18/24/30 MVA. There is adequate capacity at substation to interconnect this 18 MW hydro generation project.

7.0 Description of Existing Distribution Facilities

The point of interconnection will not be at the interconnection customer's current metering site; rather, the customer will interconnect at a location immediately south of the IPC line regulators RG88 on . See Appendix B, Vicinity Map. This location is in the vicinity of the , near the .

is a 34.5 kV feeder, grounded wye, operating at 34.5 kV and 12.5 kV. The point of interconnection will occur at the 34.5 kV voltage level. The conductor types from the substation to the point of interconnection include 500 CU UG, 336 Al, and 2/0 ACSR. The continuous thermal operating ratings of these conductor types are 29.9 MVA, 32.0 MVA, and 18.6 MVA, respectively.

Considering other loads and generation on the system, sections of the feeder will be overloaded and will require upgrades if the project operates at 18 MW (see Appendix B for upgrade location and details). However, if the project operates at a maximum of 15MW, there is adequate conductor ampacity on this feeder to serve all scenarios considered.

The point of interconnection will be to the existing 34.5 kV grounded wye feeder. Refer to Appendix A section 3 for additional grounding requirements.

8.0 Circuit Breaker Short Circuit Limits

The two feeder breakers at are each ABB type "V" breakers designed for 1200 amps continuous load current and each have a maximum fault current interrupting rating between 25,000 and 40,000 amps. These breakers are operating on 34.5 kV feeders.

With the reconductored circuit also included in the calculation, the short circuit current contribution from the generators at the project is approximately 1800 Amps of fault current. This study indicates that there is adequate short circuit interrupting capability on the breakers for the addition of the two generators.

9.0 Description and Cost Estimate of Required Facility Upgrades

The existing distribution system must be upgraded to interconnect the 18 MW . To remediate 110% loading on the 2/0 ACSR conductor immediately outside the substation, approximately 3/4 miles of existing distribution line must be reconductored with 397 ACSR. The reconductored line will run from the station along , where there is existing 397 ACSR on the circuit. A drawing of the proposed work can be found in Appendix B. However, if the generators operate at 15 MW, there is no overloaded conductor on the circuit, and no additional costs would ensue.

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 estimated costs to interconnect the 18 MW project at for , at 18 MW and 15 MW operating conditions, are shown in Table 1. The generator interconnection protection package includes a 34.5 kV recloser, controls, CTs, PTs, and communications per Idaho Power's standard for generators connected to the distribution system. 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, 18 MW	Estimated Cost, 15 MW
Approximately ¾ miles of distribution line upgrades to 397 ACSR.	$120,000	$0
Generation Interconnection Protection Package (Includes 34.5 kV recloser, controls, CTs, PTs, and communications	$225,000	$225,000
Total Estimated Cost	**$345,000**	**$225,000**

Table 1: Estimated Costs 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. The project must be controlled to operate at unity power factor or meet the voltage schedule provided by Idaho Power. If this requirement can not be met, further voltage studies will be necessary. Voltage flicker at startup and during operation will be limited to less than 5% as measured at the point of interconnection. It is preferable to bring each generating unit online separately to minimize voltage flicker on the distribution system.

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 18 MW to Idaho Power's system was studied. The results of this study confirm that the existing Idaho Power system can be upgraded to handle this project.

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.

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.

APPENDIX B
1. Vicinity Map

2. Proposed Work