GENERATOR INTERCONNECTION
FEASIBILITY STUDY

For integration of the proposed

GENERATOR INTERCONNECT PROJECT #274

In

OWYHEE COUNTY, IDAHO

To the

IDAHO POWER COMPANY ELECTRICAL SYSTEM

FINAL REPORT

MAY 7, 2009

1.0 Introduction

Generator Interconnect Project (GINT) #274 has contracted with Idaho Power Company (IPC) to perform a Generator Interconnection Feasibility Study for the integration of its 10.0MW photovoltaic project.

This report documents the basis for and the results of this Feasibility Study for GINT #274. 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 10MW photovoltaic project consisting of five 2000 kW solar inverters.

[redacted]. 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.

The substation serving this area is IPC's [redacted] substation. Currently, there is adequate capacity at this substation to serve the proposed 10MW photovoltaic project. The distribution feeder serving this area is [redacted]. Upgrades to the feeder will be necessary to serve this project whether the customer only operates a single 2000kW generator or whether they operate all five 2000kW generators.

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 $508,000.

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

GINT #274 proposes to connect to the Idaho Power system approximately 10MW of generation (maximum project output) using five solar inverters, each rated 2000kW.

5.0 Description of Existing Transmission Facilities

Two IPC transmission lines are each located within proximity of the proposed interconnection site. 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.

6.0 Description of Existing Substation Facilities

The IPC substation serving the area surrounding GINT #274 has adequate capacity to interconnect this 10MW photovoltaic project.

7.0 Description of Existing Distribution Facilities

The distribution feeder serving the area surrounding GINT #274 is [redacted]. [redacted] 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 34.5kV voltage level.

Interconnecting GINT #274 to the 34.5kV system will require a facility upgrade; approximately 8500 feet of existing 12.5kV wood pole line will be overbuilt to operate at 34.5kV. This new 34.5kV line will serve as the generators' point of interconnection.

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 [redacted] feeder breaker is a GE type "OR-H" breaker designed for 1120 amps continuous load current with a maximum fault current interrupting rating of 12,000 amps. This breaker operates on a 34.5 kV feeder.

With the facility upgrade also included in the calculation, the short circuit current contribution from the five 2000kW synchronous generators at the GINT #274 is approximately 1650 Amps of fault current. This study indicates that there is adequate short circuit interrupting capability on the [redacted] substation breakers for the addition of the five generators.

9.0 Description and Cost Estimate of Required Facility Upgrades

The existing distribution system ([redacted]) must be upgraded to interconnect the 10MW GINT #274. To provide a 34.5kV interconnection voltage, approximately 8500 feet of existing 12.5kV wood pole line must be overbuilt with conductor operating at 34.5kV.

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 10MW GINT #274 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***
Overbuild approximately 8500 feet of existing 12.5kV line with conductor operating at 35kV.	$388,000
Generation Interconnection Protection Package (Includes 34.5 kV recloser, controls, CTs, PTs, and communications).	$120,000
Total Estimated Cost	$508,000

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 details.

11.0 Conclusions

The requested interconnection of the 10MW GINT #274 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.