**GENERATOR INTERCONNECTION**

**FEASIBILITY STUDY REPORT**

for integration of the proposed

[redacted]

**IPC PROJECT QUEUE #[redacted]**

to the

**IDAHO POWER COMPANY ELECTRICAL SYSTEM**

for

[redacted]

**REPORT v.0**

**June, 2022**

# Revision History

| Date | Revision | Initials | Summary of Changes |
|---|---|---|---|
| 6/14/2022 | 0 | DLJ | FeSR GI #[redacted] – Original issue. |

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## 1.0 Introduction

[redacted] has contracted with Idaho Power Company (IPC) to perform a Generator Interconnection Feasibility Study for the integration of the proposed [redacted] upgrade [redacted] (the Project). The Project is located in IPC's [redacted] Region at [redacted] (See Figure 2: POI of [redacted] – GI # [redacted] in Appendix B). The Project is Generation Interconnect queue number [redacted] (GI #[redacted]).

The Project has applied to connect to the IPC distribution system for an injection of [redacted] upgrade at a single Point of Interconnection (POI) at a [redacted] distribution voltage level. The POI is located [redacted] from the Eckert (EKRT) substation at [redacted].

This report documents the basis for and the results of this feasibility impact study for the GI #[redacted] 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 impact of interconnecting the [redacted] upgrade Project to IPC's EKRT substation was evaluated.

The proposed POI provided is in EKRT-041 feeder service territory.

EKRT-041 is a medium to heavy loaded feeder that already hosts a 3500 kW electric generator near the GI#[redacted] POI and approximately 963 kW of roof top solar net metering. The addition of [redacted] upgrade [redacted] GI#[redacted] will increase the reverse power flow during light load conditions on EKRT-041 and the EKRT Substation.

The preliminary power flow analysis indicated that interconnecting the [redacted] to EKRT-041 will not adversely impact the IPC system. Additionally, Operating Requirements will require the generator to provide leading and lagging reactive power as detailed in section 12.0 of this report.

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

Generator interconnection service, either as an Energy Resource or a Network Resource, does not in any way convey any right to deliver electricity to any specific customer or point of delivery.

## 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

[redacted], GI #[redacted], consists of a single POI with 3 phase synchronous generators and has requested to connect to Idaho Power's [redacted] distribution system. [redacted] requested that [redacted] upgrade to the existing 18 MW total injection at the POI be studied.

## 5.0 Description of Transmission Facilities

The Project, GI #[redacted], is in IPCO's [redacted] load serving area and does not directly impact any monitored transmission path.

## 6.0 Description of Substation Facilities

Idaho Power's EKRT station is located in Ada County, Idaho. EKRT station is fed by a 138 kV transmission line. The substation transformer feeding EKRT-041, [redacted], is a three-phase [redacted] delta wye-grounded transformer rated for [redacted]. [redacted] currently serves two distribution feeders: [redacted].

## 7.0 Description of Distribution Facilities

The Project was studied with a [redacted] connection to EKRT-041. This is a grounded-wye feeder operating at [redacted]. The Project has 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.

## 9.0 Description of Power Flow Case

The Project was studied using DNV-GL Synergi load flow analysis software to analyze the impact to the EKRT-041 distribution feeder. The Project was studied at peak load and minimum load conditions with all generators on the feeder generating at 100% output.

## 10.0 Power Flow Analysis Study Results

The distribution modeling studies showed that the [redacted] conductor at the feeder/circuit head will support the additional generation request.

System Planning reviewed the study requirements and did not see any additional impact on the transmission system.

## 11.0 Short Circuit Study Results

[redacted]

Table 1: GI #[redacted] Short Circuit Currents, POI

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

The existing protection for [redacted] is a standard co-generation interconnect package with standardized interconnect settings. Increasing the generator output from [redacted] would not impact the protection package nor settings.

## 12.0 Description of Required Facility Upgrades

No upgrades due to the increased [redacted] generation limit request are required.

## 13.0 Description of Operating Requirements

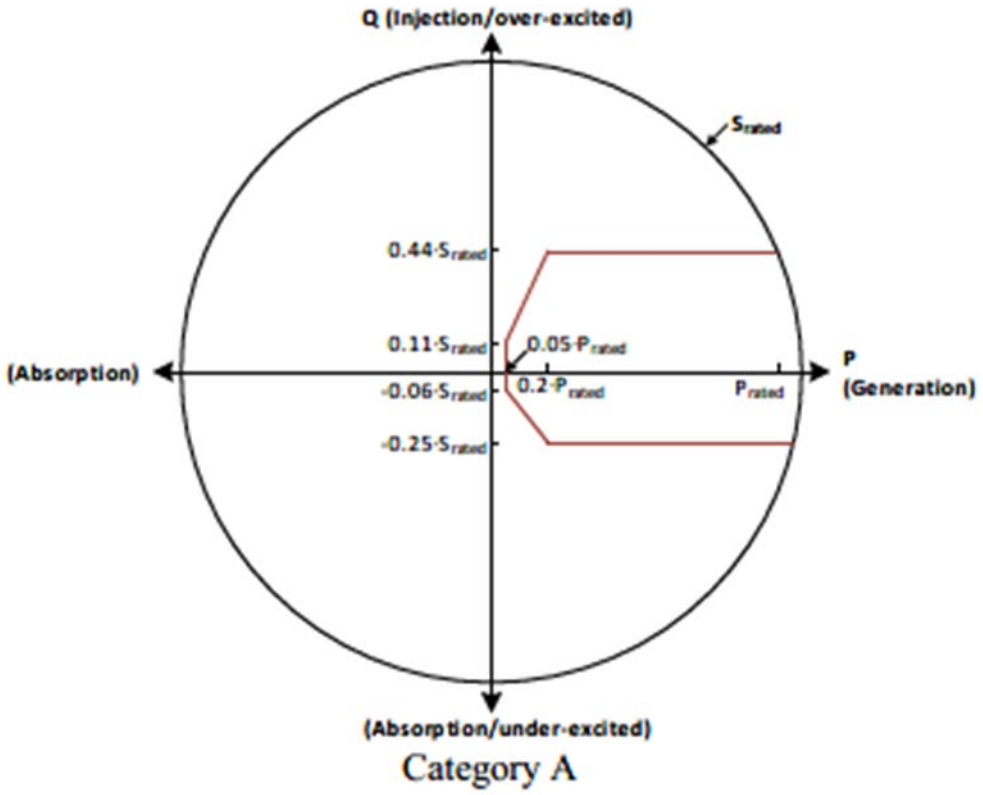


**Figure 1: Operating Requirements (IEEE 1547-2018)**

The Project shall be capable of injecting reactive power (over-excited) equal to [redacted] and absorbing reactive power (under-excited) equal to [redacted] 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. This is the requirement for the entire project and not just one generator. For clarification:

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*.

## 14.0 Conclusion

The requested [redacted] interconnection upgrade of the [redacted], GI #[redacted], to Idaho Power's system was studied. The Project will interconnect to EKRT-041 feeder at the [redacted] distribution voltage level.

The results of this study confirm that GI #[redacted], [redacted] will not adversely impact the IPC system. Operating Requirements will require the generator to provide leading and lagging reactive power as detailed in section 12.0 of this report.

All generation Projects in the area ahead of the Project in the IPC generation interconnection queue and their associated transmission system improvements were included in this study.

Generator interconnection service, either as an Energy Resource or a Network Resource, does not in any way convey any right to deliver electricity to any specific customer or point of delivery. A System Impact Study is not required.

## APPENDIX A

### A-1.0 Method of Study

The Transmission System Impact Study plan inserts the Project up to the maximum requested injection into the selected Western Electricity Coordinating Council (WECC) power flow case and then, using Power World Simulator or GE's Positive Sequence Load Flow (PSLF) analysis tool, examines the impacts of the new resource on Idaho Power's transmission system (lines, transformers, etc.) within the study area under various operating and 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 DNV·GL's Synergi Electric 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 that, in part, 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 (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 Guidance

IPC requires interconnected transformers on the distribution system 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

[redacted]

**Figure 2: [redacted] GI #[redacted] Site Location**