GENERATOR INTERCONNECTION

SYSTEM IMPACT STUDY RESTUDY REPORT

for integration of the proposed

1050 MW [redacted] PROJECT

(GI PROJECT #570)

to the

IDAHO POWER COMPANY ELECTRICAL SYSTEM

in

JEROME, LINCOLN, and MINIDOKA COUNTIES; IDAHO

for

[redacted]

Report v.0

May 12, 2021

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Revision History

Date	Revision	Initials	Summary of Changes
05/12/2021	0	MDH	Initial Report

1.0 Introduction

[redacted] has contracted with Idaho Power Company ("Transmission Provider") to perform a Generator Interconnection System Impact Study Restudy (SIS-Restudy) for the integration of the proposed 1050 MW [redacted] project (Project). The Project's location is in Idaho Power Company's (IPC's) Southern Region in Jerome, Lincoln, and Minidoka Counties; Idaho. The project is Generation Interconnect (GI) queue number 570 (GI #570). The project has chosen in the SIS-Restudy to be studied as both an Energy Resource (ER) Interconnection Service and a Network Resource (NR) Interconnection Service.

The Project has applied to connect to the Idaho Power's transmission system for an injection of 1050 MW at a single Point of Interconnection (POI) at [redacted] at Idaho Power's [redacted] bus. A SIS-Restudy was required due to [redacted] request to modify the Project to add a 500 MW Battery Energy Storage System (BESS). However, it didn't result in a material modification requiring the Project to withdraw and re-enter with a new GI queue position because [redacted] agreed to limit the combined output of the original 1050 MW wind project and the 500 MW BESS to the Project's previous stated 1050 MW output. For the purpose of the SIS-Restudy, the wind generation was modeled at ~567 MW and the BESS at 515 MW with a resulting net output at the POI of 1050 MW.

IPC project queue GI #530 is a senior queued project and the facilities and subsequent cost to integrate GI #570 1050 MW [redacted] project is potentially contingent on GI #530 integration facilities.

This report documents the basis for and the results of this SIS-Restudy for the GI #570 Generation Interconnection Customer. The report describes the proposed project, the determination of the project interconnection requirements and estimated costs for integration of the project to the Transmission Provider transmission system. This report satisfies the System Impact Study requirements of the Idaho Power Tariff.

2.0 Summary

The system impact of interconnecting the GI #570 1050 MW combined wind and BESS generation project to the Transmission Provider's transmission system was evaluated. GI #570 can be interconnected to the Idaho Power transmission system. The Point of Interconnection (POI) is located at Idaho Power's [redacted] station.

The SIS-Restudy determined if any additional network upgrades are required to integrate this project into the IPCo transmission system and evaluated full system impacts (thermal, voltage, transient stability, reactive margin). 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.

The GI #570 is a combined wind and BESS generation project. It has been assumed the BESS will be charged via the wind output. [redacted] will need to demonstrate the operating procedures and control measures which prevents the BESS from being charged via IPC's transmission system. However, if the intent is also to be able to charge the BESS via IPC's transmission system, [redacted] will need to make an IPC Large Load Service request.

The Project's combined output from the original 1050 MW wind project and the 500 MW BESS will be limited to the Project's previous stated 1050 MW output.

It is the Project's responsibility to provide reactive power capability of the project to have a power factor operating range of at least 0.95 leading (absorbing) to at least 0.95 lagging (supplying) at the POI over the range of real power output (up to maximum output of the project) and for all modes of operations (wind generation only, combined wind/BESS (charging and discharging), and BESS generation only).

GI #570 will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations. GI #570 will be required to manage the real power output of their generation project at the POI. Also, it may be beneficial for [redacted] for their own modeling compliance requirements, to install additional PMU devices at their facilities to monitor the generation source(s).

The total "Energy Resource Interconnection Service" generation interconnection preliminary cost estimate to interconnect the project to the primary study POI is as follows:

- Energy Resource Interconnection Service at proposed [redacted] POI - **$6,578,281**

See Section 6.5 Energy Resource Cost Estimate for the required Energy Resource facilities and cost breakdowns.

If GI #570 selects Energy Resource Interconnection Service only and the [redacted]

[redacted] generation tripping Remedial Action Scheme (RAS) is selected as the alternative to constructing GI #530 transformer/transmission interconnection facilities, a System Impact re-study of GI #570 will need to be commissioned to fully determine [redacted] RAS generation tripping requirements.

The total "Network Resource Interconnection Service" generation interconnection preliminary cost estimate to interconnect the [redacted] project is as follows:

- Network Resource Interconnection Service - **$51,235,718**

See Section 7.5 Network Resource Cost Estimate for the required Network Resource facilities and cost breakdowns. Both the Energy Resource and Network Resource cost estimates includes a 20% contingency and 7.25% overhead. These are cost estimates only and final charges to the customer will be based on the actual construction costs incurred. It should be noted that the preliminary cost estimates do not include the cost of the customer's owned equipment.

The schedule for designing, procuring, and constructing facilities will be developed and optimized during the Facility Study should the generation interconnection customer choose to move to that study phase of the interconnection process.

3.0 Scope of Interconnection SIS-Restudy

The Interconnection SIS-Restudy was done and prepared in accordance with the Transmission Provider's Standard Generator Interconnection Procedures to provide a preliminary evaluation of the system impact of the interconnection of the proposed generating project to the Idaho Power system. As listed in the Interconnection SIS-Restudy agreement, the Interconnection SIS-Restudy report provides the following information:

- identification of any circuit breaker short circuit capability limits exceeded because of the interconnection;
- identification of any thermal overload or voltage limit violations resulting from the interconnection; and
- identification of any instability or inadequately damped response to system disturbances resulting from the interconnection and
- description and non-binding estimated cost of facilities required to interconnect the Large Generating Facility to the IPC 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 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 Contingent Facilities

IPC projects queue GI #530, GI #551, GI #557, GI #561, GI #567, and GI #568 are senior queued project in the affected area of IPC's transmission system.

GI #570 Energy Resource, ER, Interconnection Service at the [redacted] POI is contingent upon upgrades associated with the senior queued project #530. Because GI #530 generation interconnection plan of service is to split the [redacted] line ([redacted] lines), the [redacted] series compensation was required to be replaced, and with part of the existing series compensation in the form of a new [redacted] series capacitor bank relocated to [redacted] in the [redacted] line. If GI #530 in-service date is delayed and/or withdraws their project, GI #570 will be responsible for some or all the [redacted] series compensation replacement. And, because of GI #570 [redacted] station interconnection, the [redacted] series capacitor will likely need to be replaced due to its size i.e. current rating.

Idaho Power Company project queue GI #530 is a senior project. Some of the ER/NR transmission interconnection facilities identified for GI #530 are required by GI #570 (Contingent Facilities). Changes to GI #530, including in-service date and withdrawal from the queue, may trigger a restudy associated with GI #570. Contingent Facilities are detailed in Appendix B. Without the parallel [redacted] interconnection facilities provided by the senior queue GI #530 project, the loss of the [redacted] with the GI #570 1050 MW combined wind and BESS generation project resulted in overloads in the [redacted] and [redacted] transmission facilities.

For Energy Resource Interconnection Service only, the following projects were evaluated as alternatives to constructing GI #530 [redacted] interconnection facilities if the GI #530 project withdraws:

- The [redacted] identified Network Resource Interconnection Service Upgrade (~$38M).
- The [redacted] integration of [redacted] into the Treasure Valley Project (~$21M).
    - Second [redacted] Line.
    - [redacted] Line.
- [redacted] interconnection at [redacted].
- A [redacted] generation tripping Remedial Action Scheme (RAS), which

would be required to trip ~500 MW of generation under heavy Idaho to Northwest import conditions (i.e. [redacted] line flows) and maximum [redacted] Project generation of 1050 MW, was evaluated. Performance was marginally acceptable at 500 MW [redacted] RAS generation tripping. MVE generation tripping RAS mitigated overloads in the [redacted] transmission facilities but potentially could result in overloading the [redacted] line at higher levels of [redacted] generation than what was studied. The overall lack of effectiveness of the RAS, which requires the large amount of [redacted] generation tripping for mitigation, is due to the Northwest's make-up generation response to the [redacted] generation trip component on the [redacted] line back-filling the relief obtained on the [redacted] line from the generation trip. In essence, the relief on the [redacted] line from tripping MVE generation is partially erased due to the make-up generation response coming from the Northwest on the [redacted] line.

As an Energy Resource Interconnection Service, the [redacted] RAS generation tripping make-up generation will not be the responsibility of Idaho Power Company and can potentially exceed Idaho Power Company's present contingent operating reserves requirements. If GI #570 selects Energy Resource Interconnection Service only and the [redacted] generation tripping RAS is selected as the alternative to constructing GI # 530 transformer/transmission interconnection facilities, a System Impact re-study of GI #570 will need to be commissioned to fully vet/determine [redacted] [redacted] line flows versus [redacted] generation tripping arming level and [redacted] generation tripping requirements.

5.0 Description of Proposed Generating Project

The primary point of interconnection for GI #570 is at Idaho Power's [redacted] station. GI #570 Project's is a combined wind and BESS generation project with a maximum 1050 MW delivered at the POI. The Project's location is in Idaho Power Company's (IPC's) Southern Region in Jerome, Lincoln, and Minidoka Counties; Idaho. The Project's Commercial Operation Date (COD) is December 1, 2023.

GI #570

- One 11.7-miles [redacted] transmission line (Project to POI)
- Two [redacted] station transformers with a 383/510/637 MVA capacity each
- Five [redacted] lines with lengths ranging from 4.9 to 18.0 miles
- Five [redacted] GSU transformers from 225 to 285 MVA
- 363 GE 3.03-140 wind turbines – 3.189/3.03 MVA/MW with a Power Factor 0.95

dispersed among the five Collector Stations ([redacted])

- Five 103 MW BESS's (108.8 MVA with a Power Factor 0.95) each to be located on the 34.5kV bus of the five Collector Stations [redacted] GSU transformers.
- Total plant limited to 1050 MW at the [redacted] POI
- All generation in voltage regulation (Reactive capability used to regulate voltage – supply/absorb reactive)

6.0 Energy Resource (ER) Interconnection Service

Energy Resource (ER) Interconnection Service allows the Interconnection Customer to connect its Generating Facility to Transmission Provider's transmission system and to be eligible to deliver electric output using firm or non-firm transmission capacity on an as available basis.

The GI #570 project has applied to connect to the Idaho Power transmission system for an injection of 1050 MW with a new [redacted] line-terminal at Idaho Power's [redacted] station. All generation projects in the area ahead of this project in the IPC generation queue and their associated transmission system improvements were modeled in a preliminary power flow analysis to evaluate the feasibility of interconnecting GI #570. For the purpose of the SIS-Restudy ER study, the wind generation was modeled at ~567 MW and the BESS at 515 MW with a resulting net output at the POI of 1050 MW.

6.1 Description of Substation/Transmission Facilities

As an Energy Resource, a Transmission Service Request will be required to determine the specific Network Upgrades required to deliver the project output to a designated point of delivery. Listed below are the required transmission facilities to interconnect the Project; and, no additional transmission facilities were identified to be required in the SIS-Restudy ER study. The facilities required for interconnection are consistent with the facilities identified in the Generation Interconnection Feasibility Study:

Substation/Transmission Interconnection Facilities:

The proposed generation interconnection will require a new [redacted] line terminal bay which requires two [redacted] breakers.

[redacted]

- New [redacted] Line Terminal for ER Interconnection Service

The actual station layout and detailed equipment requirements will be determined in the Facility Study should the interconnection customer choose to move to that study phase of the interconnection process.

6.2 Description of Distribution Facilities

No distribution facilities are directly impacted by this project.

6.3 Short Circuit Study Results

The short circuit/fault duty at the GI #570 POI [redacted] bus location (with/without GI #570 and BESS modeled) is as follows:

Fault Study (w/o GI #570)			
Location	SLG (A)	LTL (A)	3PH (A)
[redacted] Bus	12,994	12,618	14,855

Fault Study (w/ GI #570, w/o BESS)			
Location	SLG (A)	LTL (A)	3PH (A)
[redacted] Bus	13,111	12,919	15,178

Fault Study (w/ GI #570, with BESS)			
Location	SLG (A)	LTL (A)	3PH (A)
[redacted] Bus	13,739	13,377	15,660

Studies indicate that there is adequate load and short circuit interrupting capability on the Transmission Provider's existing [redacted] breakers after this project is interconnected.

6.4 Electric System Protection Results and Grounding Requirements

For [redacted] line protection, the Transmission Provider's System Protection Department utilizes permissive and line differential protection schemes integrated with our existing digital communication infrastructure. Digital communication infrastructure for the interconnection customer's [redacted] line terminal will be the responsibility of said interconnection customer.

The project single line does not indicate the winding configuration on the [redacted] side of the [redacted] transformers. Idaho Power requires a wye grounded connection on the high side and delta included in the transformer to create a solid ground path for the transmission system. This can be achieved with autotransformers with a delta tertiary which is a source of ground current, other configurations can and do exist. Refer to Appendix A, Section 3.0, for additional protection and grounding requirements.

6.5 Energy Resource Cost Estimate

In Table 1 below a summary is provided of the generation interconnection facilities and conceptual costs required to interconnect the GI #570 project to the Transmission Provider's

transmission system as an Energy Resource.

GI #570 [redacted] Project **Energy Resource Generation Interconnection Facilities**	
Interconnection Facilities	**Cost**
[redacted] Station New [redacted] Line Terminal Bay (~5%)	$250,000
Network Facilities	
[redacted] Station New [redacted] Line Terminal Bay (with two [redacted] breakers)	$4,861,329
Subtotal	**$5,111,329**
Contingencies (~20.0%) (1)	$1,022,266
Subtotal	**$6,133,595**
Overheads (~7.25%) (2)	$444,686
Energy Resource – Total Estimated Cost (3)	**$6,578,281**

Table 1. Estimated GI #570 Project's Energy Resource Generation Interconnection Costs

(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, and overheads as shown.

- Note that these estimates do not include the cost of the customer's equipment/facilities or required communication circuits for SCADA, PMU, and metering.
- Note that the overhead rates are subject to change during the year.
- These are estimated costs only and final charges to the customer will be based on the actual construction costs incurred.
- These are non-binding conceptual level cost estimates that will be further refined upon the request and completion of the Facility Study.

The above Interconnection Facilities are an estimate and a more accurate breakdown between Interconnection Facilities and Network Facilities will be performed in the Facility Study. The schedule for designing, procuring, and constructing facilities will be developed and optimized during the Facility Study should the generation interconnection customer choose to move to that study phase of the interconnection process.

7.0 Network Resource (NR) Interconnection Service

Network Resource Interconnection Service allows the Interconnection Customer to integrate its Generating Facility with the Transmission Provider's Transmission System in a manner comparable to that in which the Transmission Provider integrated its generating facilities to serve native load customers. The transmission system is studied under a variety of conditions to determine the transmission improvements/upgrades which are necessary. Network Resource Interconnection Service in and of itself does not convey Transmission Service.

7.1 Network Resource Single Event Exposure

If the full [redacted] 1050 MW Project elects to move forward as an Idaho Power Network Resource, consideration must be given to the amount of generation that can be lost due to a single event (for example a single [redacted] line outage, bus fault, or breaker failure). Loss of 1050 MW of generation is well beyond Idaho Power's current capability.

Section 23 and Section 24 of Business Practices, Waivers, and Exemptions on the Idaho Power OASIS site discusses Capacity Benefit Margin (CBM) and Transmission Reliability Margin (TRM) respectively. These business practices are in accordance with Idaho Power's OATT, Commission orders, Commission regulations, and Commission approved NERC Standards. Idaho Power currently reserves 330 MW of CBM based upon Idaho Power's Most Severe Single Contingency (MSSC). Moreover, Idaho Power's contingent operating reserves are also based on the MSSC. As a Network Resource Idaho Power cannot tolerate a single contingency loss of GI #570 1050 MW project. This would represent a significant increase to Idaho Power's MSSC.

For a NR Interconnection Service interconnection, the GI #570 interconnection will require a second [redacted] line, not on a common structure and preferably geographically diverse, from the Project to the [redacted] station, and the Project's [redacted] station will be required at a minimum to be a four-position ring-bus configuration – two [redacted] line terminals and two [redacted] transformers with alternating ring-bus positions between line terminals and [redacted] transformers.

And, several deficiencies were also identified in the Project's conceptual 500/230kV station which could expose Idaho Power to generation loss greater than our present MSSC:

- Loss of a single [redacted] MVA transformer will result in generation curtailment greater than Idaho Power's present MSSC.
- Loss of both [redacted] transformer due to a common [redacted] breaker-failure.
- Loss of Project's generation ([redacted]) due to common [redacted] breaker-failures between [redacted] collector lines.

The actual station layout and detailed equipment requirements will be determined in the

Facility Study should the interconnection customer choose to move to that study phase of the interconnection process.

7.2 Description of Power Flow Cases

For the Network Resource Interconnection Service study, two power flow cases were used to study the Transmission Provider's transmission system with westbound and eastbound transmission flows to determine the required Network Transmission Upgrades. For the purpose of the SIS-Restudy NR study, the wind generation was modeled at ~567 MW and the BESS at 515 MW with a resulting net output at the POI of 1050 MW.

The WECC 2020 Heavy Summer case was chosen as a power flow base case for the study. The case was modified to represent a summer month with high west to east (eastbound) transfers across the Midpoint West and Borah West transfer paths.

For the second case, a WECC 2019 Light Winter operating case, was modified to represent a shoulder month condition with high east to west (westbound) transfers across Midpoint West. Eastern generation resource in Wyoming and Utah were displaced by the Project's 1050 MW generation.

7.3 Power Flow Analysis Results

Results from the high Midpoint West/Borah West eastbound transfer case indicate the addition of the GI #570 project will result in a single pre-contingency overload and post-contingency overloads for thirteen contingencies. The following list are the overloaded contingency from the eastbound transfer case. No contingency violations were identified in the westbound transfer case.

1. P0: Steady-State (system normal)
   a. Pre-contingency loading 105.8% of the nominal rating of [redacted] Transformer.
2. P1: [redacted] Transformer
   a. Post-contingency loading 124.8% of the emergency rating of [redacted] (31.7 miles).
   b. Post-contingency loading 115.3% of the emergency rating of [redacted] (24.4 miles).
3. P1/P2: Twelve Contingencies
   a. Post-contingency loading 100.0 to 105.3% of the emergency rating of [redacted] Transformer.

7.4 Network Resource Transmission Upgrades

From the SIS-Restudy power flow/contingency analysis, the following Network Transmission upgrades were identified for the integration of GI #570 in addition to the Energy Resource

generation interconnection facilities.

Midpoint Station

- Build a 2nd [redacted] Line Terminal for NR Interconnection Service
- Install new [redacted] Transformer

IPC projects queue GI #530, GI #551, GI #557, GI #561, GI 567, and GI #568 are senior queued project in the affected area of IPC's transmission system. Idaho Power studied GI #570 with all Network Upgrades identified for senior queued projects as in service. Changes to senior queued projects including in-service date and withdrawal from the queue, may trigger a restudy associated with GI #570 Network Resource, NR, service.

7.5 Network Resource Cost Estimate

Table 2 below is a summary of the Network Transmission generation interconnection facilities and conceptual costs required to interconnect the GI #570 project to the Transmission Provider's transmission system as a Network Resource.

GI #570 [redacted] 1050 MW Project Network Resource Generation Interconnection Facilities	
Network Resource Transmission Upgrades:	**Cost**
Interconnection Facilities	
[redacted] 2nd [redacted] Line Terminal Bay (~5%)	$250,000
Network Facilities	
[redacted] 2nd [redacted] Line Terminal Bay (with two [redacted] breakers)	$4,861,329
New [redacted] Transformer	$29,587,534
Subtotal	**$34,698,863**
Contingency (~20%)	$6,939,773
Subtotal	**$41,638,636**
Overheads (~7.25%)	$3,018,801

Network Transmission – Total Estimated Cost	**$44,657,437**
Energy Resource – Estimated Costs	$6,578,281
Network Resource – Total Estimated Cost (3)	**$51,235,718**

Table 2. Estimated GI #570 Network Resource Generation Interconnection Costs

(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, and overheads as shown.

- Note that these estimates do not include the cost of the customer's equipment/facilities or required communication circuits for SCADA, PMU, and metering.
- Note that the overhead rates are subject to change during the year.
- These are estimated costs only and final charges to the customer will be based on the actual construction costs incurred.
- These are non-binding conceptual level cost estimates that will be further refined upon the request and completion of the Facility Study.

The above Interconnection Facilities are an estimate and a more accurate breakdown between Interconnection Facilities and Network Facilities will be performed in the Facility Study. The schedule for designing, procuring, and constructing facilities will be developed and optimized during the Facility Study should the generation interconnection customer choose to move to that study phase of the interconnection process.

8.0 Transient Stability Analysis

The WECC 2020 Heavy Summer case modified to represent a summer month with high solar, wind, and gas generation east of Boise was used along with PowerWorld's Transient Stability Analysis tool to perform the transient stability analysis for the Project.

For the Battery Energy Storage System (BESS), the instantaneous trips (0.01 sec) were adjusted to 0.1 (6 cycles) for the lhfrt and lhvrt models per NERC guidelines following the two large disturbances due to PV solar inverters in southern California. NERC recommends 0.2 cycles (12 cycles) but indicated the time delays needed to be long enough to accurately measure the quantity especially frequency to avoid erroneous tripping.

Secondly, for BESS, it is recommended to use the renewable energy electrical control model reec-c instead of the reec-a model. The reec-c model was specifically built to represent BESS. The reec-c model can represent the BESS both in charging and discharging i.e. negative power (load) and positive power (generation). The reec-a model is only for positive power production i.e. generation. Since the BESS was only studied in the generation mode, the

transient stability analysis was performed with the reec-a models provided, but please provide the more correct reec-c models when you obtain them.

Three transient stability runs were performed with the Project connected to the Idaho Power's transmission system to validate model and system performance:

1. 3.0 Cycle [redacted] 3-phase fault, loss of [redacted]
2. 3.0 Cycle [redacted] 3-phase fault, loss of [redacted]
3. 9.0 Cycle [redacted] Single-Line-Ground (SLG) fault, loss of [redacted] Line w/ Delayed Clearing

The results showed no transient stability violations. Appendix C contains the transient stability plots.

9.0 Description of Operating Requirements

It is the generation project's responsibility to provide reactive power capability of the project to have a power factor operating range of at least 0.95 leading (absorbing) to at least 0.95 lagging (supplying) at the POI over the range of real power output (up to maximum output of the project) and for all modes of operations (wind generation only, combined wind/BESS (charging and discharging), and BESS generation only). With only a single [redacted] Project line to the POI and with just 1050 MW of wind generation (no BESS on-line), preliminary analysis indicated that approximately 270^{+} MVAr shunt compensation will be required to be installed to achieve the 0.95 lagging (supplying) power factor. At the combined 1050 MW output from the wind and BESS generation, approximately 70 MVAr shunt compensation will be required to be installed to achieve the 0.95 lagging (supplying) power factor. With only the 500 MW BESS generation (no wind generation on-line), less than 15 MVAr shunt compensation will be required to be installed to achieve the 0.95 lagging (supplying) power factor. No additional reactive shunt compensation was identified to achieve 0.95 leading (absorbing) for the above three operating scenarios.

Identification of any additional equipment required at the plant to meet Idaho Power reactive power capability interconnection requirements will be provided in the Facility Study if the generation interconnection customer chooses to move to the next study phase of the interconnection process.

GI #570 will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations, and GI#570 will be required to manage the real power output of their stated generation at the project's POI.

The project(s) 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.*

Installation of phasor measurement unit devices at the POI and maintenance costs associated with communication circuits needed to stream PMU data will also be required to be provided to interconnect GI #570. The specific costs associated with the IPC requirements for interconnection customers with aggregate facilities larger than 20 MW to provide PMU data to IPC will be identified in the Facility Study should the generation interconnection customer choose to proceed to that phase of the interconnection process. Also, it may be beneficial for [redacted] for their own modeling compliance requirements, to install additional PMU devices at their facilities to monitor the generations source(s) separately.

Additional operating requirements for this project may be identified in the Facility Study when it is performed.

10.0 Conclusion

GI #570 can be interconnected to the Idaho Power transmission system.

Interconnection requirements detailed in Section 6.5 totaling $6,578,281 are required to interconnect the project as an Energy Resource at the primary [redacted] POI. If the project connects as a Network Resource detailed in Section 7.5, the cost to integrate the project is $51,235,718. The Energy Resource connection at 1050 MW is potentially reliant on network facility upgrades identified in a senior queued generation interconnection.

Generator interconnection service (either as an Energy Resource Interconnection Service or a Network Resource Interconnection Service) does not in any way convey any right to deliver electricity to any specific customer or point of delivery. A Transmission Service Request will be required to study the Transmission System Impacts.

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 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 and EPRI's OpenDSS 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. These 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 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 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 (VAr or 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 Electrical System Protection Guidance

IPC requires electrical system protection per Facility Connection Requirements found on the Idaho Power Web site,

https://docs.idahopower.com/pdfs/BusinessToBusiness/FacConnReq.pdf

A-4.0 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

B-1.0 Table B1 GI #530 Contingent Facilities Needed by GI #570

Table B1 is a summary of GI #530 contingent facilities and conceptual costs required by GI #570.

GI #530 Project	
Contingent Facilities/Upgrades:	**Cost**
[redacted] Add new [redacted] Station with a [redacted] -4 -1Φ Transformer	$36,970,000
[redacted] Two 0.75-mile 500kV Lines with [redacted] MCM ACSR "[redacted]" Conductor ([redacted])	$2,870,000
[redacted] One 0.5-mile 230kV line with [redacted] ACSR "[redacted]" Conductor ([redacted])	$665,000
[redacted] Add 230kV Line Terminal	$1,190,000
Subtotal	**$41,695,000**
Contingencies (~20%)	$8,339,000
Subtotal	**$50,034,000**
Overheads (~8.5%)	$4,253,000
Total Estimated Cost	**$54,287,000**

Table B1 GI #530 Facilities Needed by GI #570

APPENDIX C – Transient Stability Plots

C-1.0 3.0 Cycle [redacted] 3-phase fault

Redacted

C-2.0 3.0 Cycle [redacted] 3-phase fault

Redacted

C-3.0 9.0 Cycle [redacted] SLG fault w/ Delayed Clearing

Redacted