GENERATOR INTERCONNECTION
FEASIBILITY STUDY REPORT

for integration of the proposed

600 MW [redacted]

(GI #622)

to the

IDAHO POWER COMPANY ELECTRICAL SYSTEM

in

OWYHEE COUNTY, OREGON

for

[redacted]

REPORT v.1

January 31, 2022

Revision History

Date	Revision	Initials	Summary of Changes
01/31/2022	1	MDH	Feasibility Study Report GI #622

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1.0 INTRODUCTION

[redacted] has contracted with Idaho Power Company ("Transmission Provider") to perform a Generator Interconnection Feasibility Study (FeS) for the integration of the proposed 600 MW [redacted] (Project). The Project's location is in Idaho Power Company's (IPCo's) Western Region in Malheur County, Oregon (~ coordinates [redacted]). The project is Generation Interconnect (GI) queue reference number 622 (GI #622). The project has chosen in the FeS to study two Point of Interconnection (POI), a Primary POI and an Alternative POI. The Primary POI is to be studied as an Energy Resource Interconnection Service (ERIS) and the Alternative POI to be studied as both an ERIS and a Network Resource Interconnection Service (NRIS).

The Project's Primary POI is to connect to the Idaho Power's transmission system for an injection of 600 MW at 500kV to IPCo's/PacifiCorp's (PAC's) jointly owned Hemingway 500kV station (HMWY). Because the proposed interconnection is to the jointly owned HMWY 500kV station, PacifiCorp is an Affected Party.

The Project's Alternative POI is to connect to the Idaho Power's transmission system at 500kV to IPCo's/PAC's jointly owned Hemingway-Summer Lake 500kV line (HMWY-SMLK 500kV) [redacted]. Because the proposed interconnection is to the jointly owned HMWY-SMLK 500kV line, PacifiCorp is an Affected Party.

IPCo project's GI #530, GI #551, GI #557, GI #567, GI #570 or GI #587, GI #588, GI #590, GI #604, GI #605, GI #613, GI #619, GI #620, and GI #621 are senior queued project in the affected area of IPCo's transmission system and the facilities and subsequent cost to integrate the 600 MW GI #622 [redacted] project may be contingent on these projects' interconnection facilities and/or network upgrades. In addition to these IPCo's generation projects, PAC's GI C1-44 400 MW project, proposed to be integrated to the Hemingway-Summer Lake 500kV line [redacted], has been included as a senior contingent project.

This report documents the basis for and the results of this FeS for the Generation Interconnection Customer. It describes the Project, the determination of interconnection feasibility and estimated costs for integrating the Project to the Transmission Provider transmission system. This report satisfies the feasibility study requirements of the Idaho Power Tariff. This report will be reviewed by PacifiCorp.

2.0 SUMMARY

The feasibility of interconnecting the 600 MW [redacted] project, GI #622, to Idaho Power's transmission system at 500kV to either the Primary POI - Hemingway 500kV station or to the Alternative POI - Hemingway-Summer Lake 500kV line were evaluated and determined feasible with their identified transmission system upgrades.

An Interconnection System Impact Study (SIS) is required to determine if any additional Interconnection Facilities or Network Upgrades are required to integrate the project into Idaho Power's transmission system. Energy Resource Interconnection Service and/or Network Resource Interconnection Service in and of themselves do not convey transmission service. In addition to Network Upgrades identified in the Interconnection System Impact Study:

- For Energy Resource Interconnection Service, the Interconnection Customer's ability to inject its Large Generating Facility output beyond the Point of Interconnection will depend on the existing capacity of Transmission Provider's Transmission System at such time as a transmission service request is made that would accommodate such delivery. The provision of firm Point-to-Point Transmission Service or Network Integration Transmission Service may require the construction of additional Network Upgrades.

- For Network Resource Interconnection Service, additional studies to reduce or eliminate congestion may be required and these studies may identify the need for additional upgrades. To the extent Interconnection Customer enters an arrangement for long term transmission service for deliveries from the Large Generating Facility outside Transmission Provider's Transmission System, such request may require additional studies and upgrades for Transmission Provider to grant such request.

The project has chosen in the Feasibility Study for the Primary POI – Hemingway 500kV station to be studied as an Energy Resource Interconnection Service, and for the Alternative POI – Hemingway-Summer Lake 500kV as an Energy Resource Interconnection Service and a Network Resource Interconnection Service.

GI #622 [redacted] Primary POI – Hemingway 500kV transmission station ERIS Interconnection Facilities:

- Hemingway Station POI 500kV Line Terminal
- Hemingway 500kV 55 MVAr Line Shunt Reactor
- Hemingway T502 500/230kV 1000 MVA Transformer
- Hemingway-Caldwell 230kV Line
    - ~30-mile 230kV Transmission Line
    - Hemingway 230kV Line Terminal
    - Caldwell 230kV Line Terminal

The total preliminary/conceptual cost estimate for ERIS to interconnect the [redacted], GI #622, as requested to the Primary POI – Hemingway 500kV transmission station is **$93,307,500**. See Section 6.8 Primary POI – Energy Resource Interconnection Service Cost Estimate for the required facilities and cost breakdowns.

GI #622 [redacted] Alternative POI – Hemingway-Summer Lake 500kV line ERIS Interconnection Facilities:

- GI #622 500kV Interconnection Station (GI_622_POI)
- Two 0.5-mile 500kV lines (Hemingway-Summer Lake Loop in-and-out)
- GI_622_POI 110 MVAr 500kV Line Shunt Reactor
- Hemingway T502 500/230kV 1000 MVA Transformer
- Hemingway-Caldwell 230kV Line
    - ~30-mile 230kV Transmission Line
    - Hemingway 230kV Line Terminal
    - Caldwell 230kV Line Terminal

The total preliminary/conceptual cost estimate for ERIS to interconnect the [redacted], GI #622, as requested to the Alternative POI – Hemingway-Summer Lake 500kV line is **$118,404,000**. See Section 7.4 Alternative POI – Energy Resource Interconnection Service Cost Estimate for the required facilities and cost breakdowns.

GI #622 [redacted] Alternative POI – Hemingway-Summer Lake 500kV line NRIS Interconnection Facilities:

- Expansion of GI_622_POI Interconnection Station
- Hemingway-GI_622_POI #2 500kV Line
    - 33-mile 500kV Transmission Line
    - Hemingway 500 kV Line Terminal
    - Hemingway 500kV 55 MVAr Line Shunt Reactor
    - GI_622_POI Interconnection Station 500kV Line Terminal

The total preliminary/conceptual cost estimate for NRIS to interconnect the [redacted], GI #622, as requested to the Alternative POI – Hemingway-Summer Lake 500kV line is **$245,817,000**. See Section 8.5 Alternative POI – Network Resource Interconnection Service Cost Estimate for the required facilities and cost breakdowns.

The cost estimates include direct equipment and installation labor costs, indirect labor costs and general overheads, and a contingency allowance. 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 estimate does not include the cost of the customer's equipment to construct the generation facility.

For potential operating requirement, see Section 9.0 Description of Operating Requirements.

3.0 SCOPE OF INTERCONNECTION FEASIBILITY STUDY

The Interconnection FeS was performed and prepared in accordance with Idaho Power Standard Generator Interconnection Procedures, to provide a preliminary evaluation of the feasibility of the interconnection of the proposed generating project to the local transmission system. As listed in the Interconnection FeS agreement, the Interconnection FeS 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 Large Generating Facility to the transmission system and to address the identified short circuit and power flow issues.

Generation projects in the Generator Interconnect queue prior to this project could impact the cost of interconnection. A current list of projects in Idaho Power's queue can be found in the Generation Interconnection folder located on the Idaho Power OASIS web site at the link shown below:

http://www.oasis.oati.com/ipco/index.html

4.0 POTENTIAL CONTINGENT FACILITIES

IPCo projects queue GI #530, GI #551, GI #557, GI #567, GI #570 or GI #587, GI #588, GI #590, GI #604, GI #605, GI #613, GI #619, GI #620, and GI #621 are senior queued projects in the affected area of IPCo's transmission system. Their Network Upgrades and Interconnection Facilities are Potential Contingent Facilities. PAC's GI C1-44 400 MW project is a senior queue project in the affected area and its Network Upgrades and Interconnection Facilities are Potential Contingent Facilities. Changes to senior queued projects including in-service date and withdrawal from the queue, may trigger a restudy associated with GI #622. Should GI #622 elect to move forward into the System Impact Study phase the facilities that are contingent will be identified.

In addition to the senior GI queued projects, the Boardman to Hemingway 500kV (B2H) project with its proposed transmission integration projects and the Southwest Intertie Project – North (SWIP-N) were included in the studies since their respective in-service dates are prior to the Project's Commercial Operation Date (COD) of August 31, 2028.

B2H Transmission Integration Projects:

- Hemingway-Bowmont #2 230kV line
- Bowmont-Hubbard 230kV line
- Midpoint T502 500/345kV 1800 MVA Transformer
- Borah C344 345kV Series Capacitor (Kinport-Midpoint 345kV line)

5.0 DESCRIPTION OF PROPOSED GENERATING PROJECT

[redacted], GI #622, proposes to interconnect to the Idaho Power transmission system at 500kV with a total injection of 600 MW (maximum project output). The Primary POI is the 500kV bus at IPCo's/PAC's Hemingway 500kV transmission station. The Alternative POI is to IPCo's/PAC's Hemingway-Summer Lake 500kV line [redacted]). The project's requested in-service date is August 31, 2028.

Table 1: Project Specifications

Project Location	Project is to be in Malheur County, Oregon [redacted]
Number and Type of Generators	(3) 3-phase, 60 HZ, 15.75kV, 218 MVA, 600 RPM Synchronous Generator/Pumps
Individual Generator Nameplate Rating	218 MVA/200 MW
Total Output Power Rating	-600/600 MW Pumped Storage
Rated Power Factor	0.90
Transmission Lines	Primary POI: One ~ [redacted] Alternative POI: [redacted]
Transformers	Three GSU 3-phase 500/15.75kV 150/190/250 MVA Z = 6.5%, X/R = 35
Interconnection Voltage	500kV

6.0 PRIMARY POI – ENERGY RESOURCE INTERCONNECTION SERVICE (ERIS)

Energy Resource Interconnection Service (ERIS) 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.

For the Primary POI ERIS, the GI #622 has applied to connect to the Idaho Power's transmission system for an injection of 600 MW at a single POI at 500kV at IPCo's/PAC's HMWY 500kV station. All senior generation projects in the immediate area ahead of this Project in the IPCo generation queue and their associated transmission system improvements and PAC's GI C1-44 400 MW project were modeled in a preliminary power flow analysis to evaluate the Primary POI – ERIS feasibility of interconnecting GI #622.

A SIS will be required to determine specific network upgrades required to transfer the Project output to load.

6.1 Transmission Line Facilities

The Project will be inserted in the HMWY 500kV station.

6.2 Substation Facilities

At the HMWY 500 kV station, add a new line bay with one new 500kV power circuit breaker, associated switches, protective relaying systems, SCADA, communications, and a Generation Interconnection metering package.

The addition of GI #622 project with [redacted] 500kV line at HMWY will require a 500kV line shunt reactor to mitigate GI #622 transmission line charging when their units are unavailable/off-line. Assuming [redacted] and shunt compensating to 80-85%, the approximate size of the 500kV line shunt reactor will be 55 MVAr.

6.3 Grounding Requirements

For 500kV 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 500kV line terminal will be the responsibility of said interconnection customer.

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. The project's single line did indicate the winding configuration on the three 500/15.75kV GSU transformers are wye grounded/delta which will provide a solid ground path for the transmission system.

Grounding requirements and acceptability criteria are found in Appendix A.

6.4 System Protection Assessment

Short Circuit details at POI interconnection location:

Studies indicate that there is adequate load and short circuit interrupting capability on the Transmission Provider's existing 500kV breakers after this project is interconnected.

Fault duty at the Primary POI HMWY 500kV bus with and without generation.

Fault Study (Baseline w/o additional gen)			
Location	**SLG (A)**	**LTL (A)**	**3PH (A)**
HMWY 500kV Bus	[redacted]	[redacted]	[redacted]

Fault Study (with GI #622)			
Location	**SLG (A)**	**LTL (A)**	**3PH (A)**
HMWY 500kV Bus	[redacted]	[redacted]	[redacted]

6.5 Description of Power Flow Cases

PowerWorld simulator software was used to evaluate the 27HS1a1 WECC Base Case simulating WECC Path 14 Idaho-Northwest with the B2H Project at its Accepted Rating of [redacted] The original WECC Base Case was modified to add the B2H project with its transmission integration projects, the SWIP-N project, IPCo senior GI queue projects (GI #530, GI #551, GI #557, GI #567, GI #570, GI #588, GI #604, GI #605, GI #613, GI #619, GI #620, and GI #621) in the affected area, PAC's senior queue GI C1-44 400 MW project, and the [redacted] GI #622 project. The modified case was named 27HS1a1_Post-GI622. To add GI #622 project's 600 MW of generation, IPCo load was increased, and wind/solar generation decreased.

The pre-project power flow case with B2H, SWIP-N, and the senior GI queue projects provides baseline loads and voltages in the area prior to adding the Project. This case was named 27HS1a1_Pre-GI622.

The levels of flow represented in the study cases are intended to capture potential impact of the Project on the existing transmission system.

6.6 Power Flow Study Results

Power Flow Analysis was performed on the cases described above. The base cases were used to simulate the impact of the Project interconnection during normal and contingency operating conditions (TPL-001). Mitigation of any adverse changes in loading or voltage from pre- to post-Project was identified.

The contingencies simulated include:

- All transformers and transmission lines in the local area of the proposed Project.
- The proposed project.

The results of the power flow studies were evaluated using WECC/NERC planning standards and Idaho Power planning standards. The power flow analysis related evaluation criteria that were used are summarized below:

- All transmission facilities must remain within their thermal limits.
- Pre-contingency bus voltages within the study area must be between 0.95 per unit and 1.05 per unit.
- Maximum voltage deviation allowed at all buses under contingency conditions will be 8% for N-1 (NERC Category B).

Power flow solution was achieved for each of the N-1/N-2 outages simulated. Key findings from the power flow analysis are as follows:

- Overloading.
    - For the 27HS1a1_Post-GI622 power flow case, [redacted] contingency resulted in three thermal violations in the power flow analysis:
        - [redacted] Transformer – 129.5%
        - [redacted] 230kV Line – 113.3%
        - [redacted] 230kV Line – 113.3%
- Voltage Deviation. There were no significant voltage deviations in the power flow analysis.
- Voltage Violations. There were no significant voltage violations in the power flow analysis.

6.7 Primary POI – Energy Resource Interconnection Service Transmission Upgrades

From the power flow/contingency analysis, the following transmission upgrades were identified for the integration of GI #622 Primary POI – ERIS:

- Hemingway T502 500/230kV 1000 MVA Transformer
- Hemingway-Caldwell 230kV Line
    - ~30-mile 230kV Transmission Line
    - Hemingway 230kV Line Terminal
    - Caldwell 230kV Line Terminal

The identified transmission upgrades were included/modeled and demonstrated acceptable performance in the power flow/contingency analysis. This case was named 27HS1a1_Post-GI622_NU.

A second power flow case with the Gateway West Project's Segment 8 – Midpoint-Hemingway #2 500kV line substituted for the previous identified transmission upgrades was created. This case was named 27HS1a1_Post-GI622_GWW_Sgmt-8. With the Gateway West Project's Segment 8 Midpoint-Hemingway #2 500kV line, the power flow contingency analysis also demonstrated acceptable performance.

The Gateway West Project's Segment 8 – Midpoint-Hemingway #2 500kV line most likely will be required to deliver energy to Hemingway from IPCo internal southern and eastern resources when GI #622 [redacted] project is in the pump mode storing energy. Idaho Power Company has [redacted] of Available Transmission Capacity (ATC) east-to-west (westbound) in the [redacted] line for GI #622 Project's 600 MW [redacted] when GI #622 [redacted] project [redacted]. And the Hemingway 500/230kV transmission system was designed to deliver energy to the Treasure Valley [redacted].

A System Impact Study will ultimately be required to determine the specific network upgrades required to integrate the Project.

6.8 Primary POI – Energy Resource Interconnection Service Cost Estimate

In Table 2 below a summary is provided of the facilities and preliminary/conceptual costs required to facilitate the Primary POI – ERIS of [redacted], GI #622:

GI #622 [redacted] **Primary POI – Energy Resource Interconnection Service Facilities**	
Interconnection Facilities	
Direct Assigned:	**Cost**
Approximately 25% of a new HMWY 500kV Line Terminal for GI #622 Standard one-breaker 500kV line terminal with revenue metering	$1,000,000
Network Assigned:	
Approximately 75% of a new HMWY 500kV Line Terminal for GI #622 Standard one-breaker 500kV line terminal with revenue metering	$3,000,000
HMWY 500kV 55 MVAr Line-Shunt Reactor 55 MVAr 500kV shunt reactor, 500kV breaker, 500kV air-break switch, protection, etc.	$4,500,000
Network Upgrades	

HMWY T502 500/230kV 1000 MVA Transformer 3 single-phase 500/230kV 200.0/266.3/333.3 MVA transformer, two 500kV breakers, and two 230kV breakers	$25,000,000
Hemingway-Caldwell 230kV Line	
~30-mile 230kV Transmission Line with 1590 ACSR "Lapwing" Conductor	$37,500,000
Hemingway 230kV Line Terminal	$750,000
Caldwell 230kV Line Terminal	$750,000
Subtotal	**$72,500,000**
Contingencies (~20.0%) (1)	$14,500,000
Subtotal	**$87,000,000**
Overheads (~7.25%) (2)	$6,307,500
ERIS – Total Estimated Cost (3)	**$93,307,500**

Table 2: Primary POI – ERIS Preliminary/Conceptual Cost Estimate

(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, overheads, and contingency 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 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 ALTERNATIVE POI – ENERGY RESOURCE INTERCONNECTION SERVICE (ERIS)

Energy Resource Interconnection Service (ERIS) 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.

For the Alternative POI, GI #622 has applied to connect to the Idaho Power's transmission system for an injection of 600 MW at a single POI at 500kV to IPCo's/PAC's HMWY-SMLK

500kV line [redacted] Hemingway 500 kV station [redacted]. The new transmission generation interconnection station will be reference to as GI_622_POI. All senior generation projects in the immediate area ahead of this Project in the IPCo generation queue including and their associated transmission system improvements and PAC's GI C1-44 400 MW project were modeled in a preliminary power flow analysis to evaluate the Alternative POI – ERIS feasibility of interconnecting GI #622.

A SIS will be required to determine specific network upgrades required to transfer the Project output to load.

7.1 Transmission Line Facilities

The HMWY-SMLK 500kV line will be loop in-and-out of the proposed new GI_622_POI interconnection station.

7.2 Substation Facilities

For the new GI_622_POI interconnection station, an initial three-position 500kV ring bus configuration station will be required. However, the three position 500kV ring bus will need to be laid-out in a breaker-and half scheme configuration to allow for potential future expansion. The following are the initial three 500kV proposed line terminals:

- GI_622_POI – Summer Lake 500kV Line Terminal (or GI C1-44_POI Station)
- GI_622_POI – Hemingway 500kV Line Terminal
- GI_622_POI – GI_622 Project 500kV Line Terminal

The GI_622_POI-SMLK (or GI-44_POI) line terminal will require a 500kV line shunt reactor for switching/line energization. For estimating purpose, the required line shunt reactor size was assumed to be identical to HMWY L511 110 MVAr line shunt reactor at HMWY required for the HMWY-SMLK 500kV line. An Electromagnetic Transient Analysis (EMT) study will need to be performed to properly size this 500kV line shunt reactor.

7.3 Alternative POI – Energy Resource Interconnection Service Transmission Upgrades

From the power flow/contingency analysis, power flow case 27HS1a1-GI622_Alt_POI_ER, the transmission upgrades previously identified for GI #622 Primary POI- ERIS are required for the integration of GI #622 Alternative POI – ERIS:

- Hemingway T502 500/230kV 1000 MVA Transformer
- Hemingway-Caldwell 230kV Line
    - ~30-mile 230kV Transmission Line
    - Hemingway 230kV Line Terminal
    - Caldwell 230kV Line Terminal

A System Impact Study will ultimately be required to determine the specific network upgrades required to integrate the Project.

7.4 Alternative POI – Energy Resource Interconnection Service Cost Estimate

In Table 3 below a summary is provided of the facilities and preliminary/conceptual costs required to facilitate the Alternative POI – ERIS of [redacted], GI #622:

GI #622 [redacted] **Alternative POI – Energy Resource Interconnection Service Facilities**	
Interconnection Facilities	
Direct Assigned:	**Cost**
Approximately 20% of the new GI_POI_622 Generation Interconnection Station Three-position 500kV ring-bus laid out in a breaker-and-half configuration (future expansion)	$3,500,000
Network Assigned:	
Approximately 80% of a new GI_POI_622 Generation Interconnection Station Three-position 500kV ring-bus laid out breaker-and-half configuration (future expansion)	$14,000,000
Transmission Lines Two 0.5-mile 500kV Lines with [redacted] Conductor	$2,500,000
GI_622_POI 500kV 110 MVAr Line Shunt Reactor 3 single-phase 33.3 MVAr 500kV shunt reactor, 500kV breaker, 500kV air-break switch, protection, etc.	$8,000,000
Network Upgrades	
HMWY T502 500/230kV 1000 MVA Transformer 3 single-phase 500/230kV 200.0/266.3/333.3 MVA transformer, two 500kV breakers, and two 230kV breakers	$25,000,000
Hemingway-Caldwell 230kV Line	
~30-mile 230kV Transmission Line with [redacted] Conductor	$37,500,000
Hemingway 230kV Line Terminal	$750,000
Caldwell 230kV Line Terminal	$750,000
Subtotal	**$92,000,000**
Contingencies (~20.0%) (1)	$18,400,000
Subtotal	**$110,400,000**
Overheads (~7.25%) (2)	$8,004,000
ERIS – Total Estimated Cost (3)	**$118,404,000**

Table 3: Alternative POI – ERIS Preliminary/Conceptual Cost Estimate

(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, overheads, and contingency 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 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 ALTERNATIVE POI – NETWORK RESOURCE INTERCONNECTION SERVICE (NRIS)

Network Resource Interconnection Service (NRIS) 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 to mitigate thermal and voltage violations.

8.1 Network Resource Single Event Exposure

If the full 600 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 500kV line outage, bus fault, or breaker failure).

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 [redacted] 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 600 MW resulting from the loss of the single GI_622_POI-GI_622_Project 500kV line.

For GI #622 Alternative POI – NRIS, the GI #622 project will require a second GI_622_POI-GI_622_Project 500kV line, not on a common structure and preferably geographic diverse from the Project to the GI_622_POI generation interconnection station. The GI #622 Project station will most likely need to be reconfigure to a breaker-and-half configuration so a single

contingency (breaker-failure) does not result in the loss of both 500 kV lines and/or two units [redacted]) which also will exceed Idaho Power's MSSC.

8.2 Network Resource Available Transmission Capacity

Idaho Power Company has insufficient Available Transmission Capacity (ATC) [redacted] line for GI #622 Project's 600 MW of generation to be delivered from GI_622_POI generation interconnection station to the Hemingway 500kV station. Secondly, Idaho Power Company has [redacted] line to deliver energy from [redacted] to the GI_622_POI generation interconnection station when GI #622 [redacted] project is in the pump mode storing energy.

For GI #622 Alternative POI – NRIS, a second Hemingway-GI_622_POI 500kV line will be required for NRIS as a Network Transmission upgrade.

8.3 Network Resource Interconnection Service Transmission Upgrades

From the Network Resource single event exposure and Network Resource ATC analysis, the following Network Transmission upgrades were identified for the integration of GI #622 Alternative POI – NRIS in addition to GI #622 Alternative POI – ERIS Energy Resource generation interconnection facilities.

- GI_622_POI 500kV Line Terminal for second GI_622_POI-GI_622_Project 500kV line
- Hemingway-GI_622_POI #2 500kV Line
    - [redacted] 500kV Transmission Line
    - Hemingway 500kV Line Terminal
    - Hemingway-GI_622_POI #2 500kV 55 MVAr Line Shunt Reactor
    - GI_622_POI 500kV Line Terminal

From the power flow/contingency analysis with the proposed Network Transmission upgrades, power flow case 27HS1a1-GI622_Alt_POI_NR, resulted in no power flow/contingency reliability violations.

A System Impact Study will ultimately be required to determine the specific network upgrades required to integrate the Project.

8.4 Alternative POI – Network Resource Interconnection Service Cost Estimate

In Table 4 below a summary is provided of the facilities and preliminary/conceptual costs required to facilitate Alternative POI – NRIS of [redacted], GI #622:

GI #622 [redacted] Alternative POI – Network Resource Interconnection Service Facilities	
Interconnection Facilities	
Direct Assigned:	**Cost**
Approximately 25% of the new GI_622_POI-GI_622_Project #2 Line Terminal	$1,000,000

Expand three-position 500kV ring-bus to accommodate second GI #622 Project interconnection line	
Network Assigned:	
Approximately 75% of the new GI_622_POI-GI_622_Project #2 Line Terminal Expand three-position 500kV ring-bus to accommodate second GI #622 Project interconnection line	$3,000,000
NRIS Transmission Upgrades:	
Network Upgrades	**Costs**
Hemingway-GI_622_POI #2 500kV Line	
[redacted] **500kV Transmission Line with** [redacted] **Conductor**	$82,500,000
Hemingway 500kV Line Terminal	$4,000,000
HMWY 500kV 55 MVAr Line-Shunt Reactor 55 MVAr 500kV shunt reactor, 500kV breaker, 500kV air-break switch, protection, etc.	$4,500,000
GI_622_POI 500kV Line Terminal Expand three-position 500kV ring-bus to accommodate second Hemingway-GI_622_POI #2 500kV line terminal	$4,000,000
Subtotal	**$99,000,000**
Contingencies (~20.0%) (1)	$19,800,000
Subtotal	**$118,800,000**
Overheads (~7.25%) (2)	$8,613,000
NRIS – Subtotal	**$127,413,000**
ERIS – Total Estimated Cost	$118,404,000
NRIS – Total Estimated Cost (3)	**$245,817,000**

Table 4: Alternative POI – NRIS Preliminary/Conceptual Cost Estimate

(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, overheads, and contingency 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 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.

9.0 DESCRIPTION OF OPERATING REQUIREMENTS

The Project will be required to control voltage in accordance with a voltage schedule at the POI as provided by Idaho Power's Grid Operations. Therefore, it may be advantageous to install a plant controller for managing the real and reactive power output of the 600 MW Project at the POI. As an interconnection on Idaho Power's transmission facilities, a phasor measurement unit device (PMU) will be required at the POI, and the installation of the PMU and the maintenance costs associated with communication circuits needed to stream PMU data will be required.

The installed reactive power capability of the Project must have a power factor operating range of 0.95 leading to 0.95 lagging at the POI over the range of real power output. At full output of 600 MW, the Project would need to be able to provide approximately +/- 197.2 MVAr reactive support plus the reactive energy consumed by the customer's own facilities. Preliminary analysis of the customer's facilities showed the Project's installed reactive power capability was sufficient to meet this requirement.

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*.

Additional operating requirements for this Project may be identified in the System Impact Study when it is performed.

10.0 CONCLUSIONS

The requested Primary and Alternative POI interconnections of the [redacted], GI #622, to Idaho Power Company's transmission system at 500kV was studied.

The results of this study work confirm that it is feasible to interconnect the Project to the existing Hemingway 500kV station, Primary POI, with significant Hemingway 500kV and 230kV transmission system Network upgrades. And it is feasible to interconnect the Project to the Hemingway-Summer Lake 500kV, Alternative POI, with the identified Hemingway 500kV and 230kV transmission system Network upgrades. However, to provide NRIS for the Alternative POI, a second Hemingway to GI_622_POI 500kV line will be required. The results from the power flow analysis and short-circuit analysis confirm that the interconnection of the Project with the identified transmission upgrades will not have significant impact on the local transmission system.

A SIS is required to determine the specific Transmission Network Upgrades required to integrate the Project as a Network Resource and to evaluate the system impacts (thermal overload, voltage, transient stability, reactive margin).

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. Transmission requirements to integrate the Project will be determined during the SIS phase of the generator interconnection process.

APPENDIX A

A-1.0 Method of Study

The FeS 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 or GE's Positive Sequence Load Flow (PSLF) analysis tool, the impacts of the new resource on PacifiCorp's transmission system (lines, transformers, etc.) within the study area are analyzed. The WECC and Idaho Power reliability criteria and Idaho Power operating procedures were used to determine the acceptability of the configurations considered. 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 and PacifiCorp. 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 specifies, 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 POI, 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) 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 Idaho Power or PacifiCorp 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

Idaho Power requires interconnected transformers to limit their ground fault current to 20 amps at the POI.

A-4.0 Electrical System Protection Guidance

Idaho Power requires electrical system protection per Requirements for Generation Interconnections found on the Idaho Power Web site,

http://www.idahopower.com/pdfs/BusinessToBusiness/facilityRequirements.pdf

A-5.0 WECC Coordinated Off-Nominal Frequency Load Shedding and Restoration Requirements

Idaho Power 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.

http://www.idahopower.com/pdfs/BusinessToBusiness/facilityRequirements.pdf