GENERATOR INTERCONNECTION

FEASIBILITY STUDY REPORT

for integration of the proposed

[redacted]MW [redacted] PROJECT

IPC PROJECT QUEUE GI #530

to the

IDAHO POWER COMPANY ELECTRICAL SYSTEM

for

[redacted], [redacted]

REPORT v.1

July 13, 2018

Revision History

Date	Revision	Initials	Summary of Changes
7/13/2018	0	MDH	Feasibility Study Report GI #530 – Original issue
8/8/2018	1	MDH	Revised in-service date

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1.0 Introduction

[redacted], [redacted] has contracted with Idaho Power Company (“Transmission Provider”) to perform a Generator Interconnection Feasibility Study for the integration of the proposed [redacted]MW [redacted] project (the Project). The Project location (~ coordinates [redacted]°[redacted]'[redacted].[redacted]" N, -[redacted]°[redacted]'[redacted].[redacted]" W) is in Idaho Power Company’s (IPC’s) Capital/Southern Regions in Elmore County, Idaho. The Project is Generation Interconnect (GI) queue number 530 (GI #530). The Project has chosen in the Feasibility Study 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 Transmission Provider’s transmission system for an injection of [redacted]MW with a new 500/230kV interconnection on the jointly owned Idaho Power Company’s (IPC’s) and PacifiCorp’s Midpoint-Hemingway 500kV line with a 230kV line/tie to IPC’s [redacted] 230kV station near Mountain Home, Idaho. The Project’s Generation Point of Interconnection (POI) is assumed to be at this stations 230kV bus on the [redacted]/[redacted] – [redacted] #1 & #2 230kV lines.

This report documents the basis for and the results of this Feasibility Study for the GI #530 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 Transmission Provider transmission system. This report satisfies the feasibility study requirements of the Idaho Power Tariff.

2.0 Summary

The feasibility of interconnecting the [redacted]MW generation project to the Transmission Provider’s transmission system with a 500/230kV interconnection to the Midpoint-Hemingway 500kV line with a 230kV line/tie to the [redacted] 230kV station was evaluated. This station is referred to as the [redacted]/[redacted] 500/230kV station. The Project’s Generation Point of Interconnection (POI) is assumed to be at the [redacted]/[redacted] 500/230kV station’s 230kV bus on the [redacted]/[redacted] – [redacted] #1 & #2 230kV lines.

Power flow analysis indicated that interconnecting the [redacted] Project is feasible. With [redacted]MW of generation (**REDACTED**) at [redacted], the Project injected/delivered ~[redacted]MW at the POI.

The Project will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations. And, GI #530 will be required to manage the real power output of the [redacted]MW generation project at the Project’s POI. Also, the installation of phasor measurement unit devices (PMU’s) at the POI and maintenance costs associated with communication circuits needed to stream PMU data will be required to be provided to interconnect GI #530. Also, it may be beneficial for [redacted] for their own modeling compliance requirements to install additional PMU devices at [redacted] to monitor the **REDACTED** generations sources (**REDACTED**) separately.

A Transmission System Impact Study is required to determine if any additional network upgrades are required to integrate this project into the IPCo transmission system and to evaluate 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 total "Energy Resource Interconnection Service" generation interconnection preliminary cost estimate to interconnect the [redacted]MW Project with a 500/230kV interconnection to the Midpoint-Hemingway 500kV line with a 230kV line/tie to the [redacted] 230kV station is **$85,730,000**. The cost estimate includes a new [redacted]/[redacted] 500/230kV station with a [redacted]MVA 500/230kV transformer (4 single-phase transformers including spare), 500kV transmission lines to loop the Midpoint-Hemingway 500kV line in-and-out of the new station, a 230kV line to the [redacted] station, required 500kV series compensation upgrades at Midpoint and Hemingway 500kV stations, and protection/control/communication equipment costs. The [redacted]/[redacted] 500/230kV Station's 500kV yard was re-configured to a Double-Breaker Double-Bus configuration from the original proposed three-position ring bus configuration, laid-out in a breaker-and-half scheme, due to unacceptable post-contingency performance for [redacted]/[redacted] 500kV breaker failure contingencies which effectively clears the 500kV yard with the three-position ring bus configuration. Also, the cost estimate includes the cost of a new Midpoint-Hemingway-Summer Lake 500kV Remedial Action Scheme (MHS RAS) with redundant communication to Hemingway and [redacted]/[redacted] 500kV Stations due to the addition of the [redacted]/[redacted] 500kV Station to eliminate [redacted]-[redacted] the Hemingway-[redacted]/[redacted] and [redacted]/[redacted]-Midpoint 500kV lines for loss of the [redacted]-[redacted] 500kV line.

The total "Network Resource Interconnection Service" generation interconnection preliminary cost estimate to interconnect the [redacted]MW Project including identified Network Upgrades transmission improvements is **$139,500,000**.

The cost estimate includes 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 estimates do not include the cost of the customer's owned equipment.

The following is for information purposes only and does not convey Transmission Service: GI #530 [redacted] Project, with just the ER generation interconnection facilities, can deliver approximately [redacted]MW ([redacted]MW @ POI) on a firm basis into Transmission Provider's network load without any additional transmission improvements.

The Transmission Provider estimates it will require approximately 36 months to design, procure, and construct the facilities described in both the Energy Resource and Network Resource sections of this report following the execution of a Generation Interconnection Agreement. The schedule will be further 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 Feasibility Study

The Interconnection Feasibility Study was done and prepared in accordance with the Transmission Provider's 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 because 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 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 Description of Proposed Generating Project

Assumptions:

- New [redacted]/[redacted] [redacted] 500/230kV Station with the approximate coordinates ([redacted]°[redacted]'[redacted].[redacted]" N, -[redacted]°[redacted]'[redacted].[redacted]" W) to interconnect to the Midpoint-Hemingway 500kV line
- Point of Interconnection (POI): [redacted]/[redacted] [redacted] – [redacted] [redacted] #1 & #2 230kV Lines (Assumed to be owned and constructed by [redacted] [redacted] [redacted])
    - 230kV Revenue Class Metering at [redacted]/[redacted] [redacted] on the [redacted]/[redacted] [redacted] – [redacted] [redacted] #1 & #2 230kV Lines

- Approximately 21.0 miles Double Circuit (Circuits on Common Structure) Line with [redacted] MCM ACSR "[redacted]" Conductor
- With this proposed transmission line/conductor design, tripping of ~240MW of [redacted] generation is assumed required for the N-1 loss of a [redacted] 230kV circuit. The double-line N-2 loss of both [redacted] 230kV circuits (Common Structures) trips the entire [redacted] MW Project.

- [redacted] MW Generation
  - **REDACTED**
- All Generation in Voltage Regulation (Reactive Capability used to Regulate [redacted] 230kV Bus Voltage (Supply/Absorb Reactive))
- 100MVAr 230kV Shunt Capacitor Bank at [redacted] 230kV

This Project's projected in-service date is January 1, 2021.

5.0 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 Project has applied to connect to the Idaho Power transmission system for an injection of [redacted] MW with a new 500/230kV interconnection on the jointly owned Idaho Power Company's and PacifiCorp's Midpoint – Hemingway 500kV line with a 230kV line/tie to IPC's [redacted] 230kV station near Mountain Home, Idaho. The Project's Generation Point of Interconnection (POI) is assumed to be at this stations 230kV bus on the [redacted] #1 & #2 230kV lines. 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 #530.

5.1 Description of Transmission Facilities

The Project has applied to connect to the Idaho Power transmission system for an injection of [redacted] MW with a new 500/230kV interconnection on the jointly owned Idaho Power Company's and PacifiCorp's Midpoint-Hemingway 500kV line with a 230kV line/tie to IPC's [redacted] 230kV station near Mountain Home, Idaho.

Preliminary power flow analysis indicated that interconnection of an [redacted] MW injection with the 500/230kV interconnection to the Midpoint – Hemingway 500kV line considered in this study is feasible. With [redacted] MW of generation (**REDACTED**) at [redacted], the Project injected/delivered ~[redacted] MW at the POI.

A Transmission System Impact Study will be required to determine the specific network upgrades required to integrate the full project output of [redacted] MW. Listed below are the required transmission facilities to interconnect the Project:

Transmission Interconnection Facilities:

- Two ~0.75-mile 500kV Lines with 3 x [redacted] MCM ACSR "[redacted]" Conductor (Loop In-and-Out off the Midpoint-Hemingway 500kV Line to create [redacted]/[redacted] - Midpoint and [redacted]/[redacted] – Hemingway 500kV Lines)
- One ~0.5-mile 230kV Line with 2 x [redacted] MCM ACSR "[redacted]" Conductor ([redacted]/[redacted] – [redacted] 230 kV Line)

5.2 Description of Substation Facilities

The proposed interconnection of GI #530 Project to the Midpoint – Hemingway 500kV line will require a new [redacted]/[redacted] 500/230kV station near IPC's existing [redacted] 230kV station with a 230kV tie/line to IPC's [redacted] 230kV station. The proposed [redacted] MVA 500/230kV (4 single-phase transformers including spare) is assumed to be identical to IPC's existing Hemingway500/230kV transformer. The [redacted]/[redacted] 500/230kV Station's 500kV yard was re-configured to a Double-Breaker Double-Bus configuration from the original proposed three-position ring bus configuration, laid-out in a breaker-and-half scheme, due to unacceptable post-contingency performance for [redacted]/[redacted] 500kV breaker failure contingencies which effectively clears the 500kV yard with the three-position ring bus configuration. See [redacted]/[redacted] 500/230kV station (See Figure 1), and [redacted]/[redacted] 500/230kV Station and [redacted] 230kV Station descriptions below.

The Midpoint-Hemingway 500kV line series compensation due to the existing 67 Ohms Midpoint 500kV series capacitor is just less than 96% series compensated. Splitting this line approximately in half due to the addition of the [redacted]/[redacted] 500kV station requires the series compensation to be replaced. For the Feasibility Study, it was determined to compensate the two new 500kV lines (Midpoint – [redacted]/[redacted] 500kV Hemingway – [redacted]/[redacted] 500kV) to approximately 65% by installing 22.5 Ohms 500kV series capacitors (~1/3 of original bank) at Midpoint and Hemingway 500kV stations. And, installing the remaining 22.5 Ohms 500kV series capacitor also at Hemingway 500kV in the Hemingway – Summer Lake 500kV line. For line switching and to keep single-pole switching enable on the new Hemingway – [redacted] 500kV

REDACTED

Figure 1 [redacted]/[redacted] [redacted] 500/230kV Station

line, it was determined to move one of the existing 110MVAr 500kV shunt reactors at Midpoint to Hemingway and install it with a neutral reactor. See Midpoint and Hemingway 500kV Station descriptions below.

Due to the addition of the [redacted]/[redacted] [redacted] 500kV Station and the creation of two new line segments Midpoint – [redacted]/[redacted] [redacted] 500kV and Hemingway – [redacted]/[redacted] [redacted] 500kV, a new or significantly upgraded Midpoint-Hemingway-Summer Lake 500kV Remedial Action Scheme (MHS RAS) with redundant communication to Hemingway and [redacted]/[redacted] [redacted] 500kV Stations will be required to eliminate [redacted]-[redacted] the Hemingway-[redacted]/[redacted] [redacted] and [redacted]/[redacted] [redacted]-Midpoint 500kV lines for loss of the [redacted]-[redacted] [redacted] 500kV line.

The actual station layouts 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. Listed below are the required substation facilities to interconnect the Project:

Substation Interconnection Facilities:

New [redacted]/[redacted] [redacted] 500/230kV Station:

- 3-position 500kV Double-Breaker Double-Bus station configuration expandable to include two future 500kV line terminals (Gateway West) (See Figure 1)
    - [redacted]/[redacted] [redacted] – Midpoint 500kV Line Terminal
    - [redacted] [redacted] – Hemingway 500kV Line Terminal
    - [redacted]/[redacted] [redacted] [redacted]MVA 500/230kV Transformer
- 4-position 230kV Ring Bus
    - [redacted]/[redacted] [redacted] – [redacted] [redacted] #1 230kV Line Terminal
    - [redacted]/[redacted] [redacted] – [redacted] [redacted] #2 230kV Line Terminal
    - [redacted]/[redacted] [redacted] – [redacted] 230kV Line Terminal
    - [redacted]/[redacted] [redacted] [redacted]MVA 230/500kV Transformer
- [redacted]/[redacted] [redacted] [redacted]MVA 500/230kV Transformer (4-1Φ Transformers assumed to be identical to the Hemingway 500/230kV Transformer)
- 230kV Revenue Class Metering on the [redacted]/[redacted] [redacted] – [redacted] [redacted] #1 & #2 230kV Lines

[redacted] 230kV Station:

- New 230kV Line Terminal ([redacted] – [redacted]/[redacted] [redacted] 230kV Line)

Midpoint 500kV Station:

- Replace Midpoint C506 67 Ohms 500kV [redacted]MVA Series Capacitor with a new 22.5 Ohms 500kV [redacted]MVA Series Capacitor (~ 61% Series Compensation)
- Remove Midpoint L508 500kV 110MVAr Shunt Reactor

Hemingway 500kV Station:
- New 22.5 Ohms 500kV [redacted]MVA Series Capacitor in the Hemingway – [redacted]/[redacted] [redacted] 500kV Line (~ 68% Series Compensation)
- Re-install Midpoint L508 500kV 110MVAr Shunt Reactor with Neutral Reactor on the Hemingway – [redacted]/[redacted] [redacted] 500kV Line
- New 22.5 Ohms 500kV [redacted]MVA Series Capacitor in the Hemingway – Burns – Summer Lake 500kV Line (~ 70% Series Compensation including Burns Series Compensation)

Midpoint-Hemingway-Summer Lake 500kV RAS:
- New Midpoint-Hemingway-Summer Lake 500kV Remedial Action Scheme with redundant communication to Hemingway and [redacted]/[redacted] [redacted] 500kV Stations due to the addition of the [redacted]/[redacted] [redacted] 500kV Station and the creation of two new line segments Midpoint – [redacted]/[redacted] [redacted] 500kV and Hemingway – [redacted]/[redacted] [redacted] 500kV to eliminate MHS RAS [redacted]-[redacted].

5.3 Description of Distribution Facilities

No distribution facilities are directly impacted by this project.

5.4 Short Circuit Study Results

Studies indicate that there is adequate load and short circuit interrupting capability on the Transmission Provider's existing 500kV and 230kV breakers to serve this project. GI #530 [redacted] [redacted] [redacted] Project's short circuit study results are shown in the following table:

Table 1 [redacted]/[redacted] [redacted] 230kV Terminal Fault Duty

	POI = [redacted]/[redacted] [redacted] 230kV		
	SLG	L-L	3PH
Existing [redacted] 230kV)	9.66 kA	9.58 kA	11.06 kA
With GI #530	19.70 kA	16.90 kA	19.50 kA

5.5 Electric System Protection Results and Grounding Requirements

For 230kV 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 will be required for the new [redacted]/[redacted] [redacted] – [redacted] [redacted] #1 & #2 230kV lines. It is strongly recommended that the [redacted]/[redacted] [redacted] #1 &#2 230kV lines be constructed with an optical ground wire (OPWG) digital communication circuits for system protection and communication.

Grounding requirements and acceptability criteria are found in Appendix A.

5.6 Energy Resource Cost Estimate

In Table 2 below is a summary of the generation interconnection facilities and conceptual costs required to interconnect the GI #530 [redacted] [redacted] [redacted] Project to the Transmission Provider's transmission system as an Energy Resource.

GI #530 [redacted] [redacted] [redacted] Project **POI – [redacted]/[redacted] [redacted] 500/230kV Station** **Energy Resource Generation Interconnection Facilities**	
Direct Assigned	**Cost**
[redacted]/[redacted] [redacted] – [redacted] [redacted] #1 & #2 230kV Line Terminals Line Protection and Control, Metering, Communication, etc.	$1,750,000
Network Upgrade	**Cost**
Transmission Lines Two 0.75-mile 500kV Lines with 3 x [redacted] MCM ACSR "[redacted]" Conductor (Midpoint – Hemingway 500kV Loop in-and-out)	$3,000,000
Transmission Line One 0.5-mile 230kV Line with 2 x [redacted] MCM ACSR "[redacted]" Conductor ([redacted] Tie)	$700,000
[redacted]/[redacted] [redacted] 500/230kV Station Add new 500/230kV Station (Double-Bus Double-Breaker) with a 500/230kV [redacted]MVA - 4-1Φ Transformers	$33,580,000
[redacted] 230kV Station Add 230kV Line Terminal	$1,000,000

Midpoint 500kV Station Replace 67 Ohms Series Capacitor with a new 22.5 Ohms 500kV [redacted] MVA Series Capacitor Remove Midpoint L508 500kV 110MVAr Shunt Reactor	$6,100,000
Hemingway 500kV Station Add new 22.5 Ohms 500kV [redacted] MVA Series Capacitor (Hemingway - [redacted] 500kV) Re-install 500kV 110MVAr Shunt Reactor (Hemingway - [redacted] 500kV) Add new 22.5 Ohms 500kV [redacted] MVA Series Capacitor (Hemingway -Summer Lake 500kV)	$16,000,000
Midpoint-Hemingway-Summer Lake 500kV RAS New Midpoint-Hemingway-Summer Lake 500kV Remedial Action Scheme due to the addition of the [redacted] 500kV Station and the creation of two new line segments Midpoint – [redacted] 500kV and Hemingway – [redacted] 500kV	$1,500,000
Subtotal	**$63,650,000**
Contingencies (~20%)	$12,730,000
Subtotal	**$76,380,000**
Overheads (~12.25%)	$9,350,000
Energy Resource – Total Estimated Cost	**$85,730,000**

Table 2 Estimated GI #530 Project's Energy Resource Generation Interconnection Costs

The cost estimate includes 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 estimates do not include the cost of the customer's owned equipment.

The following is for information purposes only and does not convey Transmission Service: GI #530 [redacted] Project, with just the ER generation interconnection facilities, can deliver approximately [redacted] MW ([redacted] MW @ POI) on a firm basis into Transmission Provider's network load without any additional transmission improvements. With the double-breaker double-bus 500kV station configuration, limited by the summer emergency overload of the [redacted] – Dram 230kV line for loss of the [redacted] 500/230kV [redacted] MVA transformer.

The Transmission Provider estimates it will require approximately 36 months to design, procure, and construct the facilities described in the Energy Resource section of this report following the execution of a Generation Interconnection Agreement. The schedule will be further developed and optimized during the Facility Study should the generation interconnection customer choose to move to that study phase of the interconnection process.

6.0 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 severely stressed conditions to determine the transmission improvements/upgrades which are necessary to deliver the aggregate generation around the Point of Interconnection to the Transmission Provider's aggregate load. Network Resource Interconnection Service in and of itself does not convey Transmission Service.

6.1 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.

The WECC 2014 Light Summer operating case, approved by WECC on January 16, 2014, was chosen as the initial power flow base case for this feasibility study. It has been extensively modified to represent a shoulder month condition with high wind, solar, and gas generation east of Boise, and high east to west (westbound) transfers (representing Firm Transmission Service provided by the Transmission Provider) across the Transmission Provider's transmission system which generally occurs in the fall. Last, the base case was modified to include network upgrades assigned to projects ahead of GI #530 in the generation interconnection queue.

The second case used for the study is the WECC 2017 Heavy Summer operating case, approved by WECC on September 22, 2016. This case was chosen as an additional power flow base case for this feasibility study to represent a heavy summer operating case. Next, the base case was modified to represent high west to east (eastbound) transfers across the Idaho transmission system during heavy load conditions. Last, the base case was modified to include network upgrades assigned to projects ahead of GI #530 in the generation interconnection queue.

6.2 Network Resource Transmission Upgrades

From power flow/contingency analysis, the following Network Transmission Upgrades were identified as needed to deliver GI #530 proposed [redacted] MW of generation to the Transmission

Provider's network load and are in addition to the Energy Resource generation interconnection facilities.

<u>Westbound (East to West)</u>:

[redacted] – Dram 230kV Line:

- Rebuild 35.6 miles of 230kV line with [redacted] MCM ACSR "[redacted]" Conductor

Dram – Boise Bench 230kV Line:

- Rebuild 3.1 miles of 230kV line with [redacted] MCM ACSR "[redacted]" Conductor

Boise Bench – Hubbard 230kV Line Loop in-and-out of Dram Station (Creating Boise Bench – Dram #2 230kV and Dram – Hubbard 230kV Lines):

- Build 1.25 miles 230kV Double Circuit Line with [redacted] MCM ACSR "[redacted]" Conductor

Dram 230kV Station:

- Two new 230kV Line Terminals (Dram – Boise Bench #2 230kV and Dram – Hubbard 230kV Lines)

<u>Eastbound (West to East)</u>:

Justice – Mountain Air Tap 230kV Line:

- Rebuild 31.7 miles of 230kV line with [redacted] MCM ACSR "[redacted]" Conductor

Lower Malad – King 138kV Line:

- Rebuild 1.8 miles of 138kV line with [redacted] MCM ACSR "[redacted]" Conductor

6.3 Network Resource Cost Estimate

In Table 3 below is a summary of the Network Transmission generation interconnection facilities and conceptual costs required to interconnect the GI #530 [redacted] Project to the Transmission Provider's transmission system as a Network Resource.

GI #530 [redacted] Project **POI – [redacted]/[redacted] 500/230kV Station**	
Network Resource Transmission Upgrades:	**Cost**
[redacted] – Dram 230kV Line Rebuild 35.6 miles of 230kV line with [redacted] MCM ACSR "[redacted]" Conductor	$18,500,000

Dram – Boise Bench 230kV Line Rebuild 3.1 miles of 230kV line with [redacted] MCM ACSR "[redacted]" Conductor	$2,500,000
Boise Bench – Hubbard 230kV Line Loop in-and-out of Dram Station Build 1.25 miles 230kV Double Circuit Line with [redacted] MCM ACSR "[redacted]" Conductor	$1,000,000
Dram 230kV Station Add two 230kV Line Terminals	$1,800,000
Justice – Mountain Air Tap 230kV Line Rebuild 31.7 miles of 230kV line with [redacted] MCM ACSR "[redacted]" Conductor	$15,600,000
Lower Malad – King 138kV Line Rebuild 1.8 miles of 138kV line with [redacted] MCM ACSR "[redacted]" Conductor	$525,000
Subtotal	**$39,925,000**
Contingencies (~20%)	$7,980,000
Subtotal	**$47,905,000**
Overheads (~12.25%)	$5,865,000
Network Transmission – Total Estimated Cost	**$53,770,000**
Energy Resource – Total Estimated Cost	$85,730,000
Network Resource – Total Estimated Cost	**$139,500,000**

Table 3 Estimated GI #530 Project's Network Resource Generation Interconnection Costs

The cost estimate includes 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 estimates do not include the cost of the customer's owned equipment.

The Transmission Provider estimates it will require approximately 36 months to design, procure, and construct the facilities described in the Network Resource section of this report following the execution of a Generation Interconnection Agreement. The schedule will be further 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 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 0.95 leading (absorbing) to 0.95 lagging (supplying) at the POI over the range of real power output (up to maximum output of [redacted]MW).

Preliminary power flow analysis indicates that the reactive compensation range of the proposed GI #530 with the assumed/recommended 100MVAr 230kV shunt capacitor installed at the [redacted] 230kV bus is marginally incapable of providing a 0.95 lagging power factor at the POI ([redacted]/[redacted] [redacted] 230kV) at full output with the POI 230kV voltage at 0.95p.u. Limited by generator terminal voltages of 1.05 p.u. assuming GSU transformers on maximum buck tap (241.50/13.80kV). With assumed lower GSU transformer impedances, marginally acceptable at full output with generator terminal voltages limited to 1.05 p.u. with the POI 230kV voltage at 0.95p.u.

The leading plant reactive compensation capacity is sufficient to meet the operating requirement of 0.95 leading at the POI ([redacted]/[redacted] [redacted] 230kV) at full output.

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

GI #530 will be required to control voltage in accordance with a voltage schedule as provided by Idaho Power Grid Operations. And, GI #530 will be required to manage the real power output of the XXXMW generation project at the Project's POI.

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*.

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 #530. The specific costs associated with the IPC requirements for interconnection customers with aggregate facilities larger than 20MW 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] [redacted] [redacted] for their own modeling compliance requirements to install additional

PMU devices at [redacted] [redacted] to monitor the **REDACTED** generations sources (**REDACTED**) separately.

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

8.0 Conclusion

The feasibility of interconnecting the [redacted]MW generation project to the Transmission Provider's transmission system with a 500/230kV interconnection to the Midpoint-Hemingway 500kV line with a 230kV line/tie to the [redacted] 230kV station was evaluated. This station is referred to as the [redacted]/[redacted] [redacted] 500/230kV station. The Project's Generation Point of Interconnection (POI) is assumed to be at the [redacted]/[redacted] [redacted] 500/230kV station's 230kV bus on the [redacted]/[redacted] [redacted] – [redacted] #1 & #2 230kV lines.

The Project has chosen in the Feasibility Study to be studied as both an Energy Resource (ER) Interconnection Service and a Network Resource (NR) Interconnection Service. Power flow analysis indicated that interconnecting the [redacted] [redacted] [redacted] Project is feasible. With [redacted]MW of generation (**REDACTED**) at [redacted] [redacted], the Project injected/delivered ~[redacted]MW at the POI.

All generation projects in the area ahead of this project in the IPC generation interconnection queue and their associated transmission system improvements were modeled in a preliminary power flow analysis to evaluate the feasibility of interconnecting GI #530. The results and conclusions of this feasibility study are based on the realization of these projects in the unique queue/project order.

The total "Energy Resource Interconnection Service" generation interconnection preliminary cost estimate to interconnect the [redacted] [redacted] [redacted] [redacted]MW Project with a 500/230kV interconnection to the Midpoint-Hemingway 500kV line with a 230kV line/tie to the [redacted] 230kV station is **$85,730,000**. The cost estimate includes a new [redacted]/[redacted] [redacted] 500/230kV station with a [redacted]MVA 500/230kV transformer (4 single-phase transformers including spare), 500kV transmission lines to loop the Midpoint-Hemingway 500kV line in-and-out of the new station, a 230kV line to the [redacted] station, required 500kV series compensation upgrades at Midpoint and Hemingway 500kV stations, and protection/control/communication equipment costs. The [redacted]/[redacted] [redacted] 500/230kV Station's 500kV yard was re-configured to a Double-Breaker Double-Bus configuration from the original proposed three-position ring bus configuration, laid-out in a breaker-and-half scheme, due to unacceptable post-contingency performance for [redacted]/[redacted] [redacted] 500kV breaker failure contingencies which effectively clears the 500kV yard with the three-position ring bus configuration. Also, the cost estimate includes the cost of new Midpoint-Hemingway-Summer Lake 500kV Remedial Action

Scheme with redundant communication to Hemingway and [redacted]/[redacted] [redacted] 500kV Stations due to the addition of the [redacted]/[redacted] [redacted] 500kV Station to eliminate MHS RAS [redacted]-[redacted].

The total “Network Resource Interconnection Service” generation interconnection preliminary cost estimate to interconnect the [redacted] [redacted] [redacted] [redacted]MW Project including identified Network Upgrades transmission improvements is **$139,500,000**.

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 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).

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 or GE's Positive Sequence Load Flow (PSLF) analysis tool, the impacts of the new resource on Idaho Power'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. 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 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) 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

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

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