

Generation Interconnection Impact Study Report

For

Interconnection Customer Q0022

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Generation Interconnection System Impact Study Report
Interconnection Customer Q0022
(“Interconnection Customer”)

I. Project Description

This report provides interconnection requirements for Interconnection Customer’s Power Project located outside the city of Mona in Juab County, Utah. The Project will be built in three stages.

The first stage will be construction of two natural gas fired (simple cycle) combustion turbines rated at 140 MW each. The second stage will add a 245 MW steam turbine to stage one creating a combined cycle facility. The final stage will include two additional 140 MW gas turbines and a second 245 MW steam turbine. The overall project capacity, once completed, will be 1050 MW.

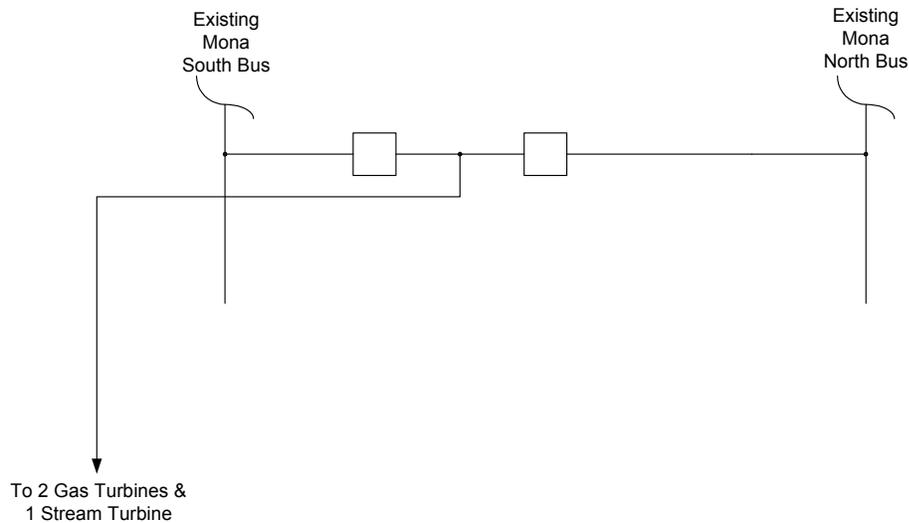
The project will interconnect at the 345 Kv bus at Transmission Provider’s Mona Substation. Phase one will interconnect the generation site to the Mona substation via a single 345 Kv line. Phase three will interconnect via a second 345 Kv line.

II. Study Objective

The objective of the Generation Interconnection System Impact Study Report is to provide a high level definition of system modifications and additions required for generation interconnection. Design detail, schedule, and costs will be defined in a Facilities Study. The scope of the modifications for this Interconnection Impact Study do not include modifications required to deliver power beyond the point of interconnection. Such modifications will be considered in a Transmission Service Impact Study. The Generation Interconnection Impact Study is required by Transmission Provider ‘s FERC Tariff, 4th Revised Volume No 11.

III. Study Results

- A. Modifications and Additions to Facilities at Transmission Provider Interconnection Location (for stage 1 & 2, maximum of 580 MW, 2 gas turbines & 1 stream turbine)**



Two 345 Kv breakers in a new bay in the Mona Substation would be added. Communication dependent relay systems would be installed for the protection of the 345 Kv line between the plant and Mona Substation. Two line protection relays would be installed at each end of the transmission line. Each relay system would use fibers on a fiber optic cable to communicate between the relays at each terminal. The fiber optic cables will need to have diverse routing. One cable could be in the overhead shield wire on the transmission line.

B. Other Modifications to Existing Facilities

1. Short Circuit Analysis

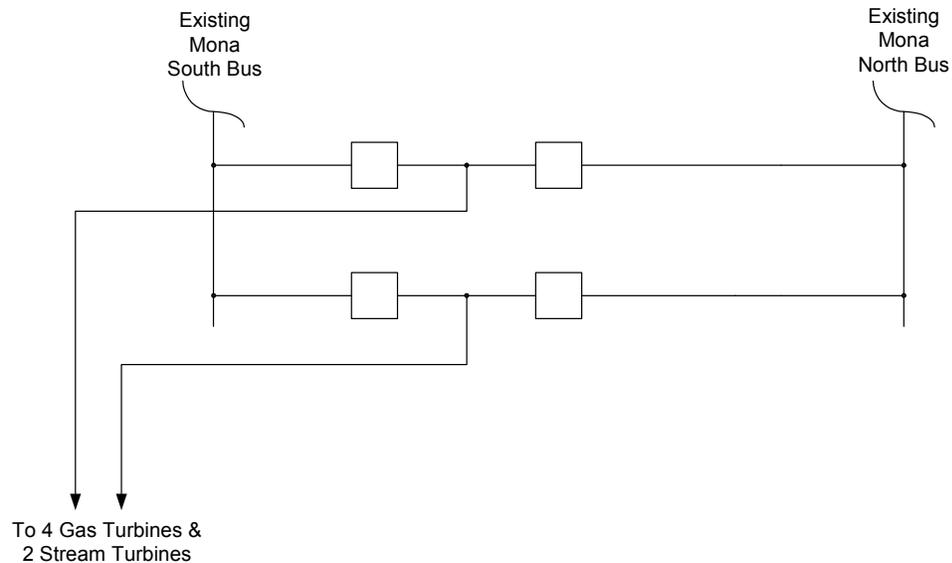
A fault analysis was performed using the computer software Aspen. Two 239 MVA generators with 11% @ 240MVA base delta – wye 18Kv – 345 Kv step-up transformers and one 264 MVA generator with 11% @ 270 MVA base delta – wye 18Kv – 345 Kv transformer were added to the latest Aspen One-liner Base Case. The generator and transformer impedances were based on the developer-supplied specifications. The interconnection will be located at the Mona Substation 345 Kv bus. Classical faults were simulated at several key locations. These faults were simulated to determine if the existing breakers had sufficient interrupting capacity.

No existing breakers will need to be replaced as a result of the addition of the generating plant facility. The fault duty on the Mona Substation 345 Kv bus will be 29,110A for a three phase fault and 28,710A for a single line to ground fault.

2. Protection & Controls

No protection will need to be modified at other facilities. An RTU will need to be installed at the power plant to monitor breaker status and analog power levels.

C. Modifications and Additions to Facilities at Transmission Provider's Interconnection Location (for stage 3, maximum of 1160 MW, 4 gas turbines & 2 stream turbines)



At Mona two additional 345 Kv breakers in another new bay would be added. The relay systems on the plant line would use fibers on the fiber optic cables installed for the first stage.

Other Modifications to Existing Facilities

1. Short Circuit Analysis

A fault analysis was performed using the computer software Aspen. Two 239 MVA generators with 11% @ 240MVA base delta – wye 18Kv – 345 Kv step-up transformers and one 264 MVA generator with 11% @ 270 MVA base delta – wye 18Kv – 345 Kv transformer were added to the Interconnection Customer's stage 1 & 2 Aspen One-liner Case. The generator and transformer impedances were based on the developer-supplied specifications. The interconnection will be located at the Mona Substation 345 Kv bus. Classical faults were simulated at several key locations. These faults were simulated to determine if the existing breakers had sufficient interrupting capacity.

No existing breakers will need to be replaced as a result of the addition of the generating plant facility. The fault duty on the Mona Substation 345 Kv bus will be 34,560A for a three phase fault and 36,500A for a single line to ground fault.

2. Protection & Controls

No protection will need to be modified at other facilities.

3. Communications

SONET fiber optic terminals will be installed at Mona Substation and Interconnection Customer's Substation. Two isolated fiber cables will be installed between the two locations. One cable will be OPGW and one will be underground (ADSS). Both fiber routes will be used for the SONET fiber ring. In addition, the OPGW route will be used for the SEL 311L protection and the ADSS route will be used for the SEL 321 protection. A PBX (telephone exchange) will be installed at the plant administration building. Two T1's will be installed from Transmission Provider's Salt Lake City Control Center (SCC) via the digital microwave system to the SONET Ring and on to the administration building. One T1 will be used for the PBX and one T1 will be used for the data network. Additional individual circuits will be provided for the plant and substation operations.

During the construction phase of the plant, the SONET terminal, PBX, and data network equipment will be located in the construction trailer. The SONET equipment will later be relocated to the substation and the PBX and data network equipment to the plant administration building.

4. Specific Site work is as follows:

Interconnection Customer's Substation/Plant

1. Install a 48-fiber OPGW cable between the Mona Substation and Interconnection Customer's Substation. This cable will provide one protection route for the two 345 Kv lines (SEL 311L) and one route for the SONET equipment.
2. Initially install a 48-fiber ADSS underground cable from the Mona Substation to the Interconnection Customer's construction trailer. If the ADSS cable location at the construction trailer allows, a separate 48-fiber ADSS underground cable will be spliced at a hand-hole near the construction trailer to the ADSS cable from Mona and installed to the Interconnection Customer's Substation control building. Otherwise, a new 48-fiber ADSS underground cable will be installed

from the Mona Substation directly to the Interconnection Customer's Substation. The ADSS cable into the Interconnection Customer's Substation will provide the second protection route for the 345 KV lines (SEL 321) and the second route for the SONENT. Also install all the additional associated hardware, innerduct, racks, fiber distribution centers, etc.

3. Install a small temporary 48 VDC battery bank and a battery charger in the construction trailer. A new 48 VDC wet cell battery will be installed in the substation and the battery charger from the construction trailer will be relocated to the substation to supply the required power for the communications equipment.
4. Purchase and install one new SONENT terminal (Lucent DMXplore) at the substation.
5. Purchase and install one new Coastcom channel bank shelf at the substation.
6. Install 5 ea. Coastcom circuits (one telemetry, one substation SCADA, one plant SCADA, two Async/SEL 321) at the substation. The Async channels are for Mirrored Bits relay protection (two lines) over the underground fiber to Mona Substation.
7. Three OPX voice extensions from the PBX will be installed at the plant for metering requirements.
8. Install four Schweitzer 2815 fiber modems for the SEL 321 Mirrored Bits protection over the Coastcom and two Schweitzer 2830 fiber modems for the SEL 311L's over the OPGW fiber at the substation.
9. Install one SCADA RTU at the substation and one at the plant. Wiring from the SCADA interposition panels to the end devices at both the substation and plant will be done by others as part of the substation wiring and plant wiring.
10. Install one 100 line PBX at the plant. The PBX will be initially installed at the construction trailer and will be relocated to the plant following construction. House cabling will be provided by others as a part of the plant wiring.
11. Install a 300 A-Hr 48 VDC battery and a 50 Amp charger at the plant or administration building for the PBX. Location of the permanent PBX will be determined later.

12. Install the data network switch, routers, and some fiber wiring/equipment etc. at the plant or administration building to support approximately 150 user connections. The major house cabling which may include fiber to remote locations will be provided by others as a part of the plant wiring.
13. Install CSU/DSU's for extending the T1's from the substation to the plant or administration building for the PBX and data connections.
14. Install a public address (PA) system in the plant to provide voice paging and fire alarm at the plant or administration building. House wiring is to be provided by others.
15. Install miscellaneous equipment to include: racks, fuse panels, DSX jackfields, digital to optical modems, and Teltone SLSS for dial access to end devices such as Schweitzer Relays.

Mona Substation

1. Install an underground splice box (hand-hole) and associated conduit for splicing the OPGW and the ADSS fiber cable that will go to the control building. Splice the fiber from the OPGW coming from Interconnection Customer's Substation. Also install all the additional associated hardware, innerduct, racks, fiber distribution centers, etc. This cable will provide for one protection route for the two 345 Kv lines (SEL 311L) and one path for the SONET equipment.
2. Splice the underground (ADSS) fiber coming from Interconnection Customer's Substation. No splice box (hand-hole) will be required at the control building. This fiber will go directly into the control building. Also install all the additional associated hardware, innerduct, racks, fiber distribution centers, etc. This fiber cable into the substation will provide the second protection route for the two 345 Kv lines (SEL 321) and the second route for the SONET.
3. Purchase and install one new SONET terminal (Lucent DMXplore).
4. Purchase and install one new Coastcom channel bank shelf.
5. Install 5 ea. Coastcom circuits (one telemetry, one substation SCADA, one plant SCADA, two Async/SEL 321). The Async channels are for Mirrored Bits relay protection (two lines) over the underground fiber to Mona Substation. Three of the circuits will be back-to-back channels to SCC. The only channels dropped at Mona will be for the SEL 321 protection of the two lines.

6. Install four Schweitzer 2815 fiber modems for the SEL 321 Mirrored Bits protection over the Coastcom and two Schweitzer 2830 fiber modems for the SEL 311L's over the OPGW fiber.
7. Provide telemetry equipment to dispatch (RFL 98 TMX Transmitter) at the substation. Install telemetry equipment as required at the plant.
8. Install miscellaneous equipment to include: racks, fuse panels, DSX jackfields, digital to optical modems.
9. Provide a connection from the new Teltone SER/DFR unit to the dial-up revenue metering.

Lake Mountain Microwave Site

1. Install required back-to-back digital channels. If sufficient capacity exists directly between Mona and SCC, these back-to-back channels will not be required.

Salt Lake City Control Center (SCC)

1. Install DSX jackfields in SCC, RJ48 patch panels in the Computer/PBX room, and one new 200 pair ABAM T1 cable between the SCC equipment room and the Computer/PBX room on the second floor.
2. Two T1's will be connected from the DACS to the Computer/PBX room. One will be for the data network and one will be for the PBX.
3. The existing Coastcom shelves in SCC will support the channels required for Interconnection Customer's Plant and Substation.
4. Install 3 ea. Coastcom circuits (one telemetry, one Substation SCADA, one Plant SCADA).

IV. Potential Third Parties Impacted

A Transmission Service Request will initiate a study to identify any necessary additions or upgrades to the regional transmission system necessary to deliver power beyond the point of interconnection. No direct impact to third parties occurs as a result of the interconnection, however export of the project output to the regional transmission system could impact third parties.

V. Possible Additional Studies Required During Facilities Study Phase

None anticipated.

VI. Exclusions/Disclaimers

These impact results are for interconnection only. They do not identify the impact of transmitting power beyond the point of interconnection. A separate transmission service request will include load flow and stability studies that may show the need for additional transmission modifications to the network system to export the output of the project.

VII. Conclusions and Recommendations

The following are conclusions that can be derived from this interconnection study:

- 1) Phases one and two will require Transmission Provider to add two new 345 Kv breakers and a new bay at the Mona Substation. Phase three will require a second set of 345 Kv breakers and a second bay in the station. A 345 Kv transmission line will interconnect the Interconnection Customer's phases 1 & 2 (525 MW) and a second 345 Kv transmission line will interconnect phase 3 (525 MW) with Transmission Provider's Mona Substation.
- 2) Results of a fault study indicate that all existing equipment ratings are adequate. No replacements for fault duty are required.
- 3) Line protection relaying will be added on each end of the new 345 Kv lines interconnecting the generation site and Transmission Provider's Mona substation. Redundant fiber optic communications systems will be installed and utilized for relaying, data, and voice purposes.
- 4) There are no impacts to existing Transmission Provider protection schemes as a result of the interconnection. An RTU will be necessary at the power plant to monitor breaker status and power flows.
- 5) Two data grade lines (T1's) will be installed from Transmission Provider's Salt Lake City Control Center (SCC) via the digital microwave system into the new fiber ring at the project.
- 6) Significant communications system modifications will be necessary at Transmission Provider's control center, Mona substation, and the Interconnection Customer's project. A facilities plan has been included in this report that includes requirements for temporary construction and permanent cutover of these systems.