

**Generator Interconnection
System Impact Study Report**

**Q0075
("Interconnection Customer")**

**Proposed Interconnection
Line 53 at Q0075 Plant
in Douglas County, Oregon**

November 2, 2006

1.0	Description of the Generating Facility	1
2.0	Generation Interconnection service Requested	1
3.0	Scope of the Study	1
4.0	Assumptions.....	2
5.0	Description of Proposed Interconnection	2
6.0	Requirements, Cost, & Schedule	2
7.0	Requirements	3
7.1	Transmission Modifications.....	3
7.2	Existing Breaker Modifications – Short-Circuit	3
7.3	Protection Requirements	3
7.4	Data Requirements (RTU)	3
7.5	Communication Requirements.....	4
7.6	Substation Requirements.....	4
7.7	Metering Requirements.....	4
8.0	Cost Estimate for NR Generation Interconnection Service.....	5
9.0	Schedule.....	5
10.0	Conclusions.....	5
11.0	Participation by Affected Systems	5

1.0 Description of the Generating Facility

The Q0075 hydroelectric plant is an existing facility located in east Douglas County, Oregon and is part of Interconnection Customer's ~~Umpqua River~~ Hydroelectric System. The generator at the plant was upgraded from 29 MW to 32 MW output in 2003. The generator controls and step up transformer were serviced but not upgraded at that time.

A PacifiCorp distribution substation is supplied from the generator bus at the plant through a delta to wye transformer bank and independent regulators. The distribution substation supplies retail customers in the Diamond Lake area.

2.0 Generation Interconnection service Requested

The Interconnection Customer has requested NR generation interconnection service.

3.0 Scope of the Study

The Interconnection System Impact Study shall evaluate the impact of the proposed interconnection on the reliability of the Transmission System. The Interconnection System Impact Study will consider Base Case as well as all generating facilities (and with respect to (iii) below, an identified Network Upgrades associated with such higher queued interconnection) that, on the date the Interconnection System Impact Study is commenced:

- (i) are directly interconnected to the Transmission System;
- (ii) are interconnected to Affected Systems and may have an impact on the Interconnection Request;
- (iii) have a pending higher queued Interconnection Request to interconnect to the Transmission System; and
- (iv) have no Queue Position but have executed an LGIA or requested that an unexecuted LGIA be filed with FERC.

The Interconnection System Impact Study may consist of a short circuit analysis, a stability analysis, and a power flow analysis. The Interconnection System Impact Study will state the assumptions upon which it is based; state the results of the analyses; and provide the requirements or potential impediments to providing the requested interconnection service, including preliminary indication of the cost and length of time that would be necessary to correct any problems identified in those analyses and implement the interconnection. The Interconnection System Impact Study will provide a list of facilities that are required as a result of the Interconnection Request and a non-binding good faith estimate of the cost responsibility and a non-binding good faith estimated time to construct.

4.0 Assumptions

No plant upgrades have been performed besides the generator output increase. System conditions analyzed include both high and typical generation output conditions with the existing transmission system and typical system loads. Both winter and summer peak load conditions are addressed, as well as system light load conditions.

5.0 Description of Proposed Interconnection

The plant is connected to Line 53 through the existing plant substation. Line 53 is a radial line originating at the Clearwater Switching station. The step up transformer is comprised of three single phase 11.5 kV delta to 138.6 kV wye connected transformers rated 10.175 MVA each. A special three phase 11.5 kV delta to 13.86 kV wye “bucking” transformer rated 3.048 MVA is installed to compensate the high side voltage to work with the 115 kV nominal transmission system. High side protection for the transformer is breaker 2U153 at Clearwater Switching station. A transfer trip scheme is in place to coordinate protection between the plant and the breaker at Clearwater Switching Station.

6.0 Requirements, Cost, & Schedule

A review of the existing plant and related transmission system reveals that there are some pre-existing deficiencies that are aggravated by but not a result of the increase in generation output. Specifically, three 115 kV line switches have loop opening deficiencies and loss of Line 39 or Line 46 between Toketee Switching Station and Dixonville Substation result in curtailment of total generation. It should also be noted that the 115 kV nominal system typically operates above 122 kV under most conditions and that the plants and distribution substations are adjusted for this elevated operating voltage.

The WECC requirements for a power system stabilizer were assessed because the plant output was increased from 29 to 32 MW, crossing the 30 MW threshold. Because the exciter controls were not upgraded as part of the plant upgrades, it is determined that the plant remains exempt from the requirement. Upgrade of the exciter to a static unit with a power system stabilizer is recommended for future consideration.

Presently there is no indication of individual plant or system total output or voltage delivered to the Portland Control Center. Line flows on Line 39 and Line 46 at Dixonville are the only indication. By standards, the size of the plant dictates that both SCADA analog and telemetry should be installed and the increase in capacity triggers this requirement for Q0075. It is also recommended, but not required under this generation interconnection request, that status and analog readings for the entire river system be delivered to the Portland Control Center. This would require communications between Toketee Control Center and the Portland Control Center

7.0 Requirements

7.1 Transmission Modifications

The following transmission switches should be upgraded or replaced to provide loop opening capability: 2U347 at Soda Springs, 2U 344 at Slide Creek Tap, and 2U342 at Toketee Switching Station under full output of the local resources. Alternatively, the hydro system output may continue to be adjusted to permit switch operation when needed, resulting in a loss of generation and potential water management difficulties. The interconnection customer should agree to either upgrade the switches or continue to coordinate the hydro unit output to permit switch operation as needed by PacifiCorp operations.

Upgrading 115 kV transmission lines 39 and 46 to permit full hydroelectric plant output with loss of either line is not recommended due to the excessive high cost. Instead the hydro system should agree to limit total system output to 117 MVA for loss of Line 46 and 153 MVA for loss of Line 39, until the lines are repaired and placed back in service. Generally, routine line maintenance by PacifiCorp may be scheduled around the hydro output cycle because the peak system output does not occur at all times of the year.

7.2 Existing Breaker Modifications – Short-Circuit

The change in the generator's capability will not increase the short-circuit currents above the interrupting capability of the exiting circuit breakers.

7.3 Protection Requirements

There are protective relays in place that will disconnect the generator for faults on the transmission system. It is currently required that a relay be installed that will disconnect the generator if the magnitude or frequency of the transmission system voltage is outside of acceptable limits. To meet the requirements a SEL 351A relay will need to be installed. The SEL 351A relay will trip the generator breaker if the voltage is outside of the acceptable limits.

7.4 Data Requirements (RTU)

A remote terminal unit (RTU) reporting back to PacifiCorp's Energy Control Center in Portland will be required at the generation facility. With this RTU PacifiCorp will be monitoring the following:

Analogs:

- Generator MW
- Generator MVAR
- A phase 13kV voltage
- B phase 13kV voltage
- C phase 13kV voltage

Status:

- Generator breaker
- Voltage relay trouble alarm

Accumulator Pulses:

Interchange metering kWh

The interchange real power MW will need to be telemetered to the PacifiCorp Energy Control Center in Portland independent of the analog supplied to the RTU

7.5 *Communication Requirements*

For Data Delivery to the Control Centers

DMX SONET multiplexers will be installed at Q0075 plant and Toketee Control Center. Any fiber jumpers required for continuity from Q0075 plant to Toketee will be installed. An RFL telemetry transmitter and shelf will be installed at Q0075 plant to transmit real time MW to Portland Control Center. One Coastcom R-409 channel bank will be installed at Q0075 plant and one will be installed at Toketee Control Center. The tone telemetry circuit and the SCADA circuit as well as required dial-up circuits will be routed through the channel banks.

Two four-wire analog telco leases will be installed between Toketee Control Center and Dixonville 230 Sub, one for the SCADA circuit and one for the tone telemetry circuit. At Medford Service Center and Portland Control Center, RFL telemetry receivers will be installed to receive the real time MW value from Q0075 plant. Channel cards will be installed in existing channel banks to route the circuits from Dixonville to Portland Control Center and Medford Service Center.

7.6 *Substation Requirements*

No substations modifications are required.

7.7 *Metering Requirements*

Under a separate project, one standard L&G 2510 meter be installed with dialup phone communications for generation accounting. The L&G 2510 will be compatible with other generation sites on the Upper Umpqua and depending on the ultimate communications infrastructure, data from Q0075 plant can be sent via ModBus protocol digitally to Hydro Central. This presupposes that the existing instrument transformers are in place and adequate for revenue metering. Revenue metering requires 0.3% accuracy class instrument transformers. The meter is housed in a standard FT-21 switchboard relay case and will require external 10-pole test switch for maintenance and testing purposes.

8.0 Cost Estimate for NR Generation Interconnection Service

Interconnection at [POI]

Interconnection – Other than Network Upgrades	\$78,595
Interconnection – Network Upgrades	\$71,556
Total Interconnection Cost	\$150,150

9.0 Schedule

The modifications described in this document can be completed within nine months of a signed interconnection agreement.

10.0 Conclusions

The increase in generator output has triggered the requirement to upgrade the Q0075 plant to meet current interconnection standards. The most significant deficiency is the lack of status and analog SCADA and telemetry indication to the Portland Control Center.

Although not directly a result of the generation increase, three line switches require upgrades to permit switch operation at all generation levels. The condition is aggravated by the increase. Presently, a reduction in hydro generation level is required to permit opening the switches. The present cooperative arrangement should be formalized if the switch upgrades are not performed.

For system normal conditions, the increase in generator output does not require any other transmission system upgrades.

11.0 Participation by Affected Systems

The PacifiCorp distribution system is supplied by the Q0075 plant at the generator bus, making the retail operations an affected system. Cooperation and operational coordination are required to continue this configuration and arrangement. Formalizing the power transfer arrangement to retail loads through the plant may be needed.