DEVELOPMENT OF NEW GENERATING STATION ADDS 40 MW OF CAPACITY TO NEWFOUNDLAND AND LABRADOR HYDRO'S POWER SYSTEM

The Granite Canal Hydroelectric Generating Station is located in south-central Newfoundland within Newfoundland and Labrador Hydro's (Hydro) existing Bay d'Espoir System. It is situated between Granite Lake and Meelpaeg Reservoirs, approximately 86 kilometres south of Millertown. Officially opened in August 2003, the plant adds 40 MW of new capacity and 220 GWh of annual electrical energy to Hydro's main power grid. The 230 kV transmission line and terminal station at Granite Canal connects this new source to Hydro's grid, via the Upper Salmon terminal station located at the Upper Salmon Generating Station, north of Bay d'Espoir.

INFRASTRUCTURE

A construction camp onsite accommodated 350 people at its peak. Facilities included dormitories, kitchen/dining facility, offices, first aid post, diesel-generator set, well water supply and sewage disposal field.

An existing 86 km access road from Millertown, used for pulpwood and mining access, part of which was built in the mid 1960's as part of the Bay d'Espoir Development, was upgraded to provide permanent access to the site. The road was widened, realigned, ditched and resurfaced, and culverts and bridges replaced or repaired.

A new warehouse, helideck and permanent accommodations for maintenance are located near the powerhouse.

DEVELOPMENT HIGHLIGHTS

- Upgrading of 86 km of existing access road from Millertown to the site
- Construction of new access roads for permanent access to all structures including a new bridge across the power canal
- Upgrading of 760 m of existing overflow spillways located on Granite Lake, to pass up to 1,154m^3/s during a probable maximum flood event
- Two-gated concrete bypass (closure) structure in the existing Granite Canal to divert the water to the new power canal

The powerhouse is a 30 m x 27 m structure containing a single turbine-generator unit, a 140 tonne overhead crane, and protection and telemetry equipment. The turbine-generator unit consists of a Kaplan turbine, having a rated output of 41.5 MW and is coupled directly to an air/water cooled generator rated at 45 MVA, with an output voltage of 13.8 kV and having a speed of 180 rpm.

- 1.9 km long power canal to convey the water to the intake
- Concrete intake structure with a single operating gate, a bulkhead gate and trashracks
- Buried steel penstock to convey the water to the new powerhouse
- Powerhouse with one vertical axis Kaplan turbine and generator unit
- 1.4 km long tailrace canal to convey the water to Meelpaeg Reservoir
- Fish habitat compensation facility to provide approximately 45,000 m^2 of fish spawning and rearing habitat
- Switchyard containing the main power transformer and take-off structure
- 76 km long, 230 kV transmission line constructed using hybrid wood pole/steel cross-arm suspension and steel tower dead-end structures
- Modifications to the Upper Salmon Terminal Station to tie in the new transmission line
- Microwave site and telecommunication equipment for remote operation of the site

WATER MANAGEMENT

The generating station utilizes the existing Granite Lake for upstream water level control and the water storage capacity of Granite Lake and other upstream water bodies of the Bay d'Espoir system, including the Victoria Reservoir. The new plant is essentially a run-of-river facility, utilizing available water enroute from Victoria Reservoir to the Upper Salmon and Bay d'Espoir power plants and the 40 m head differential between Granite Lake and Meelpaeg Reservoir.

BYPASS STRUCTURE

The reinforced concrete bypass structure provides closure of the existing Granite Canal to divert the water from Granite Lake into the power canal. It is equipped with two 3 m wide x 4 m high vertical roller gates to enable passage of up to 160m^3/s of water around the powerhouse, in the event of an exceptional flood. The gates are controlled by electrically operated screw stem hoists mounted on the structure. An adjacent building houses associated electrical-mechanical equipment.

CANALS

Water is conveyed from the existing Granite Canal to the new power facilities and then to Meelpaeg Reservoir via the power and tailrace canals. These canals are 16 m and 20 m wide, respectively, and are excavated in rock for their entire length. Along the sides of the power canal, where the existing ground surface is too low, dykes are provided to contain the water in the canal. The dykes are of zoned earth/rock fill construction with an impervious zone of glacial till. The largest dyke provides closure of the power canal to the intake and is approximately 12 m high.

INTAKE

The reinforced concrete intake is equipped with a high-density polyethylene (HDPE) trashrack to prevent adherence of frazil ice, a 5.1 m wide x 6.4 m high bulkhead gate and a 5.1 m wide x 6.4 m high vertical lift roller gate. The vertical lift gate is capable of closure under full flow and is normally used to permit maintenance of the penstock and turbine. The intake building houses the gate hoist, associated electrical-mechanical equipment and provides access to the penstock.

POWERHOUSE

The powerhouse is a 30 m x 27 m structure containing a single turbine-generator unit, a 140 tonne overhead crane, and protection and telemetry equipment. The turbine-generator unit consists of a Kaplan turbine, having a rated output of 41.5 MW and is coupled directly to an air/water cooled generator rated at 45 MVA, with an output voltage of 13.8 kV and having a speed of 180 rpm. The generator is connected via a vacuum breaker switch to a power transformer and then to the 230 kV transmission line. The powerhouse is designed for remote control from the Energy Control Center in St. John's.

ENVIRONMENTAL PROTECTION

As required under the Provincial Environmental

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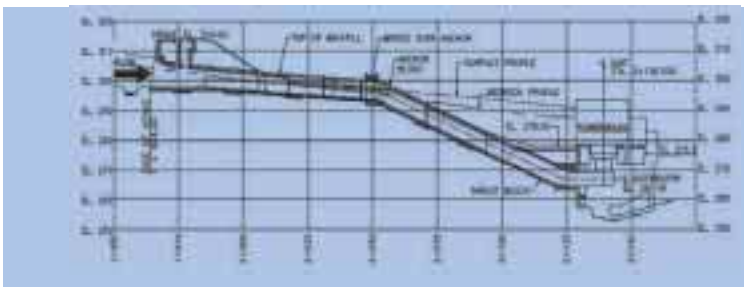
Assessment Process, an Environmental Preview Report (EPR) was submitted to the Department of Environment for review and comment. In May 2000, the Minister determined that no further environmental impact assessment was required and released the project for development subject to any other legislative approval processes.

Studies undertaken by Hydro as part of the Environmental Assessment Process predicted a loss of potential fish spawning habitat resulting from the development. The Department of Fisheries and Oceans (DFO) as a participant in the Provincial Environmental Assessment Process, and under the powers of the Fisheries Act, required mitigation to ensure compensation for fish habitat that would be harmfully altered, disrupted or destroyed. Consequently, a Fish Habitat Compensation Plan was presented to DFO. In April 2000, DFO advised their acceptance of the proposed mitigation and subsequently issued an Authorization for Works or Undertakings Affecting Fish Habitat under the Fisheries Act. A Compensation Agreement accompanied the Authorization between Hydro and DFO.

A public information session was conducted in January 2001. Processes have been put in place during project construction to minimize impact on water quality, wildlife and fish. Environmental Coordinators were present at the site to monitor compliance with regulations during construction of the project.

The most significant environmental initiatives associated with construction are:

- Implementation of control and mitigation plans to minimize the release of sediment and other pollutants



A buried steel penstock conveys water to the new powerhouse

- Regular monitoring of numbers of caribou in and around the construction site
- Fish capture and transfer from areas dewatered by construction activities
- Construction of a Fish Habitat Compensation Facility (FHCF)

FISH HABITAT COMPENSATION FACILITY (FHCF)

The FHCF provides 45,000 m2 of spawning and rearing habitat for ouananiche and brook trout that will be displaced from the existing waterway below the existing Granite Canal discharge when the water in the Granite Canal is diverted.

The FHCF comprises:

- 4.5 m wide by 400 m long diversion of a small stream around the tailrace canal (G2 diversion) designed to provide habitat for brook trout
- New 15 m wide by 1600 m long channel designed to provide habitat for ouananiche and passage for fish to migrate upstream of Meelpaeg Reservoir
- Two 4.5 m wide (average) by 1300 m (total) long side channels off of the main channel designed to provide habitat for brook trout
- Delta at the outlet of the tailrace canal designed with attention to ouananiche habitat characteristics

The channels are designed to provide spawning and rearing habitat and have instream features appropriate for the associated fish species, including spawning gravel, rune, riffles, pools, boulder clusters, bank overhangs, etc. The flows in the main channel and side channels are controlled at an inlet structure. The water level at the outlet of the main channel into Meelpaeg Reservoir, adjacent to the tailrace delta, is controlled with concrete weirs in an outlet structure. Habitat in the tailrace delta includes spawning gravel, cobble and boulder features. **ET**