Attachment 13

Bay d'Espoir Unit 8 FEED – Scope of Work

AtkinsRéalis

AtkinsRéalis

Scope of Work

Newfoundland & Labrador Hydro

18-Dec-2024
BDE-AKR-40000-EN-SOW-0001-01 B0

699257-0000-40ER-0001 B0

BAY D'ESPOIR UNIT 8 FEED

Notice

This document and its contents have been prepared and are intended solely as information for Newfoundland & Labrador Hydro and use in relation to Bay d'Espoir FEED Unit 8.

AtkinsRéalis assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

Document history

Document title: Bay d'Espoir FEED Unit 8 – Scope of Work

Document Reference: BDE-AKR-40000-EN-SOW-0001-01 / 699257-0000-40ER-0001

Rev	Purpose description	Originated	Checked	Reviewed	Authorized	Date
A0	For comment	[redacted]				2024-11-21
B0	For FEED	[redacted]				2024-12-18

Prepared by:

Verified by:

Approved by:

Table of Contents

1. General

This document presents the scope of work for the *FEED Stage Engineering Deliverables* relating to adding a Unit 8 Turbine Generator at the existing Bay D 'Espoir Hydroelectric Generating Station. The high-level Scope of Work is as follows:

1. A Water Conveyance System for Unit 8 consisting of:
    a. Headrace Channel
    b. Concrete Intake Structure with related Hydro-Mechanical Equipment and a concrete-embedded steel penstock section.
    c. East Bank Widening of the existing Tailrace to accommodate the increased flows.
2. A Power Generation System consisting of:
    a. A new 150 Mw Turbine Generator (Unit 8), installed in a service bay that will be constructed as an extension to the Exiting Unit 7 Powerhouse.

Other scopes of work, to be managed by NL Hydro, required to facilitate the addition of Unit 8 and that are not part of the Atkins Realis engineering deliverables are summarized as follows for information purposes only:

1. 230 kV Transmission Line
2. Various modifications to the existing supporting infrastructure are required to support the Addition of Unit 8, such as:
    - All overhead electrical distribution lines (new or relocating existing)
    - All fibre lines between Powerhouse 2 and new Intake and TS2
    - Electrical Service to New intake building
    - Electrical Service to New TS2 building
    - Relocating existing power, control and communication cable from Unit 7 powerhouse and TS2/ Powerhouse-1 prior to unit 8 work start
    - Disinfection system for domestic water supply

2. Site Preparation

Site preparation includes the following permanent works:

- Upgrade of permanent access roads.
- Upgrade of existing penstock crossing for planned construction equipment.
- New access road between the surge tank road and rock spoil area

3. Water Conveyance System

3.1 Headrace Channel

Excavation of a headrace channel with an entrance from the existing south channel extending to the Intake:

- A full rock cut is anticipated for 3/4 of the channel's length, with a rock plug left in place for construction purposes.
- Underwater removal of common material/blasted rock at the channel entrance.
- Removal of rock plug after completion of excavation and commissioning of Intake.

3.2 Intake Civil Works

The construction of a new reinforced concrete intake structure as follows:

- The new intake will be located about 55 m upstream and 40 m to the south of the location of the Unit 7 intake. The intake location has been selected to maintain a minimum of 25 m between the new channel and the existing south edge of the Unit 7 channel.
- The geometry for the hydraulic passage will be similar to the existing Unit 7 intake except that it will be lowered in elevation by about 700 mm to address submergence concerns.
- A hoist house will be provided to permit the lifting of the maintenance and intake gates fully out of the guides above the intake deck for maintenance.
- The new intake will include an air vent and filling valve, as well as an access hatch for divers to inspect the submerged portions of the intake.
- The length of the new penstock embedded in concrete will be 92 m downstream of the intake to have the end of the penstock embedment at the same point as for Unit 7 and thus will allow building a deep fill above the penstock on a longer distance to maintain the access at an elevation of 184.4 m to the intake of Unit 7.

3.3 Intake Hydromechanical

Supply and installation of the following hydromechanical equipment:

- Two (2) sets of removable intake trashracks with embedded parts.
- One (1) intake maintenance gate (INMG) with embedded parts.
- Two (2) sets of dogging devices to support the INOG in the raised position above the intake deck, the second set will be used to secure the INOG in the slot for installation and removal via a mobile crane.
- One (1) intake operation (vertical fixed wheel) gate (INOG) including a drain valve on the lower gate section with embedded parts.
- Two (2) sets of dogging devices to support the INMG in the raised position above the intake deck, the second set will be used to secure the INMG in the slot for installation and removal via a mobile crane.
- One (1) wire-rope hoist, including a structural frame for the operation of the INOG, mounted and secured on a twin girder mobile overhead bridge structure.

- One (1) wire-rope hoist including structural frame for the operation of the INMG, mounted and secured on a twin girder mobile overhead bridge structure. The mobile overhead bridge structure will be common between the INMG and INOG wire-rope hoists.
- One (1) twin girder mobile overhead bridge structure at the intake hoist house.
- One (1) overhead maintenance chain hoist with manual trolley and two fixed beams.
- One (1) lifting beam for intake trashracks.

3.4 Intake Electrical Supply

Supply and installation of the following electrical equipment for the intake:

- The existing 25 kV line to the Unit 7 intake will be extended to the new intake and a new set of 25 kV/600 V pole-mount transformers will be installed.
- The transformers will supply a 600 V distribution panel used as an electrical supply source for the various loads of the water intake.
- A distribution transformer will lower the supply voltage of the water intake to permit a distribution at 208/120 V.
- The motor and heating loads will be supplied from the 600 V distribution panel.
- DC system for P&C and Communication systems (125 VDC and -48 VDC)

3.5 Steel Penstock

Supply and installation of a steel penstock, including:

- Mass excavation of penstock route, including stripping, grubbing, rock and overburden excavation.
- Construction of a new sheet pile retaining wall in order not to unearth and destabilize the existing penstock of Unit 7 near the powerhouse during the construction of Unit 8 penstock.
- Fabrication and installation of a new 1100 m long steel penstock.
- The inside diameter will vary from 5.2 m at the intake to 3.76m at the connection to the spiral case at the powerhouse.
- Backfill of penstock with bedding sand and random material covered with rockfill.
- Construction of a new concrete bridge crossing the new penstock, similar to existing concrete bridges, for permanent use.

3.6 Tailrace

- Excavation for the widening of the east bank of the tailrace from approximately Sta 2+250 to Sta 2+590.
- Installation of riprap protection for the widened section on the bottom of the channel and excavated bank.

4. Powerhouse

4.1 Powerhouse Foundation

Excavation and construction for the extension of the existing Powerhouse for installation of a New Unit 8, including the following:

- Removal of rockfill in excavation placed there following rock excavation during 1977 construction for Unit 7.
- To accommodate the new service bay for Unit 8, the overburden excavation will need to be extended to the south. As a consequence, the embankment between Bay d d 'Espoir Terminal Station 1 and Powerhouse 2 will be trimmed at a slope of 2H:1V and the access road between Powerhouse 1 and Powerhouse 2 will need to be lowered to elevation 11.6 m south of Powerhouse 2.
- Further widening of the parking area south of the service bay may be required to accommodate tractor-trailer delivery to the powerhouse.
- Rock excavation for new features of the powerhouse include:
    - New Service Bay on west side of powerhouse.
    - Service Elevator.
    - Fire pump shaft and sump.
    - Gatehouse for Draft Tube Gates.
- Construction of reinforced concrete foundation of the powerhouse to Generator Floor Level (El 12.2 m) including the following:
    - Draft Tube.
    - Spiral Case Embedding Concrete.
    - Main Floor.
    - Generator Floor.
    - Turbine Floor.
    - Spiral Case Access Floor.
    - Cone Access Corridor.
    - Elevator shaft and machine room
- The final section of the penstock is embedded in concrete and included with the powerhouse scope.
- Construction of connections between existing Unit 7 portion of Powerhouse 2 and Unit 8 portion to allow access at each floor level.

4.2 Powerhouse Structural Steel

Supply and installation of:

- Powerhouse Structural Steel Superstructure.
- Crane Rails Structural Steel which includes Crane Rail Extension from existing Powerhouse 2 for use of existing crane.

4.3 Powerhouse Enclosure Architectural

Supply and installation of powerhouse enclosure including the following:

- Roofing.
- Cladding.
- Windows & Doors.
- Overhead Door.
- Finishes.
- Ladders, stairs, etc.

4.4 Auxiliary Mechanical Systems

Supply and installation of the following mechanical auxiliary systems for the new powerhouse:

- Cooling water and raw water systems.
- Fire protection system.
- Heating, Ventilation and Air Conditioning (HVAC) systems.
- Shaft seal water system.
- Drainage system.
- Piezometers system.
- High pressure compressed air system.
- Depression compressed air system.

4.5 Draft Tube Hydromechanical

Supply and installation of the following hydromechanical equipment for the draft tube gates:

- Two (2) sets of Draft Tube Gates (DTG) to be installed in existing gate guides.
- One (1) DTG monorail hoist with the extension of the existing rails. (The existing DTG monorail hoist might be used if the capacity is adequate for operation of the new gates).
- One (1) Storage Rack for two DTGs.
- One (1) two ft by seven ft existing slide gate in front of the relief valve outlet is to be replaced (if required).
- One (1) screen panel to fit in the existing embedded parts of the slide gate for the relief valve.
- All electrical, protection, controls and communication components necessary to meet the functional requirements.

4.6 Auxiliary Electrical Systems

The supply and installation of the following electrical auxiliary systems for the new powerhouse:

- Emergency Diesel Generator, outdoor package unit with double wall fuel tank.
- Isolated Phase Bus (IPB).
- Generator Step-up Transformer (GSU).
- Station Service Transformer.
- 600V Switchboard.
- Low Voltage Equipment.
- Normal and Emergency Lighting Systems.
- Fire Detection.
- Wiring Systems.
- Protection systems for generator and step-up transformer.
- Plant control system and other applicable control systems not supplied by unit manufacturer.
- DC power systems (battery banks, chargers, DC distribution, etc.).

5. Generating Unit

Fabrication, supply and installation, testing and commissioning of a new turbine-generator, Unit 8, which will be a Francis type turbine with the following characteristics and synchronous condenser capabilities:

- Rated flow: 102 m^3/s
- Gross design head: 179.73 m
- Net design head: 174.17 m
- Rotating speed: near 225 rpm
- Nominal unit capacity: 154.4 MW at generator terminals

The supplier's scope of work will also include design, manufacture, delivery to site and installation of:

- Embedments.
- Related auxiliary systems.
- Deluge-type fire protection system.
- Unit control system and other applicable control systems to be supplied with unit.

6. Interface with Existing Powerhouse

Installation of interconnections for several services for Unit 8 will be provided by the existing powerhouse, including:

- Domestic water.
- Wastewater treatment.
- Redundancy of the fire and raw water system.
- Telecommunication.

All these services can be connected to the existing powerhouses without interrupting operations.

7. Terminal Station 2 Extension

Design, fabrication, delivery to site, installation, testing and commissioning support of major equipment required for the power flow connectivity in the substation for the new unit, including the following:

- 230kV Dead Tank SF6 gas-filled Circuit Breakers.
- 230kV motor operated Disconnect Switches.
- 230kV Capacitor Voltage Transformer (CVT).
- 230kV Surge Arresters.
- 230kV Bus Post Insulators.
- 230kV Suspension Insulators.
- Civil works and foundations.
- Terminal station grounding.
- Cable trenches.
- Lightning protection.
- Bus work.
- Steel structures and gantries.
- New control building with all building electrical service, DC equipment, P&C systems.

The owner will also require the following items which are not included in the FEED stage engineering deliverables:

- A recommended list of spare parts for 10 years of service and special tools.
- Optional prices for terminal connectors as specified in technical specifications.
- Site commissioning support for Live tank CB and Disconnect switches.
- Training of Newfoundland and Labrador Hydro’s personnel.
- Guarantee (to be defined).
- P&C systems for transmission lines, busses, breakers, Motor Operated Disconnect switches

AtkinsRéalis

AtkinsRéalis
455 René-Lévesque Blvd West
Montreal (Qc) Canada H2Z 1Z3