LOWER CHURCHILL PROJECT

CD0508

SUPPLY AND INSTALL ELECTRODE STATIONS

SCOPE OF WORK SPECIFICATION

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1 GENERAL

This specification provides a general description of the project and Supplier's scope of work, and forms part of Exhibit 1 – Scope of Work of the Agreement.

Each end of the Lower Churchill Project (LCP) HVdc system will be provided with an electrode system to enable power transmission. The electrode systems will comprise of tubular electrode elements placed inside perforated wells buried in porous rocks of the breakwater for protection against ice.

Two (2) facilities are required, one at L'Anse Au Diable, in Labrador and the other at Dowden's Point in Newfoundland. The electrode facilities are sometimes referred to as "shoreline" electrode stations as the breakwater where the electrode wells are buried will be placed near the shoreline.

Figure 1-1 shows the locations of major facilities and line routing of the HVdc transmission system from Muskrat Falls to Soldiers Pond.

This led to the arrangement with tubular electrode elements placed inside perforated wells, with free flow of seawater, buried in porous rocks of the breakwater for protection against ice.

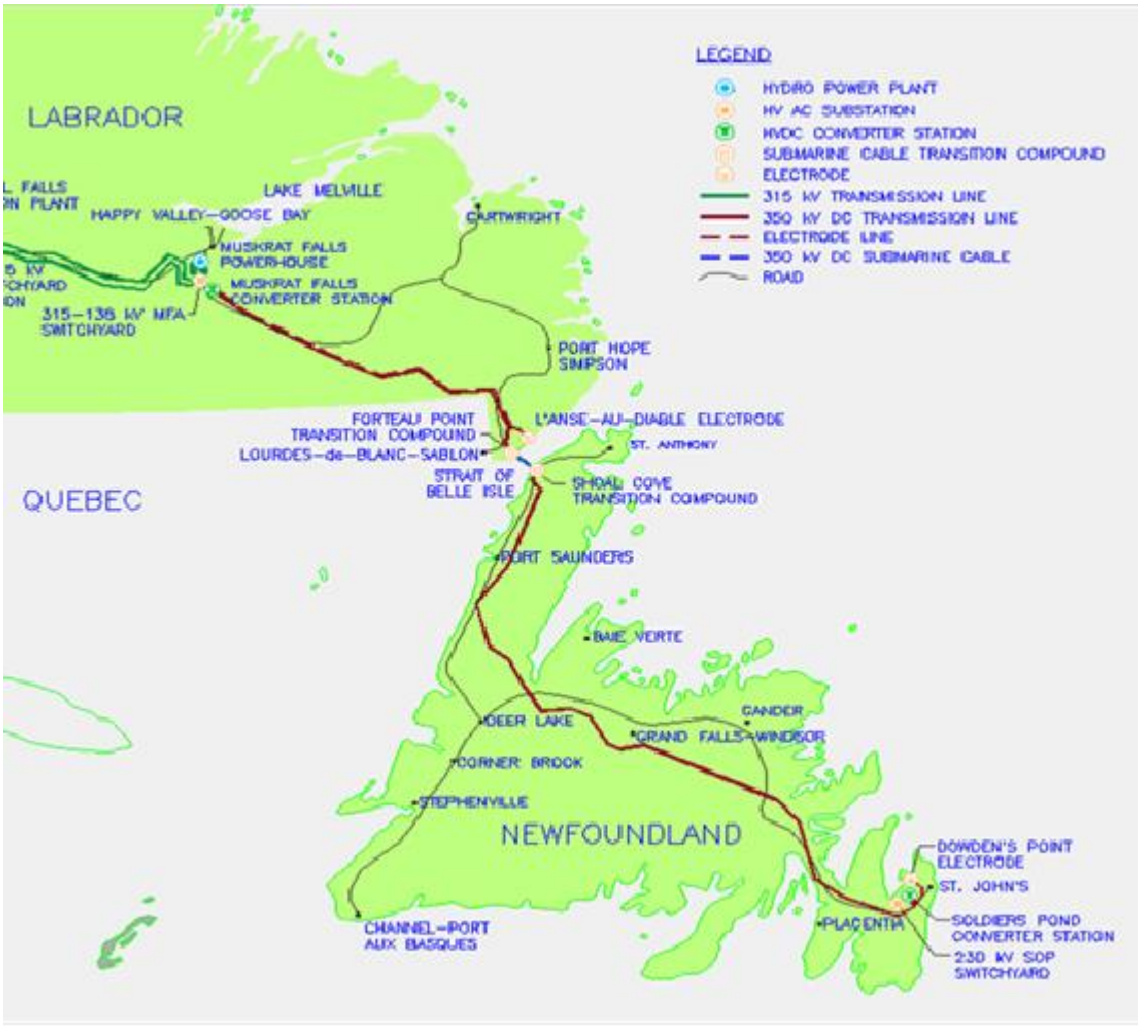

Figure 1-1: Muskrat Falls – Soldiers Pond HVdc Island Link Project

1.1 Project Description

Nalcor is developing Phase I of the LCP, which includes an 824 MW hydroelectric generating facility at Muskrat Falls and associated transmission links to Churchill Falls and the Island of Newfoundland.

The scope of the physical facilities to be constructed during Phase I of the Project includes the following:

- Muskrat Falls Generation (MFG);

- Labrador Transmission Assets (LTA); and
- Labrador – Island Transmission Link (LIL).

1.1.1 Labrador Island Transmission Link (LIL)

The electrode stations form part of the Labrador Island Transmission Link (LIL).

The LIL consists of the overland high voltage direct current (HVdc – 350kV) Transmission system and associated HVdc converter station systems, the Strait of Belle Isle (SOBI) Crossing and a new synchronous condenser facility. Specifically it includes:

- AC Switchyard at Soldier's Pond on the Avalon Peninsula;
- Muskrat Falls HVdc converter stations: HVdc bipolar converter station; 315 kV ac, converted to ±350 kV dc; Pole capacity of 450 MW;
- Shoreline pond electrode located on the Labrador side of the Strait of Belle Isle. The L'Anse-au-Diable shoreline pond electrode will be connected to the converter station at Muskrat Falls with dual overhead conductors supported on a wood pole line from the pond electrode site to the HVdc transmission line Right of Way and from there on will be supported on the HVdc line structures;
- Soldiers Pond HVdc converter station: HVdc bipolar converter station; 230 kV ac, converted from ±350 kV dc; pole capacity of 450 MW; and Shoreline pond electrode located on the east shore of Conception Bay;
- The Dowden's Point shoreline pond electrode will be connected to the converter station at Soldiers Pond with dual overhead conductors supported on a wood pole line;
- HVdc Transition Compounds for the Strait of Belle Isle submarine cable terminations;
- Three Mass Impregnated 450MW capacity each submarine cables crossing the SOBI protected using HDD boreholes and seabed rocking dumping;
- One transition compound for each side of the Strait of Belle Isle submarine cable crossing, with associated switch works to manage the junction of multiple submarine cables and the overhead transmission line;
- Overhead transmission line from the Muskrat Falls converter station to Soldiers Pond converter station: 900 MW, ±350 kV dc, bipolar line, single conductor per pole; galvanized lattice steel guyed suspension and rigid angle towers; 1100 km long; and

- New synchronous condenser at Soldiers Pond – 3 x 175 MVar units.

1.2 Language and Units

All documents, drawings, manuals, reports, nameplates, instructions, labels, and other field identifications shall be written in the English language.

Unless otherwise stated, all units shall be Metric (SI).

1.3 Site Climate Data

The Site climate data can be characterized as shown in Table 1-1.

Table 1-1: Site Climate Data

#	Description	L'Anse au Diable	Dowden's Point
1	**Temperature**		
	Maximum °C	40	40
	Minimum °C	-40	-30
	Maximum Daily Average °C	20	20
2	**Precipitation**		
	Daily Rainfall (mm)	74	109.6
	Daily Snowfall (cm)	41.8	78.2
	Mean Maximum Snow Depth (cm)	140	80
3	**Wind**		
	A) 10-min-50year (km/hr)	120	132
	B) 3-Second Gust Wind Speed (km/hr)	152	167

2 SCOPE OF WORK

The Work consists of the civil and marine portion of the electrode stations. Major components of the civil scope includes breakwater structures, electrode wells and manhole covers, access roads, buried cable duct banks, pull boxes, trenches, and junction pits.

Electrical components of the electrode stations such as electrode elements, cables, and terminal structures (and associated fence and gates), are not included in this Scope of Work.

Contractor Work shall consist of, but not be limited to, the following:

a) Provision of all labour, materials and equipment;

b) Site management and construction facilities;

c) Implementation and management of a Health and Safety, Environment and Quality Management Systems; and

d) Provision of documentation such as Quality Assurance Reports, Test Reports, Progress Reports, etc.

2.1 Work Included

Work includes, but is not limited to, the following:

2.1.1 Civil

1) Site clearing, including disposal of cleared materials;

2) Main access roads from the nearest public road (Dowden's Point only)

3) Earth works such as excavation, backfilling, levelling, and site grading etc.;

4) Terminal structure pad (Dowden's Point only)

5) Electrode wells consisting of HDPE perforated pipes installed in the breakwaters;

6) Manhole covers for electrode wells;

7) Junction pits for junction boxes;

8) Cable pull boxes and buried cable duct banks; and

9) Concrete polymer cable trenches in the breakwaters running between junction pits and electrode wells.

2.1.2 Marine and Civil

1) Breakwaters including access ramps

2) Blasting of seabed (L'Anse au Diable only).

3) Terminal structure pad (Dowden's only)

2.1.3 Site Construction

1) Site project offices for Contractor Personnel, complete with necessary amenities;

2) Two office spaces for Company Site Personnel at each electrode Site. Each space shall be no less than 25 m^2, fully furnished and equipped with telephone and internet connections. Office space is in addition to the scale house;

3) Provision of complete labour force and qualified supervisory staff;

4) Provision of all tools, machinery, vehicles, cranes, temporary works, etc. necessary for execution of the Work;

5) Removal of equipment and all left-over materials and other debris from Site after construction Work;

6) Restoration of surface; and

7) Restoration of temporary access routes and work areas.

2.1.4 Construction Verification

Submit documentation to verify the accuracy of installed Work in the form of a Survey Report (documentation item A39 specified in document No. ILK-SN-CD-8600-EL-LS-0001-01 - Electrodes Supplier Document Requirements List-SDRL) and mark-ups to the drawings.

2.1.5 Temporary Signs, Plates and Labels

Contractor shall provide all markings and labelling in accordance with applicable standards as are necessary for safety and security to identify, but not be limited to, the following:

1) Emergency exits, escape routes and muster points;

2) Danger areas and zones, e.g. explosive areas, noxious substances, falling rocks, electrical hazards etc.;

3) Fire protection and firefighting equipment;

4) First aid equipment;

5) Vehicle speed limits;

6) No smoking areas;

7) Traffic areas and zones;

8) Attention signs and personal protective equipment requirements such as safety eyewear, hardhats, gloves, protective clothing, respiratory protection, ear protection etc. as required;

9) Load carrying capacities of lifts, hoists, etc.;

10) Authorized personnel only; and

11) General danger areas and obstructions.

2.2 Work Excluded

The following are excluded in this Scope of Work:

1) Electrode elements, terminal structures, fence and gate (L'Anse au Diable), cables and junction boxes at both electrode stations;

2) Main access road to breakwater approach (L'Anse Au Diable only), including cable ductbanks underneath the main access road and

3) Terminal structure pad at L'Anse Au Diable.

3 SPECIAL REQUIREMENTS

3.1 Permits

Contractor shall be responsible for identifying quarries and completing permit applications as well as operating the quarries in accordance with the terms and conditions of the permits. Company will be responsible for making application for permits on behalf of Contractor if required and not already in place.

Contractor shall prepare documentation required for the marine blasting permit at L'Anse Au Diable and in water work at both sites. Company will be responsible for making permit applications.

4 ASSOCIATED DOCUMENTS

The documents listed in Appendix A - Technical Specifications and Drawings are submitted together with this document and form the complete Technical Specification package.

The documents listed in Appendix B are provided for reference.

APPENDIX A

TECHNICAL SPECIFICATIONS AND DRAWINGS

TECHNICAL SPECIFICATIONS AND DRAWINGS

Technical Specifications		
No	**Document Number**	**Document Description**
1	ILK-SN-CD-8600-CV-TS-0001-01	Electrode Sites Breakwater Installation Technical Specification
Drawings		
No	**Document Number**	**Document Description**
3	ILK-SN-CD-8610-CV-PL-0009-01	L'Anse Au Diable Electrode Station Breakwater Plan
4	ILK-SN-CD-8610-CV-PL-0009-02	L'Anse Au Diable Electrode Station Breakwater Section A, B, C & D
5	ILK-SN-CD-8610-CV-PL-0009-03	L'Anse Au Diable Electrode Station Breakwater Section E and Blasting Limits
6	ILK-SN-CD-8610-CV-PL-0009-04	L'Anse Au Diable Electrode Station Partial Breakwater Plans and Details
7	ILK-SN-CD-8620-CV-PL-0007-01	Dowden's Point Electrode Station Breakwater Plan
8	ILK-SN-CD-8620-CV-PL-0007-02	Dowden's Point Electrode Station Breakwater Sections A, B, C & D
9	ILK-SN-CD-8620-CV-PL-0007-03	Dowden's Point Electrode Station Breakwater Sections E & F
10	ILK-SN-CD-8610-EL-LT-0004-01	L'Anse au Diable Electrode Station General Arrangement Plan
11	ILK-SN-CD-8620-EL-LT-0001-01	Dowden's Point Electrode Station General Arrangement Plan
12	ILK-SN-CD-8600-CV-DD-0018-01	Electrode Station Electrode Wells Plan
13	ILK-SN-CD-8600-CV-DD-0019-01	Electrode Station Electrode Wells Details

14	ILK-SN-CD-8600-EL-PL-0001-01	Electrode Station Electrode Well and Junction Pit Installation Details
15	ILK-SN-CD-8600-CV-SE-0001-01	Electrode Station Buried Cable Duct Banks and Pull Boxes Details & Sections
16	ILK-SN-CD-8620-CV-PL-0008-01	Dowden's Point Electrode Station Yard Plan Site Grading and Leveling
17	ILK-SN-CD-8620-CV-SE-0003-01	Dowden's Point Electrode Station Site Sections/Grading Sections Details

APPENDIX B

REFERENCE DRAWINGS

REFERENCE DRAWINGS

No	Document Number	Document Description
1	ILK-SN-CD-8610-CV-PL-0008-01	L' Anse Au Diable Electrode Station Yard Plan Site Grading and Levelling
2	ILK-SN-CD-8610-CV-SE-0003-01	L'Anse au Diable Electrode Station Site Sections/Grading Sections Details