
Nova Scotia Utility and Review Board

IN THE MATTER OF

*The Maritime Link Act, S.N.S 2012 c.9
and the
Maritime Link Cost Recovery Process Regulation, N.S. Reg. 189/2012*

NSPML Quarterly Report Q1 2022

April 15, 2022

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1 **1.0 INTRODUCTION**

2
3 This is the Q1 2022 Quarterly Report for the Maritime Link as directed by the Utility
4 and Review Board (UARB) where the UARB ordered in its Supplemental Decision:

5
6 [115]....detailed reports must be filed by NSPML on a semi-
7 annual basis, on June 15 and December 15 each year. The reports
8 shall commence December 15, 2013. Updated status reports must
9 be filed quarterly.

10
11 As per the UARB's order in its Decision regarding the NSPML's Application for final
12 approval of Maritime Link Project Costs and approval of the 2022 cost assessment
13 (M10206), NSPML continues its quarterly reporting to the UARB by way of this
14 Report, with such ongoing reporting including financial data comparing capital and
15 operating expenditures against budgeted amounts, reports on the status of Muskrat
16 Falls Generating Station and Labrador Island Link commissioning, outstanding
17 contractual, warranty and insurance claims, final close out punch list matters,
18 outstanding expropriations, and outstanding operating agreements yet to be finalized.

19
20 Given that the benefits to ratepayers prior to the Nova Scotia Block and Nalcor
21 market-priced energy are secured by Nova Scotia Power through the Maritime Link,
22 Nova Scotia Power continues to report on these in its Quarterly Fuel Adjustment
23 Mechanism Report.

1 **2.0 UPDATE OF PROJECT SCHEDULE**

2

3 The Maritime Link was placed in-service on January 15, 2018.

4

5 Detail respecting the status of the Nalcor Project and Muskrat Falls is outlined in
6 Section 2.9.

7

8 **2.1 Gates and Milestones**

9

10 On August 6, 2021, NSPML signed an Acceleration Agreement with Nalcor which
11 commenced delivery of the NS Block starting August 15, 2021.

12

13 **2.2 Safety**

14

15 Safety is a fundamental core value and integral part of every aspect of NSPML's
16 business.

17

18 In accordance with its COVID-19 Pandemic response and safe return to normal
19 operations, NSPML continues to follow local epidemiology, best available pandemic
20 protocols and jurisdictional health guidance. Masking and physical distancing
21 continue to be required both within offices and on-site. NSPML continues to be
22 risk-focused in the assessment of all work activities ensuring that all high-risk work is
23 reviewed and evaluated both before commencement of activities and through post-
24 completion evaluations.

25

26 There have been no recordable incidents to date in 2022.

27

28 **2.3 Commercial Activities**

29

30 The key major procurement activities are presented in Table 1 with an update of the
31 status for each initiative. As all key major procurement initiatives have been closed,
32 Table 1 will be removed from future reporting.

1 **Table 1 Key Major Procurement Activities**

2

Commercial Activity	Background	Initiative Number	Status in December 2021
HVDC Submarine Cable Supply and Installation	The Contract was awarded to Nexans in January 2014. Substantial Completion occurred in September, 2017. Contract Final Completion Certificate signed February 5, 2018.	E11-18	Closed
Converter stations, switchyards and related structures (“converters and structures”)	The Contract was awarded to ABB Inc. in June 2014. Final System Test Completed January 15, 2018. Substantial Completion achieved on January 15, 2018.	E12-74	Closed
Right of Way Clearing along Transmission Lines	Contracts were awarded to Majors Logging Limited in NL and to R. MacLean Forestry in NS in February 2014.	E13-88	Closed
Transmission Structures and Grillages	The Contract was awarded to Kalpataru Power Transmission Ltd. in September 2014 for design and delivery of Structures and Grillages.	E13-85	Closed

Commercial Activity	Background	Initiative Number	Status in December 2021
Site Preparation Services (Includes construction of access road upgrades)	<p>The Contract was awarded to JonelJim Concrete Construction (1994) Ltd. for NS Site Preparation Services in September 2014.</p> <p>Contracts awarded to Marine Contractors Inc., MCI Limited Partnership for NL Site Preparation Services in September 2014.</p>	E13-92	<p>Closed</p> <p>Closed</p>
Transmission Line Construction	<p>E13-95 contract terminated as of late 2016.</p> <p>Contract replaced with E16-284 and E16-269 previously reported.</p>	E13-95	Closed
Transmission Line Construction – NL AC Line	The contract with PowerTel was re-assigned to NSPML for the completion of the two Grounding Lines and the HVAC Line. Final Completion was achieved January 31, 2019.	E16-284	Closed
Transmission Line Construction - NL and NS HVDC Lines	The contract for the construction of the HVDC Transmission Lines was awarded to a joint venture of Emera Utility Services and Rokstad Power Corporation (ERJV).	E16-269	Contract terminated following mechanical completion. Warranty claims being actively pursued.

Commercial Activity	Background	Initiative Number	Status in December 2021
Transmission Line Conductors	<p>The Contract for the supply of conductors was awarded to Midal Cables in March 2015.</p> <p>The contract for the supply of OPGW was awarded to Composite Power Group Inc. in June 2015. This is also within the scope of the E13-87 initiative.</p>	E13-87	<p>Closed</p> <p>Closed</p>
Horizontal Directional Drill (HDD) Construction Program	<p>Contract awarded to Directional Horizontal Drilling (DHD) in January 2016.</p> <p>E13-157 was divided into two contracts.</p> <p>E13-157 A was awarded to Schlumberger in March 2016 for the supply of HDD fluids. E13-157B was awarded to Baker Hughes in April 2016 for the Supply of directional drilling services, drill bits and other materials.</p> <p>E13-158 for marine intervention services was awarded in April 2016 to DOF Marine.</p> <p>The supply of the HDD casing (E15-238) was awarded to East Coast Tubulars Limited in October</p>	<p>E13-156</p> <p>E13-157</p> <p>E13-158</p> <p>E15-238</p>	<p>Closed</p> <p>Closed</p> <p>Closed</p> <p>Closed</p>

Commercial Activity	Background	Initiative Number	Status in December 2021
	2015.		
Accommodations Operations	The contract for the accommodations operations services was awarded to East Coast Catering in April 2015.	E13-89	Closed

1

1 **2.3.1 Land Access Agreements**

2
3 The majority of land rights are now in place, and NSPML is in the final stages of
4 securing any outstanding rights; moving to expropriation for 54 parcels of land as
5 required where agreement could not be reached, landowners could not be found, or
6 title to a land parcel was imperfect. These easements do not impact the ability of the
7 project to complete contract closeouts or to operate according to plan.

8
9 **2.3.2 Funding**

10
11 The final draw against the \$1.3 billion Federal Loan Guarantee was requested in
12 February 2020.

13
14 **2.3.3 Joint Development Agreements**

15
16 NSPML continues to work with Nalcor and NS Power to finalize one agreement
17 relating to regulation service which is anticipated to be concluded in 2022. The two
18 remaining agreements are internal matters to Nalcor as they relate to the assignment by
19 Nalcor of these agreements to an affiliate. Nalcor is not contractually required to
20 assign the agreements to an affiliate. The status of these agreements does not impact
21 the ability of the company to operate according to plan. Please refer to Attachment 1
22 for a listing of the Agreements that remain to be concluded.

1 **2.4 Engineering Activities**

2

3 During execution of the Project, engineering was captured in three main categories
4 across several Work Breakdown Structures (“WBSs”):

5

6 • HVDC Submarine Cable Supply and Installation - Completed.

7

8 • HVDC Converters and Substations – Completed.

9

10 • Overland Transmission – All project as-builts completed.

11

12 **2.5 Submarine Cables**

13

14 Please see Confidential Attachments 2 and 3 for the 2020 Survey Results Report for
15 the deep-water section of the Maritime Link cables (59 km of each cable) and
16 associated NSPML memo as requested by the Board (see M09939). A full survey of
17 the cables was conducted in 2021 with no immediate concerns identified over the
18 course of the campaign. Reporting is being finalized and assessment of the results by
19 NSPML continues.

20

21 Planning for the marine survey campaign in 2022 is in progress with the intent to
22 obtain the necessary services to complete the survey in the second half of 2022.

23

24 NSPML continues to mature its inspection, maintenance, and repair framework across
25 multiple proactive and contingency elements, including its consideration of a
26 Contingency Services Agreement.

27

28 **2.6 Converters and Substations**

29

30 The Converters and Substations have been in service since January 2018 and continue
31 to operate as expected.

1 **2.7 Transmission Lines**

2
3 The overhead transmission system continued to perform well into the fifth year of
4 operations with no significant reliability or downtime impacts experienced.

5
6 The inspection program for 2022 is underway with ground level inspections completed
7 for the NL HVDC Line, NL Grounding Line, and the NL HVAC line. Remaining
8 inspections for NL and NS lines will occur later in 2022. To date, no major issues have
9 been identified in 2022.

10
11 By letter dated January 10, 2020, the Board asked NSPML to provide the root cause
12 analysis of the corrective work referenced in NSPML’s Q3 2019 Quarterly Report, and
13 details of the final costs of that corrective work, once complete. NSPML retained an
14 external expert, EFLA Consulting Engineers, to conduct the root cause analyses into
15 the issues giving rise to this corrective work. Its conclusions are contained in four
16 separate reports delivered to NSPML which were previously filed in response to BW
17 IR-025(c) in NSUARB M10206.

18
19 NSPML concluded the Project corrective work in 2021. NSPML resolved its claims
20 under the project insurance and is now in the process of negotiating final resolution of
21 the outstanding warranty claims with the relevant contractor parties.

22
23 **2.8 Independent Engineer**

24
25 NSPML remains engaged with the Independent Engineer (IE) related to the Operations
26 phase of the Maritime Link, as per the Federal Loan Guarantee requirements.

27
28 Please see Attachment 4 for the most recent IE site visit report.

1 **2.9 Status of Nalcor Project and Muskrat Falls**

2
3 **Muskrat Falls Assets**

4
5 Units 1-4 are all in operation and have been released to the Newfoundland and
6 Labrador system Operator for control. Unit 2 operating limits continue to be reviewed
7 while the unit is available at approximately 85% of maximum.

8
9 **Synchronous Condensers at Soldiers Pond**

10
11 In mid-November, Synchronous Condenser (“SC”)1 was taken out of service to repair
12 an end bearing that was damaged during testing. The SCs are not on the critical path
13 for project completion; they are relevant for system stability purposes as they
14 eliminate the need for Newfoundland and Labrador Hydro to use the Holyrood
15 Generating Units for equivalent system stability reasons through the lower power
16 demand months in the summer. GE Power is continuing with the bearing replacement
17 work SC1, with completion of the work scheduled for July 2022. SCs 2 and 3 are
18 online.

19
20 **Labrador Island Link**

21
22 GE is continuing to resolve the remaining punch-list items to release the next version
23 of software; however, GE has advised that software release has been moved to the
24 second quarter of 2022, after which GE and NLH/Nalcor will conduct dynamic
25 commissioning activities before entering into a trial operating phase.

26
27 NSPML and Newfoundland and Labrador Hydro coordinate testing, which is expected
28 to be ongoing in April, after the LIL having being down for a few weeks as reported
29 previously.

1 **2.10 Status of Benefits to NS Power Customers**

2

3 Customer benefits received to date are being reported by NS Power with its Quarterly

4 Fuel Adjustment Mechanism Report and otherwise in accordance with the Board's

5 directions in Decision M10206.

1 **3.0 UPDATED COST SUMMARY**

2

3 As per Enerco U-31, section 6, the details below outline the DG3 forecasted costs.

4

5 Table 2 provides an updated cost summary for the Maritime Link, which includes all
6 actual costs incurred as of December 31, 2021 and forecasted total costs for the
7 remainder of the Project's construction activities as detailed in the Maritime Link
8 Project Capital Cost Application.

9

10 NSPML continues to track and report all costs, actual and forecast, consistent with the
11 methodologies used in the cost forecast represented in the Maritime Link Project
12 Application. Capitalized project costs reported to the end of December 2021 include
13 fully allocated costs for the entire Project Management Team, including contractors,
14 employees, executives dedicated to the project, and NS Power seconded employees at
15 rates in accordance with the Affiliate Code of Conduct. All costs provided are in
16 Canadian dollars.

17

18 Adjustments relating to The Board's ML Capital Cost Decision will be reflected in the
19 Q2 2022 Quarterly Report to be filed in June 2022.

20

21 Actual AFUDC has been tracked and recorded monthly up to December 31, 2017 and
22 totaled approximately \$209 million, which is below the \$230 million amount
23 originally estimated. AFUDC will be adjusted, to reflect the Board's Decision, in the
24 Quarterly Report to be filed in June 2022.

1 **Table 2 Updated Cost Summary for the Maritime Link Project**
 2

(000's of Canadian Dollars)	Actual Costs					Total Project to Date	Estimate to Completion	Total Project Estimate at Completion (A)
	Description	2011-2020	Q1 2021	Q2 2021	Q3 2021			
Emera NL Project Management Costs	194,834	966	657	950	(329)	197,078	6,225	203,302
Nalcor Project Support Costs	16,214	-	-	-	-	16,214	2	16,216
Construction and Engineering Initiatives	1,349,520	2,361	950	78	197	1,353,106	(1,394)	1,351,712
Environmental Approval	18,416	-	-	-	-	18,416	1	18,417
Submarine and related	343,449	-	-	-	-	343,449	2	343,451
Converters, structures, and other ancillary equipment	548,481	64	13	2	58	548,618	1,460	550,078
AC and DC Transmission	439,174	2,297	937	76	139	442,623	(2,857)	439,766
Grand Total	1,560,568	3,327	1,607	1,028	(132)	1,566,398	4,833	1,571,230

3
 4
 5 Note: Total forecast for Project completion is in accordance with NSPML's final cost
 6 application. All adjustments relating to the approved Final Capital Cost will be
 7 reflected in the June 2022 Quarterly Report. Recovery of costs from third parties
 8 relating to transmission insurance and warranty claims continue to be advanced and
 9 will be reported once finalized.

10
 11 **Total Actual Project Costs at end of Q4 2021 Compared to Previous Forecast**

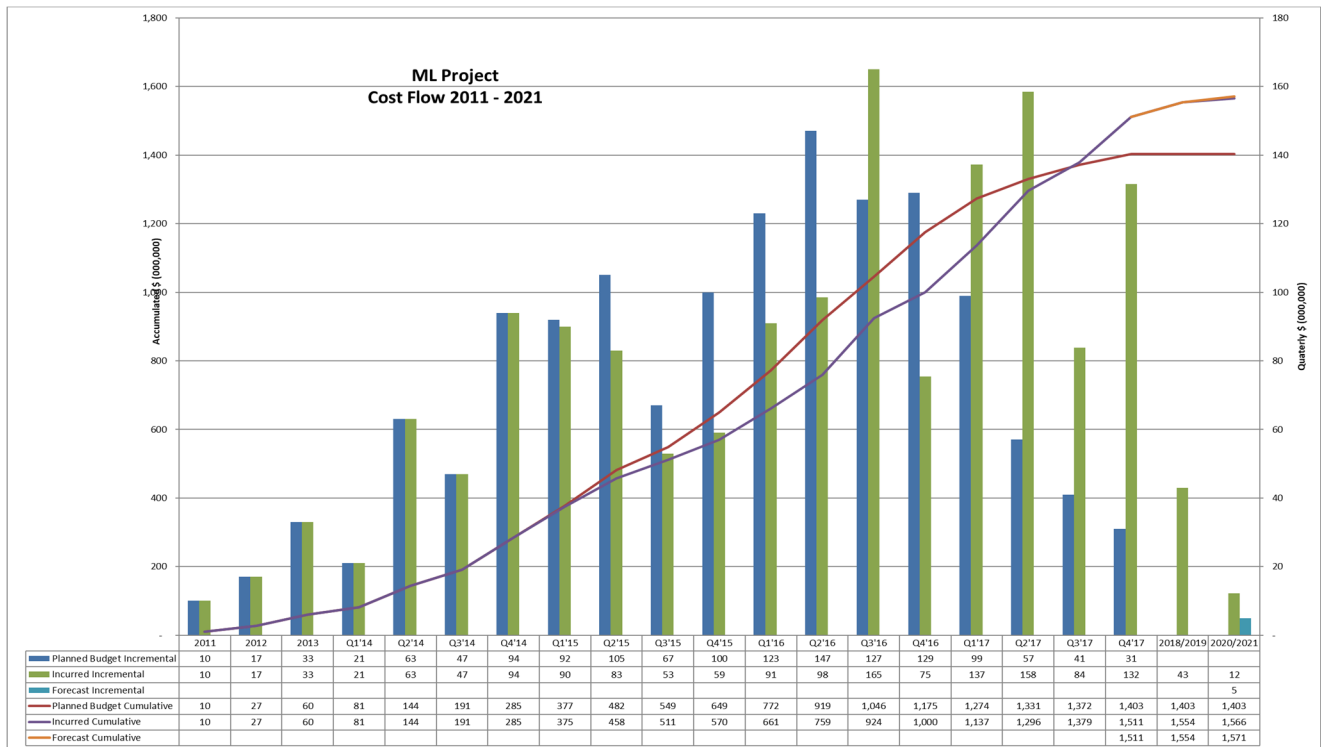
12
 13 As reflected in Table 2, the total actual project capital costs incurred during Q4 2021
 14 was a net credit of \$132,000 primarily relating to an adjustment for project
 15 management costs and costs relating to corrective transmission activities.

4.0 COST FLOW

As per Enerco U-31, section 2.2, please refer to Table 3 below for the cost flow of the Maritime Link. This cost flow report for the base capital spending is forecast at \$1.571 billion in accordance with NSPML’s final cost application. All adjustments relating to the Board’s Decision will be reflected in the Quarterly Report to be filed in June 2022.

The remaining budget primarily relates to the regulatory requirements relating to the construction aspect of the project and project close-out activities.

Table 3 Maritime Link Cost Flow



1 **5.0 INTERIM ASSESSMENT FINANCIAL UPDATE 2021**

2

3 NSPML filed its 2021 annual audited and regulated financial statements with the
4 UARB on March 31, 2022 which include a summary of actual and budgeted costs for
5 the year.

Operating Agreement Requirements Arising from the Formal Agreements

	Agreement	Parties	Description	Formal Agreement Source	Status
1.	Asset Interconnection Agreement (NL)	Emera, NLH	Interconnection of ML with the Island Interconnected System	ML-JDA, s. 2.1 (c)	Completed
2.	Multi-Party Pooling Agreement	Emera, NLH	NLH (SO) to have operational control of ML NLH AC Upgrades	ML-JDA, s. 2.1 (d)	Completed
3.	Transmission Operating Agreement (NL)	Emera, NLH	NLH (SO) to have operational control of ML NL HVdc Facilities	ML-JDA, s. 2.1 (e)	Completed
4.	Asset Interconnection Agreement (NS)	Emera, NSPI	Interconnection of ML with NS bulk electric transmission system	ML-JDA, s. 2.1 (f)(i)	Completed
5.	Transmission Operating Agreement (NS)	Emera, NSPI	NS SO to have general operational control of the ML	ML-JDA, s. 2.1 (f)(ii)	Completed
6.	ECA – Metering and Measuring Standards – Transmission Losses	NSPML, Nalcor	Metering and measuring standards used in the calculation of Transmission Losses	ECA, Schedule 3, s. 5	Completed
7.	Regulation Service Agreement	NS Power NLH	Nalcor’s provision of the Regulation Service with respect to the Nova Scotia Block for the Initial Term	ECA, Schedule 5	Expect completion in 2022.
8.	Metering and Measuring Standards – NS NTQ transmission losses	NSPML, Nalcor	Metering and measuring standards used in calculation of NS –NTQ Path Peak and Off-Peak Hour transmission losses	NSTUA, Schedule 3, s. 6	Completed
9.	NB Back-up Capacity Agreement	Bayside Power L.P, Nalcor	Emera’s provision of backup Capacity to NB to Nalcor until March 31, 2021	NBTUA, s. 2.1(d)	No longer required given sale of Bayside to NB Power.
10.	IOA – ML Transmission Procedures	NSPI, NLH	Rules and practices applicable to administration of transmission service over the ML	IOA, Schedule D	Completed
11.	IOA – Reserve Sharing	NSPI, NLH	Sharing of energy and reserves between the Parties to improve Reliability	IOA, Schedule A	Completed
12.	IOA – Description of Interconnection Facilities	NSPI, NLH	Description of Interconnection Facilities for which each Party is responsible	IOA, Schedule B	Completed
13.	IOA – Functional Operating Relationship	NSPI, NLH	Various matters relating to operating relationship	IOA, Schedule C	Completed

14.	IOA – Operating Procedures	NSPI, NLH	IOC to develop “operating procedures”	IOA s.7.2 and s. 7.4(a)	Completed
15.	IOA – Schedule A1.0	NSPI, NLH	Parties to prepare a plan for NLH participation in Reliability Assessment Program (“RAP”)	IOA Schedule A1.0	Completed
16.	ML TSA – ML Scheduling Process	Emera and Nalcor	Scheduling process applicable to the provision of Firm Point-to-Point Transmission Service	MLTSAs, Schedule 2	Completed
17.	Amendments to Formal Agreements	Emera, Nalcor	Amendments to Formal Agreements required by Sanction Agreement	Sanction Agreement	Completed
18.	Energy Access Agreement	Emera, Nalcor	Commitments regarding access to market priced energy	Compliance Filing, Appendix A	Completed
19.	Balancing Service Agreement	Emera, Nalcor	Nalcor commitment to provide balancing services from generation sources in NL for 25 years.	Energy Access Agreement Term Sheet, s. 7(g) and Appendix 1	Completed
20.	Assignment of Transmission Rights under ML(E)TSA	Emera, Nalcor	Assignment of Transmission Rights	ML(E)TSA, s. 3.3 (h)	Completed
21.	Assignment of Energy Access Agreement	Emera, Nalcor, NSPI and Nalcor Energy Marketing (NEM)	Assignment/assumption of Nalcor’s rights and obligations to/by NEM	EAA s. 15.1 (a)	At Nalcor’s discretion. Not a requirement of NSPML.
22.	Assignment of Nalcor Master Agreement (EAA Schedule 2)	Nalcor, NSPI and NEM	Assignment/assumption of Nalcor’s rights and obligations to/by NEM	Nalcor Master Agreement s. 10.5 (a)	At Nalcor’s discretion. Not a requirement of NSPML.
23.	JOA-Joint Operating Committee (“JOC”)	Nalcor and NSPML	Establish/Operationalize JOC	JOA s. 3.1, 3.5	Completed
24.	NS Transmission Utilization Agreement	Nalcor and Emera	Status of Emera firm Point to Point Transmission Service	NSTUA s.s.2.2 (a)-(c)	Completed

**Attachment 2 (Cable Inspection Survey) has been removed
due to confidentiality.**

Attachment 3 (Memo Re: Cable Inspection Survey) has been removed due to confidentiality.



LCP - ML PROJECT

SITE VISIT REPORT NOVEMBER 8 TO 11, 2021

Prepared for: Natural Resources Canada and NSP Maritime Link Inc. (NSPML)

IE Point of Contact: Nik Argirov

Date: January 12, 2022

Quality Assurance Statement

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1. GENERAL

Independent Engineer (IE) team participated in the site visits for the Maritime Link (ML) project. The site visits took place in the province of Nova Scotia between November 8th and 11th 2021. NSPML management representatives Craig Snelgrove, Rory MacNeill and Eric Cayouette led the site meetings and accompanied the IE team listed below. Norm Dimmell and Anne-Marie Curtis participated by Webex call.

IE team: Nik Argirov (IE Team Lead)
Hamdy Khalil (IE Transmission Lines SME)
Vlad Kahle (IE Electrical SME)-participated by Webex call

The trip itinerary was as follows:

November 8:

- Arrive and overnight in Halifax, NS

November 9:

- Meeting at EMERA office
- Travel to Sydney, NS

November 10:

- Point Aconi Transition Site and Big Lorraine Grounding Site visits
- Woodbine Converter Station site visit and meeting

November 11:

- Travel from Sydney to home base

2. NOVA SCOTIA PROJECT SITES– NOVEMBER 10, 2021

Transportation to all sites was by road.

2.1. Point Aconi Landfall and Transition Compound Sites

IE visit was facilitated by Craig Snelgrove. The facility, cable trench and cable site have been well maintained and were in perfect order.



Photo 1: Landfall HDD cables site.



Photo 2: Transition compound – west land cable terminal and control building.



Photo 3: Transition compound – post insulators, disconnect switches and main gantry.

2.2. Big Lorraine Grounding Site

IE visit was facilitated by Craig Snelgrove. The facility has been well maintained and was in perfect order.



Photo 4: Grounding site - grounding lines transitions from overhead to underground.



Photo 5: Grounding site - grounding wells with electrodes under precast concrete covers inside the fenced enclosure.



Photo 5: Grounding site – outer side of protective berm in good condition.



2.3. Woodbine Converter Station Site Visit and Technical Meeting

Site walkthrough and technical discussions were led by Rory MacNeill and Eric Cayouette.

Meeting was moderated by Eric Cayouette; Norm Dimmell and Vlad Kahle and Anne-Marie Curtis participated by Webex call.

a) Pandemic Update:

- Although Pandemic had some impact on the business, major maintenance activities such as damper replacements, annual outage work, TL LTSA and subsea survey were complete.
- Alerts are low in NS/ NL, 80% of Emera staff are double vaccinated and all staff are back in the office and at sites. Masking and social distancing are compulsory in the offices.
- Mandatory vaccination program is in place for the staff and contractors

b) Safety Highlights:

- By Oct. 2021 there were no near misses, OSHA IR, Contractor OSHA recordable injuries, lost time, Restricted Work or High Potential incidents.
- Safety Management System review was restructured and is slated for completion in Q4 of this year.
- Serious Injury and Fatality (SIF) prevention framework, pilot training for Emera and High-Risk Task Register were implemented and completed.
- Marine Survey was preceded by High- Risk Review (HRR); daily meetings were held throughout the program.

c) Environment:

- To date no moderate or significant environmental incidents have been reported; one minor incident and thirty-three proactive reports have been entered.
- ENL remains compliant with all environmental permits and requirements in 2021.
- Final installment of the crab and lobster monitoring program was deferred until Q3 2022. The regulator (DFO) was informed of this decision.

d) 2021 ML Performance

- Maritime Link's STATCOMS (static compensators) were extensively utilized for reliability and economic purposes in both provinces.
- Frequency controllers provide notable reliability benefits.
- Active Power is transferred between the provinces on an economic basis in conjunction with agreement terms.
- Two monopole forced outages have been recorded year to date (see below).
- Active Power Availability:
 - Monopole- 96.0%
 - Pole 2- 81.5%
 - Pole 1- 69.9%
 - Bi- pole- 55.3%

	01.16 TO Q1	Q2	Q3	YTD
%EU	7.33	11.81	17.38	19.25
%FEU	0	0.01	0.01	0.01
%SEU	7.33	11.8	17.37	19.24
%EA	92.67	81.19	82.62	80.75
BFO	0	0	0	0

Legend:

EU	Equipment Unavailability
FEU	Forced Equipment Unavailability
SEU	Scheduled Equipment Unavailability
EA	Equipment Availability
BFO	Bipole Forced Outage

- Forced Outages:
 - April 15th Pole 2 outage was attributed to human error by a party not under NSPML's management. NSPML's understanding is that this party inadvertently initiated trip from incorrect Protection equipment and this incident was followed up by appropriate corrective actions.
 - Post Meeting Note: IE suggested additional measures and issuance of Safety Bulletin.
 - July 11th Pole 2 outage was caused by abnormal cell capacitance alarm and a trip. The capacitance was later confirmed to be correct. Investigation driven actions to date consist of revision to capacitance calculation algorithm and installation of metallic shield around the capacitor board. Based on results, additional actions may be required.

e) Asset Management- HVDC Preventative Maintenance:

- Planned Activities:
 - Q1 2021- 454 Complete
 - Q2 2021- 469 Complete
 - Q3 2021- 381 Complete, 1 Not complete, on track
 - Oct. 2021- 115 Complete, 1 Not complete, on track
 - YTD- 1419 Complete, 1 Not complete, on track
 - Total: 1420

f) Asset Management- Transmission Line (TL) Maintenance:

- TL Activities:
 - 2021 maintenance program completed
 - A Long-Term Service Agreement (LTSA) for Transmission line service support was awarded to CAUS. Detailed contingency repair plans are being developed as part of TL LTSA.
 - Started replacement of OHSW Jumpers on HVAC.
 - Insulators, cross arm, HVAC dampers and composite poles on order as spares for contingency.
 - Additional access mats (500) were relocated to Bottom Brook as part of the TL contingency planning.
- Vegetation Management:
 - 2021 Vegetation Management program executed.
 - RFPs in progress for support of 2022 program forward.



g) Transmission Line Inspections Findings:

In general, the findings are minor and typical for this type of work. The following are examples of some of the findings:

- HVDC NS: 2 missing counterpoise connections, 2 damaged guy wires and 1 broken insulator glass were replaced.
- HVDC NL: 1 cotter pin missing in shield wire connection, 1 damaged guy wire and 1 broken braided jumper were replaced.
- HVAC NL: Loose bolts in X brace – re- torqued and punched all in SOW and 1 OPGW damaged jumper was replaced
- Grounding Line NS: Backfilling required around base of 1 structure (not properly sloped when pole erected), 1 low guy wire tension and 1 bolt missing in jumper Nema pad connection were repaired.
- Grounding Line NL: minor items were found but did not require repairs.
- Other missing minor items such as number sign and pole cap, missing and loose bolts, and damaged OPGW clamp.

All jumpers for the HVAC are also to be replaced over 10 years as part of the yearly climbing inspection. Approximately 10% yearly over 10 years.

h) Marine:

- NSPML awarded the contract to Horizon Maritime using their Horizon Arctic vessel along with subcontractors Seaforth Geosurveys and Bourbon Offshore DNT. The scope consists of a full survey (167km on each cable) using ROV based MBES, SSS, Visual inspection and determination of depth of burial.
- Preliminary results indicate depth of cover appears to keep improving.

i) Procurement:

- Submarine Cable Survey was awarded to Horizon.
- Transmission Line Services Inspection and Repair (2021-2023) were awarded to Connect Atlantic Utility Services.
- Vegetation Management Program for 2022- 2024 RFP is being developed.
- Fire Protection and HVAC maintenance agreements are in place.

i) Bottom, Brook Short Circuit:

- Short Circuit Ratio (SCR) is used to quantify the strength of the AC system at the converter bus of an HVDC system. The SCR is defined as the ratio of the short circuit MVA of the AC system at the AC bus to the rated HVDC power at that bus. Interconnections with low short circuit ratio do not allow line commutated converters to operate in consistently stable manner. Short circuit levels at BBR are much lower than originally specified resulting in restrictions on HVDC power import/ export and ability to operate in Bi- pole mode in certain conditions.
- In order to establish new import / export limits for conditions with one or two AC transmission lines out service, Hitachi Energy, NLH and TransGrid Solutions were engaged to refine PSCAD models and perform revised operational studies.
- Addition of Special Protection System (SPS) will facilitate the following HVDC transfer limits for different operating configurations with one and two transmission lines out of service (o.o.s.):
 - All lines in service permit Bi- pole transfer of +/- 500MW
 - Either TL 211 or TL233 o.o.s. permits Bi- pole transfer of +/- 250MW
 - TL269 o.o.s. permits Bi- pole transfer of +350MW, -320MW
 - TL211 and TL223 o.o.s. permit Mono pole transfer of +/- 175MW



- TL269 and TL211 or TL2334 o.o.s. permit Bi-pole transfer of +250MW, -320MW.

j) Diesel Generator Alternator Replacement and Commissioning Records Review:

Forced Bi-pole outage on 19 June 2019 was caused by emergency diesel failure to pick up the essential station load. Subsequent investigation concluded that the BBR and WB emergency diesels did not have functioning high speed differential protection and neither system had been properly commissioned by the supplier. Following action was taken:

- Alternators were replaced at both Bottom Brook and Woodbine converter stations.
- Differential protections were re-commissioned and put in service.
- Emergency diesels' transfer sequences were verified by operational tests including loss of both sources.

Apparent deficiency in original commissioning quality control necessitated review of the Project commissioning records by NSPL. Two gaps were identified:

- Breaker cross-tripping from HVDC to AC station documentation was not found.
- Documentation showing that Low Voltage Switch gear breaker setting verification and testing was not found.

k) 2022 Maintenance Outlook for Stations:

- HVDC System: Longer outage are planned for 2022 to accommodate activities pushed from 2021 plan and brought back from 2023 plan. 500MW performance test is expected to be performed in Q3 2022.
- Subsea Cable: Complete subsea survey is planned for 2022.
- Transmission and Grounding Lines: No outages are planned specifically for this component. Ground Level Inspections are planned for Q1/Q2, 2022 and Vegetation Management and Climbing Inspections, for Q3/Q4, 2022.
- AC Substations: Nominal inspection and maintenance will be carried out by NLH and NSPI.

l) 2022 Maintenance Outlook for Marine:

- Marine Inspection Survey: Planning is underway for cable inspection and Kraken update.
- Cable Protection Plan: Scoping assessment for supplementary rock installation campaign, or other remediation, will take place once 2021 marine survey results are received and assessed.
- Cable Integrity Assessment: An update is anticipated using marine survey results and other data.
- Inspection, Maintenance and Repair Framework: Repair and contingency plan will be updated and completed.

3. COMMENTS

The marine survey final data sets will be available in early 2022. It is expected this information to be reported to IE.