Q. Reference: "2020 Capital Budget Application," Newfoundland Power, July 5, 2019, Report 1.4 "Topsail Hydro Plant Penstock Replacement," sec. 3.0, at p. 3.

Overall, the 38-year-old penstock is in poor condition. Issues have been noted with all components of the woodstave penstock including cradles, steel bands, wooden staves, site drainage and buried sections of penstock.

Please provide Newfoundland Power's preventive maintenance manual for all woodstave penstocks and describe Newfoundland Power's plan to maximize the service life of all penstocks.

A. Newfoundland Power does not have a preventive maintenance manual for its woodstave penstocks. Rather, the Company implements plant-specific operating guidelines.

Two specific operating guidelines apply to woodstave penstocks: (i) *POG100.07 Maintenance of Dams, Gates and Penstocks;* and (ii) *POG100.14 Leached Preservatives Used on Penstocks and Other Wood Structures.* Copies of these guidelines are provided as Attachment A to this response.

Preventative maintenance is currently the primary means through which Newfoundland Power maximizes the service life of its penstocks.[1] Preventative maintenance of penstocks is completed by operational staff as part of regular dam safety operator inspections.[2] Examples of preventative maintenance activities include inspecting the alignment of the penstock and the condition of: (i) air vent and relief valves; (ii) drainage ditches and bedding; (iii) culverts; (iv) wooden staves, bands and butt joints; (v) cradles; and (vi) anchor blocks.

Any issues identified through the inspections, such as required leak repairs, drainage improvements, clearing of culverts, or band replacements, are dealt with at that time.

The typical design life for a woodstave penstock is 30 to 40 years.[3] As shown in response to Request for Information NLH-NP-017, the average age of Newfoundland Power's woodstave penstocks currently in service is approximately 50 years.

[1] Historically, the application of creosote preservative to wooden staves and asphalt coating to steel bands were the primary activities employed by Newfoundland Power to extend the service lives of woodstave penstocks. As stated in Report *1.4 Topsail Hydro Plant Penstock Replacement* (page 4), these activities have been discontinued due to health and environmental concerns.

[2] Dam Safety Engineering Assessments also include the inspection of penstocks.

[3] In the Fall 1985 edition of the journal *Hydro Review*, the authors suggested that a relatively short life of between 30 and 40 years could be expected for small, low-head penstocks. This is consistent with the typical design life estimate of 40 years in the condition assessment completed by MECO provided as Appendix C of Report *1.4 Topsail Hydro Plant Penstock Replacement*. This is also consistent with Newfoundland and Labrador Hydro's report on the *Snook's Arm Wood Stave Penstock* (page 10) filed with its *2005 Capital Budget Application*, which states the anticipated life of woodstave penstocks is typically 40 years.

Newfoundland Power Plant Operating Guidelines
POG100.07 and POG100.14

Bulletin Number: POG100.07
Date Issued: 1999 07 15
Date Revised: 2012 01 20
Date Reviewed: 2018 08 20

Maintenance of Dams, Gates and Penstocks

Created By: K. Nicholson
Revised By: P. O'Leary
Reviewed By: G. Whitty
Approved By: G. Humby

1.0 Purpose

To identify existing or potential issues, related to the condition of dams/gates/penstocks that may negatively impact the environment and conduct immediate improvements.

2.0 Scope

This procedure provides guidelines for the inspection and other preventive maintenance activities relating to all dam structures (both storage structures and gate structures) and penstocks owned and operated by the Company.

3.0 General

Regularly scheduled preventative maintenance (PM) activities ensure that dam structures (both storage structures and gates structures) and penstocks are functioning as intended. The PM program includes inspection activities, operational assessments, and normal maintenance required to maintain structures in an appropriate operating condition. A properly maintained system will reduce the potential for loss of water control and flooding that may cause disruption/ creation of fish habitat, erosion, and inefficient use of the water resource.

4.0 Responsibilities

4.1 Director Responsible for Generation Operations

- Will ensure that the overall PM program is appropriately resourced and coordinated.

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4.2 Manager, Generation

- In conjunction with the Manager responsible for Civil Engineering, shall deploy resources as required to complete repairs and improvements in a timely and cost effective manner.

4.3 Supervisor(s), Generation Operations

- Will ensure structures are inspected and make decisions, in conjunction with the Superintendent, Generation Operations, regarding repairs or improvements to structures that have a potential to adversely affect the environment.

5.0 Procedure

5.1 Dam structures (storage structures and gates) will be operated in accordance with the POG100.03 Series – Reservoir and Turbine Operating Procedures.

5.2 Power plant staff to conduct a site visit and inspection of each dam structure (storage structures and gate structures) and penstock on a frequency as scheduled in Avantis.

5.3 Power plant staff conduct PM activities to ensure structures are maintained in an appropriate operating condition.

- Maintenance to penstock bands and staves will minimize the potential for flooding caused by an uncontrolled release/blowout.
- Maintenance to forebay sluice gates will minimize leaks, and thus prevent the inadvertent creation of unsustainable fish habitat.
- Maintenance to gated spillway structures will ensure that adequate flood discharge capacity is maintained. This will reduce the risk of dam overtopping and subsequent downstream siltation.

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5.4 Supervisor(s) Generation Operations to identify and coordinate appropriate repairs or improvements relating to issues identified during the inspections that have the potential to negatively impact the environment.

6.0 References

6.1 Reference Documents

- POG100.03 Series – Reservoir and Turbine Operating Procedures

6.2 Related Significant Aspects

- 270; 720

6.3 Legal and Other Requirements

- Environmental Legal Requirements Application - Webster

7.0 Records

- No records

8.0 Glossary

Abbreviations

- **PM** - Preventive Maintenance

Bulletin Number: POG100.14
Date Issued: 2002 04 05
Date Revised: 2013 07 25
Date Reviewed: 2018 08 20

Leached Preservatives Used on Penstocks and Other Wood Structures

Created By: B. Titford
Revised By: D. Ball
Reviewed By: G. Whitty
Approved By: G. Humby

1.0 Purpose

To reduce soil and water contamination caused by leaching of contaminants from treated wooden structures.

2.0 Scope

This procedure applies to all treated wooden structures associated with Company owned hydroelectric developments, primarily penstocks and spillway stoplogs.

3.0 General

We must manage our use of wood preservatives and treatments to minimize environmental impact. As well, it is important that soil contaminants are either removed or controlled to prevent environmental damage to surrounding areas and waterways.

4.0 Responsibilities

4.1 Manager, Engineering and Manager Generation

- Will ensure that employees and Contractors, conducting work on behalf of the Company, comply with this procedure.

4.2 Supervisor(s) Generation Operations

- Will ensure penstock leaks are repaired as part of regular plant maintenance.

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5.0 Procedure

5.1 Appropriate Use of Preservatives

5.1.1 Petroleum grease is not to be used as a lubricant for mechanical fittings on penstocks. A non-toxic, biodegradable synthetic grease (Mobilgrease EAL 102, or alternate) shall be used for lubricating mechanical fittings.

5.1.2 Creosote treated wood staves, in existing inventory only, will be used for penstock maintenance. No new creosote treated wood material will be purchased. See OPR200.03 – Chemically Treated Poles and Timbers for further information.

5.1.3 Wood treated with CCA is not to be used within 15m of a waterway unless regulatory approval has been received.

5.1.4 Field treating of timbers and decking is to be done in dry conditions only and shall not contact water until completely dry.

5.2 Penstock Right-of-Way Drainage

5.2.1 New penstock installations will ensure appropriate surface drainage systems are provided. Such drainage systems will facilitate surface water flow away from the penstock right-of-way.

5.2.2 Plant staff shall inspect and correct problems identified with surface drainage. See POG100.07 – Maintenance of Dams, Gates and Penstocks for further information.

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5.2.3 Penstock right-of-way drainage systems are required to minimize the extent of uncontrolled dispersal of surface runoff. This control may be achieved through the use of transverse cross drains/ditching which direct surface water away from the right-of-way, as well as longitudinal collection drains which flow parallel to the penstock. Longitudinal collection drains are normally located at an offset of one to two metres from the outside of the penstock.

5.3 Soil Remediation

5.3.1 When existing treated wooden penstocks are replaced, the underlying soil will be tested for contamination. If tests indicate contaminants in the soil exceed regulation limits, the soil will be remediated in accordance with applicable regulations. This may, subsequently, result in soil removal and/or risk management of contaminated soil. See OPR200.36 – Environmental Management of Company Property for further details.

6.0 References

6.1 Reference Documents

- POG100.07 – Maintenance of Dams, Gates and Penstocks
- OPR200.03 – Chemically Treated Poles and Timbers
- OPR200.36 – Environmental Management of Company Property

6.2 Related Significant Aspects

- 720;

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6.3 Legal and Other Requirements

- Environmental Legal Requirements Application - Webster

7.0 Records

- No records

8.0 Glossary

Abbreviations

- CCA - Chromated Copper Arsenate