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December 20, 2024

Board of Commissioners of Public Utilities
Prince Charles Building
120 Torbay Road, P.O. Box 21040
St. John's, NL A1A 5B2

Attention: Jo-Anne Galarneau
Executive Director and Board Secretary

Re: Mini-Hydro: Economic and Technical Assessment

Please find enclosed Newfoundland and Labrador Hydro's ("Hydro") Mini-Hydro: Economic and Technical Assessment Report ("Mini-Hydro Report"). This report is filed as committed by Hydro in its response to Request for Information ("RFI") PUB-NLH-001 of the 2025 Capital Budget Application.[1]

The Mini-Hydro report provides details of the assessment referenced in Hydro's response to RFI CA-NLH-025 of Hydro's 2022 Capital Budget Application,[2] wherein Hydro was asked whether it was considering retiring small Hydro facilities and to provide any related studies Hydro had completed on such facilities, with focus on those with capacities of less than 1 MW. In response, Hydro had noted it was actively *". . . assessing the alternatives for the future of [mini-hydro] facilities, including the alternative of retirement."*

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

Shirley A. Walsh
Senior Legal Counsel, Regulatory
SAW/kd

Encl.

ecc:

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Dominic J. Foley
Regulatory Email

[1] RFI PUB-NLH-001 of the "2025 Capital Budget Application," Newfoundland and Labrador Hydro, July 16, 2024, asked Hydro to provide an update on when the Mini-Hydro Report would be filed with the Board of Commissioners of Public Utilities. Hydro committed to providing the updated report in the fourth quarter of 2024.
[2] "2022 Capital Budget Application," Newfoundland and Labrador Hydro, rev. September 17, 2021 (originally filed August 2, 2021).

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Mini-Hydro: Economic and Technical Assessment

December 20, 2024

A report to the Board of Commissioners of Public Utilities

Executive Summary

This report serves as screening level assessment to determine the least-cost options for Newfoundland and Labrador Hydro's ("Hydro") mini-hydro[1] generating stations within the Island Interconnected System. Hydro owns three mini-hydro generating stations in Roddickton, Snook's Arm, and Venams Bight. These facilities have an array of assets which are either approaching or past their useful service life; as such, significant capital investment would be required to ensure the reliable generation of electricity from these facilities.

The combined nameplate capacity of all three mini-hydro generating stations was designed as 1.32 MW, which is not included in Hydro's firm capacity at the time of system peak due to low flows at each reservoir.[2] The annual generation of all three units was estimated to be 6.87 GWh of electricity; in comparison, Hydro's 13 other hydraulic generating units on the Island Interconnected System annually generate approximately 4,496 GWh of electricity, combined.

Preliminary cost-benefit and sensitivity analyses were conducted to determine the most economically feasible option for all three mini-hydro generating stations. For each location, two technically viable[3] alternatives were developed and outlined in this report as follows:

- Alternative 1 – Life Extension of the Generating Stations; and
- Alternative 2 – Decommissioning of the Generating Stations.

Life extension work required for each generating station varies based on the requirements to extend its useful service life to a minimum of 30 years.[4] Decommissioning requirements for each location include, but are not limited to, the development of a decommissioning plan and the registration of the

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[1] Mini-hydro units have a power range capacity between 0.1–1.0 MW, as seen in Table 2. In the past, Hydro has referenced these units as 'small' but this was in comparison to other hydro units within its fleet.

[2] The rated capacity of the hydraulic generating units in Roddickton, Snook's Arm, and Venams Bight are 0.4 MW, 0.56 MW, and 0.36 MW, respectively. The generating stations in Snook's Arm and Venams Bight have since been derated to 0.50 MW and 0.33 MW, and have been out of service since 2019 and 2011, respectively.

[3] The full replacement of each location was not considered a viable alternative due to the different life spans of the assets that make up a generating station, such as the concrete structures and penstocks. It would be cost-prohibitive with no added material capacity or energy benefit compared to life extension.

[4] 30 years corresponds to the original life cycle of the timber crib dams in all three locations.

undertaking in accordance with the Newfoundland and Labrador *Environmental Assessment Regulations, 2003* under the *Environmental Protection Act*.

Hydro recognizes that its most recent update of the Reliability and Resource Adequacy Study[5] indicates that energy and capacity will be required on the system to serve customer load during the study period from 2030 through 2034. Hydro's Minimum Investment Expansion Plan includes the construction of Unit 8 at Bay d'Espoir and a 150 MW combustion turbine plant on the Avalon Peninsula, plus the necessary procurement of energy for which Hydro plans to issue a supply Expression of Interest.

These mini-hydro generating stations do not represent a feasible source of energy or capacity. In total, they generate less than 7 GWh of energy on an annual basis and energy produced by these mini-hydro plants is lowest in the winter months when Hydro is forecasting to require this additional energy. In addition, the capacity contribution of these sites is considered negligible and non-firm; therefore, they have no material contribution to Hydro's system needs. Based upon the current economic and technical analyses, the least-cost alternative for each mini-hydro generating station currently owned by Hydro would be to decommission and remove all equipment from the site.

As it has been confirmed that the continued operation of these facilities by Hydro is not economically feasible, Hydro has identified the sale of these assets as a potential opportunity to avoid incurring further costs. On this basis, Hydro has engaged Independent Power Producers ("IPP") and will further explore potential sale of assets opportunities prior to proceeding with the decommissioning of each site.

Absent any viable opportunities for sale of the assets, and with decommissioning remaining the least cost, viable alternative for each site, Hydro plans to complete detailed engineering, beginning in 2025, to further develop the decommissioning plan and confirm the breadth of environmental remediation required for each site prior to proceeding.[6] Once the scope of the decommissioning and remediation work is refined, Hydro will revisit the cost-benefit analysis and provide an update to the Board of Commissioners of Public Utilities ("Board") on the results.

[5] "2024 Resource Adequacy Plan – An Update to the Reliability and Resource Adequacy Study," Newfoundland and Labrador Hydro, rev. August 26, 2024 (originally filed July 9, 2024).

[6] Cost estimates completed for the analysis were Association for the Advancement of Cost Engineering ("AACE") Class 5; given the uncertainty of the breadth of environmental mitigations required for each site, Hydro plans to complete detailed engineering to further develop the scope and estimate of the decommissioning plan.

Contents

1.0 Introduction

Hydro owns and operates 9 hydroelectric generating stations containing 16 generating units, ranging in size from 0.36 MW to 154.4 MW. The location, capacity, and annual production of each unit are listed in Table 1. Based on the hydroelectric industry unit sizing classification outlined in Table 2, Hydro operates 1 large unit, 11 medium units, 1 small unit, and 3 mini units. Hydro predominately operates and maintains medium-sized hydroelectric generating units that have a typical capacity range of 10–100 MW.

Table 1: Capacity of Hydro's Hydroelectric Generating Stations

Location	Installed Capacity (MW)	Gross Continuous Unit Rating[7] (MW)	Annual Production (GWh)
Bay d'Espoir:			
Units 1–6 (each)	76.5	76.5	2,650.0[8]
Unit 7	154.4	154.4	
Upper Salmon	84.0	84.0	570.0
Granite Canal	40.0	40.0	220.0
Cat Arm:			
Units 1–2 (each)	67.0	67.0	680.0[9]
Hinds Lake	75.0	75.0	340.0
Paradise River	8.0	8.0	36.0
Roddickton	0.40	0.00	0.81
Snook's Arm	0.56	0.00	3.57
Venams Bight	0.36	0.00	2.49

[7] Gross Continuous Unit Rating reflects the generation by source that is assumed available during peak times. The Gross Continuous Unit Rating associated with the mini-hydro plants has been assumed to be 0 MW due to the seasonality of the flows at these facilities.
[8] Total annual production of the Bay d'Espoir Hydroelectric Generating Station ("Bay d'Espoir"), including all seven units.
[9] Total annual production of the Cat Arm Hydroelectric Generating Station ("Cat Arm"), including both units.

Table 2: Hydroelectric Industry Unit Sizing Classification

Hydro Classification	Capacity Power Range
Large	>100 MW
Medium	10–100 MW
Small	1–10 MW
Mini	100 kW–1 MW
Micro	5 kW–100 kW
Pico	0 kW–5 kW

1.1 Assets Under Consideration

Hydro's fleet of mini-hydro units have reached the end of their useful service life, and require capital investment to ensure continued safe and reliable operation. This report will outline the economic and technical aspects of analyzing its three mini-hydro generating stations; Roddickton, Snook's Arm, and Venams Bight, and will provide information to help inform strategic decisions regarding Hydro's future direction with mini-hydro facilities.

For each location, two alternatives were developed and outlined in this report, including life extension of the generating stations and decommissioning of the generating stations. The alternatives assessed were the technically viable options known at the time the analysis was completed; however, pending terms and conditions of an agreement, Hydro acknowledges the sale of some or all of the assets could be the least-cost alternative. As such, a potential sale will also be explored.

2.0 Roddickton Mini-Hydro Plant

2.1 Asset Overview

2.1.1 Asset Background

The Roddickton Mini-Hydro Plant ("Roddickton Plant") consists of a single horizontal crossflow[10] hydraulic generating unit rated at 0.4 MW.[11] The development consists of a single run-of-river hydro plant located on Marble Brook near Roddickton, on the Great Northern Peninsula.

[10] A crossflow turbine is designed using a large cylindrical mechanism composed of a central rotor surrounded by a cage of blades arranged into a water wheel shape. This is a type of impulse turbine, similar to the Pelton turbine, as it uses water jets to create an impulse.

[11] The plant went into operation in 1980, and was built under a mini-hydro pilot project through an agreement with the Government of Canada.

The reservoir for the Roddickton Plant is impounded by the Roddickton Dam, a timber crib structure that was constructed in 1980. The dam is approximately 75 metres long with a maximum height of 4 metres and includes a 31-metre overflow spillway section designed to convey up to 23 m^3/s of flow during flood events. The water from the reservoir is conveyed to the powerhouse via a buried high-density polyethylene ("HDPE") penstock, installed during the original construction of the Roddickton Plant.

The Roddickton dam, plant and hydraulic generating unit are shown below in Figure 1, Figure 2, and Figure 3, respectively.

Figure 1: Roddickton Dam

Figure 2: Roddickton Plant

Figure 3: Roddickton Generating Unit

2.1.2 Historical Reliability

Since 1980, the Roddickton Plant has been manually operated when sufficient flows were available for generation. Although the unit is rated for 0.4 MW, it rarely achieved this capacity and typically did not generate power during the winter months due to low water levels.

The average monthly production of the Roddickton Plant over a 34-year period (1985–2019) is shown in Chart 1.[12]

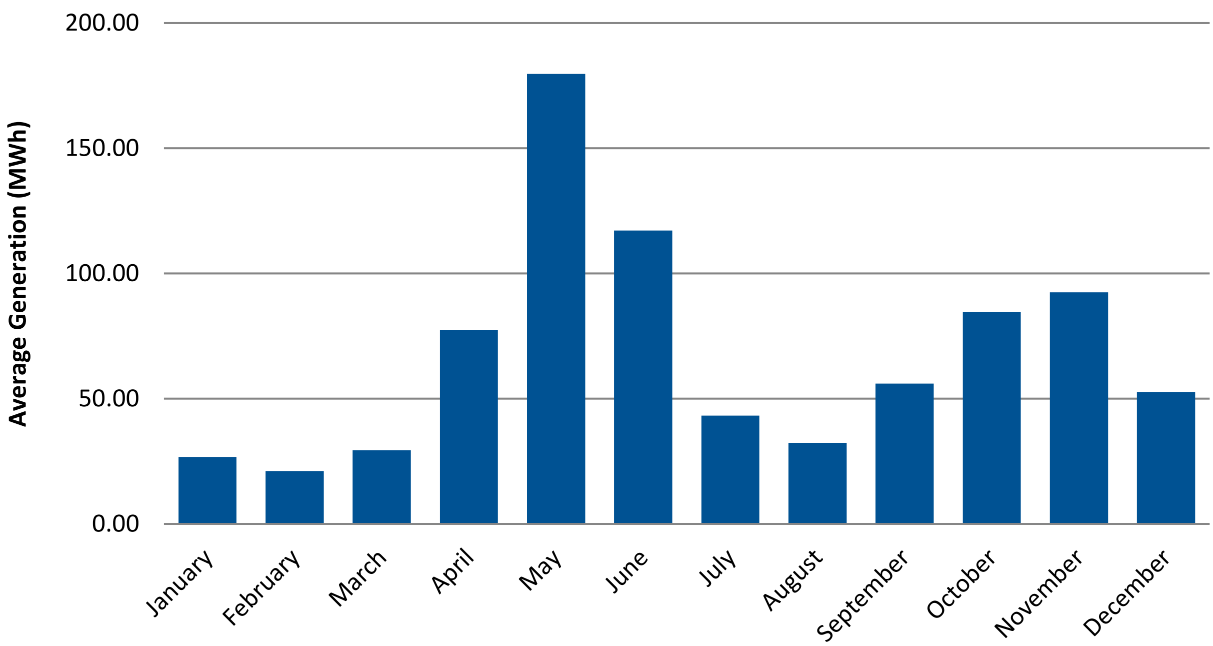

Chart 1: Roddickton Plant Average Monthly Production (1985–2019)

2.1.3 Asset Condition

Dam

The Roddickton Dam structure is now over 40 years old and has deteriorated to a point where the internal timbers are rotting and stability is marginal, particularly under ice load conditions. Annual inspections since 2017 have noted increasing deterioration, and continual movement of the walls of an internal access chamber has been identified. This movement has been significant over the last few years and is indicative of the deterioration of the internal timbers of the crib and the resultant movement of crib ballast material. Some of the exterior timbers, as well as the upstream facing and membrane, were

[12] As the generating unit of the Roddickton Plant has not run reliably in recent years, data beyond 2019 has not been provided as it would not provide an accurate reflection of the average monthly production.

replaced in 2005; however, these materials show signs of significant decay along a portion of the upstream face of the dam.

Due to the deteriorated condition of the dam, there is an increased probability of dam failure without mitigations in place. An In-Service Failure Project[13] was completed in 2020 to temporarily mitigate this failure by placing ballast rock immediately downstream of the structure to provide bulk stability to the dam. Since this project was completed, the Roddickton generating unit has not run reliably, resulting in additional stress on the dam structure due to the reservoir continually filling. While temporary repairs have been completed in recent years to mitigate the risk associated with dam failure in the near term, the additional stress on the structure creates an added risk of failure, creating a need for further temporary refurbishment until the structure can be properly decommissioned. Long-term dam repair is not a viable option.

Penstock

The Roddickton penstock is 440 meters in length and was installed during the original construction of the mini-hydro plant. The penstock is approaching 40 years of age or about half of its service life;[14] a condition assessment is required to determine the actual remaining service life of the penstock.

Hydraulic Generating Unit

The performance of the generation unit was historically perceived to be satisfactory; however, in recent years, performance has decreased, and work is required to extend its service life. Recent issues include a turbine leak and multiple leaks on the governor, which have contributed to its hindered performance. The generator itself was replaced in 2014 with an expected service life of 20 years; therefore, there is no anticipated work required for this component until 2034.

Generating Station

The Roddickton Plant's Powerhouse is a pre-engineered, 22'x27' structure erected on a concerted base. The structure is less than 50 years of age and has not experienced a major failure. The powerhouse is in

[13] Executed under the 2020 Hydraulic In-Service Failure Project, submitted as part of the "2020 Capital Budget Application," Newfoundland and Labrador Hydro, August 1, 2019, vol. I, sec. C, pp. C-25–C-27.
[14] The estimated service life of a HDPE penstock is 80–100 years.

functional and good operating condition and requires routine maintenance to maintain the building envelope to ensure operability.

2.2 Analysis

2.2.1 Evaluation of Alternatives

Cost-benefit and sensitivity analyses were conducted to determine the least-cost option for the Roddickton Plant. Hydro evaluated the following technically viable alternatives:

- Alternative 1 – Life Extension of the Roddickton Plant; and
- Alternative 2 – Decommissioning of the Roddickton Plant.

Alternative 1 – Life Extension of the Roddickton Plant

This alternative involves extending the life of the Roddickton Generating Station for a minimum of 30 years, which requires full replacement of the timber crib dam in 2030 and refurbishment of the generating unit.[15] Penstock refurbishment is not included, as the existing 43-year-old HDPE penstock has an estimated service life of 80–100 years.

The new timber crib dam will have the same design and specifications as the existing structure,[16] aside from the use of untreated crib timbers.[17] The dam and associated reservoir are within the protected public water supply area ("PPWSA") for the community of Roddickton, and current Environment and Climate Change policy directives include restrictions on the use of treated wood in PPWSAs. The use of untreated timber is expected to result in a shorter lifespan for the structure; however, the exact impact on its life expectancy remains unknown.[18]

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[15] The speed increaser and generator were replaced in 2014; it is assumed that these components will require replacement again in 2034.

[16] Like-for-like replacement (aside from the use of untreated crib timbers) was used for the analysis; however, design requirements for the new timber crib dam are subject to change upon completion of detailed engineering. Given the lack of as-built and design information, a number of outstanding engineering studies will be required to ensure the structures align with the Canadian Dam Association ("CDA") Guidelines.

[17] The original design included the use of Creosote Western Hemlock. Untreated Douglas Fir was used for the analysis; however, this may change upon the completion of detailed engineering.

[18] Hydro has assumed the dam will remain serviceable for a minimum of 30 years; however, as the exact impact of using untreated timber remains unknown, it is possible that the plan to extend the life of the Roddickton Plant may require a secondary dam replacement in future.

Alternative 2 – Decommissioning of the Roddickton Plant

This alternative involves the decommissioning of the Roddickton Plant. Decommissioning of the plant is assumed to require the removal and disposal of all hazardous materials, equipment and site infrastructure, including the dam, penstock, generating unit, station equipment, and 1.25 kms of transmission line.[19]

A Hydrotechnical Engineering study will be completed to determine new watercourse and flood characteristics that will result from the decommissioning of dam structures.[20] Where required, a remedial action plan ("RAP") will be developed to address any identified site contamination and special handling and disposal requirements will be incorporated into the decommissioning plan.

2.2.2 Least-Cost Evaluation

The least-cost evaluation performed to determine the most economically viable alternative for the Roddickton Generating Station included the following considerations:

- The Roddickton Generating Station is located within the PPWSA for the town of Roddickton; as such, proposed shoreline stabilization and vegetation restoration work in the forebay area would require consultation with town officials.
- The Gross Continuous Unit Rating associated with the Roddickton Generating Station has been assumed to be 0 MW due to the seasonality of the flows at this facility. As such, the 0.4 MW of capacity available from the site has not traditionally been considered to contribute to Hydro's available capacity at the time of system peak and has not been included in Hydro's forecast or real-time operating reserves.
- In 2020, Hydro executed a project to temporarily stabilize the Roddickton Dam and extend its service life by approximately ten years.
- Consultation with Hydro's Environmental Services team aided in the development of required environmental considerations for each alternative, including:
    - Potential impact on fish and fish habitat due to change in reservoir levels;

[19] The decommissioning scope is subject to refinement upon completion of detailed engineering.
[20] The potential change in reservoir levels and impacts on fish and fish habitat has yet not been assessed and will be considered during detailed engineering.

  - Potential for environmental contamination due to current and historical site activities;
  - Potential for hazardous building materials due to the age and construction of site infrastructure;
  - Environmental Assessment ("EA") and Regulatory permitting requirements; and
  - Environmental monitoring during project execution.
- AACE Class 5 estimates were developed for each alternative,[21] which included key inputs such as:
  - Hydro Project Management, Project Engineering, Environmental Services, Operations Support, and Construction Monitoring costs;
  - Travel for Hydro personnel to site;
  - Fees associated with the EA process and water sampling during construction; and
  - Contingency, interest and escalation.

Specifically, key assumptions for Alternative 1 – Life Extension of the Generating Station included:

- A study period of 30 years was chosen, which corresponds to the assumed life cycle of the timber crib dam;
- Geotechnical investigations for the dam are not required, and a minimum flow of 200 L/s is maintained during dam construction;
- Third-party contract costs for replacement of the dam and refurbishment of the Hydraulic Generating Unit;
- No portions of the components being replaced will have salvage value;
- Annual operation and maintenance ("O&M") costs, including annual preventative maintenance and corrective maintenance by internal Hydro labour forces;[22] and

[21] The accuracy range for an AACE Class 5 estimate ranges between -20% to -50% and +30% to +100%.
[22] Any costs for unforeseen or forced outages were not included in this analysis.

- The benefit of this alternative was evaluated based on long-term maximum energy production each year using projections of marginal energy[23] prices and was determined to be 0.81 GWh of electricity.

Key assumptions for Alternative 2 – Decommissioning of the Generating Station included:

- Third-party contracts for the removal of all equipment and infrastructure on site, including the dam, penstock, generating unit and station equipment, and 1.25 km of transmission line; and
- No portions of the components being removed will have salvage value.

Table 3 presents the Cumulative Present Worth ("CPW") of the two alternatives and the difference in CPW between each alternative.

Table 3: Least-Cost Evaluation Summary[24]

Alternative	CPW[25] ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 2 – Decommissioning of the Generating Station	2,562,519	
Alternative 1 – Life Extension of the Generating Station	3,042,881	480,362

The CPW of Alternative 1 – Life Extension of the Generating Station is $480,362 higher than Alternative 2 – Decommissioning of the Generating Station. As such, based on the analyses, Alternative 2 – Decommissioning of the Generating Station is the least-cost alternative for the Roddickton Plant.

2.2.3 Sensitivity Analysis

Sensitivity analysis was performed to determine which variables have the greatest influence on the results of the economic analysis, and could potentially produce an alternative least-cost option. The following variables or inputs were assessed:

[23] All marginal cost evaluations are based on Hydro's Marginal Cost Update, October 2023.
[24] Numbers may not add due to rounding.
[25] Discounted to 2024.

- Capital costs associated with the Life Extension of the Generating Unit;
- Decommissioning and environmental remediation costs;
- Operating costs of the generating unit; and
- Estimated energy rates ($/MWh).

Alternative 1 has an estimated capital cost of $3.61 million.[26] The reoccurring cost of operation and maintenance is estimated to be $23,000 a year, or approximately $886,000 (including escalation) over 30 years. Alternative 1 includes an estimate of the value of the generated electricity, calculated based on Hydro's marginal cost of energy. The energy rates are expected to vary over the 30-year period of this analysis and are estimated to provide value in the analysis of $735,000, assuming constant production of 0.81 GWh per year.

Alternative 2 includes an estimate of one-time operating costs associated with decommissioning and environmental remediation $3.03 million.

Capital Costs

The capital cost was adjusted to determine the amount of a decrease that would alter the results of the least-cost evaluation. It was found that if the cost of Alternative 1 – Life Extension of the Generating Station were to decrease by 17%, and the cost of Alternative 2 – Decommissioning of the Generating Station remained the same, Alternative 1 would become marginally favourable.

Table 4: Least-Cost Evaluation Sensitivity Analysis – Varying Capital Costs of Alternative 1[27]

Alternative	Varying Capital Costs (%)	CPW ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 1 – Life Extension of the Generating Station	-17	2,551,120	
Alternative 2 – Decommissioning of the Generating Station		2,562,519	11,399

[26] There are additional capital costs in 2034 for the assumed generator replacement.
[27] Numbers may not add due to rounding.

Similarly, if the total cost of Alternative 2 – Decommissioning of the Generating Station were increased by 19%, and the cost of Alternative 1 – Life Extension of the Generating Station remained the same, Alternative 1 would become marginally favourable, as shown in Table 5.

Table 5: Least-Cost Evaluation Sensitivity Analysis – Varying Costs of Alternative 2

Alternative	Varying Costs (%)	CPW ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 1 – Life Extension of the Generating Station		3,042,881	
Alternative 2 – Decommissioning of the Generating Station	+19	3,049,397	6,516

Hydro notes that these sensitivity results are within the accuracy range of the Class 5 estimate, however, Hydro plans to complete detailed engineering, beginning in 2025, to confirm the breadth of environmental mitigations required for decommissioning prior to proceeding with the recommended technical alternative.

Operating Costs

Varying the O&M costs by -50%, or half the estimated amount, and +100%, or double the estimated amount, has no impact on the outcome of the analysis and therefore operating costs are not considered a consequential variable in the analysis.

Estimated Energy Rates

Increasing the varying marginal cost of energy by a constant 174% would change the results of the least-cost evaluation slightly in favour of Alternative 1 – Life Extension of the Generating Station. Any decrease in energy pricing would further support Alternative 2 – Decommissioning of the Generating Station.

2.3 Recommended Alternative

Based on the analysis above, Alternative 2 – Decommissioning of the Generating Station is the least-cost solution for the Roddickton Plant; however, given the uncertainty around the breadth of environmental remediation required, Hydro plans to complete detailed engineering, beginning in 2025, prior to proceeding with the recommended technical alternative. Once the scope of the decommissioning and remediation work is refined, Hydro will revisit the cost-benefit analysis and sensitivities.

3.0 Snook's Arm Generating Station

3.1 Asset Overview

3.1.1 Asset Background

The Snook's Arm Generating Station consists of a single horizontal Francis-type[28] hydraulic generating unit, rated at 0.56 MW. The Generating Station was constructed in 1956 and commissioned in 1957 for First Maritime Mining Corporation Limited, with the intention to provide power to the Tilt Cove Mine.[29] The Newfoundland and Labrador Power Commission, now Hydro, purchased the generating station in 1968.

There are seven dams in the Snook's Arm watershed; six timber crib dams, and one concrete dam with an overflow spillway, gravity section and intake. The water from the intake structure is conveyed to the powerhouse via a 939 meter-long steel penstock, the majority of which was installed in 2006 to replace the original wood-stave penstock.[30]

On June 29, 2019, a fire occurred at the Snook's Arm Generating Station, resulting in significant damage to the generating station and equipment and the generating station has been inoperable since this time.

The location of the Snook's Arm Generating Station and associated infrastructure are shown in Figure 4. Images of the Snook's Arm Generating Station and the hydraulic generating unit prior to the 2019 fire are shown in Figure 5 and Figure 6, respectively.

[28] In a Francis turbine, the water enters radially to the runner blades and exits axially.
[29] This generating station is not an original Hydro asset; as such, not all history and maintenance records are known.
[30] The upper 24-metre section of the penstock remains as the original wood-stave construction.

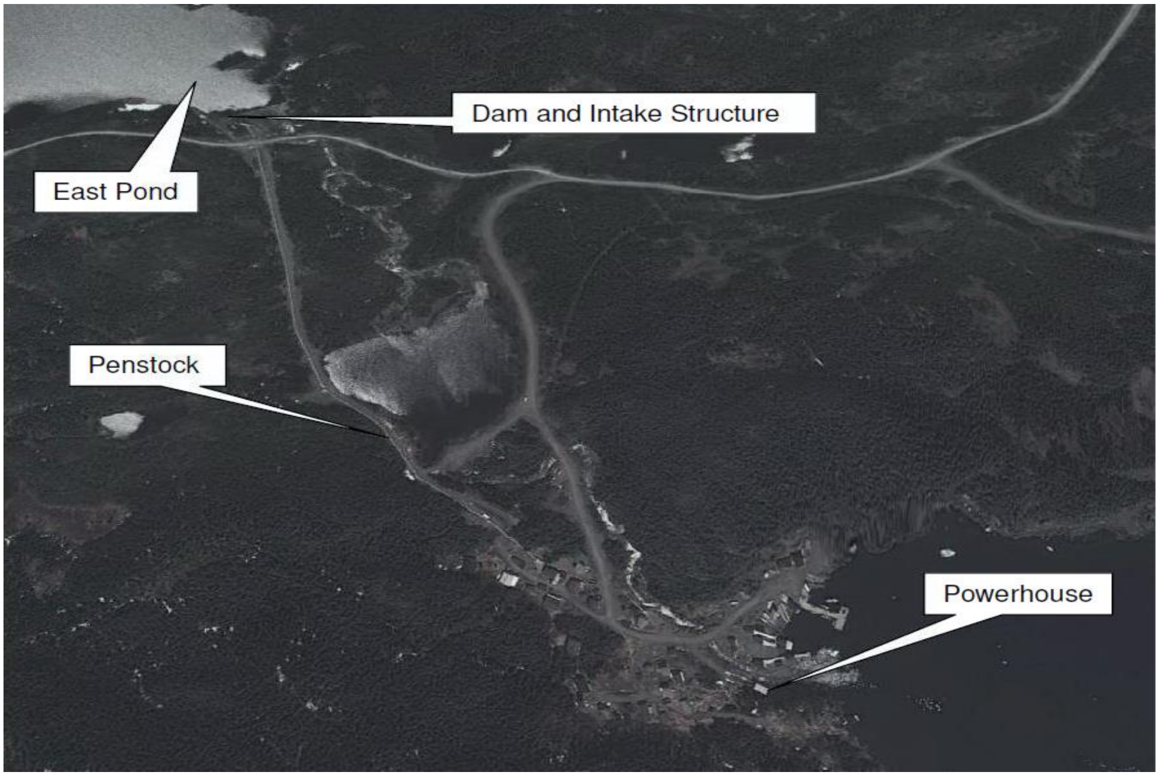

Figure 4: Snook's Arm Generating Station Location

Figure 5: Snook's Arm Generating Station

Figure 6: Snook's Arm Generating Unit

3.1.2 Historical Reliability

Until the June 2019 fire, the Snook's Arm Generating Station operated continuously for over 60 years[31] in accordance with the monthly target generation output settings shown in Chart 2.[32]

Although the unit is rated for 0.56 MW, it was derated to 0.50 MW in 2008 due to a failure on the unit braking mechanism, in conjunction with an issue with unit alignment.[33] This results in a slight decrease in the average monthly target generation from April to July.[34]

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[31] Aside from outages due to preventative and corrective maintenance.

[32] Chart 2 utilizes the maximum long-term energy production rate for Snook's Arm Generating Station, to identify the maximum target generation that could be achieved if refurbishment were to occur.

[33] The unit was realigned and the braking mechanism repaired; however, the unit's capability was reduced to 0.50 MW since that time.

[34] The months of April to July are typically the only time throughout the year where it is possible for the unit to achieve full generation capacity due to water levels; as such, the derating to 0.50 MW only negatively affects production during those months.

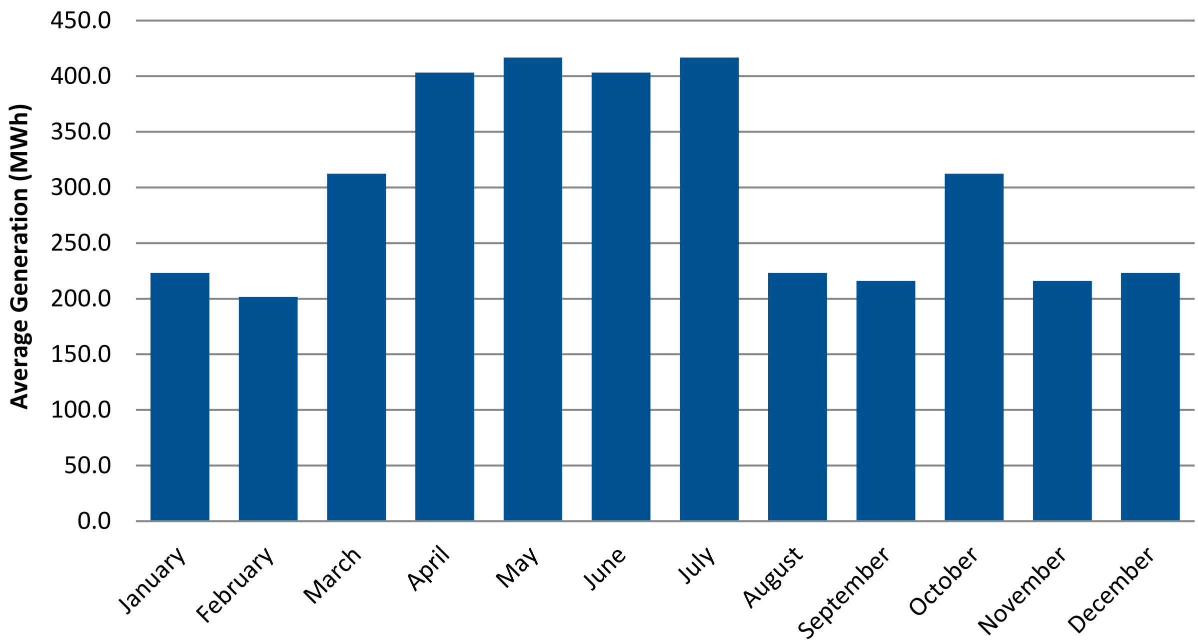

Chart 2: Snook's Arm Generating Station Unit Target Generation Settings by Month

3.1.3 Asset Condition

Dams

The current condition of the seven dams in the Snook's Arm watershed is shown in Table 6.[35] All dams were originally constructed in 1957 and rebuilt throughout the 1980s and 1990s.

Table 6: Snook's Arm Watershed Dam Condition

Asset Description	Identification Number	Condition	Age
Concrete Dam	SV-1	Poor	Rebuilt in 1988
Timber Crib Dams	SV-2	Fair	Rebuilt in 1997
Timber Crib Dam	SV-3	Fair	Rebuilt in 1996
Timber Crib Dam	SV-4	Fair	Rebuilt in 1998

Timber crib dams SV-2 and SV-4 were noted to be in fair condition during recent internal inspections. While the timbers in both dams are in good condition, they are exhibiting signs of damage to the plywood along the outlet chambers, and have been subject to an increase in leakage from the structures

[35] SV-2 consists of four separate sections.

year over year. The largest timber crib dam, SV-3, was also found to be in fair condition, and requiring replacement of the upstream membrane. As per the results of the Dam Safety Review ("DSR") completed by a consultant in 2015, all timber crib dams, as well as SV-1 were found to meet the minimum stability requirements as per the CDA Guidelines, with the exception of winter ice loading.

A more recent DSR was completed for SV-1 due to its higher dam classification than the other Snook's Arm structures. The recent DSR was completed by a consultant in 2022, and noted the concrete was generally in poor to fair condition, with the upstream face showing signs of considerable weathering and degradation. A number of areas of significant erosion and spalling were also identified. The recent review also confirmed the 2015 DSR findings that the structure does not meet the minimum stability requirements for winter ice loading.

Penstock

The wooden penstock was replaced in 2006 with a steel penstock. At 18 years old, the penstock has no operational issues of note.

Generating Station and Hydraulic Generating Unit

The Snook's Arm Generating Station is a steel frame structure, approximately 28'x34' in size. On June 29, 2019, a fire occurred at the Snook's Arm Generating Station which resulted in significant damage to the generating station and equipment, particularly the generator and slip rings. The removal of hazardous soot and debris resulting from the 2019 fire was completed in 2024; however, a complete hazardous building materials assessment has not been completed, and it is unknown if other hazardous materials may be present.

3.2 Analysis

3.2.1 Evaluation of Alternatives

Cost-benefit and sensitivity analyses were conducted to determine the least-cost option for the Snook's Arm Generating Station. Hydro evaluated the following technically viable alternatives:

- Alternative 1 – Life Extension of the Generating Station; and
- Alternative 2 – Decommissioning of the Generating Station.

Alternative 1 – Life Extension of the Generating Station

This alternative involves extending the life of the Snook's Arm Generating Station for a minimum of 30 years, which requires replacement of the generating unit, and replacement or refurbishment of all seven dams in 2031.[36] The existing 0.56 MW generating unit would be replaced with a unit of similar size by the same original manufacturer, with an expected service life of 50 years.[37] Penstock refurbishment is not included, as the current penstock was replaced in 2006 and has a useful service life of 80 years.[38]

Substantial refurbishment of the powerhouse interior is required due to the June 2019 fire. Modifications to the existing site access road are also required to permit vehicular access.

Alternative 2 – Decommissioning of the Generating Station

This alternative involves decommissioning of the Snook's Arm Generating Station and is assumed to require the removal and disposal of all hazardous materials and equipment and site infrastructure, including the dam, penstock, generating unit, station equipment, and transmission line.[39]

A hydrotechnical engineering study will be completed to determine new watercourse and flood characteristics upon decommissioning of dam structures.[40] Where required, a RAP will be developed to address site contamination and special handling and disposal requirements will be incorporated into the decommissioning plan.

3.2.2 Least-Cost Evaluation

The least-cost evaluation performed to determine the most economically viable alternative for the Snook's Arm Generating Station included the following considerations:

- The Snook's Arm Generating Station is located within the former community of Snook's Arm, which was entirely resettled in 2018. Until resettlement, the community utilized the penstock

[36] Like-for-like replacement was used for the analysis; however, design requirements for the new dams are subject to change upon completion of detailed engineering. Given the lack of as-built and design information, a number of outstanding engineering studies will be required to ensure the structures align with the CDA Guidelines.
[37] Due to the damage caused by the 2019 fire and the age of the existing unit, refurbishment of the generating unit was not considered to be a technically viable option.
[38] The penstock has not been assessed in detail since installation; however, it is assumed to be in good condition.
[39] The decommissioning scope is subject to refinement upon completion of detailed engineering.
[40] The potential change in reservoir levels and impacts on fish and fish habitat has yet not been assessed and will be considered during detailed engineering.

for emergency water supply, with the generating station located within a PPWSA.[41] Hydro made no commitment regarding the continued operation of the Snook's Arm Generating Station upon community relocation and is not obligated to keep the penstock in the former community; however, would consult with the Government of Newfoundland and Labrador prior to decommissioning the asset.

- The Gross Continuous Unit Rating associated with the Snook's Arm Generating Station has been assumed to be 0 MW due to the seasonality of the flows at the facility. As such, the 0.56 MW of capacity available from the site has not traditionally been considered to contribute to Hydro's available capacity at the time of system peak and has not been included in Hydro's forecast or real-time operating reserves.
- Consultation with Hydro's Environmental Services team aided in the development of required environmental considerations, including:
    - Potential impact on fish and fish habitat due to change in reservoir levels;
    - Potential for environmental contamination due to current and historical site activities;
    - Potential for hazardous building materials due to the age and construction of site infrastructure;
    - EA and Regulatory permitting requirements; and
    - Environmental monitoring during project execution.
- AACE Class 5 estimates were developed for each alternative, which included key inputs such as:
    - Hydro Project Management, Project Engineering, Environmental Services, Operations Support, and Construction Monitoring costs;
    - Travel for Hydro personnel to site;
    - Fees associated with the EA process and water sampling during construction; and
    - Contingency, interest and escalation.

[41] While the PPWSA designation for the Snook's Arm watershed has been repealed since resettlement; property owners remain in the area that continue to use the existing penstock as a water source.

Specifically, key assumptions for Alternative 1 – Life Extension of the Generating Station included:

- A study period of 30 years was chosen, which corresponds to the assumed life cycle of the timber crib dam;
- Geotechnical investigations for the dams are not required;
- Third-party contract costs for removal of the existing generating unit, installation of the replacement unit, and dam refurbishment;
- No portions of the components being replaced will have salvage value;
- Annual O&M costs, including annual preventative maintenance and corrective maintenance by internal Hydro labour forces;[42] and
- The benefit under this alternative was evaluated based on long-term maximum energy production each year using projections of marginal energy prices and was determined to be 3.57 GWh of electricity.

Key assumptions for Alternative 2 – Decommissioning of the Generating Station included:

- Third-party contracts for the removal of all equipment and infrastructure on site including the dams, penstock, transmission line, generating unit and station equipment; and
- No portions of the components being removed will have a salvage value.

Table 7 presents the CPW of the two alternatives and the difference in CPW between each alternative.

Table 7: Least-Cost Evaluation Summary

Alternative	CPW[43] ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 2 – Decommissioning of the Generating Station	6,089,569	
Alternative 1 – Life Extension of the Generating Station	8,316,285	2,226,716

[42] Any costs for unforeseen or forced outages were not included in this analysis.
[43] Discounted to 2024.

The CPW of Alternative 1 – Life Extension of the Generating Station is $2,226,716 higher than Alternative 2 – Decommissioning of the Generating Station. As such, based on the analysis, Alternative 2 – Decommissioning of the Generating Station is the least-cost alternative for the Snook's Arm Generating Station, however, given the uncertainty around the breadth of environmental remediation required, Hydro plans to complete detailed engineering, beginning in 2025, prior to proceeding with the recommended technical alternative.

3.2.3 Sensitivity Analysis

Sensitivity analysis was performed to determine which variables have the greatest influence on the results of the economic analysis and could potentially produce an alternative least-cost option. The following variables or inputs were assessed:

- Capital costs associated with the Life Extension of the Generating Unit;
- Decommissioning and environmental remediation costs;
- Operating costs of the generating unit; and
- Estimated energy rates ($/MWh).

Alternative 1 has an estimated capital cost of $6.20 million, plus an additional $4.98 million to address the replacement or refurbishment of all seven dams in 2031. The reoccurring cost of operation and maintenance is estimated to be $95,800 a year, totalling approximately $3.69 million (including escalation) over 30 years. Alternative 1 includes an estimate of the value of the generated electricity, calculated based on Hydro's marginal cost of energy. The energy rates are expected to vary over the 30-year period of this analysis and are estimated to provide value in the analysis of $3.58 million of revenue, assuming a constant production of 3.57 GWh per year.

Alternative 2 includes an estimate of one-time operating costs associated with decommissioning and environmental remediation of $7.60 million dollars.

Capital Costs

The capital cost was adjusted to determine the amount of a decrease that would alter the results of the least-cost evaluation. As shown in Table 8, it was found that if the cost of Alternative 1 – Life Extension of the Generating Station were to decrease by 45%, and the cost of Alternative 2 – Decommissioning of the Generating Station remained the same, Alternative 1 would become favourable.

Table 8: Least-Cost Evaluation Sensitivity Analysis – Varying Capital Costs of Alternative 1

Alternative	Varying Capital Costs (%)	CPW ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 1 – Life Extension of the Generating Station	-45	6,079,512	
Alternative 2 – Decommissioning of the Generating Station		6,089,569	10,057

Similarly, if the total cost of Alternative 2 – Decommissioning of the Generating Station were increased by 37%, and the cost of Alternative 1 – Life Extension of the Generating Station remained the same, Alternative 1 would become favourable, as shown in Table 9.

Table 9: Least-Cost Evaluation Sensitivity Analysis – Varying Costs of Alternative 2

Alternative	Varying Costs (%)	CPW ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 1 – Life Extension of the Generating Station		8,316,285	
Alternative 2 – Decommissioning of the Generating Station	+37	8,342,709	26,424

Hydro notes that these sensitivity results are within the accuracy range of the Class 5 estimate; however, Hydro plans to complete detailed engineering, beginning in 2025, to confirm the breadth of environmental mitigations required prior to proceeding with the recommended technical alternative.

Operating Costs

Varying the O&M costs by -50%, or half the estimated amount, and +100% has no impact on the outcome of the analysis, and therefore operating costs are not considered a consequential variable in the analysis.

Estimated Energy Rates

Increasing the varying marginal cost of energy by a constant 166% would change the results of the least-cost evaluation slightly in favour of Alternative 1 – Life Extension of the Generating Station. Any decrease in energy pricing would further support Alternative 2 – Decommissioning of the Generating Station.

3.3 Recommended Alternative

Based on the analysis above, Alternative 2 – Decommissioning of the Generating Station is the least-cost solution for the Snook's Arm Generating Station; however, given the uncertainty around the breadth of environmental remediation required, Hydro plans to complete detailed engineering, beginning in 2025, prior to proceeding with the recommended technical alternative. Once the scope of the decommissioning and remediation work is refined, Hydro will revisit the cost-benefit analysis and sensitivities.

4.0 Venams Bight Generating Station

4.1 Asset Overview

4.1.1 Asset Background

The Venams Bight Generating Station consists of a single horizontal Francis-type hydraulic generating unit, rated at 0.36 MW. The generating station was constructed in 1956 and commissioned in 1957 for First Maritime Mining Corporation Limited, with the intention to provide power to the Tilt Cove Mine.[44] The Newfoundland and Labrador Power Commission, now Hydro, purchased the Generating Station in 1968.

There are six dams in the Venams Bight watershed; one concrete-faced rockfill dam with an intake, a concrete spillway structure and five timber crib dams. The timber crib dams were originally constructed

[44] This generating station is not an original Hydro asset; as such, not all history and maintenance records are known.

in 1961 and rebuilt in 2000. The water from the reservoir is conveyed to the powerhouse via a 681 metre-long wood-stave penstock, installed during the original construction of the generating station. As shown in Figure 8, the structure requires replacement, with excessive leakage seen on the penstock. Due to the deteriorated condition of the hydraulic generating unit and wood-stave penstock, the generating station has been out of service since 2011.

The location of the Venams Bight Generating Station is shown in Figure 7, Figure 8, Figure 9, and Figure 10 show the penstock, generating station, and hydraulic generating unit, respectively.

Figure 7: Venams Bight Generating Station Location

Figure 8: Venams Bight Penstock

Figure 9: Venams Bight Generating Station

Figure 10: Venams Bight Hydraulic Generating Unit

4.1.2 Historical Reliability

Until 2011, the Venams Bight Generating Station operated continuously for over 50 years[45] in accordance with the monthly target generation output settings shown in Chart 3.[46] Although the unit is rated for 0.36 MW, the maximum generation output of the unit was approximately 0.33 MW, achieved during the month of July, due to low water levels.

[45] Aside from outages due to preventative and corrective maintenance.

[46] Chart 3 utilizes the maximum long-term energy production rate for the Venams Bight Generating Station, to identify the maximum target generation that could be achieved if refurbishment were to occur.

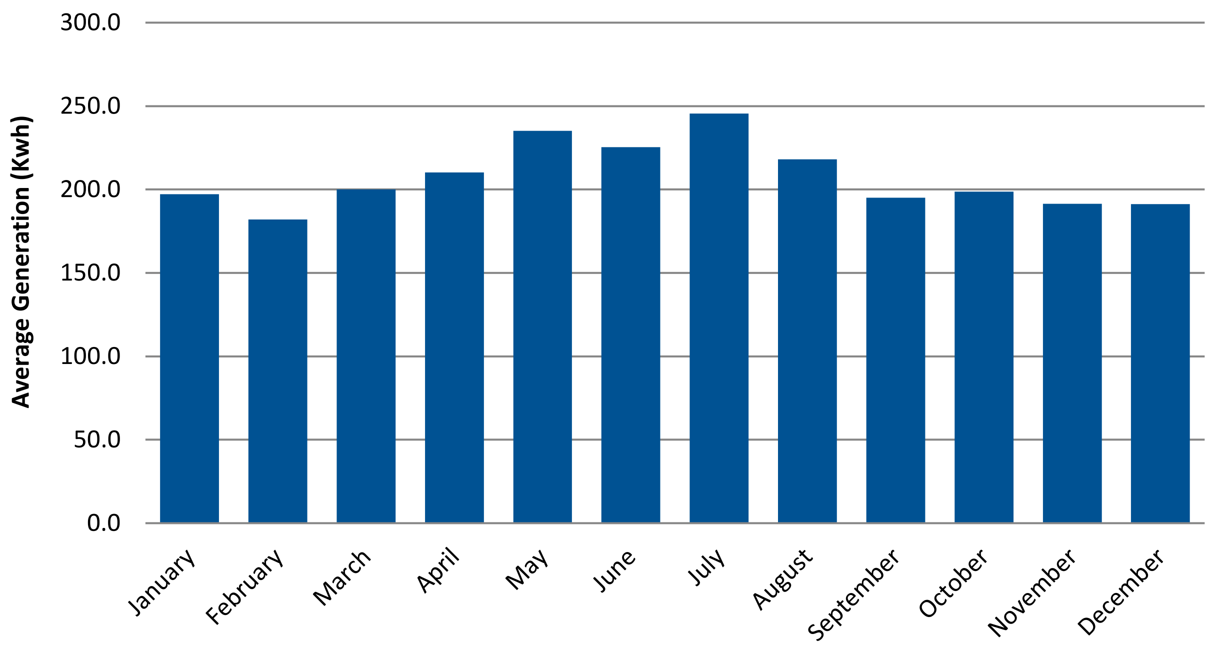

Chart 3: Venams Bight Generating Station Unit Target Generation Settings by Month

4.1.3 Asset Condition

Dams

The six dams in the Venams Bight watershed are shown in Table 10.[47]

Table 10: Venams Bight Dam Condition

Asset Description	Identification Number	Condition	Age
Concrete-faced, Rockfill Dam and Concrete Spillway	SV-5	Good	Spillway Rebuilt in 1994
Timber Crib Dam	SV-6	Good	Rebuilt in 2000
Timber Crib Dam	SV-7	Good	Rebuilt in 2000

Timber crib dams SV-6 and SV-7 were originally constructed in 1961 and rebuilt in 2000. The structures were inspected by a consultant as a part of a high-level DSR in 2023; the timber cribs were found to be in good condition overall.

[47] SV-6 consists of three structures; SV-7 consists of two structures.

The concrete-faced rockfill dam, which includes an intake section, and the concrete spillway were originally constructed in 1961. The concrete spillway was rebuilt in 1994. Inspection as a part of the DSR found the structures to be in good condition overall, with minor spalling noted along the upstream face of SV-5. Significant concrete deterioration was noted at the left abutment of the spillway section that will require repair but does not pose an immediate risk to the safety of the structures.

While the structures were found to be in good condition, the consultant noted that given the lack of as-built and design information, a number of outstanding engineering studies are required to ensure the structures align with the CDA Guidelines.

Penstock

The Venams Bight wood-stave penstock was installed during the original construction of the generating station and is approaching 70 years of age. The structure has reached the end of its useful service life, with excessive leakage observed, and requires replacement to safely and reliably operate the generating station.

Hydraulic Generating Unit

The Venams Bight generating unit was taken out of service in early 2011 for a runner inspection, which revealed damage to the runner due to debris passing through the unit. During the repair, it was observed that the main inlet valve had experienced damage to the sealing seat, and could not be fully closed, forcing the unit offline.[48] Further manipulation of the valve caused the stem shear pin to break, which halted the attempt to return the unit to service.

Generating Station

The Venams Bight Generating Station is a steel frame structure, approximately 28’x34’ in size. The building remains heated and is checked regularly. The structure has not experienced major failure and is in functional and good operating condition, and requires routine maintenance to maintain facia, siding, roof, etc. to ensure operability.

Other upgrades to the facilities are likely required if the life of the generating station is to be extended.

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[48] The failure of the main inlet valve forced the unit offline due to safety concerns; without this valve, there is no way of stopping the flow to the unit in the powerhouse.

4.2 Analysis

4.2.1 Evaluation of Alternatives

Cost-benefit and sensitivity analyses were conducted to determine the least-cost option for the Venams Bight Generating Station. Hydro evaluated the following technically-viable alternatives:

- Alternative 1 – Life Extension of the Generating Station; and
- Alternative 2 – Decommissioning of the Generating Station.

Alternative 1 – Life Extension of the Generating Station

This alternative involves extending the life of the Venams Bight Generating Station for a minimum of 30 years, which requires immediate replacement of the generating unit and penstock, and replacement or refurbishment of all six dams by 2035.[49] The existing 0.36 MW generating unit would be replaced with a unit of similar size by the same original manufacturer, with an expected service life of 50 years.[50] The existing wood-stave penstock would be replaced with a steel penstock.

Minimal refurbishment of the powerhouse interior will be required prior to occupancy and installation of the new generating unit. Modifications to the existing site access road are also required to permit vehicular access to the powerhouse and penstock.

Alternative 2 – Decommissioning of the Generating Station

This alternative involves the decommissioning of the Venams Bight Generating Station. Decommissioning of the generating station is assumed to require the removal and disposal of all hazardous materials and equipment and site infrastructure, including the dam, penstock, generating unit, station equipment, and transmission line.[51]

A Hydrotechnical Engineering study will be completed to determine new watercourse and flood characteristics upon decommissioning of dam structures.[52] Where required, a RAP will be developed to

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[49] Like-for-like replacement was used for the analysis; however, design requirements for the new dams are subject to change upon completion of detailed engineering. Given the lack of as-built and design information, a number of outstanding engineering studies will be required to ensure the structures align with the CDA Guidelines.
[50] Due to the current condition of the unit and its inoperability since 2011, refurbishment of the generating unit was not considered to be a technically viable option.
[51] The decommissioning scope is subject to refinement upon completion of detailed engineering.
[52] The potential change in reservoir levels and impacts on fish and fish habitat has yet not been assessed and will be considered during detailed engineering.

address site contamination and special handling and disposal requirements will be incorporated into the decommissioning plan. Modifications to the existing site access road are also required to permit temporary vehicular access to the powerhouse, penstock and dams.

4.2.2 Least-Cost Evaluation

The least-cost evaluation performed to determine the most economically viable alternative for the Venams Bight Generating Station included the following considerations:

- The Venams Bight Generating Station is located in an extremely remote area that is only accessible by all-terrain vehicles or watercraft; it is expected that this difficult terrain will slow productivity and result in higher execution costs.
- The Gross Continuous Unit Rating associated with the Venams Bight Generating Station has been assumed to be 0 MW due to the seasonality of the flows at the facility. As such, the 0.36 MW of capacity available from the site has not traditionally been considered to contribute to Hydro's available capacity at the time of system peak and has not been included in Hydro's forecast or real-time operating reserves.
- Consultation with Hydro's Environmental Services team aided in the development of required environmental considerations, including:
    - Potential impact on fish and fish habitat due to change in reservoir levels;
    - Potential for environmental contamination due to current and historical site activities;
    - Potential for hazardous building materials due to the age and construction of site infrastructure;
    - EA and Regulatory permitting requirements; and
    - Environmental monitoring during project execution.
- AACE Class 5 estimates were developed for each alternative, which included key inputs such as:
    - Hydro Project Management, Project Engineering, Environmental Services, Operations Support, and Construction Monitoring costs;
    - Travel for Hydro personnel to the site;
    - Fees associated with the EA process and water sampling during construction; and

- Contingency, interest and escalation.

Specifically, key assumptions for Alternative 1 – Life Extension of the Generating Station included:

- A study period of 30 years was chosen, which corresponds to the assumed life cycle of the timber crib dam;
- Geotechnical investigations for the dams are not required;
- Third-party contract costs for removal of the existing generating unit, installation of the replacement unit, penstock replacement, and dam refurbishment;
- No portions of the components being replaced will have salvage value;
- Annual O&M costs, including annual preventative maintenance and corrective maintenance by internal Hydro labour forces;[53] and
- The benefit of this alternative was evaluated based on long-term maximum energy production each year using projections of marginal energy prices and was determined to be 2.49 GWh of electricity.

Key assumptions for Alternative 2 – Decommissioning of the Generating Station included:

- Third-party contracts for the removal of all equipment and infrastructure onsite including the dams, penstock, transmission line, generating unit and station equipment; and
- No portions of the components being removed will have salvage value.

[53] Any costs for unforeseen or forced outages were not included in this analysis.

Table 11 presents the CPW of the two alternatives and the difference in CPW between each alternative.

Table 11: Least-Cost Evaluation Summary

Alternative	CPW[54] ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 2 – Decommissioning of the Generating Station	5,586,183	
Alternative 1 – Life Extension of the Generating Station	10,299,768	4,713,585

The CPW of Alternative 1 – Life Extension of the Generating Station is $4,713,585 higher than Alternative 2 – Decommissioning of the Generating Station. As such, based on the analysis, Alternative 2 – Decommissioning of the Generating Station is the least-cost alternative for the Venams Bight Generating Station; however, given the uncertainty around the breadth of environmental remediation required, Hydro plans to complete detailed engineering, beginning in 2025, prior to proceeding with the recommended technical alternative.

4.2.3 Sensitivity Analysis

Sensitivity analysis was performed to determine which variables have the greatest influence on the results of the economic analysis, and could potentially produce an alternative least-cost option. The following variables or inputs were assessed:

- Capital costs associated with the Life Extension of the Generating Unit;
- Decommissioning and environmental remediation costs;
- Operating costs of the generating unit; and
- Estimated energy rates ($/MWh).

Alternative 1 has an estimated capital cost of $8.98 million, plus an additional $5.21 million to address the replacement or refurbishment of all six dams. The reoccurring cost of operation and maintenance is

[54] Discounted to 2024.

estimated to be $95,800 a year, totalling approximately $3.69 million (including escalation) over 30 years. Alternative 1 includes an estimate of the value of the generated electricity, calculated based on Hydro's marginal cost of energy. The energy rates are expected to vary over the 30-year period of this analysis and are estimated to provide value in the analysis of $2.59 million of revenue, assuming a constant production of 2.49 GWh per year.

Alternative 2 includes an estimate of one-time operating costs associated with decommissioning and environmental remediation of $6.60 million.

Capital Costs

The capital cost was adjusted to determine the amount of a decrease that would alter the results of the least-cost evaluation. As shown in Table 12, it was found that if the cost of Alternative 1 – Life Extension of the Generating Station were to decrease by 66%, and the cost of Alternative 2 – Decommissioning of the Generating Station remained the same, Alternative 1 would become favourable.

Table 12: Least-Cost Evaluation Sensitivity Analysis – Varying Capital Costs of Alternative 1

Alternative	Varying Capital Costs (%)	CPW ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 1 – Life Extension of the Generating Station	-66	5,550,375	
Alternative 2 – Decommissioning of the Generating Station		5,586,183	35,808

Similarly, if the total cost of Alternative 2 – Decommissioning of the Generating Station were increased by 85%, and the cost of Alternative 1 – Life Extension of the Generating Station remained the same, Alternative 1 would become favourable, as shown in Table 13.

Table 13: Least-Cost Evaluation Sensitivity Analysis – Varying Costs of Alternative 2

Alternative	Varying Costs (%)	CPW ($)	CPW Difference between Alternative and the Least-Cost Alternative ($)
Alternative 1 – Life Extension of the Generating Station		10,299,768	
Alternative 2 – Decommissioning of the Generating Station	+85	10,334,438	34,670

These adjustments to Alternative 2 – Decommissioning of the Generating Station are within the accuracy range of the Class 5 estimate; however, the decrease to Alternative 1 – Life Extension of the Generating Station is not. Hydro plans to complete detailed engineering at the site, beginning in 2025, to confirm the breadth of environmental mitigations required prior to proceeding with the recommended technical alternative.

Operating Costs

Varying the O&M costs by -50%, or half the estimated amount, and +100% has no impact on the outcome of the analysis, and therefore operating costs are not considered a consequential variable in the analysis.

Estimated Energy Rates

Increasing the varying marginal cost of energy by a constant 486% would change the results of the least-cost evaluation slightly in favour of Alternative 1 – Life Extension of the Generating Station. Any decrease in energy pricing would further support Alternative 2 – Decommissioning of the Generating Station.

4.3 Recommended Alternative

Based on the analysis above, Alternative 2 – Decommissioning of the Generating Station is the least-cost solution for the Venams Bight Generating Station; however, given the uncertainty around the breadth of environmental remediation required, Hydro plans to complete detailed engineering, beginning in 2025, prior to proceeding with the recommended technical alternative. Once the scope of the decommissioning and remediation work is refined, Hydro will revisit the cost-benefit analysis and sensitivities.

5.0 Conclusion

Hydro has completed a screening level assessment to determine the least-cost options for its mini-hydro generating stations located in Roddickton, Snook's Arm, and Venams Bight. The combined capacity of all three mini-hydro generating stations is 1.32 MW and is not included in Hydro's firm capacity at the time of system peak due to low flows at each reservoir. These facilities have an array of assets which are either approaching or past their useful service life; as such, significant capital investment is required to ensure their safe, reliable generation of electricity.

Based upon the preliminary economic and technical assessment, which considered life extension or decommissioning for each mini-hydro generating station, the least cost alternative for each facility currently owned and operated by Hydro would be to decommission and remove all equipment from the site.

As it was confirmed that the continued operation of these facilities by Hydro is not economically feasible, Hydro has identified the sale of these assets as a potential opportunity to avoid incurring further costs. On this basis, Hydro has engaged IPP regarding the sale of these assets. This alternative will be explored prior to proceeding with the decommissioning of each site.

Should decommissioning remain the least-cost, viable alternative for each site, given the uncertainty around the breadth of environmental remediation required, Hydro plans to complete detailed engineering, beginning in 2025, prior to proceeding. Once the scope and cost of the decommissioning and remediation work are refined, Hydro will revisit the cost-benefit analysis and sensitivities and provide an update to the Board on the results.