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May 25, 2023

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

Attention: Cheryl Blundon
Director of Corporate Services and Board Secretary

Re: *Reliability and Resource Adequacy Study Review* – Listing of Planned Reports, Studies, and Analyses

In correspondence dated May 5, 2023, the Board of Commissioners of Public Utilities ("Board") directed Newfoundland and Labrador Hydro ("Hydro") file a number of updates regarding the studies and analyses ongoing within the *Reliability and Resource Adequacy Study Review*. In particular:

1) Hydro shall file by May 19, 2023 a comprehensive list of all reports, studies and analyses it has currently underway or planned with respect to the reliability of the LIL, potential alternative generation resources, the load forecast, and any other issues raised in the 2022 RRAS Update and the May 1-2, 2023 technical conference. This list shall include a description of the scope of each study, report and analysis, the consultant or group undertaking the work and the schedule for completion.

2) Hydro shall file with the Board a copy of each report, study or analysis listed in response to number 1 above as it is completed.[1]

A list of all reports, studies, and analyses currently underway or planned to support future filings in relation to the *Reliability and Resource Adequacy Study Review* proceeding is provided in Table 1. Attachment 1 to this letter contains the requested information on each of these reports, studies, and analyses, including a description of the scope, responsible party, and estimated filing date. For studies not yet underway, scopes remain under development and are therefore subject to change. While Hydro endeavours to meet the listed timeframes, the expected filing dates are subject to change, in particular for studies to be completed by third parties for which contracts have not been awarded.

[1] "Newfoundland and Labrador Hydro - Reliability and Resource Adequacy Study Review - To Parties - Further Process," Board of Commissioners of Public Utilities, May 5, 2023, p. 2.

Table 1: Planned Reports, Studies, and Analyses

Title	Estimated Filing Date
Labrador-Island Link Investigations	
Summary of Findings from L3501/2 Failure Investigation: Turnbuckle Failures – Structures 1872, 1806, and 1014	September 2023
Summary of Findings from L3501/2 Failure Investigation: OPGW[2] Tower Peaks – Structures 1230 and 1231	September 2023
Summary of Findings from L3501/2 Failure Investigation: OPGW Top Plates – Structures 2135 and 2136	September 2023
Summary of Findings from L3501/2 Failure Investigation: Electrode Conductor Failure – Structures 513 to 515	September 2023
Supply Options and Support	
Battery Energy Storage System	September 2023
Pumped Storage at Existing Hydro Sites	October 2023
Pumped Storage Feasibility at Greenfield Sites	Fourth Quarter 2024
Combustion Turbines Feasibility Study	August 2023
Fuel Market Study	First Quarter 2024
Avalon Supply (Transmission) Study Update	October 2023
Bay d'Espoir[3] Unit 7 Uprate Study	First Quarter 2024
Incremental Capacity/Efficiency Potential from Existing Hydro Units	Fourth Quarter 2024
Island Hydroelectric Supply Refresh Study	Third Quarter 2024
Pre-Winter Impact of Lower Reservoir Levels with the Addition of Bay d'Espoir Unit 8	First Quarter 2024
Impact of Prolonged Loss of the LIL on Reservoir Levels	First Quarter 2024
Combustion Turbine FEED[4]	Fourth Quarter 2024
Bay d'Espoir Unit 8 FEED	Fourth Quarter 2024

Should you have any questions, please contact the undersigned.

Yours truly,

NEWFOUNDLAND AND LABRADOR HYDRO

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Encl.

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Newfoundland Power Inc.
Dominic J. Foley
Lindsay S.A. Hollett
Regulatory Email

[2] Optical ground wire ("OPGW").
[3] Bay d'Espoir Hydroelectric Generating Facility ("Bay d'Espoir").
[4] Front-end engineering design ("FEED")

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Reliability and Resource Adequacy Study Review

Listing of Reports, Studies, and Analyses

May 25, 2023

newfoundland labrador hydro

Contents

1.0 Background

1.1 2022 Update

On October 3, 2022, Newfoundland and Labrador Hydro ("Hydro") filed its "Reliability and Resource Adequacy Study – 2022 Update," ("2022 Update")[1] which was filed as a compliment to the "Reliability and Resource Adequacy Study"[2] and the "Reliability and Resource Adequacy Study – 2019 Update."[3] The 2022 Update included additional detail on system planning matters in consideration of the Labrador-Island Link ("LIL") reliability assessments[4] and the Holyrood Thermal Generating Station ("Holyrood TGS") assessment.[5]

The 2022 Update was presented in two volumes:

- Volume I outlined Hydro's study methodology and proposed planning criteria; and
- Volume III provided long-term resource planning considerations, resource options available to meet the planning criteria proposed in Volume I, and Hydro's proposed action plan.

Additionally, a summary document ("Planning for Today, Tomorrow, and the Future") was included to briefly highlight the key considerations of the 2022 Update. The "Near-Term Reliability Report" (Volume II), which provides an in-depth view of near-term resource adequacy, was not included in the October 3, 2022 filing and was filed on November 15, 2022.

Subsequent to the filing of the 2022 Update, on December 5, 2022, the Board of Commissioners of Public Utilities ("Board") set a schedule for requests for information ("RFI") in relation to the 2022 Update. Hydro's responses to the 170 RFIs received from the Board and parties were provided on February 17, 2023.

[1] "Reliability and Resource Adequacy Study – 2022 Update," Newfoundland and Labrador Hydro, October 3, 2022.
[2] "Reliability and Resource Adequacy Study," Newfoundland and Labrador Hydro, rev. September 6, 2019 (originally filed November 16, 2018).
[3] "Reliability and Resource Adequacy Study – 2019 Update," Newfoundland and Labrador Hydro, November 15, 2019.
[4] "Assessment of Labrador Island Transmission Link (LIL) Reliability in Consideration of Climatological Loads," Haldar & Associates Inc., rev. April 11, 2021 (originally issued March 10, 2021) and "Assessment of Labrador Island Transmission Link (LIL) Reliability in Consideration of Climatological Loads - Phase II," Haldar & Associates Inc. December 12, 2021, filed as Attachment 1 to the "Reliability and Resource Adequacy Study – Additional Considerations of the Labrador-Island Link Reliability Assessment and Outcomes of the Failure Investigation Findings," Newfoundland and Labrador Hydro, December 22, 2021.
[5] "*Reliability and Resource Adequacy Study Review* – Assessment to Determine the Potential Long-Term Viability of the Holyrood Thermal Generating Station," Newfoundland and Labrador Hydro, March 31, 2022.

Following the review of Hydro's responses, a technical conference was held on May 1 and 2, 2023 to discuss these responses, the current state of the proceeding, and future steps. Through its presentation and the discussion that followed, Hydro highlighted that:

- In addition to the evaluation of a prudent reliability decision, the Reliability and Resource Adequacy Study also needs to focus on the recent materiality of the provincial load growth and the urgent action required to avoid impacts on access to power;
- A clear and efficient process is required for a decision and approval, as new supply is between seven and ten years away once received; and
- As the energy landscape is constantly changing, decisions will need to be made both incrementally and based on the best available information, as uncertainty cannot be fully resolved.

As a result of the discussions held during the technical conference, the Board provided the following direction:

> **1)** Hydro shall file by May 19, 2023 a comprehensive list of all reports, studies and analyses it has currently underway or planned with respect to the reliability of the LIL, potential alternative generation resources, the load forecast, and any other issues raised in the 2022 RRAS Update and the May 1-2, 2023 technical conference. This list shall include a description of the scope of each study, report and analysis, the consultant or group undertaking the work and the schedule for completion.
>
> **2)** Hydro shall file with the Board a copy of each report, study or analysis listed in response to number 1 above as it is completed.
>
> **3)** Hydro shall file by June 19, 2023 its current schedule for future RRAS updates and its proposed application for approval for a new generation addition.
>
> **4)** The parties shall file by June 13, 2023 a list of issues or topics that they want addressed in the work being undertaken by Hydro.[6]

2.0 Summary of Planned Reports, Studies, and Analyses

A list of all reports, studies, and analyses that are currently underway or planned to support future Reliability and Resource Adequacy Study filings is provided in Table 1. A description of the scope for each report or study is provided herein; for studies not yet underway, scopes remain under

[6] "Newfoundland and Labrador Hydro – Reliability and Resource Adequacy Study Review – To Parties – Further Process," Board of Commissioners of Public Utilities, May 5, 2023, p. 2.

development and are therefore subject to change. While Hydro endeavours to meet the timeframes outlined herein, the estimated filing dates are subject to change, in particular for studies to be completed by third parties for which contracts have not been awarded. The timeframes identified include an allocation of time for Hydro to review reports completed by third parties and to develop any summary documentation that may be required. In addition to studies planned or underway, Hydro provided copies of all studies completed since the data cut-off for the 2022 Update in its RFI response to PUB-NLH-288 of this proceeding.[7]

Table 1: Planned Reports, Studies, and Analyses

Title	Estimated Filing Date
Labrador-Island Link Investigations	
Summary of Findings from L3501/2 Failure Investigation: Turnbuckle Failures – Structures 1872, 1806, and 1014	September 2023
Summary of Findings from L3501/2 Failure Investigation: OPGW[8] Tower Peaks – Structures 1230 and 1231	September 2023
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Combustion Turbines Feasibility Study	August 2023
Fuel Market Study	First Quarter 2024
Avalon Supply (Transmission) Study Update	October 2023
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Incremental Capacity/Efficiency Potential from Existing Hydro Units	Fourth Quarter 2024
Island Hydroelectric Supply Refresh Study	Third Quarter 2024
Pre-Winter Impact of Lower Reservoir Levels with the Addition of Bay d'Espoir Unit 8	First Quarter 2024
Impact of Prolonged Loss of the LIL on Reservoir Levels	First Quarter 2024
Combustion Turbine FEED[10]	Fourth Quarter 2024
Bay d'Espoir Unit 8 FEED	Fourth Quarter 2024

[7] Hydro's response to PUB-NLH-288 of this proceeding was filed on February 17, 2023, <http://pub.nl.ca/applications/NLH2018ReliabilityAdequacy/rfis/PUB-NLH-288.PDF>.
[8] Optical ground wire ("OPGW").
[9] Bay d'Espoir Hydroelectric Generating Facility ("Bay d'Espoir").
[10] Front-end engineering design ("FEED")

2.1 Labrador-Island Link Investigations

2.1.1 Summary of Findings from L3501/2 Failure Investigations

Description of Scope

The following failure investigations are underway to determine the root cause of the failures and to conclude what actions can be taken in order to prevent further damage to the line.

- L3501/2 Failure Investigation: Turnbuckle Failures – Structures 1872, 1806, and 1014;
- L3501/2 Failure Investigation: OPGW Tower Peaks – Structures 1230 and 1231;
- L3501/2 Failure Investigation: OPGW Top Plates – Structures 2135 and 2136; and
- L3501/2 Failure Investigation: Electrode Conductor Failure – Structures 513 to 515.

Hydro will provide the Board with a summary of the findings and mitigating actions within each of these failure investigations, including the following components, as applicable:

- Failure description;
- Weather;
- Construction quality review;
- Review of similar past failures;
- Review of galloping and vibration issues;
- Material testing; and
- Mitigating actions

Responsible Party

Hydro is responsible for this deliverable, supported by consultants EFLA Consulting Engineers, Wayland Engineering, and Maskwa High Voltage.

2.2 Supply Options and Support

2.2.1 Battery Energy Storage System

The purpose of this study is to provide Hydro with updated information on the feasibility of battery technology especially as it pertains to capacity constraints on the Avalon. The study will also provide updated cost information for modelling purposes.

Description of Scope

The scope of this analysis includes two phases:

- **Phase 1**: An update of the 2022 battery study,[11] which focused on the development of a battery storage project on the Avalon Peninsula. The Battery Energy Storage System ("BESS") may support a short-term power shortfall in contingency situations. Hydro is seeking an update to the AACE[12] Class 5 cost estimates for the following two options:
    - **Option 1**: 20 MW with a 4-hour reserve; and
    - **Option 2**: 50 MW with a 4-hour reserve.

  These options were selected to be representative of a small and large battery project and can be scaled to represent larger battery projects. The consultant will provide an update to the 2022 battery study, with updated sections highlighting changes in technology, as required.

- **Phase 2**: Investigate batteries with larger storage capacities. These would likely be newer battery technologies (e.g., iron air, flow, etc.) with potential storage capacities of up to 50 to 100 hours, with capacities of 20 to 50 MW. The consultant will provide guidance on storage capacities for any identified options. As these are newer technologies, the consultant will do a jurisdictional scan to see if there are other utilities using the identified technologies and assess the maturity of the technology. The consultant will provide a report for any reasonable options that may be identified, with the following content:
    - Description of the technology and technical characteristics;
    - Description of elements included or not included in the estimate;
    - Description of assumptions made in the preparation of the estimate;
    - Reference to vendor quotes;
    - Preliminary cost estimate (AACE Class 5);
    - Description of anticipated development/construction schedule;

[11] "BESS Project Preliminary Cost Estimate 254388-000-DF00-STY-002," Wood Canada Limited, August 22, 2022, provided as Attachment 3 to Hydro's response to PUB-NLH-288 of this proceeding.
[12] American Association of Cost Engineering ("AACE").

- Commentary on the feasibility of deploying BESS on the Hydro grid;
- Commentary on environmental considerations associated with this type of development;
- Commentary on how the batteries can be used to store excess energy (e.g., wind, hydro spill) and supply to the grid on a regular basis; and
- Estimated lifespan of the batteries being proposed.

Responsible Party

The party responsible for this deliverable is Wood Canada Limited.

2.2.2 Pumped Storage at Existing Hydro Sites

The purpose of this study is to provide Hydro with information on the feasibility of pumped storage technology at Hydro's existing sites to allow Hydro to assess the role this technology may have as a future resource option, especially when paired with energy resources such as wind. This study will also provide cost information for modelling purposes.

Description of Scope

The scope of this study includes a review of the feasibility of converting existing hydro generating stations into pumped storage. This study is intended to be a desktop exercise only. When determining feasibility, the consultant will consider but not be limited to the following:

- Review of unit/facility usage in the system as a whole, unit maintenance history (planned and unplanned), recent service issues, etc.
- Whether the existing unit(s) can be used as they are, require modification, require replacement, or require the addition of a dedicated pump storage unit;
- Impact of pump storage on existing electrical systems at the generating stations and associated terminal stations;
- Impact of pump storage on the upstream and downstream usage in the area, both environmentally and community use;

- Viability of using the existing hydraulic structures, penstocks, and dams for pump storage facility; and
- Added benefit of pump storage at each location and assessment of how pump storage can enable wind generation on the Island.

The consultant will create a ranking system of all hydro generating units and complete AACE Class 5 cost estimates for those units/facilities considered most feasible.

Responsible Party

The party responsible for this deliverable is Hatch Ltd. ("Hatch").

2.2.3 Pumped Storage Feasibility at Greenfield Sites

The purpose of this study is to provide Hydro with information on the feasibility of pumped storage technology on a greenfield site, especially as it pertains to capacity constraints on the Avalon. This study will also provide cost information for modelling purposes.

Description of Scope

Similar to the desktop study to determine the feasibility of pumped storage at existing hydro generating station locations, as discussed in Section 2.2.2, this study is to determine the feasibility of pumped storage at greenfield sites on the Island, specifically if there is potential on the Avalon Peninsula.

Responsible Party

The party responsible for this deliverable is yet to be determined.

2.2.4 Combustion Turbines Feasibility Study

The purpose of this study is to provide the necessary information for Hydro to select a combustion turbine option, to support a decision to proceed to the next stage of project development, and to provide updated costs for modelling purposes.

Description of Scope

The scope of this feasibility study is to complete the engineering and analysis required for alternative selection considering the following:

- **Size Constraints**: Identify any constraints on the size of the combustion turbine option in consideration of 150 MW, 300 MW, and 450 MW plant capacities;
- **Site Selection:** Investigate potential brownfield and greenfield site locations based on the feasibility of plant size, engine selection, fuel supply chain, availability of a suitable water source, proximity to existing electrical transmission, and environmental impact. The consultant will investigate and determine possible site locations on the northeast Avalon Peninsula that are downstream of the 230 kV transmission lines that connect the Western Avalon and Soldiers Pond Terminal Stations—TL201 and TL217. Site selection will include land acquisition requirements along with estimated applicable costs for each site location. One brownfield site located at the Holyrood TGS will be considered for evaluation as the property is under the ownership of Hydro. All sites selected will be large enough to be expandable from 150 MW to 450 MW.
- **Engine Selection**: As a baseline, a simple-cycle, liquid-fueled, aero-derivative combustion turbine package with a capacity of approximately 50 MW (rating) will be the minimum utilized size. The consultant will optimize the number of units and power rating for the plant size option listed. The consultant will also explore other combustion turbine manufacturer options and ratings to determine the best economical value, procurement lead times, and the ability to operate or be converted to operate on biofuel and/or gas (natural gas, hydrogen) in the future.
- **Fuel Supply**: As a baseline, the combustion turbine would initially be installed to operate on No. 2 diesel fuel. The consultant will investigate and determine the fuel supply chain to each site location and develop a transportation plan to include the occurrence of fuel deliveries and the onsite storage requirements for each option with input from Hydro. Fuel storage will sustain continuous baseload operation for five days for each plant size option. The consultant will provide commentary on any operational risk or significant operating cost such as fuel degradation. The consultant will also consider biofuel and gas (e.g., natural gas, hydrogen) fuel types as possible future alternatives. The consultant will provide applicable commentary to

discuss the feasibility of fuel sources aside from No. 2 diesel fuel, estimated costs, and future infrastructure requirements.

- **Water Supply**: The consultant will investigate raw water options as it relates to each proposed site location. This would include but is not limited to water requirements for plant size options, permits and/or licenses required from municipal and provincial authorities, and existing water rights.
- **Electrical Interconnection**: Upon selection of site locations to study, the consultant will work with Hydro to develop the System Operating Diagram. Once the System Operating Diagram is finalized, the consultant will review and state all high-level requirements for the terminal station design and interconnection for each site location and each plant size option. For each site location, the consultant will include and consider, but not be limited to, major equipment requirements and estimated dimensions and footprint for each terminal station for each plant option. Each terminal station will be required to connect to Hydro's 230 kV transmission system. The consultant will also consider the level of construction and/or relocation of existing infrastructure at each site location to interconnect into an existing Hydro terminal station.
- **Environmental:**
    - A social and environmental review for each site location would include but is not limited to site location, commercial or recreational use of the area, land use and zoning, indigenous land use, archaeological use, flora/fauna risks, wildlife, and environmental assessments or restrictions.
    - A noise impact study will be completed for each site. The consultant will provide a high-level noise impact review for the selected sites and power plant options.

An AACE Class 5 estimate will be developed for each feasible alternative.

Responsible Party

The party responsible for this deliverable is Hatch.

2.2.5 Fuel Market Study

The purpose of this study is to look beyond the known suppliers that will be considered in the Combustion Turbine Feasibility Study, detailed in Section 2.2.4, and review the broader and longer-term market availability of No. 2 diesel fuel.

Description of Scope

The scope of this analysis includes a Long-Term Fuel Supply Study that considers the ability to ensure a reliable supply of fuel with a planning timeframe out to 2050. The fuel and assets to be reviewed need to consider the existing 123.5 MW combustion turbine in Holyrood (Holyrood Gas Turbine) along with the addition of another 150 MW combustion turbine in Holyrood. The consultant will review the fuel supply chain and the existing assets for the transportation plan of fuel deliveries to existing and planned storage facilities on the Island. The consultant will provide applicable commentary to discuss the feasibility of the No. 2 diesel fuel for the time horizon provided.

The consultant will review the current fuel source for the Holyrood Gas Turbine and provide an outlook that considers the following criteria for the provided timeline:

- **Market Forecast and Availability of No. 2 Diesel Fuel**: The market forecast will consider the supply chain for No. 2 diesel fuel for the Island and provide an outlook of expected supply and demand out to 2050. The market forecast should outline the major sources of supply for the regional (North America) market and highlight any recent or expected changes (e.g., refinery retirements). The forecast should also consider the current energy transition including the impacts of emerging policies and initiatives:
    - Canada's *Clean Electricity Regulations*;
    - Canada's target to have 100% of new car sales being electric;
    - Provincial government's oil-to-electric rebate, in which homes are switching from oil to electric heat; and
    - Industries and large customers transitioning to greener fuel sources (e.g., Memorial University of Newfoundland's oil-to-electric boiler).

- **Review Supply Chain and Outline Any Significant Risks**: The consultant will provide an overview of the current supply chain that is currently in place and review any potential risks to the availability of the required amount of No. 2 diesel fuel in the expected timeline. This review will consider:
    - The timeline it takes for the province to receive No. 2 diesel fuel;
    - The assets that are currently utilized for the delivery of No. 2 diesel fuel to the local storage tanks;
    - An outlook on the maximum amount of No. 2 diesel fuel that could be available for combustion turbine generation at Holyrood;
    - Highlight alternatives to the current supply chain and any material impacts on the sourcing or price of No. 2 diesel fuel; and
    - The expected decline of oil consumption in regional and local markets.

- **Outline Any Critical Assets to the Supply Chain**: Once the review of the existing supply chain is complete, outline any critical assets that would disrupt the supply chain for No. 2 diesel fuel for the Holyrood Gas Turbine. This should include any refineries, storage tanks, or delivery assets that would impact the planned operation or feasibility to operate the combustion turbine on No. 2 diesel fuel. These risks should include any potential impact on the timing of No. 2 diesel fuel deliveries or significant impacts on pricing outside of normal diesel market oil price variability.

- **Provide Outlook to Alternative Fuel Sources**: Provide an outlook to alternative fuel sources (e.g., hydrogen, bio-fuel) and an anticipated timeline for when these fuel sources could potentially be available. Provide a high-level outlook and comparison of the potential alternative fuel sources to No. 2 diesel fuel.

Responsible Party

The party responsible for this deliverable is yet to be determined.

2.2.6 Avalon Supply (Transmission) Study Update

The purpose of this study is to analyze the On-Avalon transmission constraints and how increases in generation Off-Avalon impact the requirement for transmission upgrades in order to increase power flow to the Avalon.

Description of Scope

The scope of this analysis includes two phases:

- **Phase 1:** Identify Base Case transfer limits. The first task is to determine the power transfer limits on the 230 kV transmission corridor between Bay d'Espoir and Soldiers Pond ("BDE–SOP") if no transmission reinforcements are made. This will be done for each n-1 contingency along the 230 kV BDE–SOP corridor. The evaluation will be focused on steady-state analysis to ensure thermal ratings of 230 kV transmission lines are not violated and that steady-state voltages remain within steady-state criteria. Various Island Interconnected System demand levels will be tested with thermal line ratings adjusted appropriately for the ambient temperature rating. Once the most limiting contingencies and power transfers/demand levels are identified, they will be tested in transient stability to ensure the system remains stable.
- **Phase 2:** Investigate transmission reinforcements. Identify the amount of Island Interconnected System demand that can be served and the BDE–SOP transfer limits for a list of various transmission system solutions to increase the transfer capability to the Avalon Peninsula when the LIL is unavailable. Considering the worst-case contingencies and system conditions identified in Phase 1, Phase 2 will investigate various transmission reinforcements to identify the increase in power transfer capability between BDE–SOP associated with each transmission solution and to identify how much demand can be served as a result of each transmission solution. The aim will be to develop transmission solutions for specific increments of increased BDE–SOP power transfer capability (e.g., +50 MW, +100 MW, etc.). For example, receiving an extra 100 MW from BDE–SOP may be achieved by applying dynamic line ratings on TL201. The increment amount is to be determined and there may be multiple solutions for each increment.

Responsible Party

The party responsible for this deliverable is TransGrid Solutions.

2.2.7 Bay d'Espoir Unit 7 Uprate Study

The purpose of this study is to assess the possibility of uprating Bay d'Espoir Unit 7 for consideration as an option to increase island capacity.

Description of Scope

This study will assess the possibility of uprating the Bay d'Espoir Unit 7. Bay d'Espoir Unit 7 was selected first to coincide with the Unit 7 Condition Assessment (2023) – Bay d'Espoir ("2023 Unit 7 Condition Assessment").[13] This study will consider the following constraints and assumptions:

- Existing water flow and headrace level at rated output is maintained;
- Scroll Case, draft tube, and other major embedded parts are not replaced; and
- New equipment is geometrically similar and requires no major modifications to concrete or other powerhouse structures including the overhead crane.

Uprating strategies may include:

- Uprating existing equipment by releasing it for service at higher outputs;
- Runner replacement for a more efficient runner;
- Operating at higher temperatures and modifications necessary to withstand such temperatures without prejudice to useful life;
- Stator and rotor rewind or generator replacement;
- Modifications to exciter parameters, including exciter replacement, if necessary; and
- Other actions or upgrades to components or systems that will allow the generating unit to produce a higher output within the listed constraints.

The study will clearly describe the possibilities for uprating and the associated dollar per installed megawatt cost to each of them. The study will also clearly inform synergies with the findings of the 2023 Unit 7 Condition Assessment. For example, if a recommendation made for life extension can also achieve a net output increase, it will be clearly indicated. For synergistic approaches (i.e., an action that

[13] "2023 Capital Budget Application," Newfoundland and Labrador Hydro, July 13, 2022, vol. II, proj. 25.

achieves life extension and uprating), the costs associated with maintaining existing output and increasing the rated output will be clearly determined.

Hydro's remaining island hydroelectric generating units will be studied in 2024.

Responsible Party

The party responsible for this deliverable is yet to be determined.

2.2.8 Incremental Capacity/Efficiency Potential from Existing Hydro Units

The purpose of this study is to identify any opportunities to uprate units in Hydro's island fleet, similar to the work started on the Bay d'Espoir Unit 7 Uprate Study, as detailed in Section 2.2.7.

Description of Scope

This study will assess the feasibility of incremental capacity and/or efficiency on Hydro's existing hydraulic fleet. The detailed scope of work of this study and strategy is still under development.

Responsible Party

The party responsible for this deliverable is Hydro.

2.2.9 Island Hydroelectric Supply Refresh Study

The Island resource options currently included in Hydro's supply stack are based on historical reviews. The purpose of this study is to refresh the feasibility of all potential Island hydroelectric resource options for future consideration.

Description of Scope

This study is required to identify hydro generation options on the Island Interconnected System to meet increasing long-term projected demand. Scope includes the management, procurement of services, and engineering for the development of a list of potential hydro generation options. The main deliverables include:

- Categorized list of options, including feasible options, not suitable options, potential partnerships, and mini-hydro options;
- Existing documentation review;

- Feasibility assessment on the top six options, including site and drainage area identification, water supply assessment, accessibility assessment, and maximum capacity calculation;
- Environmental screening on the top six options; and
- Plant/Infrastructure layout options assessment and high-level cost estimate for the top two options.

Hydro does not expect this study to be concluded in time for its next annual update to the Reliability and Resource Adequacy Study;[14] however, the study will be used to inform future supply options on the Island Interconnected System.

Responsible Party

The party responsible for this deliverable is yet to be determined

2.2.10 Pre-Winter Impact of Lower Reservoir Levels with the Addition of Bay d'Espoir Unit 8

A hydraulic study completed in 2020 confirmed the feasibility of Bay d'Espoir Unit 8 as a capacity-only project.[15] The purpose of this study is to inform if any changes are required for the operation of the Bay d'Espoir reservoirs in advance of winter with the addition of Bay d'Espoir Unit 8.

Description of Scope

A further study to examine the impact that lower reservoir levels in advance of winter may have on generation at Bay d'Espoir with the addition of Bay d'Espoir Unit 8.

Responsible Party

The party responsible for this deliverable is yet to be determined.

[14] The timing of Hydro's next Reliability and Resource Adequacy Study update is to be determined. Hydro will inform the Board of its expected filing timeframe on or before June 19, 2023.
[15] "Final Report For Hydrology and Feasibility Study for Potential Bay d'Espoir Hydroelectric Generating Unit No. 8," Hatch Ltd., December 11, 2020, filed as Attachment 7 to the "Reliability and Resource Adequacy Study – 2022 Update," Newfoundland and Labrador Hydro, October 3, 2022.

2.2.11 Impact of Prolonged Loss of the LIL on Reservoir Levels

The purpose of this study is to understand the impact that a prolonged loss of the LIL has on the Island reservoir storage during the winter and shoulder seasons to inform if any changes are recommended for the operation of the reservoirs.

Description of Scope

A further study to examine the impact that a prolonged loss of the LIL (i.e., six weeks) has on reservoir levels on the Island during the winter and shoulder seasons.

Responsible Party

The party responsible for this deliverable is yet to be determined.

2.2.12 Combustion Turbine FEED

This study will only proceed if the results of the Combustion Turbine Feasibility Study, detailed in Section 2.2.4, warrant the move to the next phase of project development. Hydro included this study in its list, as it is likely to be required.

The purpose of this study would be to complete the engineering and planning required for the development of a cost estimate and other evidence to support a project sanction decision and a build application.

Description of Scope

This study will include the FEED and development of a Class 3 estimate for a combustion turbine option. A selection of combustion turbine(s) for the study will be informed by the Combustion Turbine Feasibility Study.

Responsible Party

The party responsible for this deliverable is yet to be determined

2.2.13 Bay d'Espoir Unit 8 FEED

As outlined in the 2022 Update, Hydro has already started work on FEED for Unit 8. The purpose of this study is to complete the engineering and planning required for the development of a cost estimate and other evidence to support a project sanction decision and a build application.

Description of Scope

The scope of this study includes:

- The development of front-end execution planning deliverables:
  - Project charter;
  - Update project scope of work document and work breakdown structure;
  - Contracting strategy;
  - Project management strategy, based on chosen contracting strategy;
  - Project controls strategy;
  - Construction management strategy, based on chosen contracting strategy;
  - Health and safety strategy;
  - Environmental management strategy and environmental assessment registration; and
  - Quality management strategy.
- The following field investigations will be completed to advance/update the preliminary engineering design and complete design optimizations:
  - Topographic and bathymetric surveys;
  - Geotechnical investigations; and
  - Condition assessment of existing infrastructure.
- The following FEED activities will be completed:
  - Undertake design optimizations, which include:
    - Optimize preliminary designs based on results of the field investigations;
    - Additional hydraulic design of the headrace and tailrace canals and finalize the preliminary designs;
    - Selection of:
      - Intake location; and
      - Penstock route and excavation quantities;

- Finalize the design of the vent shaft and gate shaft;
- Determine site access during construction; and
- Determine temporary relocation of underground cables;

- Update Class 3 cost estimate based on updated contracting strategy, schedule, design optimizations, updated material take-offs, unit costs, and costs for long-lead items; and
- Prepare Level 2 schedule based on updated material take-offs, timelines for long-lead items, environmental timelines, construction sequencing, and contracting strategy.

The results of this study will form part of the evidence to support an application to the Board for the Bay d'Espoir Unit 8 project, should Hydro's assessment of supply options recommend this project.

Responsible Party

The party responsible for front-end execution planning and overall management of this study is Hatch, the party responsible for the field studies is Advanced Access Engineering, and the party responsible for FEED is yet to be determined.