

1 Q. What is the current status of gas turbine technology burning "green" fuels; e.g., switchgrass?

2

3

4 A. Since filing the "Reliability and Resource Adequacy Study – 2022 Update" ("2022 Update"),
5 Newfoundland and Labrador Hydro ("Hydro") received the "Combustion Turbine Screening Final
6 Study Report" ("Combustion Turbine Report") conducted by Hatch Ltd ("Hatch"),¹ included as
7 Attachment 4 of Hydro's response to PUB-NLH-288, which considers the use and sourcing of
8 biodiesel, ethanol, and hydrogen to generate electricity, including technical limitations, based
9 on Hydro's current requirements. Certain technical limitations provided in the report are
10 described herein.

11 The use of renewable or low-emitting fuel sources in combustion turbine technology is
12 increasing, with some combustion turbine models already designed to use hydrogen as a fuel
13 source. If a combustion turbine is to be considered, Hydro maintains it is prudent to ensure
14 future utilization of alternative fuel sources forms part of the specification for such new
15 equipment. Hydro will continue to monitor technical and proven ability regarding renewable
16 and reduced emission fuel sources as inputs to decision-making on the suitability of combustion
17 turbines for long-term supply options.

18 **Biofuel: Biodiesel, Renewable Diesel, Ethanol**

19 While the production capacity of biofuel has grown significantly over the last decade, the
20 current supply chain in Canada is not developed enough to meet the demand required nor to
21 make long-term decisions regarding firm and reliable generation supply. Therefore, there is a
22 low probability that there will be reliable supply availability for Newfoundland and Labrador in
23 the near future. The Combustion Turbine Report noted that as the biofuel supply chain grows in
24 Canada, provinces in proximity to Newfoundland and Labrador such as Ontario, Quebec, Nova
25 Scotia, and New Brunswick may have the ability to import biofuel to Newfoundland and
26 Labrador.²

¹ "Combustion Turbine Screening Final Study Report," Hatch Ltd., rev. October 28, 2022 (originally issued October 17, 2022).

² "Ibid., p. 38.

1 **Hydrogen**

2 Newfoundland and Labrador’s proximity to natural gas reservoirs (blue or grey hydrogen
3 production) and its renewable energy sources in hydropower and wind (green hydrogen
4 production) demonstrate the significant potential for hydrogen production in the province. The
5 Combustion Turbine Report states that province is not currently projected to have a large
6 domestic demand at this time and the production is being considered for export markets.

7 **Combustion Turbine Renewable Fuel Capability**

8 The Combustion Turbine Report focused on three major original equipment manufacturers that
9 proposed units that closely matched Hydro’s requirements. The proposed units are General
10 Electric GE-LM6000 PC Sprint, Siemens SGT 800, and Mitsubishi Power Aero MHI-FT4000.

- 11 • General Electric GE-LM6000 PC Sprint: This unit is designed to burn a maximum of 35%
12 hydrogen by volume. This combustion turbine has limited experience burning ethanol or
13 biodiesel.
- 14 • Siemens SGT 800: The SGT800 is capable of burning 75% hydrogen. Siemens has limited
15 experience with biodiesel but confirms its capability. At the time of the study, Siemens
16 does not have any experience burning ethanol in their combustion turbine fleet.
- 17 • Mitsubishi Power Aero MHI-FT4000: This combustion turbine is designed to run on
18 liquid fuels such as diesel and natural gas. As of the time of the Combustion Turbine
19 Report, the MHI-FT4000 does not have the capability to burn any biofuel and its
20 capability to burn hydrogen has not been verified.

21 The proposed federal Clean Electricity Standard has raised questions about resource options
22 that would traditionally have been recommended, including whether they will be a viable future
23 resource option (i.e., fossil fuel-burning combustion turbine). In the 2022 Update, Hydro
24 committed to continue assessing thermal generation as a resource option in relation to the
25 proposed Clean Electricity Standard and investigate combustion turbines with a renewable fuel
26 source as a resource option in the Reliability and Resource Adequacy Study – 2023 Update.

27 Hydro notes that although it now has further information with respect to gas turbine
28 alternatives, in particular the use, sourcing and cost of biofuel technology, a comprehensive

1 feasibility review of gas turbine alternatives is necessary to determine whether it is a viable,
2 least-cost option that would fit Hydro's need as a resource. There is significant interest in
3 hydrogen as a fuel for the electricity generation industry and should this industry advance, it is
4 expected supply will be available. Due to the early age of this industry, confirmation of a fuel
5 supply to the domestic market in the province is yet to be determined. Hydro will continue to
6 monitor this availability and consider this fuel source in a combustion turbine. Hydro will
7 continue with its analysis in preparation for the 2023 Update. The range of additional analysis
8 includes the determination of possible site locations, land purchase requirements, fuel supply
9 considerations, water supply considerations, engine selection, and electrical interconnection
10 and environmental impacts in the Northeast Avalon area.