

UNDERSTANDING QUÉBEC HYDROPOWER

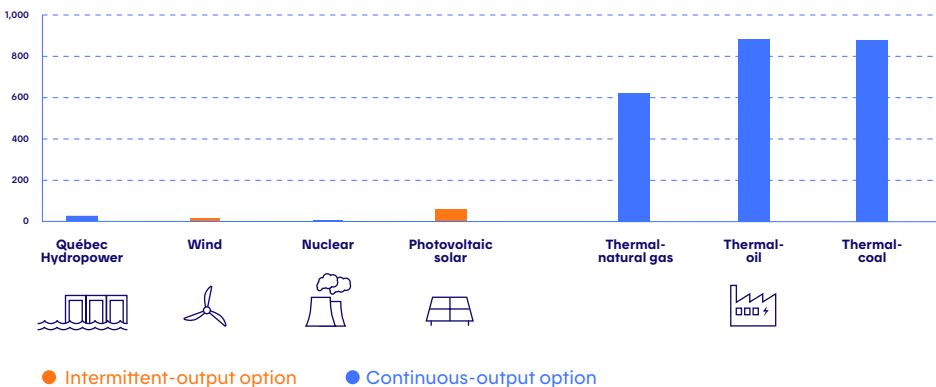
Among the lowest greenhouse gas emissions of all electricity generation options

All forms of electricity generation emit greenhouse gases (GHG) over the course of their lifespan (construction, operation and decommissioning). For Québec hydropower, GHG emissions are mainly carbon dioxide, and to a lesser extent, methane, resulting from decaying vegetation in flooded land. Based on a life cycle analysis, net GHG emissions from Québec hydropower are significantly lower than electricity generation from natural gas and coal, and on par with wind.^{1,2}

GHG EMISSIONS

Power generation options based on life-cycle analysis

(g CO₂ eq.³/kWh)



METHANE IS NOT AN ISSUE IN QUÉBEC RESERVOIRS

Northern reservoirs emit little methane for two main reasons:

Location

Vegetation is very sparse in the northern environments where Hydro-Québec's reservoirs are located. Additionally, they are far from agricultural or urban areas, so run-off that reaches them is very low in organic matter and in nutrients. Less organic matter means that Québec reservoirs and lakes are less productive ecosystems than those in other regions.

Low temperatures

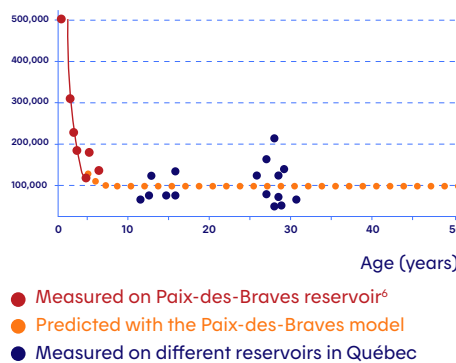
Cold water contains more dissolved oxygen than warm water, leading to the formation of more carbon dioxide and less methane when organic matter decomposes. Some carbon in sediments decomposes to form methane due to low oxygen levels, but this will turn into carbon dioxide in the presence of oxygen in the water as it migrates to the surface. There is enough oxygen in one metre of the water column to oxidize the methane produced.

Temporary emissions

Hydro-Québec has been a pioneer in the study of greenhouse gas emissions from hydroelectric reservoirs. Our studies show that emissions peak immediately after reservoir creation, and decline to natural lake levels generally within ten years.⁴

Future Projections of Net GHG Emissions

Net CO₂ eq.³ emissions (t C⁵/yr)



¹ CIRAIG (2014). These results are similar to those published by the IPCC (2011)

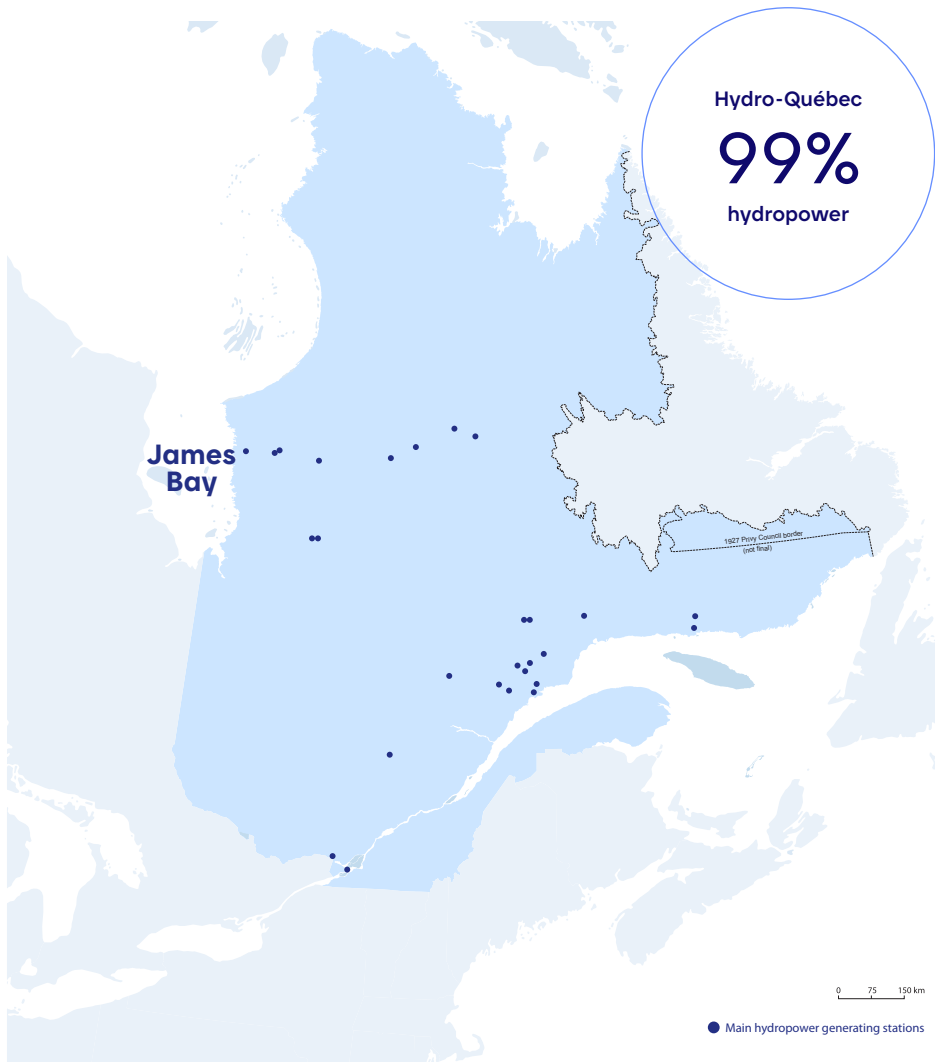
² Levasseur et al. (2021)

³ CO₂ = Carbon dioxide; CO₂ eq. = CO₂ equivalent

⁴ Tremblay et al. (2005)

⁵ C = carbon

⁶ Formerly the Eastmain 1 reservoir



Due to Québec climatic and biological conditions, little methane is emitted.

Québec hydropower emissions are similar to wind & solar

1993

Year Hydro-Québec's GHG research started

>17

Years of study on the Eastmain reservoir in James Bay (before, during and after impoundment)

>100

Number of experts involved in the Eastmain-1 GHG study

>500,000

Number of measurements taken

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For more information on hydropower generation and greenhouse gas emissions, please consult our Web site:

<https://www.hydroquebec.com/sustainable-development/specialized-documentation/ghg-reservoir.html>