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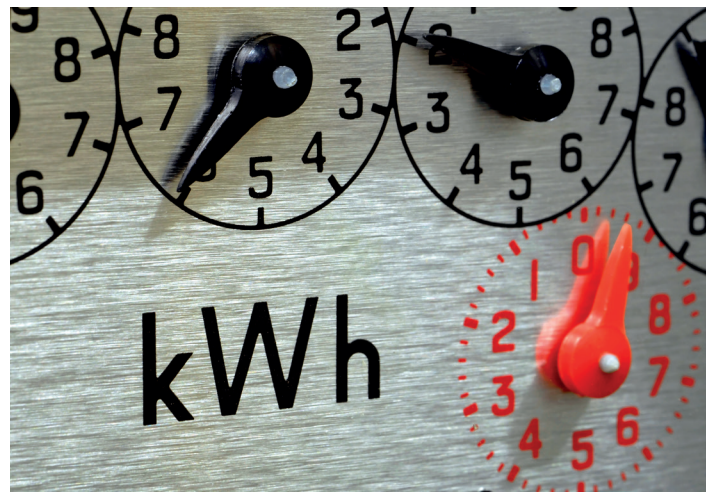
QUEBEC'S UNCERTAIN ENERGY FUTURE

By Gabriel Giguère, with the collaboration of Daniel Dufort

The Quebec government, through Hydro-Québec, is working toward the electrification of many sectors of industry in the province.¹ Its *Strategic Plan 2022–2026*, which assesses Quebec's electricity needs,² determines unequivocally that current electricity supply capacities will be insufficient to meet the growing demand from households and businesses. The next decade³ will witness the end of surplus electricity in the province. Ensuring an increase in electricity supply in such a short period of time poses a new challenge. While wind power can play a part, complementary options must also be considered in this conversion to a heavy reliance on electricity. In order to reliably meet future demand, maintaining or even increasing natural gas, recognized as a transitional energy source, in the energy mix would appear to be necessary.

TOWARD THE END OF ELECTRICITY SURPLUSES

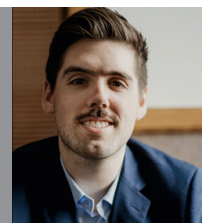
The government's choices with respect to energy issues are geared toward reducing the use of certain types of energy historically used in the province, notably oil and natural gas, with a view to achieving carbon neutrality by 2050. These sources still represent a significant share of Quebec's energy mix (see Figure 1). This energy transition depends heavily on electricity, and this will pose a significant challenge to the province's future energy supply, as Hydro-Québec's current supply will not be able to meet future demand.



However, the energy picture in Quebec is changing rapidly. In its *2023–2032 Electricity Supply Plan*, Hydro-Québec forecasts significant growth in electricity demand in Quebec, estimating an increase of 14% over the next decade.⁴ This rise is the result of a number of factors, including the conversion of buildings and industrial processes, the electrification of transport, and various emerging sectors (green hydrogen, data centres, battery industry).⁵

In light of this increasing demand, Hydro-Québec's *Supply Plan 2020–2029* stresses the need to increase supply rapidly: “[T]he evaluations show the need for new long-term supplies from winter

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2026-2027 onwards, in terms of power, and from 2027 on, in terms of energy.”⁶

In addition to having to increase the quantity of electricity to be delivered, Hydro-Québec will also have to increase the power available.⁷ The importance of energy capacity requirements in Quebec becomes clear when one considers the supply of electricity over the winter peak period in which 80% of residential heating uses electricity.⁸ In the event of increased electrification of heating systems, as is currently planned, power requirements will necessarily increase. And if less natural gas is used, the pressure on the electricity grid will become even greater.⁹ Indeed, this power requirement was remarked during the winters of 2021-2022 and 2022-2023. In 2023, Hydro-Québec underestimated its peak power needs by 8% and was forced to draw on its reserves.¹⁰

In other words, the supply must definitely increase to meet growing demand. What does the government propose to do about this?

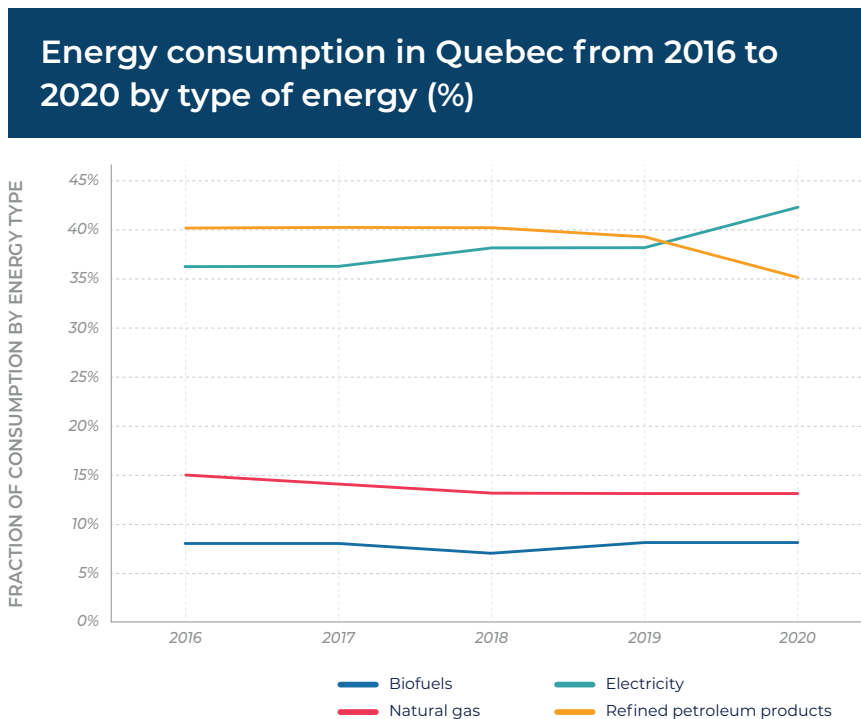
THE LIMITS OF GOVERNMENT SOLUTIONS

The need for Hydro-Québec to find new electricity supply capacity in the near, or even very near, term is one of the main limitations on the energy production options available. Indeed, some of these options do not allow for increased energy production before the electricity surplus runs out, as they require more time to become operational. Other options can be deployed more quickly, but they suffer from other drawbacks.

The hydroelectric dam solution

During the 2022 election campaign, Quebec’s Premier stated his preference for the employment of hydroelectric dams, a stance that the former CEO of Hydro-Québec disagrees with.¹¹ The state-owned company is nonetheless looking to meet the growing demand for electricity by replacing turbines on some dams, a move that promises to increase electricity production. Indeed, the replacement of turbines at just four power stations is expected to result in an increase of 128 MWh by the year 2028, and a wider mod-

Figure 1



Note: The energy types *Coal Coke* and *Propane and Others* respectively represent 1% of the energy mix in Quebec.

Source: Johanne Whitmore and Pierre-Olivier Pineault, *État de l'énergie au Québec: Édition 2023* (in French only), HEC Montréal, February 2023, p. 35; Johanne Whitmore and Pierre-Olivier Pineault, *État de l'énergie au Québec: Édition 2022* (in French only), HEC Montréal, February 2022, p. 31; Johanne Whitmore and Pierre-Olivier Pineault, *État de l'énergie au Québec: Édition 2021* (in French only), HEC Montréal, January 2021, p. 26; Johanne Whitmore and Pierre-Olivier Pineault, *État de l'énergie au Québec: Édition 2020* (in French only), HEC Montréal, January 2020, p. 28; Johanne Whitmore and Pierre-Olivier Pineault, *The State of Energy in Quebec: 2019*, HEC Montréal, December 2018, p. 29.

ernization of Quebec power plants is projected to add a total of 2,000 MW of power by 2035.¹² Unfortunately, the timeframe for this initiative will overshoot the date by which Quebec’s electricity surplus will have run out, though this additional generation will help to meet some of the future demand.

Hydro-Québec forecasts significant growth in electricity demand in Quebec, estimating an increase of 14% over the next decade.

Over the longer term, the government is also considering the construction of additional dams. This is the avenue being explored by Hydro-Québec in its preliminary study on the Little Mécatina River,¹³ but this dam will take some ten years to build,¹⁴ and fifteen to be fully operational.¹⁵

For the moment, Hydro-Québec has progressed no further than preliminary studies.¹⁶ While these solutions are appropriate for longer-term energy supplies, they will not suffice to meet energy and power needs quickly.

The wind power solution

Hydro-Québec is betting heavily on wind turbines to meet its future needs.¹⁷ But one major limitation of this technology is the intermittent nature of its production; without wind, no electricity can be produced. The power guaranteed to be supplied by wind turbines thus represents only 35% of the installed capacity.¹⁸ A balancing system must therefore be put into place to compensate for the intermittency of the wind turbines and to hedge against their unpredictable supply. In Quebec, hydroelectricity is used to make up the difference when the wind turbines are idle.¹⁹ The planned addition of wind power supply²⁰ by December 1st, 2026 is intended to meet energy and power supply needs by 2027. But what if this plan were to encounter delays, or if, for example, some projects fail to pass the Régie de l'énergie's environmental assessment?²¹ To be sure of meeting the growing needs of Quebec households and businesses, the government should also consider other forms of energy.

The energy-efficiency solution

Energy efficiency is another factor that Hydro-Québec is focusing on in hopes of encouraging energy conservation and reducing the demand for electricity in the coming years.²² One of the main factors pushing Hydro-Québec to be more ambitious in terms of efficiency is the increased demand for electricity.²³ However, the reduction

of consumption has its limits and this approach cannot fully offset the growth in demand, especially during the demand spikes at peak times that put significant pressure on the network.²⁴

Hydro-Québec's low prices are yet another hindrance to energy efficiency because they give the population little or no incentive to reduce energy consumption while the residential sector enjoys cheap rates subsidized by the commercial and industrial sectors.²⁵ The government must therefore ensure an increase in production and consider the use of other energy sources in the coming years.

A COMPLEMENTARY PATH

In order to ensure a reliable energy supply for the province in the years ahead, the government will need to use other complementary forms of energy that possess the necessary flexibility and reliability to meet the growing demand.

Given this context, natural gas is a source that provides a reliable, secure, and efficient supply to the energy mix.²⁶ Indeed, it is easily accessible on Canadian markets, although no production actually takes place within Quebec's borders.²⁷ Natural gas is also an energy source with the flexibility to be used for heating, industrial processes, and even electricity generation²⁸ (see Box 1). Lastly, natural gas is a cheaper form of energy than electricity, which reduces the financial pressures on consumers.²⁹

Faced as we are with significant short-term energy needs, natural gas deserves to be considered as a resource that can play a major part in meeting those needs. Though Quebec's policy aims are to reduce the use of this type of energy,

Box 1: The case of the Bécancour natural gas power plant

Changes in energy requirements have highlighted the relevance of the Bécancour natural gas-fired power plant. Hydro-Québec entered into an agreement in 2003 to ensure a supply of electricity from the plant until 2026.³⁰

Initially intended to meet peak demand and the needs of the Gentilly 2 nuclear power plant,³¹ Bécancour's supply potential for non-leap years amounted to 4.1 TWh,³² with a current capacity of 550 MW, i.e., almost the equivalent of all the energy required by data centres in 2029 according to the 2021 progress report of the *2020–2029 Electricity Supply Plan*.³³

While the plant's electricity production was almost nothing for several years, it was used 18 times during the winter of 2021–2022.³⁴ Given the current situation of imminent need for rapid growth in Quebec's energy supply, Hydro-Québec should negotiate an extension to push the duration of the supply agreement beyond 2026. This approach would at least ensure a supply of electricity to meet peak demand.

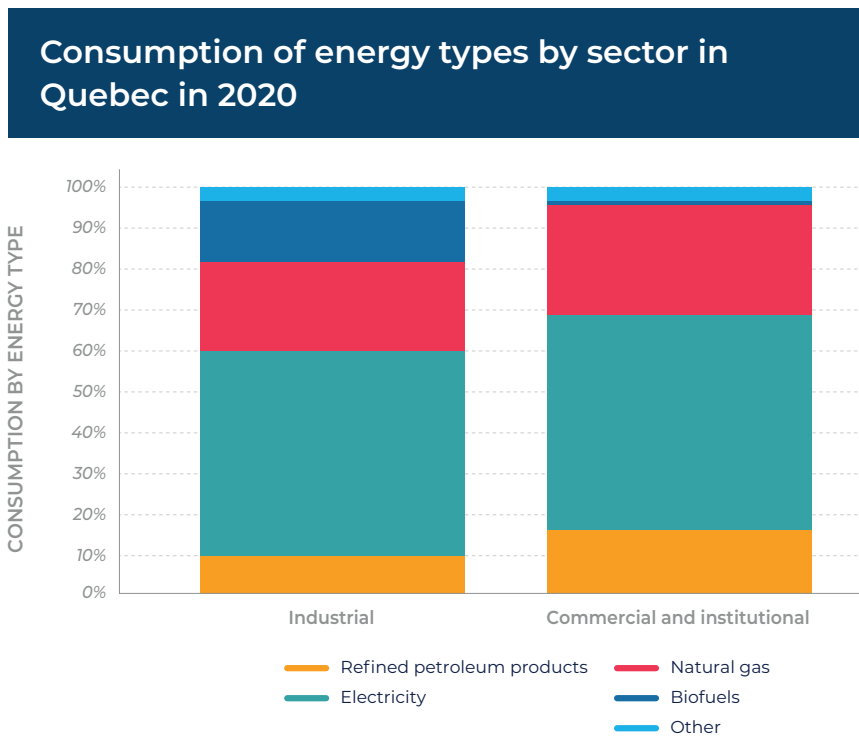
gas still powers a considerable fraction of both industrial processes and the heating of buildings.³⁵ In 2020, this resource represented 22% of the energy mix in the industrial sector, the category with the largest energy consumption, and 27% in the commercial and institutional sector (see Figure 2).³⁶

Hydro-Québec's recommended approach is to convert industrial processes and buildings' heating systems to electricity, which will increase pressure on supply by 4.5 TWh by 2032.³⁷ One of the goals behind this increase is to reduce the use of natural gas in the commercial and industrial sectors. Simply maintaining, or increasing, the resource in the energy mix would facilitate the transition by reducing the growth in demand for electricity. Indeed, the use of natural gas represents the equivalent of 17,000 MW of electricity, according to the Minister of the Economy, Innovation, and Energy.³⁸ In other words, natural gas provides the equivalent of 42% of the peak power needs projected by Hydro-Québec for 2023-2024.³⁹

Natural gas is an energy source with the flexibility to be used for heating, industrial processes, and even electricity generation.

Keeping natural gas in Quebec's energy mix could logically go hand in hand with a lifting of the ban on hydrocarbon exploration and development in Quebec. Without necessarily locking ourselves into a vision of energy autarky, natural gas reserves within Quebec are sufficient to provide for its consumption for at least the next forty years.⁴⁰ The economic benefits of developing this resource would amount to \$93 billion,⁴¹ which would contribute to wealth creation. In order to benefit from these economic returns, it is important that we address the place of natural gas in the province's energy mix as part of a public debate on Quebec's energy future.

Figure 2



Note: The energy types *Coal Coke* and *Propane and Others* occupy only a marginal place in the energy mix of the sectors presented.
Source: Johanne Whitmore and Pierre-Olivier Pineault, *État de l'énergie au Québec: Édition 2023*, HEC Montréal, February 2023, p. 35.

Finally, natural gas is recognized as a transitional energy by Quebec's Ministry of the Economy, Innovation and Energy,⁴² and qualifies officially as "green energy" in Europe.⁴³

CONCLUSION

In the short and medium terms, the Quebec government is relying primarily on wind power generation and energy efficiency improvements to ensure an adequate supply of electricity through the end of the present decade. To take into account the uncertainties and restrictions raised above, it should nevertheless mandate Hydro-Québec to prepare a plan B in case the supply of electricity turns out to be less than expected, or demand exceeds projections. This alternative plan should maintain, if not increase, the place of natural gas, which is recognized as a transitional energy, in Quebec's energy mix.

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