



# The battery of the US Northeast

Canadian provincial utility Hydro-Québec is helping to reinvent Big Hydro to meet new demand from the energy transition, writes Darius Snieckus

Meeting the surging renewable energy demand in the densely populated, power-hungry cities of the US Northeast could in some large part be solved by a single company — and it won't have to even set foot inside the lower 48.

With a 100TWh annual surplus from a 37GW fleet of hydroelectric plants spread across the vast wilderness of Canada's largest province, utility Hydro-Québec has plenty of power to ratchet-up export of electricity to its neighbour to the south.

The government-owned company, North America's largest renewables generator, has in each of the past three years pulled in C\$800m-900m (\$644m-725m) from electricity distributors in New England. And demand — and revenue — is only expected to rise, especially as states such as Massachusetts and New York enshrine hugely ambitious emissions-

reduction targets and begin to roll out clean-energy tenders in support.

As *Recharge* went to press, Massachusetts was set to award supply deals for 9.45TWh annually under a landmark clean-energy auction. At the same time, next door in New York, the New York Power Authority is aiming to contract 1TWh each year, while NYSERDA, the state's energy R&D body, wants to buy another 1.5TWh annually — collectively the largest clean-energy procurement in US history and designed to move New York towards its 50% renewables goal for 2030.

For the Massachusetts tender, Hydro-Québec is part of a front-running bid with Gaz Metro and Boralex to supply hydropower and 300MW of wind from the Seigneurie de Beaupré development near Quebec City into the US state, with the utility providing hydropower to “firm up” the variable

wind generation. It has also put in several other bids, including a solo 100% hydropower tender.

In New York, Hydro-Québec has put forward two options: the first sees it exporting 700GWh a year using upgraded existing transmission infrastructure; the second has the utility linking with several US transmission developers to build a series of new power trunklines able to transport up to 8.3TWh into New York each year — several times more than the state is looking for in its current procurement round, and a big slice of what it will need to meet its renewables target.

“There is no question we can be the battery of the [US] Northeast — our [hydroelectric] dams are full of water, [and] we have major new transmission projects under development,” says Hydro-Québec president of distribution David Murray. “And,



while for a long time we weren't really recognised much outside of Canada — chiefly due to pricing misperceptions — we are getting much more visibility [in the US] now and that attracts possibilities for us.

“Our reputation as a low-price, green source of power is only becoming better and better in the eyes of these states' governments.”

New hydro capacity continues to be built in Quebec to keep pace with the upswing in demand in the province and for export to the US, underpinned by the utility's 1.55GW La Romaine complex, a four-stage project being constructed on the north shore of the St Lawrence River at a cost of \$6.5bn. Once the final generating station is commissioned in 2020, the plant will add 8TWh a year to existing capacity of 176TWh.

“Having this extra capacity is giving

us the opportunity to make bids to export more into key markets, such as the US

Northeast, which — if we win, of course — would allow us to increase from our current levels by more than 30TWh a year,” says Murray.

Wind's place in the Hydro-Québec operation has been growing steadily in importance since the first power-purchase agreements (PPAs) were signed in 2003, with 3.7GW contracted since, including most recently, a 25-year deal with US developer Pattern Energy for its 147MW Mont Sainte-Marguerite project in southern Quebec.

“Production of hydroelectricity has been cheap for us but wind has and will continue to be an opportunity for us,” says Murray. “We'll pass the 4GW mark soon and we continue to develop transmission projects to

support the sector's production to market.

“Wind is something entirely positive for us because it lets us offer a wider range of supply possibilities to customers. Ultimately, it is all about cost, and the cost of wind has come down dramatically.”

Along with the numerous transmission projects under way to expand and shore up the Quebec grid, the utility is eyeing up construction of a series of US-bound export lines including the Quebec-New Hampshire Interconnection Project, an 80km high-voltage direct-current line recently rubber-stamped by government, which, together with the Eversource Energy-backed Northern Pass Transmission project, made up one of the three power transmission options put forward by Hydro-Québec for the Massachusetts tender.

Trajectories for ongoing market

**CLEAN ENERGY:** Clockwise from top left: The reservoir and spillway of Hydro-Québec's 5.6GW Robert-Bourassa plant; New York governor Andrew Cuomo, who is leading the US state's drive for renewable energy; Hydro-Québec's 270MW Romaine 1 hydropower generating station

*Inset:* Hydro-Québec's David Murray



**ENERGY GIANTS:** Transmission lines near Radisson in remote north-central Quebec; *right:* the 56MW phase one of Le Nordais wind farm, outside Cap-Chat, eastern Quebec; *top right:* high-voltage power lines in Boucherville, near Montreal

## Building hydropower in ‘la belle province’

Hydro-Québec’s history holds a mirror up to Canada’s modern industrial evolution. Early waves of expansion in the 1920s, when more than 80 hydroelectric dams sprang up along provincial waterways, nationalisation in the 1940s, a construction boom through the 1960s and 1970s crowned by a “project of the century” — in the utility’s case the 16.5GW James Bay project built over decades at a cost of tens of billions of dollars, and the infrastructure renewal programmes of the 1990s and 2000s.

When Éric Martel took on the chief executive mantle at Hydro-Québec in 2015, he presented a five-year strategic plan to the company’s 100% shareholder — the government of Quebec — which was underpinned by the belief that it was “important to go with the wave of the energy transition we saw building then, globally,” says president of distribution David Murray.

“The starting point for us is always reliability — we have an environment here in Quebec that is very cold in the winters, down into the -30°Cs sometimes, and one where, because of climate change, there are more storms — so it is of paramount importance that we can properly manage supply [of electricity]. But we are working toward the future low-carbon economy and the changing grid that is coming with it at the same time, which is a huge opportunity in itself.”

Running a yearly surplus of 100TWh and with a network of 62 generating stations powered by reservoirs filled to historically high levels, expansion of the utility was supported by a business case that was “good for the province and good for the commercial balance book”, notes Murray.

It also aligns neatly with the government energy-transition targets designed to boost the total production of renewable energy in

the province by 25% by 2030.

“Naturally it is our ambition to reduce this surplus — it’s money lost to Quebecers otherwise,” he adds. “And in doing so we are working toward the government’s energy-transition targets, which are good for society as a whole. It’s a real win-win.”

Hydro-Québec already contributes about \$3bn to provincial government coffers each year — and supports a \$3.5bn supply chain of companies building dams and maintaining the sprawling 150,000km network of power lines, as well as the telecommunications grid, IT infrastructure and real estate holdings owned by the utility. And a buoyant provincial economy is showing an increasing appetite for power. “Demand in our urban centres is definitely growing,” says Murray, “and will only increase more with greater decentralisation of the grid and more EVs [electric vehicles].”

growth at home and abroad in the US are such that Hydro-Québec has now set 2020 as the deadline to decide on a new round of capacity-building capital spending.

“By then we will have to make the call on the next major investment round based on where we are seeing the energy transition going and its impact on the decentralisation of demand,” says Murray. “We have to consider so many variables — more wind, more

decentralised PV, and so on.”

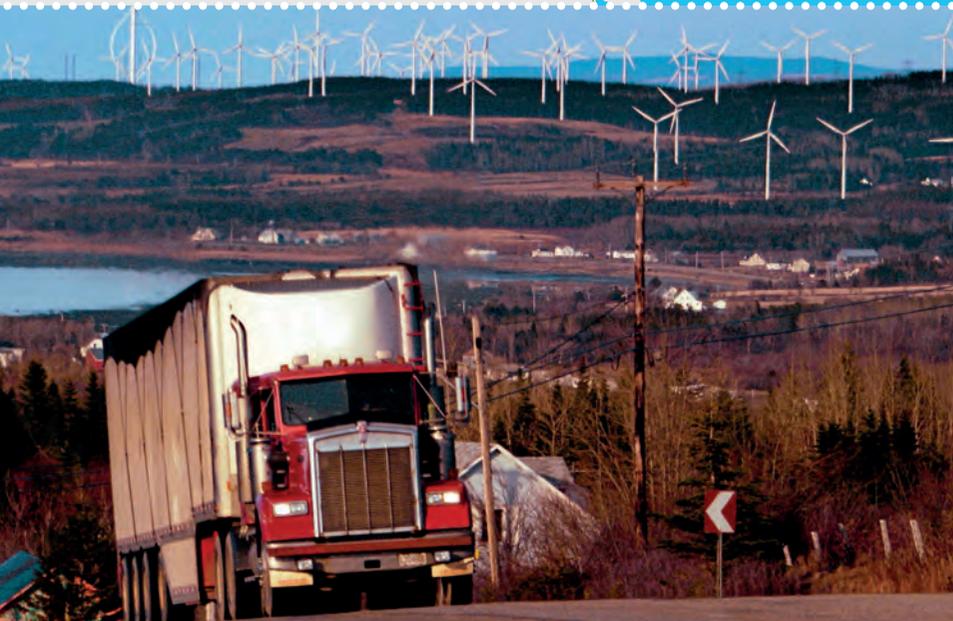
Along with phase 4 of its giant La Romaine plant adding a further 245MW to the supply portfolio, Murray notes the utility expects to increase the efficiency of its existing fleet to make the equivalent of another 500MW of capacity available to markets old and new.

“For now, we are going to push our surplus — which for the first time in ten years saw a reduction, which

is the right trend — but the energy landscape is changing all the time, so it is a matter of always finding and managing the best balance. We are in our own transition.

“Energy efficiency is also an area that has to be factored in: over the last ten years we have managed to find 10TWh of improvements in the network — which is actually the size of output of La Romaine.”

The financials coming in are strong



Photography | Hydro-Québec | Bloomberg/Getty

and stable. Bullish Q3 2017 results brought net income for the year to just shy of \$2.2bn, as Hydro-Québec rang up 27.1TWh of exports — “among our best third-quarter performances”, Murray adds.

After 75 years, Hydro-Québec is looking out to new and broader horizons — with the aspiration to be a new breed of utility. “We have been builders of many things over our long history — hydroelectric

dams, transmission lines, distribution centres. And now we want to be one of the builders of the energy transition in Canada — we have the experience and we have the expertise. We see a huge opportunity ahead in the energy transition,” says Murray.

“Even our ‘green-ness’ we see as an opportunity,” he adds. “[Being hydropower] we are already 99.9% clean-energy, sure, but we are working on the 0.1%. ☐

## Distribution diversification, batteries and EVs



Alive to the wider changes coming with the energy transition, Hydro-Québec has set out a “distribution diversification” strategy centred on the mushrooming data-centre market, but with strategic pushes in next-generation battery storage, smart-grid technology and e-mobility — half of the electric vehicles (EVs) in Canada are in Quebec.

The growth of corporate power-purchase agreements with IT companies has been “crazy”, says president of distribution David Murray. “We’ve gone from zero to 40 [data-centres] in what seems like no time and we expect it to continue exponentially in the coming years. Our rates [uniquely] cover distribution, transportation and production — it is all-in.”

As a major landowner in Quebec, Hydro-Québec has packaged a “one-stop-shop offering” that wraps the construction site, as well as our in-house telco [telecommunications] network, and, of course, electricity supply at the lowest rates in North America. It is proving a winning argument.”

The rising role of grid-connected batteries in the renewable-energy build-out is at the same time leading the utility to focus R&D investment on a new concept based on lithium-phosphate chemistry. The first 1.2MW units were wired into the grid in 2017 as part of a project meant to flesh out “the many beauties of large-scale batteries — including peak-shaving”.

Alongside development of smaller-scale batteries for the residential market, Hydro-Québec is hatching other linked technologies. It has already sold 5,000 of its electric engines for cars and buses; is developing smart-home electrical systems; and is planning to expand its network of EV charging stations in the province from more than 1,000 to 2,500 by 2020.

“We have high aspirations, but we recognise we are in a learning phase,” says Murray. “The bottom line is: if you want to build a grid network for the future then you need to think about the full decentralised energy system. The grid of the future has to be able to handle production, transmission, distribution and the balancing of all this with local generation supply. It is also going heavily into EVs.

“This adaptive instinct is destined to make Hydro-Québec a different animal than it was even ten years ago. Never say ‘never’, but even with rapid decentralisation, there is going to still be a large share of the network that is going to be best handled by us.

“Production-transmission-distribution is a fine balancing act. Add in local generation and it will be an even more complex one. But we feel ready for it. There is great momentum in Hydro-Québec for the energy transition.”