

Abnormally Dry Canada Taps U.S. Energy, Reversing Usual Flow

Lower-than-normal rain and snow have reduced Canada's hydropower production, raising worries in the industry about the effects of climate change.



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By Ivan Penn Photographs by Ruth Fremson

Reporting from Hydro-Québec's Robert-Bourassa Generating Station, Montreal and Portland, Ore.

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In February, the United States did something that it had not done in many years — the country sent more electricity to Canada than it received from its northern neighbor. Then, in March, U.S. electricity exports to Canada climbed even more, reaching their highest level since at least 2010.

The increasing flow of power north is part of a worrying trend for North America: Demand for energy is growing robustly everywhere, but the supply of power — in Canada's case from giant hydroelectric dams — and the ability to get the energy to where it's needed are increasingly under strain.

Many energy experts say Canadian hydroelectric plants, which have had to reduce electricity production because of a recent drop in rain and snow, will eventually bounce back. But some industry executives are worried that climate change, which has already been linked to the explosive wildfires in Canada last year, could make it harder to predict when rain and snowfall will return to normal.

“We’ve all got to be humble in the face of more extreme weather,” said Chris O’Riley, president and chief executive of the British Columbia Hydro and Power Authority, which operates hydroelectric dams in western Canada. “We manage

from year to year the ups and downs of water, and when we have the downs like we're having, the lower levels, it's common for us to import power, and we expect to continue that this year."

The United States and Canada have long relied on each other because power use tends to peak north of the border during the winter when Canadians use electric heaters, and American electricity use peaks in the summer during air-conditioning season.

The abundance of Canada's hydroelectric power has been a cornerstone of the trade, providing relatively low-cost renewable energy to California, Oregon, Washington State, New York State and New England.

But the supply-and-demand equation for energy is changing. Demand for electricity in many states has been climbing sharply in summer and winter. Some experts predict that winter electricity demand in the United States could eclipse summer demand by 2050.

At the same time, utilities are increasingly reliant on intermittent resources like solar and wind power. Large hydroelectric plants, once considered a stable source of electricity, have struggled with low reservoirs in California, around Hoover Dam and recently in Canada.

"We are facing real changes in the weather, and we're finding out in real time how that's going to affect hydroelectric operations, pretty much across North America," said Robert McCullough of McCullough Research, a firm based in Portland, Ore., who has been a consultant for corporate customers of Canadian utilities since the 1980s.

In addition, electricity use is expected to climb as people and businesses turn to electric heat pumps, cars and industrial equipment to replace devices that burn oil, natural gas and coal. Demand is also growing because of data centers.

One solution is to build more power lines, something the Biden administration and some states are working on. But energy experts say the United States also ought to add more such connections to Canada. That would allow, for example, solar farms

in California to supply Canada when its dams don't have enough water and for Canadian utilities to send more power south when they have an abundance.

"Most models suggest that a more interconnected grid is a better grid," said Shelley Welton, a presidential distinguished professor at the University of Pennsylvania who helped write a recent report on electric grid reliability and governance. "I do think there is power in being interconnected across North America. We need scenario planning. We need long-term planning."



The Robert-Bourassa hydroelectric dam and its spillway, along La Grande River.

Set among the pine and spruce trees of northern Quebec, the Robert-Bourassa hydroelectric dam represents the promises and challenges inherent in harnessing renewable energy.

The plant's operator, Hydro-Québec, a utility owned by the Canadian province, built the power plant on a bank of La Grande River as part of a network of stations that can produce more than twice as much electricity as the largest U.S. power plant — the Grand Coulee Dam on the Columbia River in Washington State.

The La Grande complex has helped Hydro-Québec become a leading supplier to New York State and New England. But less snow than normal has forced Hydro-Québec and other Canadian utilities to import more power from the United States in recent months.

"It looks like conditions are abnormally dry," said Gilbert Bennett, president of Water Power Canada, a nonprofit that represents the hydropower industry. "The year-to-year variations are becoming large."

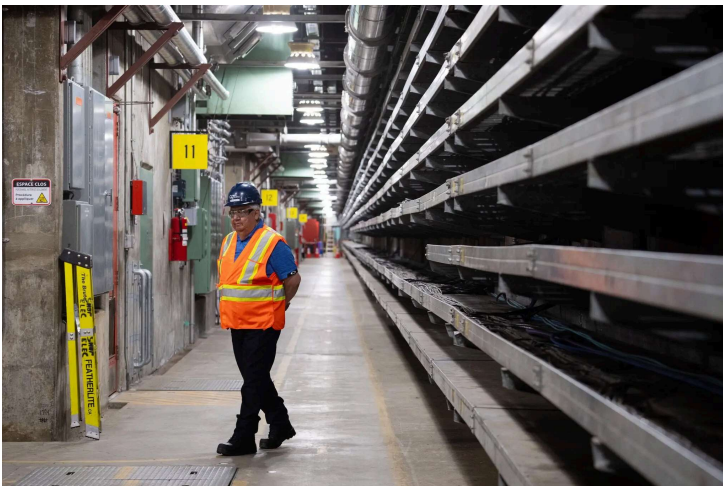
Hydro-Québec executives say they expect the dry spell to end soon, citing similar stretches in 2004 and 2014. Models predict an increase in precipitation of 6 to 8 percent for eastern Canada over the next 25 years, the company said.

Serge Abergel, chief operating officer for Hydro-Québec Energy Services, said Canada's greater reliance on the United States had been a temporary way for hydro plants to save their water. He added that as both countries modernized and expanded their grids with more renewable and efficient resources, they would be able to complement each other.

"The transition is also creating opportunities," Mr. Abergel said during a recent tour of the Robert-Bourassa dam. "You optimize these resources."



Hydro-Québec built the Robert-Bourassa plant as part of a network of stations that can produce more than twice as much electricity as the largest U.S. power plant.



The complex has allowed Canada to become a leading power supplier to New York State and New England.



Parts of the plant are reached through underground tunnels.



Less snow than normal has forced Hydro-Québec and other Canadian utilities to import more power from the United States in recent months.

In general, the United States would prefer to import more power from Canada because it's much cheaper. Hydro-Québec's residential customers pay about \$50 for 1,000 kilowatt-hours of energy, Mr. Abergel said, compared with \$236 in New York State and \$276 on average in New England.

The company's costs are low because its hydro plants were built and paid off long ago. But bringing that affordable power south is expensive — Canadian hydro energy costs homeowners in Massachusetts twice as much as it does residents of Quebec, according to an analysis by McCullough Research.

Hydro-Québec has been building more power lines. It is taking part in one project, the Champlain Hudson Power Express, which is expected to be completed by mid-2026. The \$6 billion, roughly 339-mile-long transmission line will connect a

substation in La Prairie, near Montreal, to a converter station in Astoria, Queens. The line will be able to deliver enough energy to serve more than a million homes in New York City.

“If you want to transition quickly, you need more transmission,” Mr. Abergel said. But, “we’re not incentivizing someone to come up with solutions,” he added. “We’re doing things piecemeal.”

Mr. Abergel said Hydro-Québec would meet all of its obligations to New York and other states despite the dry conditions because it can preserve water by reducing how much electricity its hydro power produces and importing more energy from the United States. This way, the company will still have enough water to export power when energy demand is higher in New York and New England.

But some energy experts are not so sanguine. Mr. McCullough, the consultant, said he worried that global warming could so strain reservoirs that it would no longer be feasible for Canadian utilities to keep enough water in reserve to make it through a very long dry spell.

“Each time we have one of these episodes,” Mr. McCullough said, “it’s a white-knuckle moment.”



Portland General Electric tracks water flows and snowpack in British Columbia from a center in Oregon.

How dependent the utilities in the United States and Canada are on each other is on stark display in Oregon. Portland General Electric, a utility serving about two million residents in the state, tracks water flows and snowpack in British Columbia from an operations center near Portland.

When drought and wildfires threaten areas around the Columbia River, hydroelectric plants and transmission lines that connect Canada, Washington, Oregon and California become vulnerable.

“What we’re really concerned about right now is the snowpack is low in Canada,” said Darrington Outama, senior director of power operations at Portland General Electric. “What we focus on as a region is how are they doing up there.”

In addition to importing electricity from British Columbia, PGE gets power from two small hydroelectric plants in the Bull Run watershed east of Portland.

Oregon's Bull Run rainforest does not get water from the Columbia River. But a severe wildfire like one last summer could force officials to shut down those dams and stop drawing water from Bull Run. If that happened, Portland would have to rely on groundwater, which could in turn affect the Columbia River and hydroelectric dams tied to it.

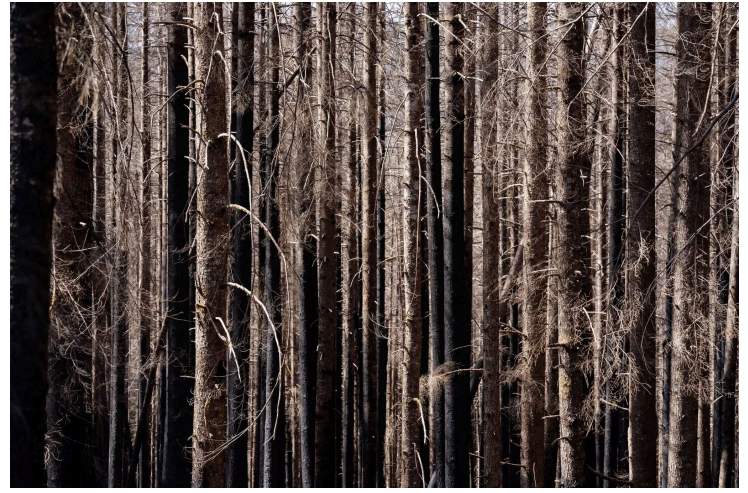
"We have to think about all of the scenarios," Kristin Anderson, water resources program manager for the Portland Water Bureau, said during a tour of the Bull Run. "We've been seeing more rapid shifts of weather moments. We're planning throughout the season to be ready for anything."



The power station below the upper dam of the Bull Run watershed east of Portland.



A temperate rainforest surrounds the upper dam area of the watershed.



Trees that were charred by a wildfire last year.



Anna Buckley, left, the watershed's protection manager, and Sarah Santner, the resource protection and planning director, during a visit to a part of the watershed that was damaged by the fire.

Hydroelectric plants often are the lowest priority for water use. As a result, wildfires, low snowpack and drought can lead to significant reductions in their production. If demand for electricity is high at the same time, regional energy grids could buckle.

“There were these historic patterns of power from north to south,” Mr. O’Riley of British Columbia Hydro said. “All of those patterns have been upended. Power’s flowing in all different directions.”

In a twist, California, which suffered a severe drought in recent years, has lately been awash. Blizzards, atmospheric rivers and other storms have covered the state’s mountains in snow and topped off reservoirs, enabling its dams to crank out lots of electricity.

The state also recently installed many large batteries that allow utilities to use the abundant solar power for hours after the sun has set.

California’s energy plenitude should be a boon to British Columbia, Oregon and Washington State, but energy executives said there weren’t enough transmission lines to carry all of that surplus electricity north where it is needed.

Ivan Penn is a reporter based in Los Angeles and covers the energy industry. His work has included reporting on clean energy, failures in the electric grid and the economics of utility services. [More about Ivan Penn](#)

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