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## **The quest for clean power: With coal-fired generating plants slated to close, Ontario will need to develop new energy sources**

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Photo: Robert Fleming International Research Inc. /  
Water from the Depot Lakes surges over the Bellrock dam

Electricity is a vital lifeline, and according to Jan Carr, chief executive officer of the newly minted Ontario Power Authority, power supplies are "being stretched to the limit."

For the past three months, I have taken the equivalent of an immersion course in the complexities and challenges of power generation. For the lay person, the issues confronting the government, energy industry and consumers defy simplification and are almost overwhelming. For example, what is "clean power?" It is the electricity generated from a non-polluting source such as water or wind, as opposed to coal-fired generation.

My foray into energy, first sparked by accident, began last spring. My wife and I had gone to Bellrock, near Verona, for the auctioning of the historic water-powered mill there. Shut down for some years, the mill and its ancient machinery, including the water-powered turbines, were being sold.

In view of the urgent need to develop more sources of renewable energy in Ontario, I thought the old Bellrock Mill site, and many others like it, could possibly be turned into small, automated hydroelectric generating stations. By-now curious, I decided to take a bird's eye look at Ontario's electricity resources, and water power in particular. My search took me to interviews and meetings with government officials, power-industry people from the corporate sector and site visits in the Kingston area.

A site map created by an industry group, the Ontario Waterpower Association (which includes the mammoth Ontario Power Generation), showed 192 existing water-powered stations rated from more than 100 megawatts to under one megawatt and clustered on rivers throughout the province.

The 1,472-megawatt Sir Adam Beck 2 station at Niagara Falls can power about 1.1 million households. The little 187-kilowatt Washburn station at Lower Brewers Mills, on the Rideau River north of Kingston, is among the smallest, along with four other Rideau River stations and the Gananoque station. It can supply electricity to about 2,500 homes, according to the owner-operator, Fortis Inc. Ontario.

The Ontario Waterpower Association includes about 90 public and private corporations involved in the construction and maintenance of hydroelectric power facilities, ranging from operators, engineering and environmental consultants to equipment suppliers, financial and law firms.

The organization held its 2005 annual meeting in Kingston last month. I sat in on a session and later photographed association president Paul Norris against a backdrop of the waters of the Little Cataraqui Creek Wetlands Project. Norris told me: "We're on the verge of what I call a 'renewable energy renaissance' in Ontario. There is a re-awakening to opportunities, but it will be particularly important to sustain the political will that puts new and renewed projects into production."

My inquiry took me to Toronto and a day-long meeting of industry executives, energy association leaders, environmentalists and think-tank representatives. Staged by the Ontario Power Authority, the focus group sought to assess the province's current energy- supply mix and proposed alternatives for the future.



Photo: Robert Fleming International Research Inc. / Paul Norris, President of the Ontario Waterpower Association, photographed at the Little Cataraqui Creek Wetlands Project in Kingston

The Ontario Power Authority is a distinct and separate entity from Ontario Power Generation (the old Ontario Hydro) and operates under the Electricity Restructuring Act of 2004. The authority has functioned since early this year as a non-profit corporation reporting to the legislature through the Ministry of Energy. Its job is to assess and make recommendations for Ontario's current and future electricity supplies so that power is there when needed.

The Ontario Power Authority's recently released five-volume Supply Mix Advice Report to the Minister of Energy provided Ontarians, for the first time, with a detailed energy road map for the future. The supply mix proposals set out in the report, along with an accounting of the economic and environmental tradeoffs involved, are pretty serious stuff for anyone in or out of government to tackle.

Ontario's population is projected to increase from 12.6 million now to almost 16 million by 2025. The current Liberal provincial government has promised to phase out coal-fired plants currently producing 27 per cent of the province's electricity by 2009. The daunting issue for the government is how to make up the shortfall, after factoring in nuclear power making up 50 per cent of it and other non-renewable and renewable energy resources, including a conservation program.

In this connection, my thoughts go back 50 years to 1954. The Sir Adam Beck 2 station was then under construction on the Niagara River. John Diblee, a senior manager at Ontario Hydro, had taken me and several colleagues on a tour of giant rock cuts and tunnels designed to channel massive amounts of water from above the Horseshoe Falls to a battery of turbines at Sir Adam Beck 2 in Queenston.

I won't forget Diblee's insistence that Hydro's responsibility was to ensure that the then 4.6 million residents of Ontario, their public institutions, farms and industries would have an adequate supply of electricity for the following two decades.

With the completion of Sir Adam Beck 2 in 1958 and the large St. Lawrence Generating Station at Cornwall in 1959, Diblee and his fellow Hydro executives recognized that the death knell had been sounded for large hydroelectric generating plants in Ontario. They could no longer be economically or environmentally feasible.

In looking at the future, it was clear that, in addition to moving into nuclear power, many smaller renewable energy projects in the form of water, wind, solar and biomass would have to be developed and phased into the power supply. That did not happen in Ontario, although several European countries had successfully set out on this new road. Ontario Hydro, a government monopoly, lacked the flexibility or the financial resources to act.

In the 1980s, Ontario Hydro's reputation for excellence began to unravel. Coal-fired generators introduced in the 1920s (and good to this day for a "quick fix" in the event of a power shortage) now came under fire from politicians and environmentalists alike. Nuclear power generated at the Bruce and Darlington stations, which had been the hope for the future in the 1960s and '70s, also faced growing criticism.

In 1998, during Mike Harris's Conservative government, the Energy Competition Act was enacted. It put into place, for the first time, a competitive electricity market in Ontario. On April 1, 1999, Ontario Hydro ceased operations. It was replaced by Ontario Power Generation and the Ontario Hydro Services Company, handling transmission and retail energy services. Shortly after, the Independent Electricity Market Operator was formed as a provincial Crown corporation to ensure that all independent power producers would have "fair access" to the transmission system.

In trying to nail down what was happening with hydroelectric power, I found that one result of the Harris legislation had been that some major Ontario and Canadian private-sector corporations have been able to enter the power-generation field in Ontario in water and wind power, including Brascan Power of Toronto, Canadian Hydro Developers Inc. of Calgary and Fortis Inc. Ontario, a subsidiary of St. John's, Newfoundland, based Fortis Inc., which also owns Newfoundland Power.

In 2001, the Ontario Ministry of Energy estimated there was potential to create about 953 megawatts of power from sites in Ontario where small, "run-of-river" hydroelectric stations could be established - enough electricity to supply about 400,000 homes.

At the other end of the spectrum, I learned that Ontario Power Generation was undertaking the Niagara Tunnel Project. A concrete-lined tunnel 12.7 metres in diameter will carry millions of gallons of water under the city of Niagara Falls and 10.4 kilometres to the Sir Adam Beck 2 Station at Queenston. The project, to be completed in 2009, will add 500 megawatts to the Hydro grid.

In terms of other large hydroelectric power possibilities, Eric Boysen, manager of renewable energy resources at the Ministry of Natural Resources, told me that, in his view, "the greatest source of remaining power in Ontario could be the Moose River Basin, north of Cochrane. If developed, a hydroelectric station there could likely produce 1,500 MW of electricity. However, the cost of building a generating station in that remote area would be considerable."

My research showed that in Ontario, there are currently about 12 new small hydroelectric projects either nearing completion, underway or at the approvals stage. There is a long way to go, however, if water power is to significantly add to securing the future electricity lifeline.

Tomorrow, the second part of my probe into clean power will include an assessment of site visits and suggest how governments at all levels could help to speed the construction of water- and wind-powered facilities.

"In those early days, farmers' windmills in Ontario provided them with electricity, and many flour and lumber mills were water-powered. We're a long way away from that self-reliance today," David Rayner, a retired Kingston lawyer, told me.

During my investigation into the thinking of Ontarians on electricity issues, Rayner described how in the 1940s, his grandfather from Grimsby took him to visit the Sir Adam Beck 1 power station at Niagara Falls. "I won't forget those big turbines steadily whirring away," he said. "Grandfather, who had just sold his grain business, was so impressed that he put his money into Hydro bonds. He thought that with a station already built and paid for and consumers paying 1.5 cents a kilowatt hour, the rates would just remain the same in the future and offer a good rate of return."

Now, years later, Rayner, whose only connection with power generation was as an officer on Canadian navy ships, said: "We've been wantonly wasteful. Taxpayers are going to have difficulty dealing with the tens of billions of dollars needed to fix the electricity system for the future. It's ridiculous we've reached a point where Ontario doesn't have enough power. Perhaps we need to start all over again."



Photo: Robert Fleming International Research Inc. / John Wynsma, Project Engineer, Innergex, inspects the new 8.0 MW Glen Miller power station being completed at Trenton by Innergex of Longueuil, Quebec

Innergex of Longueuil, Quebec, a private company, started from scratch in Ontario to explore and bring to market new hydroelectric and wind-power production units. A site visit took me to its just-completed eight-megawatt generating station at Glen Miller on the Trent River, several kilometres north of Trenton. The \$20-million-plus generating facility contained within a concrete chamber in an extensively rebuilt dam will supply enough electricity to the Hydro grid to power 4,000 homes.

John Wynsma, 42, of Cobourg, an Innergex engineer and project manager, pointed out that the station's generators and ancillary equipment, such as the steel water-control gates, were all governed by computer, including the option of laptop control. Wynsma was involved earlier in an Innergex joint venture with the Pic River First Nation to construct a 23-megawatt hydroelectric station on the White River at Umbata Falls, near Marathon on Lake Superior.

Almost unanimously, executives from companies that have gone through the lengthy proposals and approvals process, or that have approved hydroelectric projects under construction, estimated that it took at least two years to obtain the necessary permits before construction could start. They said up-front costs could amount to not less than \$250,000 for time spent chasing down government departments, completing applications and paperwork, and meeting with officials and lawyers.

Several of the parties I interviewed were concerned that there were so many government bodies involved in the approvals process that "at times they even appeared to be working against each other."

Chris Litschko, president and chief executive officer of Lakeland Holding Inc. of Bracebridge, whose organization is opening a 1.5-megawatt station at High Falls, told me: "High up-front costs make it pretty hard for small operators such as us to make small generating plants viable when you add them to the actual construction costs of \$4 million to \$4.5 million."

To speed the approvals process, Litschko thought developers needed "a central contact person or persons whose full-time job would be to guide clients through the paperwork from start to finish. Ideally, this arrangement should be co-ordinated between all levels of government so that this liaison person could cover

all the bases."

Litschko said that those making application to develop hydroelectric projects recognize the necessity and importance of environmental planning, and the need to go to great lengths to meet standards set by legislation so as not to disturb fish-spawning habitats, watercourse flow, riverbanks, farmers' fields and public trails, and to ensure public safety.

I visited Fortis Ontario generating stations at Kingston Mills, Washburn, Upper Brewers Mills and Jones Falls, where the existing sites of hydroelectric stations in idyllic river settings are often the special haunts of local fishermen.

At Kingston Mills, I met Dick Allen, 66, and his wife, Mamie. Retired two years ago from Fortis Ontario and its predecessor company, Granite Power of Gananoque, Allen had maintained the Kingston Mills operation since 1965. Before retiring, part of his work had been to automate the station. "I truly worked my way out of a job," he said.

To illustrate the changes in the industry over the years, Allen told me that when he first came to work at Kingston Mills, he had been surprised to find a muskrat trap tied to a malfunctioning generator governor. Apparently, during spring runoffs on the Rideau River, there could be sudden water surges through the siphon penstocks (the large-diameter tubes that carry water to the generators). In such an emergency, the muskrat trap was arranged to spring, pulling a string attached to the governor, which then slowed the generator and prevented damage to the propellers.

"I loved it here," Allen, who lived next door, said. "Walking over to my work was the perfect situation, although I remember one winter when in the middle of the night I had to crawl on my hands and knees along a catwalk in the rain and over ice to get into the station. The storm was so bad that lightning even started jumping around inside the station."

Mamie spoke up. "What kept us going in those days was knowing that we were producing something that was important for people in our community."

Although the Kingston Mills hydroelectric station is small, Allen had ideas as to how two of its three generators might be beefed up from a current output of 2.2 megawatts to perhaps 4.2 megawatts to help add to renewable energy supplies. However, he admitted that his solution, based on replacing two turbines, might prove too costly and uneconomical to be undertaken.

In Gananoque, I met Fortis Ontario's manager of generation, Blaine Desrosiers, and Murray Hall, facilities supervisor for the Eastern Ontario stations. The company's historic office building, which straddles the Gananoque River, has been a hydroelectric power station for more than 100 years.

Desrosiers said it was unlikely that there could be any expansion of the stations on the Rideau. There simply wasn't the water power; in fact, in some recent years there has been so little summer rainfall that the company had to shut down the Rideau stations. For three months, Desrosiers said, a Fortis team was assessing possible hydroelectric generating sites in other areas of Ontario.

The new Ontario Power Authority, now in the leadership role for advising on supply mix policy in Ontario,



Photo: Robert Fleming International Research Inc. / Dick Allen maintained the Kingston Mills hydroelectric power station for 35 years before retiring two years ago

may become the great hope for those private- and public-sector firms seeking to develop small renewable energy projects in Ontario. The power authority would perform an enormous service if it could enable governments at all levels and conservation authorities in Ontario to come together to make the needs of the growing power- generation industry a priority. If there are to be increased supplies of new, clean electricity in the future, as well as serious efforts to conserve power, it will take an enormous, sustained, united effort on the part of all parties involved, including consumers. This is a challenge akin to getting prepared to wage war.

As for me, I'm back to where my research began. I sent photographs of the Bellrock Mill site and dam to Ian Murray, an engineer at Kinectrics Inc. (formerly the development arm of Ontario Hydro) in Toronto, which specializes in the development of mini- hydro sites for small communities. Murray told me: "Your picture of the Bellrock site is almost emblematic of former water-powered mills in Ontario. These possible sites have been undervalued in the total scheme of things."

Murray, who recently oversaw the installation of a 100-kilowatt station for the Serpent First Nation near Spanish, Ont., saw similar possibilities for Bellrock. "From what I can see," he said, "the volume of water there looks sufficient for a 100-to-150 kilowatt station. It could supply the homes in that community."

Throughout my investigations I've seen excitement in people's eyes and felt it in their voices as they worked at developing or completing new water-powered projects. When I began to look at clean power, Paul Norris of the Ontario Waterpower Association had told me: "I have never met anyone in this industry who was not absolutely passionate about what they were doing."

He was right.

*- Bob Fleming is President of Robert Fleming International Research Inc., which produces the reference book Fleming's Canadian Legislatures*