# A Brief History of Wind Power Development in Canada 1960s-1990s

Adapted from: Collection Assessment on Wind Energy, By Anna Adamek, Curator, Natural Resources and Industrial Design, Unpublished: Canada Science and Technology Museum, 2009.

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**Figure 1 - One of the windmills in the collection of the Canada Science and Technology Museum. This windmill was used to draw water from a well on a Southern Ontario farm.**

Wind power has been harnessed for centuries. As a direct drive force, it has been applied to sailing, grinding, sawing and water pumping. In 1881, William Thompson (Lord Kelvin,) first suggested that wind could be used to generate electricity. Nine years later, Charles F. Brush erected the first wind turbine on his property in Cleveland, Ohio. The turbine (called a "Wind Dynamo") was adapted from a windmill to charge batteries and power electric motors in Brush's house. Despite Brush's early adoption of wind turbines the majority of the early innovation and experimentation was done in Europe. Before 1960 wind power technologies were developed mostly in Europe: in Denmark, France, Germany, Russia and Netherlands.

Georges Darrieus, a French engineer, patented (US1835018) the first vertical axis wind turbines (VAWT) in 1931. However, Darrieus did not continue his work with vertical axis wind turbines and those contributions were soon forgotten. In the aftermath of World War II, Europe experienced an energy shortage while the demand sharply increased providing impetus for further research and development into wind energy that lasted until the 1960s.

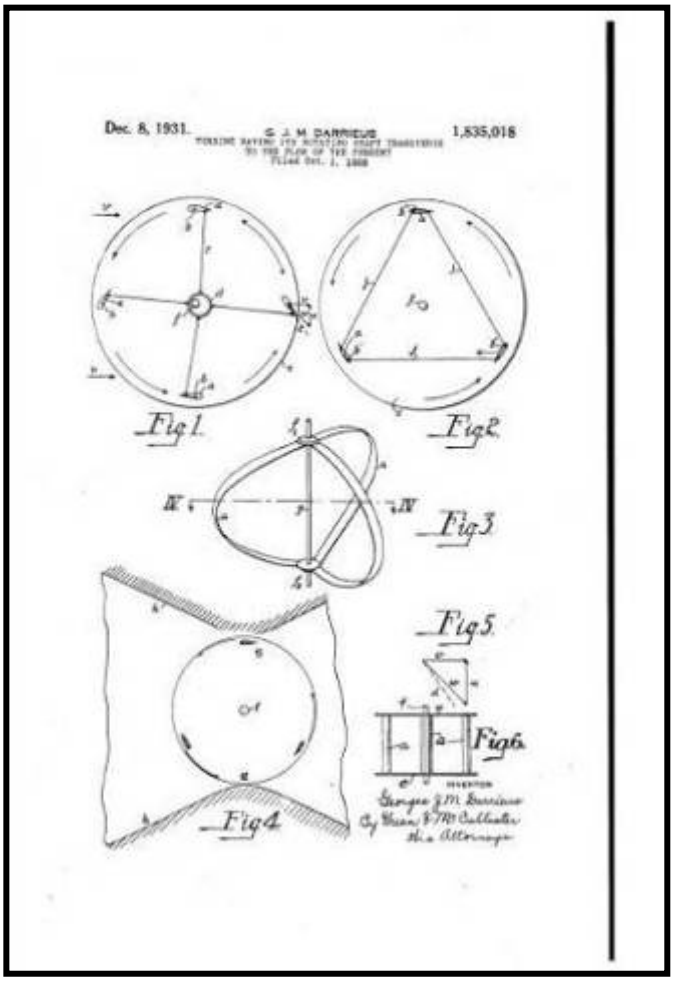


**Figure 2 - The drawing of the vertical axis wind turbine from the 1933 Darrieus patent (US1835019).**

Unlike on the European continent, there was a decreased interest in wind power in North America during the post-war period. It was not until the early 1960s that the Brace Research Institute at McGill University first undertook the work with wind turbines. The Institute investigated the wind as a source of electrical energy for application in developing countries; rural; and remote areas for water management. The Institute experimented with two and three blade vertical and horizontal axis; sail-type turbines; and erected a Savonius type turbine on the grounds of the Macdonald College. Later, the Brace installed a similar turbine in Barbados to monitor its performance on location.

**Figure 3 - The first Darrieus type vertical axis wind turbines developed by Raj Rangi and Peter South. This turbine was erected on the top of one of the research buildings as the National Research Council of Canada.**

In 1966, Raj Rangi and Peter South began to experiment with wind power at National Research Council of Canada (NRC). Unbeknownst to them they developed models and prototypes for vertical axis turbines similar to the work done by Georges Darrieus. Their work was so similar that when the team of Rangi/South went to patent their “new” design it was denied, leading to the “rediscovery” of the Darrieus VAWT.

One of Rangi/South’s early experimental turbines installed on the roof of a NRC laboratory caught the attention of a senior manager and the project received an official approval. Ironically, what began as an after-hour research led to worldwide recognition for Rangi and South. The team is credited with rediscovering and popularizing the Darrieus turbine. Rangi’s and South’s design was later used by Sandia Laboratory to create prototypes, and through Sandia it entered the market in California.

**Figure 4 - Testing a vertical axis wind turbine manufactured by Bristol Aerospace LTD. near Edmonton, Alberta.**

The 1973 Oil Crisis led to a decade long political and economic support for the wind power. The federal government established the Independent Panel on Energy Research and Development, and included wind power as one of the recommended programmes.
The programme targeted limited or remote geographic regions such as the Canadian Arctic as potential sites for wind energy capture and conversion. Both Raj Rangi and Peter South were involved in the research and development whereas the actual construction of wind turbines was contracted to the Dominion Aluminium Fabrication Ltd (DAF). One of the first machines manufactured by DAF was delivered to the Defence Research Establishment in Ottawa and was set up in the Arctic.

Bristol Aerospace Ltd. of Winnipeg was also involved in the construction of vertical axis wind turbines. A VAWT manufactured by Bristol was installed at an autonomous meteorological station in the Beaufort Sea. The station functioned well, and Bristol constructed six other turbines intended to power telecommunications applications in remote areas of Canada.

In 1976, the *Institut de recherche de l'Hydro Quebec* in cooperation with National Research Council installed an experimental 230 kW vertical axis wind turbine manufactured by DAF Indal at Iles-de-la-Madeleine, Quebec. Although it was retired in 1986, this prototype is still on site and remains one of the few remaining VAWT's of this period. None of the five smaller machines built and installed by DAF Indal in 1978 remain. These machines were installed in Holyrood, Newfoundland and Labrador; Swift Current, Saskatchewan; Christopher Point, British Columbia and Churchill, Manitoba.

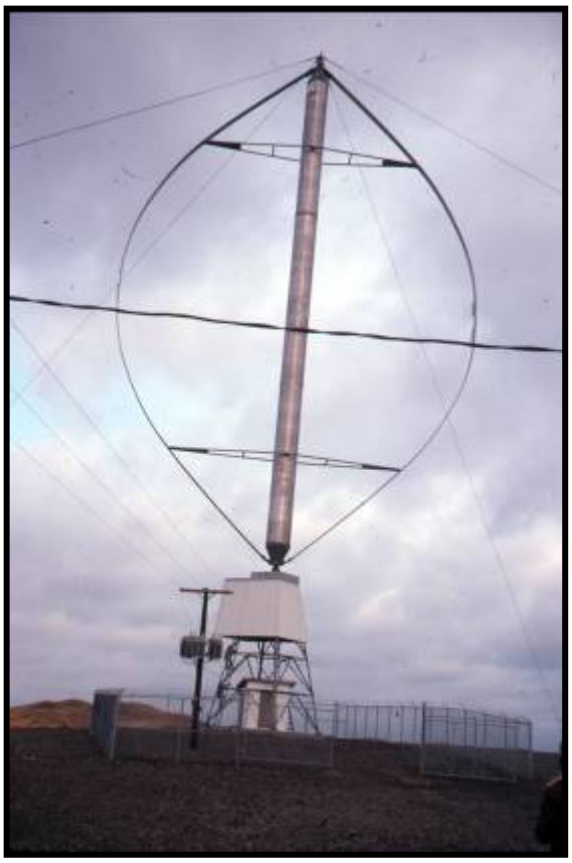

**Figure 5 – The Vertical Axis Wind Turbine installed by Hydro Quebec in 1976 on Iles-de-la-Madeleine**


**Figure 6 - Installing the turbine at the Rideau Falls model home. The turbine is now in the collection at the Canada Science and Technology Museum in Ottawa, Ontario. (1984.1223)**

Growing concerns related to the Oil Crisis in the early 1970s created a growing public interest in exploring alternative energy sources. In 1978, National Research Council, the Department of Energy, Mines (now Natural Resources Canada), and Resources and Public Works Canada (now Public Works and Government Services Canada) constructed a model home at Rideau falls in Ottawa, Ontario furnished with solar and wind power to educate the visitors about these new technologies. The exhibit was dismantled in 1983 and the Vertical Axis Wind Turbine was donated to the Canada Science and Technology Museum.

By the early 1980s DAF Indal began commercial production of wind turbines for the market in California. Wind/diesel combination machines were also developed by DAF at the time, in the cooperation with the Ontario Ministry of Energy and NRC. These were tested at Toronto Island and in Sudbury. At the same time research into wind energy extended beyond Ottawa with the establishment of The Atlantic Wind Test Site in 1981 on the North Cape of Prince Edward Island.

**Figure 7 - Testing a vertical axis wind/diesel hybrid on Toronto island in September 1977.**

In the 1980s the wind power Research & Development initiatives around the world generally concentrated on mega-projects. In Canada, massive, megawatt turbines were erected at Cap-Chat in Gaspésie. The turbines were connected to the Hydro Quebec grid. Although theoretical studies concluded that there was a positive correlation between the size of the turbines and their cost-effectiveness, in fact the mega-projects rarely succeeded. The construction and maintenance costs were high, the VAWT proved susceptible to the environmental damage, and as the power output of the VAWT increased so to did the footprint of the base. The solution lay in the Horizontal Axis Wind Turbine, which until 1986 had not made a major presence in the Canadian market or in federal research initiatives. In Canada, Hydro Quebec was the first company to demonstrate grid connected HAWT in 1986. The HAWT community believed that this type of turbine was superior to VAWTs: being more efficient and less prone to material fatigue. Because the bulk of the NRC research was concentrated on developing the vertical axis turbine, a large portion of the early horizontal axis machines in Canada were imported from Europe.

In 1984, the golden age of wind power in Canada ended with severe cuts to research and development at the National Research Council resulting in a reorganisation that placed the programme under the Energy, Mines and Resources Canada. With the global oil crisis at an end, oil production increased and the federal government stopped its support for research on the alternative energy sources. By mid-1990s, companies such as Adecon created by Peter South, FloWind, and U.S. Windpower (Kenetech) were out of business and DAF Indal cancelled wind power projects. However, the wind power research community was well established by that time and some projects, directed mostly at the power for Yukon and Northwest Territories persisted. The production, although on a smaller scale, also went on, and companies such as Wenvor Technologies continued manufacturing blades and parts for turbines.

In the 1990s the culture of the wind power industry changed. The industry developed economic and marketing strategies to promote the technology; lobbying governments and regulators. Some of the more successful initiatives included: The Renewable Portfolio Standard, the Systems Benefit Charge, Green Pricing, and the Electricity Feed Law. The commitment paid off, and the first commercial wind farm was established in Canada in Cowley Ridge, Alberta in 1994. Today there are 92 Wind Turbine sites spread across Canada feeding into the makeup of the country.