

Wind Energy R&D Program

A Clean Energy Solution

Canada has tremendous wind energy potential and supports the development of this alternative energy source as part of its response to the climate change challenge and to achieve the goals of energy diversification, technology development, job creation and increased trade. The main vehicle of technical support at the national level is the CANMET Energy Technology Centre's (CETC) Wind Energy Research and Development (WERD) Program.



660 kW Vestas Wind Turbine in southern Alberta - Four such turbines supply green power to customers in Calgary (Photo courtesy of Vision Quest Windelectric Inc.)

Remarkable progress has been made in wind energy technology over the past decade. As a result of declining technology costs and improved efficiency and reliability, wind energy is now competitive with conventional sources of electricity in some applications, such as remote communities. Coinciding with these technology developments, the global challenge of climate change has heightened interest in wind energy as part of a cleaner energy mix for Canada and the world

Wind is one of the world's cleanest sources of energy. According to the

World Energy Council, in an "ecologically driven scenario", wind energy systems could supply up to 4.8% of world electricity needs in year 2020. Many countries have established targets for wind-generated power. Denmark, for example, has set a goal of using wind energy to supply 50% of the country's electricity consumption by 2030. Already, wind energy supplies more than 10% of Denmark's electricity demand. By the end of 1999, 12 455 megawatts (MW) of wind energy capacity had been installed worldwide, generating

some 30 000 gigawatt hours of power per year — enough to meet about 6% of Canada’s electric energy needs.

Wind Energy R&D Program

The Canadian Wind Energy Research and Development (WERD) Program is co-ordinated by Natural Resources Canada’s CANMET Energy Technology Centre (CETC). CETC collaborates with Canadian industry to develop commercially viable technologies that foster the wise use of energy and the increased use of renewable energy and alternative fuels.

Through the WERD Program, CETC helps the wind energy industry meet challenges at key stages of the technology development cycle and shares the R&D costs of promising technologies that have strong commercialization potential in domestic and export markets. The Centre’s partners in the field of wind energy include manufacturers, site developers, consultants, utilities, universities, research institutions, provincial governments and other federal government departments.



The 100 MW Le Nordais Wind Farm in Gaspé, Quebec



80-kW Wind Turbine, Cambridge Bay, NWT - Courtesy of KHJ Photography/ Kevin Johnston

The WERD Program’s main objectives are to:

- improve the cost-effectiveness, safety and reliability of wind energy technologies;

- identify, facilitate and promote technology applications that exploit Canada’s large wind energy potential; and
- enhance the competitiveness of the Canadian wind energy industry and establish a technology base for domestic and foreign markets.

As described below, these objectives are achieved through work in four areas: resource assessment; technology development; technology testing, evaluation and field trial; and technology/information transfer.

Resource Assessment

The WERD Program co-funds assessments of wind energy resources in areas of Canada that offer significant near-term potential for wind turbine installations. To date, WERD has supported assessments in south-west Alberta; south-west Saskatchewan; south-west, south-east Ontario and some communities in northern Ontario;

Quebec (Waskaganish); Nova Scotia (Dartmouth); a number of sites in PEI; the Yukon Territory (Whitehorse); and Nunavut (Iqaluit). The program has also funded the development of sophisticated computer models that are used to predict the suitability of sites for wind turbine installations.

Technology Development

The wind energy industry is currently focusing its technology development efforts in two main areas: horizontal axis and vertical axis electricity-generating wind turbines. Both technologies are supported by the WERD Program. As well, the program supports technology development activities related to:

- components for large wind turbines for use in wind farms;
- small to medium wind turbines for use in agro-business, remote locations and to supplement diesel-electricity generation in remote communities;

- wind/diesel control systems for wind/diesel hybrids in remote communities; and
- water pumping and aeration for agriculture.

Examples of specific wind energy technologies and installations supported by the WERD Program include the following:

- a 25 kilowatt (kW) wind turbine is currently being manufactured by Wenvor-Vergnet Technologies of Guelph, Ontario. Domestic and export markets are growing for this smaller-size turbine;
- one 600 kW (utility size) wind turbine installation at the Bruce Nuclear Power Station near Tiverton, Ontario. This wind turbine is owned and operated by Ontario Hydro Generation Inc. As a result of this project, Polymar in Huron Composites (PHC), formerly Tacke Windpower Inc., established a plant in Huron Park, Ontario, to manufacture blades for wind turbines. Since 1995, the company has exported over \$20 million worth of blades for 600 and 750 kW wind turbines. Up to 150 skilled workers are employed, depending on the workload. The company has started to manufacture blades for wind turbines in the range of 1 to 2 MW, using a new blade manufacturing process. This process, called the Vacuum Assisted Resin Transfer Molding (VARTM) process, reduces resin emissions and integrates the following improvements: reduced labour costs; workers exposure to liquid resin due to large blade width is reduced (reducing the risk of sensitization); improved repeatability; reduced cycle time (more blades per mold, per week); weight reduction (higher fibre content); energy savings (reduced ventilation/heating requirements); and
- a new high penetration no-storage wind/diesel system, was developed in cooperation with the Institut de



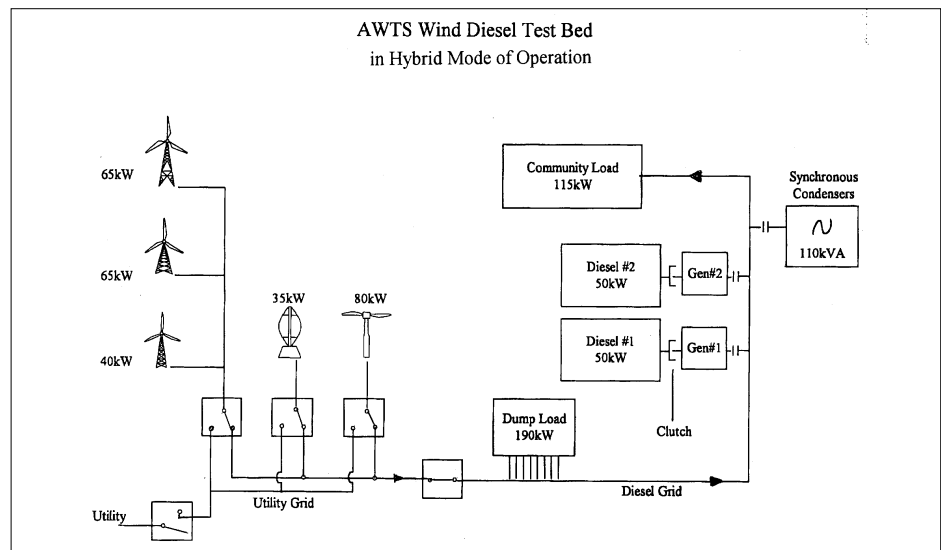
Atlantic Wind Test Site, North Cape, PEI

Recherche en électricité du Québec (Hydro- Québec's research institute). The high penetration control system increases the input of wind energy in a wind/diesel generating plant by a factor of 2 to 3. This means that the wind turbine market potential in remote communities could increase from an estimated 80 MW to about 200 MW.

The WERD Program also supports field trials and the monitoring of new wind energy technologies to assess their performance, reliability, safety, economics, environmental impact, opportunities for improvement and other factors.

Testing and Evaluation

The Atlantic Wind Test Site, a world-class facility that tests and evaluates electricity-generating wind turbines, is jointly funded by Natural Resources Canada and the Prince Edward Island Energy Corporation (a provincial corporation). Horizontal axis and vertical axis wind turbines are being tested at the site, located at North Cape, P.E.I. The site also operates a wind/diesel test bed for evaluating hybrid systems. Once the testing and evaluation has been completed, some monitoring assistance is also provided for the first field trial project.



Technology/Information Transfer

Conferences, workshops and seminars are held to raise industry's awareness of new technologies. Events such as the annual Canadian Wind Energy Association–American Wind Energy Association Wind/Diesel Workshop provide information exchange and technology transfer. Technical reports and other publications are also available.

Internationally, CETC promotes Canadian expertise on the world market by participating in the International Energy Agency's Wind Energy R&D Implementing Agreement. Participation in this agreement ensures that Canada's growing wind energy industry has access to the latest information on technological developments from around the world.

Finally, CETC works with national and international standards associations and other stakeholders to support the development of technical and safety standards, which encourage acceptance of wind energy technologies in the marketplace.

To find out more about CETC's Wind Energy Program, please contact:

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Information on wind energy is also available from:

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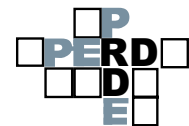
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