



RENEWABLE ENERGY TECHNOLOGIES

CLEAN ENERGY TECHNOLOGIES

WIND ENERGY

Wind Energy in Canada

Wind power is the world's fastest growing energy source with worldwide wind-generated capacity exceeding 59,000 MW at the end of 2005. Installed capacity in Canada reached over 1,000 MW in 2006 and the provinces are currently targeting over 9000 MW of installed wind capacity by 2015. A number of federal and provincial initiatives such as the Wind Power Production Incentive and the Canadian Wind Energy Atlas have set the stage for this continued growth. Canada's wind trade association estimates that 50,000 MW of wind energy could be generated in Canada, considering developable wind resources and wind's capacity to be integrated into the electricity grid.

CETC-Ottawa's Wind Energy Experts

The CANMET Energy Technology Centre-Ottawa (CETC-Ottawa) is the federal government's leading centre for wind energy science and technology expertise. CETC-Ottawa partners with private sector and other government agencies to advance the Canadian wind energy industry, with a focus on technology development and optimization for the Canadian context. This includes the collaborative development of technical and safety standards.

To increase awareness about wind technologies, CETC-Ottawa experts are active in industry consortia, technology demonstrations, and outreach activities,

nationally and internationally. This includes participation in the International Energy Agency's Wind Energy R&D Implementing Agreement and several of its Annexes addressing focused research areas. Participating in this agreement ensures that Canada's growing wind energy industry has access to the latest information on technological developments from around the world.

The following are some activities undertaken by the wind energy experts of CETC-Ottawa:

Wind Energy Institute of Canada

Since 1981, the Atlantic Wind Test Site (AWTS), located in North Cape, PEI, has been Canada's primary facility for wind turbine testing, technical



Future Site of the Wind Energy Institute of Canada - Source: WEICan

innovation and technology transfer. The national Wind Energy Institute of Canada (WEICan) will evolve from the regionally-based AWTS and with the support of CETC-Ottawa will focus on four strategic areas: testing and certification, research and innovation, training and public education, and technical consultation and assistance. WEICan will support the development and implementation of wind power generation and wind energy products and services for Canada and export markets.

Small Wind Turbine Systems

Small Wind Turbines (SWT) are those with power outputs ranging from 300 watts to 300 kW. An estimated 2,500 small-scale wind turbines are currently providing on-site power to homes and businesses in Canada. Canada's small wind turbine manufacturers generally specialize in the development of turbines in the 10 – 60 kW range.

In recent years there has been growing interest for net-metering, where customers are credited for electricity that is generated on their property in excess of their own consumption. As a result, provincial utilities are enacting regulations to allow small power producers to connect to the grid. With support from CETC-Ottawa, WEICan commissioned its first SWT connected in single-phase to be tested for net-metering applications. This turbine is part of a verification project to test very small turbines (less than 15 kW) for electricity production, reliability of system components, and ability to withstand the Canadian climate. This is important for the deployment of SWTs because rural homes and a majority of farms are serviced by single-phase power.

Large Wind Turbine Systems

The federal government's Wind Power Production Incentive (WPPI) and several provinces' requests for proposals for wind energy have spurred the development of new wind energy generation across the country. Large, utility-scale wind turbines (generally those with power outputs greater than 300 kW) are already commissioned in almost every Canadian province as well as in the Yukon. Several others are under construction, or have



2.5 kW Small Wind Turbine in Testing and Large Turbines Producing Electricity at the Wind Energy Institute of Canada – Source: WEICan

been awarded power purchase agreements. As a result, Canadian component manufacturers have started to provide blades, nacelles, and towers for developing wind farms. CETC-Ottawa supports market infrastructure for large wind technologies through the development of industry standards and planning aids such as the Canadian Wind Energy Atlas, a tool that identifies areas best suited for wind power.

Wind Energy and Remote Communities

In 2004, Canada's first wind-diesel demonstration project was completed with the support of CETC-Ottawa. Six 65 kW wind turbines were installed on the island of Ramea, Newfoundland. The objective of the project was to demonstrate that the Wind-Diesel Integrated Control System

(WDICS) can be used to displace diesel power generation by introducing wind to the island's grid and to show significant energy efficiency and reliability for northern, remote or isolated locations. The CETC-Ottawa wind energy experts have also begun exploring the production of hydrogen from wind and other renewable sources. Hydrogen can be stored and used to produce electricity when the wind is not blowing, thus displacing electricity generated by diesel engines commonly used in Canadian remote communities.

Wind Energy and Cold Climates

CETC-Ottawa is also actively studying the effects of cold climate on power generation and operational safety of wind turbines. In the University of Manitoba's wind tunnel, severe icing events are being simulated in order to study icing's effect on wind turbines. These experiments will contribute to the development of anti-icing and de-icing technologies to mitigate the effect of Canada's harsh climate on the performance of wind turbines.



Wind Turbines at Ramea – Source: Simone Kendall

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