

WIND ENERGY R&D PARK

Wind Energy R&D Park and Storage System for Innovation in Grid Integration

In August 2010 Prime Minister Stephen Harper was at WEICan's North Cape, PEI site to announce that a contribution agreement had been signed to support WEICan's "Wind Energy R&D Park and Storage System for Innovation in Grid Integration".



Prime Minister Harper accompanied by PEI Premier Robert Ghiz; Fisheries and Oceans Minister, Gail Shea; and Senator Mike Duffy for announcement at WEICan in August.

The project will be made possible with federal funding through the Clean Energy Fund and a loan from the PEI government. As the percent of wind penetration on the Prince Edward Island electric grid increases the ability to manage the energy input and operation of the grid becomes more complex. This research project will look at how energy storage can be utilized to maximize renewable energy production and stabilize the grid. The Wind Energy R&D Park will also be made available for purposes of wind technology research and development; making its data available for research projects and also as a test bed for auxiliary technology concepts for wind turbines and wind farms. Support, through this project will also further WEICan's research, development, and demonstration in the small wind sector. The project involves a number of collaborators:

- Maritime Electric Company Limited (MECL)
- New Brunswick System Operator (NBSO)
- Canadian NSERC Wind Energy Strategic Network (WESNet)
- Canadian Wind Energy Association (Can WEA)
- Prince Edward Island Energy Corporation (PEIEC)
- Natural Resources Canada (NRCan)

Over the next year WEICan will finalize selection of the wind turbines, begin construction and confirm the storage technology. **To follow the Project's progress, please sign up for our distribution list at:**

<http://weican.ca/distribution.php>

MISSION

WEICan advances the development of wind energy across Canada through research, testing, training & collaboration.

STRATEGIC FOCUS

WEICan's Four Areas of Strategic Focus:

- *Testing Leading to Certification*
- *Research, Development and Demonstration*
- *Training, Outreach and Public Education*
- *Technical Consultation and Assistance*

Testing leading to Certification

In 2007 WEICan initiated a Type Testing program for small wind turbines in accordance with the International Electrotechnical Commission (IEC) 61400 standard and the American Wind Energy Association (AWEA) standard. Specific tests include; power performance, power quality, acoustic noise emissions, duration and safety. Results can be certified through organizations such as the Small Wind Certification Council (SWCC). WEICan continues to investigate options for acceptance of test results in jurisdictions around the world. Listed below are wind turbines currently under test at WEICan.

Raum Energy's 1.3 kW

The 1.3kW wind turbine was the first wind turbine installed at WEICan for Testing Leading to Certification. During the installation period, there were technical modifications to the wind turbine that resulted in this becoming a R&D project. Power performance testing is complete. WEICan has taken ownership of the turbine and it will remain operational for small wind turbine R&D projects.

Raum Energy's 3.5 kW

Resulting from collaboration, between Raum and WEICan on the 1.3kW wind turbine, a contract to test the Raum 3.5kW turbine was signed in January 2010. Installation of the Raum 3.5kW turbine is expected to begin in the fall 2010. Following installation and commissioning tests will be conducted for power performance, duration, safety, and acoustics emissions.

Cleanfield Energy Corp's V3.5

Cleanfield's 3.5 kW vertical axis wind turbine (VAWT) was erected in December 2008. Since installation, modifications have been made to the wind turbine blade design, communication module, and the control system. Data collection is ongoing and improved performance is being observed. Modifications are scheduled for completion in the fall 2010 at which time testing leading to certification will begin.

Zephyr Corporation's 1.1 kW

The Zephyr Airdolphin GTO-Z1000 wind turbine was installed and commissioned in February 2010. Power performance, duration, and safety and function testing has been completed. Acoustic testing is scheduled to finish in the fall 2010, which will see testing completed 4 months ahead of schedule. The test report will be issued to Zephyr for submission to SWCC for certification. This project is utilizing an internet connection to allow Zephyr to communicate with their equipment and run diagnostics from their offices in Japan. One of the unique aspects to this project is the utilization of ARE's 100ft Ground Control Motorized Monopole tilt up tower.



Zephyr Airdolphin GTO-Z1000

VBine Energy's 5kW VBine

Delivery and installation of the 5kW VBine VAWT is expected to take place in the fall 2010. The VBine will be tested for power performance, safety and function, duration, and acoustics according to IEC and AWEA standards.

New Small Wind Test Bed

A new Test Bed has been setup near the AWTS Guest House at WEICan's North Cape site to accommodate up to four more small turbines (10kW or less). The new test bed includes a network switch so the clients will have the option of accessing their equipment over the internet.

Research, Development and Demonstration (R, D&D)

Net Metering for Community Rinks

Prince Edward Island community rinks are large electricity consumers and are facing high-energy costs that could threaten their financial sustainability. This initiative will see appropriately sized wind turbines installed to help lower costs for electrical consumption while helping the environment, promote awareness of an environmentally friendly energy sources, and allow communities to maintain a facility which promotes a healthy life style for all Islanders. This project will provide a template for other communities across Canada to explore similar net metering projects.

WEICan as project manager for the Net-Metering Initiative has produced technical assessments, with the assistance of the expert advisory committee, to rank the facilities. WEICan is engaged with the successful facilities; helping them understand siting issues, technologies, applications, permits and providing information for community and board meetings. Installation is scheduled for winter 2010/11.

Sugen's 5kW VAWT

Sugen Research Inc., a Cape Breton based company, has developed a 5 kW VAWT in cooperation with Gaul Industries of France. The VAWT has a unique configuration which may be well suited for high wind environments, such as northern Cape Breton. WEICan has provided technical, engineering, and project management services to assist in the design of the VAWT. The VAWT has been installed at WEICan for a test period and is now being moved to Grand Etang, Cape Breton for power performance testing and further design verification.



Sugen Research Inc. 5kW VAWT

PEI Hydrogen Village Project

WEICan has assisted the PEI Energy Corporation (PEIEC) in their Wind-Hydrogen Village project which is housed at North Cape. WEICan has developed controls for the integration of their small wind turbine inventory to supply power to the system to produce the hydrogen. WEICan participated in a trip to Nunavut in February, 2010 led by the PEIEC to meet with representatives of Qulliq Energy (Nunavut power utility) and the Nunavut government in an effort to promote the wind/hydrogen system for Northern applications. WEICan continues to work with Qulliq Energy to evaluate wind resources assessment options for Northern communities.

Wind Energy Strategic Network

The NSERC Wind Energy Strategic Network (WESNet), Canada's nationwide wind energy research collective is a multi-partner alliance which includes leading researchers from 16 Canadian universities in six provinces, NRCan and Environment Canada, the Canadian Wind Energy Association, utility companies, wind sector businesses, and WEICan. WESNet is poised to play a leading role in nationwide academic wind energy research.

WEICan in collaboration with Dr. Tariq Iqbal of Memorial University (MUN) are conducting research into the effects of power factor variations on small wind turbine performance. An undergraduate student conducted a literature review and initial investigation of WESNet data.

NSERC has approved supplementary funding to WESNet to support research interns. This funding is supporting André Bégin-Drolet, Université de Laval, on a 4 month internship that will support his research into ice free anemometers. WEICan is working with WESNet to put in place a recruiting process under this program.

Small Wind Turbine Inventory

WEICan maintains a small wind turbine inventory in order to have equipment available for testing, research, development, and demonstration purposes; specific examples of such have been explained above. An EWS 50kW wind turbine formerly installed at the Agriculture and Agri-food Canada research site in Harrington PEI will be added to our inventory. This wind turbine will be installed in the fall in collaboration with PEI Energy Corporation and will provide power to the hydrogen village project.

Training, Outreach and Public Education

International Electrotechnical Commission (IEC) Standards

Small wind certification is being driven by market expansion and incentive programs for small wind (primarily in the US and UK) and net metering. As a result, the IEC Technical Committee TC 88 initiated a revision of "Wind Turbines - Part 2: Design Requirements for small wind turbines", Standard 61400-2, edition 2. The intended result of these meetings is the development of a unified small wind standard that is accepted and used by all certifying bodies. International Energy Agency (IEA) has approved a task group that is part of the process to assist with collating information to support decisions to change the standard and develop an internationally recognized label.

This past year WEICan participated in IEC and IEA meetings held in Germany, Scotland, and USA where there were approximately 20 participants from the following countries; UK, US, Canada, Spain, Sweden, Japan, Australia, Germany, France and Korea. With WEICan's knowledge of testing procedures and small wind turbine technology; and understanding of the IEC, BWEA, AWEA standards; it is providing input on Canadian requirements and is promoting the revised standard to the Canadian manufacturing sector. To this end, WEICan has accepted the position of chairperson for the Canadian Standard Association (CSA) working group for C61400-2: Design Requirements for Small Wind Turbines.

Public Outreach Activities

This past year WEICan has hosted numerous professional groups in North Cape, including; the Prime Minister, Provincial and Territorial Premiers and Ministers, MLA's and MP's, journalists, diplomats, wind industry professionals, conference organisers, and others. In addition, WEICan has participated in industry conferences in Canada, United States, UK, and

Germany; and other wind related seminars. WEICan participated in the development of NRCan's Technology Road Map which is now available at: http://canmetenergy-canmetenergie.nrcan-rncan.gc.ca/eng/renewables/wind_energy/trm.html. These activities have been an important part in the process of educating key decision makers about the technical and economic capabilities of wind energy; as well as allowing WEICan staff to remain current on the status of the industry.

Training Tower Project

PEI's Wind Turbine Service Technician training program is now underway at Holland College (www.hollandcollege.com). As such, WEICan in collaboration with Holland College has installed a training tower with the financial assistance of ACOA. This training tower marketed as a tower for Fall Arrest/Safety/Rescue training is available for educational training programs as well as private sector companies who wish to use the tower on a fee for service basis.



Training Tower at WEICan

Visiting Professors and Academics Program (VPAP) / Coop Engineering Students

The "Visiting Professors and Academics Program" provides an opportunity for scholars in the field of wind energy to work at WEICan. During this period, Nicholas Tartibu, a graduate student from Université de Moncton, joined WEICan for 6 weeks in May as a visiting academic. Under the supervision of Dr. Yves Gagnon, Nicholas is working on testing systems for wind and atmospheric measurement techniques in cold climate conditions. For more information on this program please visit our website: www.weican.ca.

In order to provide the opportunity for engineering students to explore the wind energy field, WEICan has been offering work terms at WEICan. To date, students from Memorial University of Newfoundland, Dalhousie University, Concordia University, University of Waterloo, McGill University, University of Regina, University of Saskatchewan, and University of Toronto have worked at WEICan. WEICan has also had international students on work terms.

Technical Consultation and Assistance

Saskatchewan Research Council (SRC)

In partnership with SRC, WEICan embarked on a study of multiple sites in Saskatchewan which have seen wind turbines installed with assistance from the Net Metering Rebate program SRC administers on behalf of the Government of Saskatchewan and SaskPower Eneraction. The study has two aspects; calculation of expected power based on modelling software and analysis of actual power production data compared to predicted.

WEICan engineers visited 40 sites with small wind turbines installed in a net metering application, to choose the 12 best suited for the study. SRC then installed meteorological (MET) towers at these sites to log wind resource and power production for the purpose of verifying power and energy performance. Concurrently, WEICan used data collected during the 40 site visits to enter into WindPro (modelling software used for wind farm design) to accurately model all sites; Windpro considers actual site features such as obstacles, terrain and wind characteristics to provide a more accurate model. Once these models were completed they were compared to models done using RETScreen (a less complex and free modelling software developed by NRCan) for validation. The final report was issued at the end of March, 2010. Results of this study were co-presented by WEICan and SRC at CanWEA's Conference in Montreal in November, 2010.

This collaboration is continuing; 5 additional sites have been visited and data collected for modelling. The objective of phase two is to search for trends.

National Research Council Canada / Industrial Research Assistance Program (NRC/IRAP)

WEICan continues to work with NRC/IRAP to provide technical assistance and review of applications NRC/IRAP receive from the wind energy sector. This work continues to help expand WEICan's client base. This year WEICan has:

- provided a technical review of a two bladed vertical axis wind turbine
- reviewed and reported on a hydraulic drive system concept; and
- issued a report of a technology review of a new variable speed drive concept

Other Government Assistance

WEICan also assists other government agencies with due diligence and feasibility studies. As an example WEICan developed a report on the feasibility of installing wind turbine in net-metering applications at seafood processing plants.

Wind Data Sales

WEICan provided wind data from its permanent met tower to a client on a monthly basis, this contract ended in August 2010.

Ventura Turbine Installation at Tignish Initiatives Centre

WEICan installed a 10 kW Ventura wind turbine in a net metering application, to provide power to the North Cape Complex visitor centre, owned by Tignish Initiatives, a local community development group. The installation has a data logging system to enable a live data displayed for tourists in the information centre. The data will also be logged to provide information to UNB on the inverter's performance. An upgrade will be made to the tower with the 3.7 m extension; the new section will be smaller in diameter with the intention of reducing acoustic emissions from the turbine. Acoustic testing was conducted in September to investigate the impact of the tower upgrade on reducing acoustic emissions.

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WEICan also employs students/interns on a regular basis.

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