

# Wind Energy Development in Prince Edward Island

February 2010

## INDUSTRY HIGHLIGHTS

- Prince Edward Island relies on off-Island utilities for most of its electricity needs: supplied by two submarine transmission cables under the Northumberland Strait (installed in 1977) from New Brunswick Power Corporation.
- In their *Island Prosperity* report, the Province of PEI set a goal to reach 500MW of installed capacity by the year 2013. This feat would position the province as the first net producer and exporter of green energy in North America.
- There are currently 89 utility-grade wind turbines installed over 6 wind farms in operation in Prince Edward Island with a combined wind energy capacity of 164 megawatts.
- The largest wind turbine erected in the province is the Vestas V-90 which is about 80 meters in height (263 feet). By comparison, the V-90 would stand roughly 20 feet taller than the Confederation Bridge-from base to peak!
- The wind farms operating in the province have a capacity factor in the 35% range (i.e. the actual amount of energy generated relative to potential/full capacity).
- All the electricity generated at the North Cape Wind Farm is transmitted to Maritime Electric's substation (located in Huntley, PEI) via a 28km transmission line.
- Maritime Electric owns and operates three electrical generating stations on PEI: two in Charlottetown (50MW and 62MW capacities) and one in Borden (42MW), and are primarily used for back-up supply and to meet seasonal demand, peak loading (i.e. Winter months).

### Did you know...???

...that the blade of the Vestas V-90 is 44 meters in length (144 feet)?

...the Atlantic Wind Test Site in North Cape officially opened in 1980?

...PEI Energy Corporation built Atlantic Canada's first commercial wind farm at North Cape in 2001?

... that approximately 62 MW of wind energy produced for the PEI market - enough to power 26,000 homes?

...that the capital cost of increasing wind production to the targeted 500MW is over \$1 Billion?

...the Eastern Kings Wind Farm supplies nearly 8% of PEI's electricity needs?

...Maritime Electric purchases up to 52MW of wind generation from the wind farms in North Cape and Eastern Kings?

...there are approximately 5000 KMs of power lines on PEI?

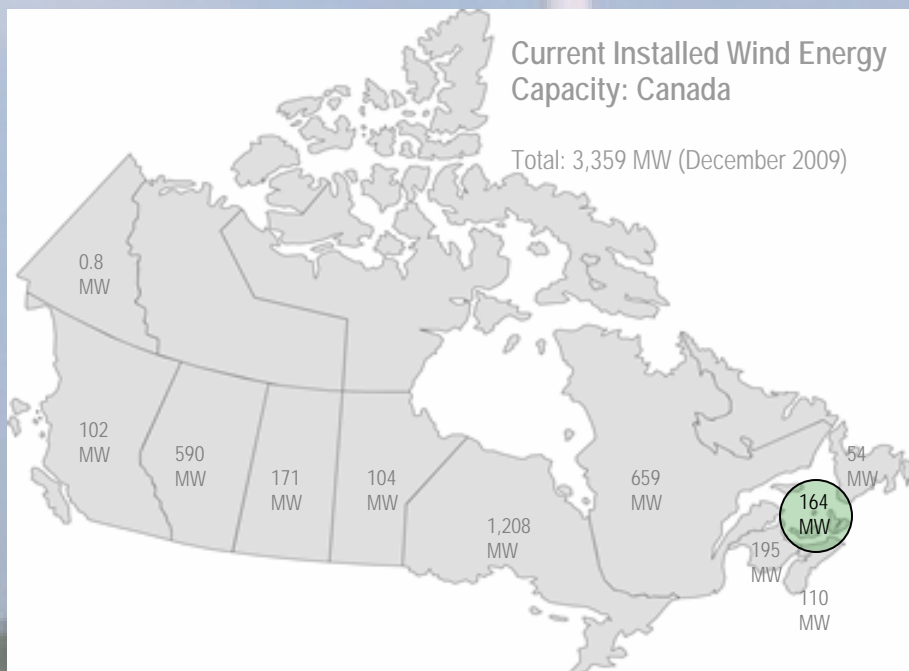
...that under Kyoto, Canada is committed to cutting greenhouse gas emissions to levels 6% below 1990 levels?

## INDUSTRY CHARACTERISTICS

### Snapshot of Windmill Farms in Prince Edward Island

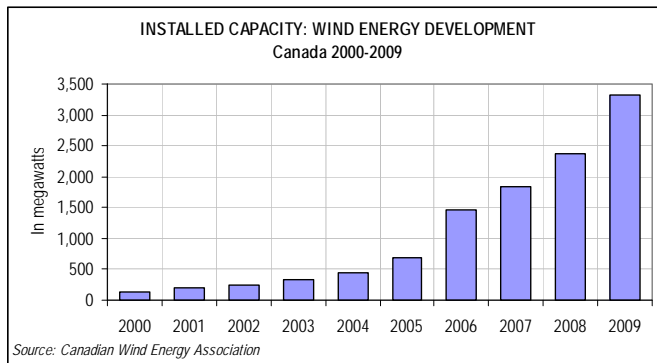
Wind Farm	Turbines	Windmill Model	Capacity (MW)	Installation Date	Site Location PEI
North Cape	8	Vestas V47-660	5.3	November 2001	North Cape
	8	Vestas V47-660	5.3	November 2003	
Aeolus	1	Vestas V90	3	August 2005	Norway, PE
Eastern Kings	10	Vestas V90	30	January 2007	Souris-Elmira
West Cape	11	Vestas V80	19.8	May 2007	O'Leary
Norway	3	Vestas V90	9	June 2007	Norway
West Cape – Phase 2	44	Vestas V80	79.2	August 2009	O'Leary
Summerside	4	Vestas V90	12	December 2009	Summerside

A single wind turbine (660 kW) in an average year will produce 2,000 MWh of electricity, enough power for over 250 PEI homes. Using wind to produce electricity rather than burning coal will leave 900,000 kilograms of coal in the ground and reduce 2,000 tonnes of greenhouse gases annually, the same positive impact as taking 417 cars off the road or planting 10,000 trees. Newer and larger wind turbines will result in an even greater positive impact. *Source: Canadian Wind Energy Association*



## INDUSTRY TRENDS

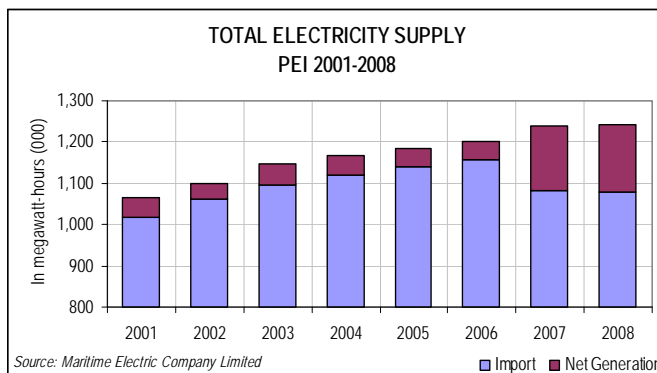
### The trend in renewable wind energy development in Canada has grown significantly



Wind energy development in Canada has grown considerably over the past decade-particularly in the last five years. From 2000-2004, installed wind energy capacity expanded by an average annual rate of 35% across the country, and in the latter half, accelerated by 52%, on average. In 2009, installed capacity in Canada totalled 3,359MW. PEI capacity, at

164MW, accounted for 5% of the national total. On the world stage, Canada ranks close to the top 10 according to the World Wind Energy Association. The United States leads the world in installed capacity at 25,170MW, followed by Germany and Spain.

### PEI showing reduced dependence on imported electricity



The supply of electricity in the province totalled 1.2 million megawatt-hours in 2008, comprised of imported (1 million MW-hours) and domestically generated electricity (0.2 million MW-hours). PEI has shown reduced dependence on imported electricity in recent years. In 2007 and 2008, about 13% of its electricity needs were produced domestically-up considerably from 4% over the 2001-2006 period,

on average. Also over this period, the amount of electricity imported from New Brunswick expanded by an average annual rate of about 2.5% before dropping 6.5% in 2007.

### Labour force in wind turbine technology growing in PEI, predominantly male

According to Census 2006, there were 180 persons employed in the occupation of construction millwrights and industrial mechanics (includes windmill repairers), an increase of 12.5% over Census 2001 estimates. Although actual numbers specific to windmill repairers are not available at this level, it stands to reason that with the acceleration in windmill development over the past decade, this could have been a factor supporting labour force growth within this occupation. The Census data indicate that men accounted for the entire labour force in the construction millwrights and industrial mechanics occupation in 2006.

## **INDUSTRY CHALLENGES**

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*(The following summaries were derived from industry consultations)*

### ***U.S. and global economic conditions***

The U.S. recession has had a dampening effect on energy markets-particularly for green energy. Wind energy is market driven and demand for it is influenced by the health of an economy, prices for substitute products (i.e. natural gas, oil, etc.) and so forth. The recent recession in the U.S. has resulted in reduced demand of wind energy exports from the province, particularly in the New England region.

### ***Changes to energy prices and substitute products***

The demand for green electricity is market driven and is affected by changes in prices for substitute products. Natural gas in North America for example is in a position of excess supply (high storage volume) which put downward pressure on prices. At present, natural gas is a significantly cheaper alternative to green electricity which therefore impedes demand for wind energy.

### ***Inconsistent nature of wind power, revenue structure***

Wind generation is a direct function of wind speed and is therefore not a consistent energy supply. Fluctuations in energy production can result in penalties for wind producers. For example, Maritime Electric enters bids to purchase a specified volume of wind power at a set price at a specific period of time. If too much wind energy is produced, Maritime Electric is required to sell the excess-and if sold below the purchase price, the difference (loss) translates into a penalty for the producer; similarly, wind producers can face penalties if not enough wind energy is produced to meet demand. In which case, Maritime Electric is required to purchase the difference in the open market-and if purchased at a higher price than what it was contracted to pay wind producers, the difference (loss) translates into a penalty.

## **INDUSTRY INITIATIVES**

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*(The following summaries were derived from industry consultations)*

### ***Regulatory initiatives aimed at reducing greenhouse gas emissions***

Under the Kyoto Protocol, Canada committed to the reduction of greenhouse gas emissions to 6% below 1990 levels (599 metric-tonnes of carbon dioxide equivalent), over the 2008-2012 period. In their 2007 Kyoto report, Environment Canada projects that Canada's emission levels in 2010 will be about 24% above 1990 levels, but follows that provincial plans and actions are expected to result in reduced emission levels in the country.

At the provincial level, some jurisdictions have introduced policies to reduce emissions, such as the carbon offset program in Alberta. For PEI, government committed to a renewable portfolio standard for electricity-where 15% of its electrical capacity must be accessed by renewable sources.

## OCCUPATIONAL HIGHLIGHTS

### P.E.I. Job Futures: Occupations related to Wind Energy

<p><b>Construction Millwrights and Industrial Mechanics (NOC 7311)</b>  <i>Install, maintain, troubleshoot and repair stationary industrial machinery and mechanical equipment. Industrial mechanics are employed in manufacturing plants, utilities and other industrial establishments. "Windmill repairer" is an example title included in this occupation.</i></p>	<p><i>Employment Outlook to 2011 is Fair.</i>            Average annual income: \$43,481            Employed (2006 Census): 165            Age composition: 15-24(0%); 25-54(100%); 55+(0%)</p>
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## INDUSTRY PARTNERS AND COMPANIES

### Local Partners and Companies

<p><b>Department of Environment, Energy and Forestry</b>            Fourth Floor, Jones Building, 11 Kent Street, P.O. Box 2000, Charlottetown, PEI, C1A 7N8</p>	<p><b>The Wind Energy Institute of Canada</b>            21741 Route 12, North Cape, Prince Edward Island, Canada, C0B 2B0, Phone: +1-902-882-2746, Fax: +1-902-882-3823, Website: www.weican.ca, Email: info@weican.ca</p>
<p><b>Maritime Electric</b>            180 Kent St., P.O. Box 1328, Charlottetown, PEI, C1A 7N2, Phone 1-800-670-1012, Fax 1-902-629-3630  <a href="http://www.maritimeelectric.com/">www.maritimeelectric.com/</a></p>	

### National

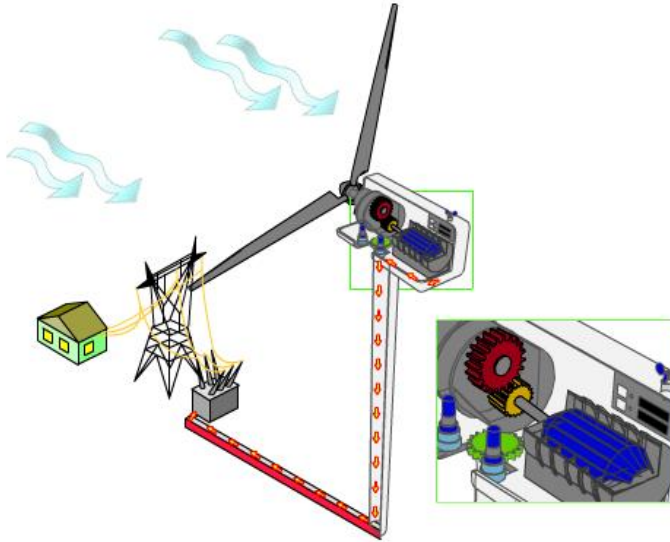
<p><b>Canadian Wind Energy Association (CanWEA)</b>            Suite 810, 170 Laurier Avenue West, Ottawa, Ontario, Canada K1P 5V5 Phone: 613-234-8716 or 1-800-922-6932 Fax: 613-234-5642</p>	<p><b>Natural Resources Canada</b>            580 Booth, Ottawa, ON K1A 0E4, Tel: 613-995-0947</p>
<p><b>Vestas-Canadian Wind Technology Ltd.</b>            65 Queen St. West, Suite 2000, Box 56, Toronto, Ontario, M5H 2M5, Canada, (647) 837 6100, (647) 837 6101, <a href="http://www.vestas.com">www.vestas.com</a></p>	

### International: Wind Energy Organizations

<p>World Wind Energy Head Office            American Wind Energy Association            Global Wind Energy Council            European Wind Energy Association            Association of Danish Wind Turbine Manufacturers            German Wind Energy Association            The British Wind Energy Association            Australian Wind Energy Association</p>	<p><a href="http://www.wwindea.org">www.wwindea.org</a>  <a href="http://www.awea.org">www.awea.org</a>  <a href="http://www.gwec.net">www.gwec.net</a>  <a href="http://www.ewea.org">www.ewea.org</a>  <a href="http://www.windpower.org">www.windpower.org</a>  <a href="http://www.wind-energie.de/en">www.wind-energie.de/en</a>  <a href="http://www.bwea.org">www.bwea.org</a>  <a href="http://www.auswea.com.au/auswea/">www.auswea.com.au/auswea/</a></p>
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# HOW WIND TURBINE TECHNOLOGY WORKS

Source: U.S. Department of Energy



Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth.

The terms wind energy or wind power describe the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power.

So how do wind turbines make electricity? A wind turbine works the opposite of a fan. Instead of

using electricity to make wind, like a fan, wind turbines use wind to make electricity.

The energy in the wind turns two or three propeller-like blades around a rotor. The rotor is connected to the main shaft, which spins a generator to create electricity.

Wind turbines are mounted on a tower to capture the most energy. At 100 feet (30 meters) or more above ground, they can take advantage of faster and less turbulent wind.

Wind turbines can be used to produce electricity for a single home or building, or they can be connected to an electricity grid (shown here) for more widespread electricity distribution.



Source: Canadian Wind Energy Association

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