Title: Renewable Energy on Prince Edward Island
Prepared for: Canada Research Chair on Sustainable Community Development

Case Summary:

Despite its population of just 138,000, Prince Edward Island (PEI) has undertaken an ambitious renewable energy strategy that has delivered innovative policies, public engagement strategies and economic benefits. PEI was the first province in Canada to adopt renewable energy tariffs as a policy mechanism to encourage wind development. The tariff is balanced with a renewable energy portfolio standard goal of 15 percent of electricity generation from renewable sources by 2010; but because this goal will be met by 2007, the Minister increased the target to 30 percent of all of Prince Edward Island's energy requirements by 2016. In order to initiate wind energy development, the provincial government, through the PEI Energy Corporation, constructed the first two wind farms and in so doing set the bar in terms of public consultation and financial benefits for future private developments.

Another component of the strategy involves innovation such as the Hydrogen village, a project that builds on the island-based Atlantic Wind Testing Station's expertise in hybrid wind-diesel generator systems to use only clean fuels. PEI is also developing a biofuels strategy to offset fossil fuel consumption resulting from transportation.

Sustainable Development Characteristics

Prince Edward Island's approach to renewable energy is multi-faceted with social, ecological and economic dimensions. The province's energy goals are as follows (PEI Energy Corporation, 2003):

1. Ensure Security of Supply
2. Improve Price Equity for Citizens and Businesses
3. Encourage Diversity of Supply
4. Achieve Minimal Environmental Impact
5. Promote Efficient Energy Usage
6. Support Economic Development

- **Environmental Benefits**

Prince Edward Island is highly dependent on fossil fuels; approximately 80 percent of PEI's energy needs are met using fossil fuels (PEIDEE, 2004). As a result, PEI's greenhouse gas emissions totaled 2090 kilotonnes of C02 in 2003 (Environment Canada, 2006).

Table 1: Source of PEI's Energy, 2004

Source	Percentage
Petroleum Products	80
Imported and oil-fired electricity	13
Biomass	6.5
Electricity from on-island wind power	0.5

Source: PEIDEE, 2004

While these emissions include transport-related emissions, Prince Edward Island's electricity is also primarily dependent on fossil fuel. Since the installation of two submarine energy supply cables, Nova Scotia Power (NS Power) and New Brunswick Power (NB Power) have provided the majority of PEI's electricity, 94 percent in 2004 (PEIDEE, 2004). Both NS Power and NB Power are highly dependent on fossil fuels for electricity generation, to the tune of 88 percent (Nova Scotia Power, 2005) and 85 percent (New Brunswick Natural Resources and Energy, 2001) respectively.

The only on-island power generation is an oil-fired power plant run by Maritime Electric, and the North Cape Wind Farm with eight wind turbines rated at 5.28 MW (PEI Energy Corporation, 2003).

As a result, PEI's initiative to shift to wind energy has significant environmental benefits. For example, the eight wind turbines at North Cape reduced greenhouse gas emissions by 13,000 tonnes per year (Natural Resources Canada, 2001).

- **Economic benefits**

In announcing the renewable energy strategy, Premier Pat Binns highlighted the local economic development aspects of renewable energy, "Each year, some $440 million leaves Prince Edward Island, as fossil fuels are imported to heat and power our homes and fuel our vehicles. This target is about keeping more of those dollars in PEI to strengthen our economy. And it is about creating new opportunities for Island farmers and a healthier environment today and for future generations" (Renewable Energy Access, 2006).

The wind energy project has attracted significant investment. Ventus Energy has two wind farm projects underway in the province with a total rated capacity of 108 MW. Both projects are funded entirely through private financing from venture capital firms such as Wellington Financial LP (Ventus, 2006). The total investment for the two wind farms is $230 million (City of Summerside, 2006).

PEI Energy Corporation also took measures to maximize the economic benefit to islanders, setting the standard for future private developments. Two and a half percent of gross revenue from the turbines is distributed to local people in a revenue sharing agreement- the person whose land the turbine is on receives 70 percent, those who are directly impacted receive 20 percent and those who are impacted but are further away receive 10 percent. The corporation ensured that all the turbines were placed on private property even when publicly owned property was available and had a comparable wind resource (Interview with PEI Energy Corporation official).

The Province decided on an alternative ownership model in the development of a new 30 MW wind farm near Kings County, with a "government and co-op" approach. A PEI Energy subsidiary will own the wind farm, and a "wind-energy cooperative" will become a shareholder in the PEI Energy subsidiary. Prince Edward Island residents can then become members of the co-op by investing in it and the government intends to make investments in the wind co-op project qualify as a "Registered Retirement Savings Plan" under Canadian law (Global Power Report, 2005).

On December 1st, 2006, the PEI government will begin marketing a new $56 million bond issue called the Eastern Kings Wind Farm Bond. Listed as five-year bonds with a five percent return, they will be available only to PEI residents up to a maximum purchase of $10,000 per year. The bond issue ensures that islanders have the opportunity to benefit financially from the wind turbines (Interview with PEI Energy Corporation official). The money raised will be used either to pay down the debt on the turbines or to finance new developments.

A two percent royalty paid from one two-megawatt turbine in one of the windiest locations on PEI could generate a long term annual royalty of $10,000. Given that the average 100 acre farm could handle two to three of these windturbines with minimal impact to existing land use, the potential annual royalty payments add up to $30,000 (Douglas, 2005).

Tourism is an ancillary benefit. The Wind Energy Institute has become a major tourist destination with 60,000 people visiting each year (CanWEA, 2006).

Critical Success Factors

- **History of Innovation**

Prince Edward Island has a long history of innovative environmental initiatives. The Institute of Man and Resources was born in the midst of the 1970s energy crisis. In 1975 with the support of then Premier Alex Campbell, the institute's program included 'analysis, invention, adaptation and application of appropriate energy, food and crop production and living and shelter systems,' however, it quickly narrowed down to a focus on energy. In 1978, the Institute published a paper titled the Prince Edward Island Wind Energy Program which detailed a program involving wind speed testing, the integration of wind energy conversion systems, applications for farms and testing of machines at the Atlantic Wind test site (Lodge, 1978). Another famous venture, the Prince Edward Island Ark, was conceived in cooperation with the New England-based New Alchemy Institute. The Ark was an experimental building that was heated with passive solar and tested indoor agriculture. An unfavourable political climate in the early 1980s resulted in the conclusion of the Institute of Man and Resources, but its legacy continues in the Atlantic Wind Testing Station (Varty, 2004).

The Atlantic Wind Testing Station (AWTS) was formed in 1981 by the Institute and was designated the government of Canada's wind energy research station. In 1983, the world's largest vertical axis wind turbine, a 500 kW machine, was installed for testing purposes. Natural Resources Canada assumed responsibility for the site in 1984 and AWTS became involved in international projects around integrated wind and diesel systems. The University of New Brunswick established its Renewable Energy Research facility at the site in 1994, and in 2001 AWTS was involved in the development of Atlantic Canada's first commercial wind plant, North Cape Wind Plant. In 2003, Vestas selected North Cape for testing its V90, with a 90 MW rating, the largest wind turbine in North America, and in 2005, the AWTS was announced as the site of a wind-hydrogen village. In 2006, the name was changed to the Wind Energy Institute and a research building was constructed.

AWTS's work focuses on four key areas:

- Technical innovation: AWTS helped develop a vertical axis wind turbine, was instrumental in the development and deployment of wind-diesel systems and helped improve smaller wind turbines

- Testing: AWTS has tested a wide range of turbines from 0.05 kW to 500 kW, both for performance and for long-term operation.

- Developing collaborative relationships: AWTS works with industry, researchers and government agencies.

- Information transfer: AWTS has become the point of reference for inquiries regarding wind across Canada, as well as hosting nearly 100,000 visitors each year.

The 20 year history of experimentation with wind energy, both at the AWTS and by the population in general, has resulted in a pool of technical skill and a public familiarity with the technology that provided a solid foundation for a major expansion of wind generation capacity.

The general population has supported and even driven the development of wind energy on PEI, support that is derived from an awareness of environmental issues. This awareness has manifested itself in other innovative policies such as the Conservation Strategy for Prince Edward Island. In 1987 the provincial government initiated a public consultation process that brought together government officials, industry, business leaders, local community groups, leaders of indigenous groups, and churches, to demonstrate that economic development can proceed in harmony with environmental goals. The plan spanned 20 years and sought to demonstrate that conservation and economic development need not conflict but can proceed in harmony (Co-ordinating Committee for Conservation, 1987).

In 2004, Premier Binns had sparked a storm of controversy with his suggestion that the Island become free of genetically modified organisms (GMOs) (Government of Prince Edward Island, 2004). While the idea has yet to become law, PEI residents debated the idea at length, and the question ultimately arrived at the floor of the provincial legislature.

- **Natural resources**

Unlike every other provincial jurisdiction in Canada, PEI doesn't have extensive natural sources of energy such as hydro or petroleum. The province historically has been dependent on imported energy. The insecurity of this system was highlighted when one of the two submarine electricity cables was severed in 1997.

The island does, however, have extensive indigenous resources of wind energy (Natural Resources Canada, 2001).

- **Political Climate**

Because PEI is a small province with a population of 138,000, it is difficult to mobilize the financial resources required to undertake major, capital intensive projects such as wind energy from the private sector. The provincial government has therefore played a key role in initiating the development of wind energy, firstly through creating a policy environment and secondly by initiating wind energy development by constructing two wind farms through the PEI Energy Corporation. These initial wind farms also set the bar in terms of public expectations for future developments, and ensured that wind energy has widespread support amongst both islanders and politicians.

In 2001, when the PEI Energy Corporation approached the federal government to increase its support for the Atlantic Wind Testing Station, the response was that they would support the development of a wind farm instead.

Thus, the ability of PEI Energy Corporation to pursue the initial wind farm at North Cape was, in part, due to the government of Canada's commitment to purchase electricity from emerging renewable sources. The national government and the provincial government committed $4.5 million and $1.1 million over a ten-year period, respectively, toward the purchase of electricity generated by the wind turbines (Ibid).

Detailed Background Case Description

Historically, PEI has been dependent on importing electricity; increasing petroleum prices, recognition that PEI has significant wind resources and the need to reduce greenhouse gas emissions all contributed to a focus on wind energy.

Efforts to promote renewable energy on Prince Edward Island consist of: a mix of policy instruments, including the Renewable Energy Act; innovative pilot projects such as the Hydrogen Village; and an established research program called the Wind Energy Institute.

The Renewable Energy Act, which was passed during the fall 2004 session of the Legislative Assembly, requires utilities to acquire at least 15 percent of electrical energy from renewable sources by 2010, and came into effect December 31, 2005. Initially, the policy included a section that committed the province to a target of 100 percent of electricity from renewable sources by 2015, but in recognition of the technological challenge stemming from intermittency of wind power, this section was withdrawn. In the near future, the PEI government will announce a new target of 30 percent of PEI's total energy needs – including transport and heating - be supplied by renewable energy by 2016. The increased scope of this project intends to stimulate biofuels such as ethanol (Interview with PEI Energy Corporate official, 2006).

Other elements of the policy include:

- Minimum Purchase Price Regulations establish the price utilities must pay for power produced by large-scale renewable energy generators (those capable of producing more than 100 kilowatts of energy). The PEI government has set this rate at 7.75 cents per kilowatt-hour, with 5.75 cents of that a fixed rate and 2.0 cents a variable rate that may be adjusted annually to reflect changes in operating costs. The variable rate will be tied to the Consumer Price Index.

- The Designated Areas Regulations are designed to ensure that large-scale (more than 100 kilowatts) wind farm projects take place in areas where development is economically viable. The criterion for identifying the Zones of Inclusion – areas where development may occur – is an average wind speed of 7.5 metres per second. The regulations do not mean that any development may proceed; proposed projects must receive all necessary approvals and are subject to any existing development restrictions and the Environmental Impact Assessment process. They must also comply with requirements under the Planning Act Subdivision and Development Regulations, for setbacks from buildings and other structures.

- The Net-Metering System Regulations make it more economically feasible for Island homeowners, small businesses, or farmers who have an interest in generating their own electricity, to install small-scale generating systems – those that produce 100 kilowatts of energy or less. Under the regulations, any excess energy that small-scale generators supply to the electrical grid will be credited at the same price paid for power purchased from the utility.

- The PEI Government maintains ownership of the environmental attributes of any wind energy development. Any carbon credits or 'offsets' that are generated are treated in the same manner as oil and gas royalties, on the basis that the wind is owned by the people of Prince Edward Island, and therefore any greenhouse gas mitigation benefits that result from its use also belong to the people of Prince Edward Island.

- Renewable energy projects and appliances receive a provincial sales tax exemption

At the time it was introduced, PEI's Renewable Energy Act was considered the most progressive policy measure in North America (Gipe, 2006-1). Renewable energy technologies need financial incentives because they have three limitations: higher costs due to commercial immaturity, capital intensiveness relative to long term costs, and their intermittent production.

The government of PEI used a combination of policy mechanisms to stimulate investment in wind energy, including the first implementation of a renewable energy tariff in Canada. While the renewable energy portfolio has been the policy of choice in North America, renewable energy tariffs have been used extensively in Europe. The portfolio approach addresses the problem in a linear fashion: X amount of generating capacity is required, therefore issue a Request for Proposals(RFP) for X, and build X. A Renewable Tariff mechanism is less prescriptive: problem X requires so much generating capacity; therefore, what is the price that will stimulate the rate of development desired (Gipe, 2006)?

PEI elected to use a portfolio standard, 15 percent by 2010, in concert with a renewable energy tariff; this policy in combination with other factors has meant that the 15 percent target will be met three years early. While the portfolio standard ensures the utility has a standard, the renewable energy tariff ensures that the wind farms will be economically viable and prevents the utility from 'squeezing' the developer post construction (Interview with PEI Energy Corporation official).

Renewable Energy Tariffs

One of the most innovative aspects of PEI's strategy is the renewable energy tariff (RET). RETs are determined from the cost of developing the resource plus a reasonable or "prudent" profit. While this approach was the norm in North America from the 1920s until the 1990s, the neo-liberal induced deregulation attempted to sweep aside the cost-based determination of tariffs, favouring an unregulated market instead(Gipe, 2006).

Advantages of RETs include:

- Simple, transparent
- Simplified interconnection
- Prices sufficient to drive development
- Lengths sufficient for profitability
- Prices differentiated by technology
- Prices differentiated by resource

Because PEI's RET is used in concert with other policy measures, it is considered non-standard; when it was introduced the only other jurisdictions in North America that employed this measure were Minnesota, Washington State and recently, Ontario. There are serious discussions regarding renewable energy tariffs in British Columbia, Manitoba and Nova Scotia.

On a number of fronts, Ontario's new Standard Offer Program, a standard RET, is more innovative then PEI's mechanism (Gipe, 2006-1). While only wind energy is viable at PEI's tariff rate, Ontario's tariffs vary according to the technology. Ontario's Standard Offer Program is also limited in size to 10 MW, thus ensuring that one or two companies don't come to dominate the market; PEI's tariffs are available for any project.

Gipe (2006-2) states that RETs generate more capacity more quickly and more equitably. They are effective because they grant high financial support, while minimizing the costs of transaction for the developers in relation with their obliged purchases, and by limiting quantity risk and price risks for them. Guaranteed over the long term with sufficiently high prices to generate a profit, banks easily agree to lend (Sawin, 2004). The transaction costs between purchaser and developer of the energy in this arrangement are also minimal, since the rate is set at a constant amount for an extended period with possible small adjustments. It is also possible to avoid a contract between developers and purchasers.

Critiques of this measure fall into three categories (ibid): there is no market incentive to reduce development costs, high tariffs lead to an installed renewable energy capacity that is sub-optimal, and too much rent goes to the developers. The first argument is countered by the fact that producers can increase their profit margin by reducing their costs, a powerful incentive. The issue of too much rent going to developers induces a higher learning effect, as this rent is re-invested in technical innovation. In terms of the second argument, that the capacity may be sub-optimal, this depends on the level of the pricing and the willingness of investors to invest at that level. This contrasts directly with the mandated targets system in which governments set a minimum share of capacity and let the market determine the price. In the tariff system, the share of capacity will increase with a constant price. In the mandated target system, the share will stay the same while the price per unit of energy decreases, which may be beneficial to the public, if these savings are transferred to the public.

Table 1: Renewable Energy Tariff and Quota System

	Renewable Energy Tariff	Quota System
Is it a market model?	The price is political, the amount is decided on a market	The amount is political, partly set by market, partly political
Does it further competition between equipment suppliers?	The equipment producers as a group can expand sales and profit by lowering production costs	Equipment producers face a 6-8 year politically set production quota. They can expand profits by lowering costs and increasing sales prices.
Can it differentiate the price between good and bad "politically desired" wind sites?	Yes, as happens in the PEI model	No, same price is paid everywhere.
Can it price differentiate between the first years and last years of the production of a given renewable energy (RE) plant?	Yes, as happens in the German model	No, same price is paid everywhere.
Can it lower the price in conjunction with RE technology improvements?	Yes, in the German model 2002 wind turbines are 1.5 percent cheaper than 2001 turbines.	No, the quota has to be set for 6-8 years and new improved wind turbines are getting the same price as older inefficient ones
Does it support neighbours and local investors?	Yes, the foreseeable prices make it possible for local communities to borrow from banks.	No, the fluctuating and politically manipulated prices make it difficult to secure loans.
Does it put a cost pressure on equipment producers?	Yes, almost the same cost pressure is put on high and low wind performance sites.	No, in general the coastal sites generate high profits and the inland sites are more marginal.

Source: Hvelplund, 2001

RETs have also incubated a whole new manufacturing sector by allowing a steady flow of manufacturing orders from many diverse project developers. In Germany, 45,000 people are employed in the wind industry alone, and this is forecasted to grow to 110,000 by 2010. This success contrasts sharply with the inherent boom and bust cycle experienced under the periodic release of project tenders (RFPs).

There is little or no cost anticipated for the provincial treasury. The prices for the power delivered using RETs are incorporated into overall system pricing and are borne by the ratepayer.

Financial Costs and Funding Sources

Wind energy on Prince Edward Island is being funded by a mix of private sector, community and public investment.

The two wind farms owned by the PEI Energy Corporation are financed using a mix of federal and provincial government money- the government of Canada and the provincial government committed $4.5 million and $1.1 million over a 10-year period, respectively, toward the purchase of electricity generated by the wind turbines (Natural Resources Canada, 2001). This will be supplemented through private investment collected through the issuance of bonds available to PEI residents.

Ventus Energy has two wind farm projects underway with a rated capacity of 108 MW, funded entirely through private financing from venture capital firms such as Wellington Financial LP (Ventus, 2006). The total cost is estimated at $230 million (City of Summerside, 2006). Summerside Electric, a subsidiary of the City of Summerside, committed to purchase nine MW a year over 20 years from Ventus Energy.

Maritime Electric, PEI's utility, signed a twenty year agreement with Ventus to purchase the power from its nine MW Norway Wind Farm at the rate of $0.0775 per KWh. At $18 million total cost, the wind farm will generate 31,000 kWh of green power for approximately 5000 homes and offset 30,000 tonnes of emissions each year (Ventus Energy, 2006). Ventus' West Cape Wind Farm, rated at 99 MW, is being built in two stages, with a completion date in 2007-2008. The power generated by this farm will be marketed off island.

Research Analysis

The PEI government took a highly proactive and cautionary approach to wind energy development. Careful research ensured that the province learnt from the experiences of jurisdictions with extensive experience in wind development, in particular Europe. As a result, PEI's approach includes a range of features innovative in the North American landscape including:

- No development zones
- The combination of the portfolio standard with the renewable energy tariff
- Extensive public consultations
- Issue of public bonds
- Payment scheme for impacted residents
- Ownership of carbon offsets

Because PEI Energy Corporation was able to construct the first two wind farms on the Island, it was able to set a high bar in terms of public expectations for revenue generation and public consultation. Future private wind energy developments will have to meet this standard, thus ensuring that wind energy on Prince Edward Island benefits local residents.

In the case of Prince Edward Island, the utility was a major roadblock (interview with PEI Energy Corporation official) and continues to present challenges. For example, the utility charges a penalty against wind developers for incorrectly forecasting wind output, called an energy imbalance charge. Each day the wind company predicts how much power will be generated the next day; if the wind is not as strong as anticipated, in the case of Prince Edward Island, the utility has to phone NB Power to request additional power. Similarly, if there is too much power, the utility has to request a reduction. The intermittency of wind energy means that a power plant somewhere must be on standby to compensate for the variation, and from the perspective of a utility, this is a stranded asset which could otherwise be generating power for sale.

These challenges are being overcome through inter-utility cooperation, both between Atlantic province utilities and between New England States and Atlantic provinces. The Minister of Energy on Prince Edward Island chairs an inter-provincial council of Atlantic energy producers and has hosted a meeting on PEI for New England producers.

The commitment of the PEI government to ensure that the economic benefits of wind transfer directly to PEI residents is innovative. The three key aspects of this strategy include, issuing public 'wind farm' bonds, committing 2.5 percent of total revenue to residents impacted by the development and retaining ownership of the carbon offsets that result from wind developments.

While wind farm developments typically attract backlash focused on the issues of noise, bird kill and visual impact, PEI has not yet encountered resistance; this is due to the following factors:

- High level of public understanding of wind power, due to PEI's history of experimenting with wind
- Careful public consultation around new developments
- Opportunity for PEI residents to receive economic benefits
- Use of designated areas restrictions to ensure wind developments occur in areas with low population density and high wind regime

- Maximizing the benefit of each wind turbine by selecting a few larger rather then many smaller wind turbines.

In conclusion, PEI's renewable energy strategy is a carefully thought out and well executed policy that is delivering results.

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