

Chapter 5

Canada

5.1 INTRODUCTION

Canada ratified the Kyoto Protocol in 2002 and is pursuing the implementation of wind energy as part of its response to the climate change challenge. In addition, the country supports the development of this renewable resource to achieve the goals of energy diversification, technology development, job creation, and increased trade. Canada has tremendous wind energy potential, and federal and provincial governments support its deployment through an increasing number of incentive programs. The main vehicle of technical support at the national level is the Wind Energy Research and Development (WERD) Program, at Natural Resources Canada, a department of the federal government of Canada. In 2002, Canada introduced the Wind Power Production Incentive, a 260 million Canadian dollars (CAD) program to accelerate the introduction of wind energy in Canada.

5.2 NATIONAL POLICY

Strategy

The main elements of the WERD program are technology development, resource assessment, test facilities, and information/technology transfer. Field trial projects are selected to evaluate the performance of the new technology under special environmental conditions or for specific applications.

Progress Towards National Targets

Though there are no national wind energy deployment targets, the federal government's Wind Power Production Incentive (WPPI) program ensures the provision of economic incentives for up to 1,000 MW of new installed capacity by 2007. This program is presently the main driver for wind energy deployment in Canada. Other levels of government support the development and expansion of the wind energy industry to varying degrees, and installed capacity is set to grow quickly.

5.3 COMMERCIAL IMPLEMENTATION

Installed Wind Capacity

By December 2003, a total of 315 MW of wind power had been installed in Canada. Alberta is the province with the highest installed capacity, totaling 255 MW. While Quebec did not see a big increase of installation since the Le Nordais installation in 1999, it is poised for increased development in the near future, with two new 54-MW wind farms slated to be commissioned by the end of 2004, and installation of the 1,000-MW request for proposals (RFP) starting in 2006.

New installations in 2003 included the MacBride Wind Farm (75.9 MW) in Alberta, the North Cape Wind Farm Expansion (5.3 MW), and the Aeolous Wind Turbine (3 MW) in PEI, the Parc éolien du Renard (2.25 MW) in Quebec, the Cypress Hill Wind Farm Expansion (4.6 MW) in Saskatchewan, and the Ontario Place Wind turbine (0.75 MW) in Ontario.

Rates and Trends in Deployment

Installed wind power capacity in Canada has experienced an average annual growth rate of 60% over the past five years. Though

average growth is high, it has varied widely from year to year. Large capacity additions occurred in 1999 (100 MW) and 2001 (77 MW). With an estimated 18 MW of capacity additions in 2002, the year-over-year growth was only 8%. In spite of this recent, subdued increase, it is expected that the commencement of new projects supported by WPPI will ensure rapid growth in 2003 and the following four years.

Contribution to National Energy Demand

The national electrical energy demand in Canada in 2003 was 590 TWh. Total installed generation capacity at the end of 2003, the most recent year for which statistics are available, was projected at 112 GW, which includes hydropower, coal, nuclear, natural gas, oil-fired, wood-fired, tidal, and wind plants. The installed wind capacity was 317 MW by the end of 2003, and an estimated 765 GWh of wind energy was produced that year.

5.4 MARKET DEVELOPMENT AND STIMULATION INSTRUMENTS

Main Support Initiatives and Market Stimulation Incentives

Currently, Class 43.1 of the federal Income Tax Act provides an accelerated rate of write-off (30% per year on a declining balance basis) for certain capital expenditures on equipment that is designed to produce energy in a more efficient way or to produce energy from alternative renewable sources.

In addition, the government has legislated the extension of the use of flow-through share financing for intangible expenses in certain renewable projects, through the Canadian Renewable and Conservation Expense (CRCE) category in the income tax system. With CRCE, the Income Tax Act allows the first, exploratory wind turbine of each section of a wind farm to be fully deducted in

the year of its installation, in a manner similar to the one in which the first, exploratory well of a new oil field can be written off.

The federal government has established a Green Power Purchase program. This program allows developers to sell electricity, generated by wind and other forms of renewable energy, to the government at premiums negotiated through a competitive process. As a byproduct of the federal program, wind power producers have built additional wind plants, and green energy is being sold to private, provincial, and municipal consumers.

The newest, and likely the most influential market stimulation instrument so far, is the federal government's 260-million-CAD WPPI program for wind energy developers. This initiative is for projects commissioned after 31 March 2002 and before 1 April 2007. Qualifying wind energy facilities receive an initial incentive payment of 0.012 CAD/kWh of production, declining to 0.008 CAD/kWh of production by the fifth year of the program. The incentive is available for the first ten years of production and helps to provide a long-term, stable revenue source. The program is intended to help address climate change and improve air quality.

Interest in WPPI has been high – by December 2003, the program had registered Letters of Interest applications totaling 110 projects and 5,300 MW of capacity. (Funding, however, is limited to supporting about 1,000 MW of wind power.) On the basis of quantity and quality of applicants, it is expected that 2004 will be a watershed year for wind power development in Canada.

Provincial and territorial governments are being encouraged to provide additional support, and a number of provinces have begun to develop their own complementary programs. For example, Quebec has announced RFPs for 1,000 MW to be built between 2006 and 2012. Ontario has also recently

announced support for renewables through a significant tax rebate program and RPS. So far, however, none of the provincial programs offers the same level of incentive as that provided by WPPI.

Unit Cost Reduction

Does not apply.

5.5 DEPLOYMENT AND CONSTRAINTS

Wind Turbines Deployed

Several wind turbines of 150-kW or less are deployed in Canada, in addition to the following higher-capacity wind turbines:

- 57 US Windpower (Keneteck) 360-kW and 375-kW wind turbines
- One NEG-Micon 900-kW and 136 NEG-Micon 750-kW wind turbines
- 20 Nordex 1.3-MW wind turbines
- Five Vestas V44-600-kW, 87 Vestas V47-660-kW, and seven Vestas V80-1.8-MW wind turbines
- One Enercon E 40-600-kW wind turbine
- One Turbowinds 600-kW wind turbine
- One Tacke 600-kW wind turbine

Operational Experience

Most of the wind turbines presently operating in Canada are privately owned, which makes it very difficult to obtain their operating performance data.

Main Constraints on Market Development

The main constraints for wind energy development in Canada are the lower cost of conventional energy and a surplus of generation capacity in many areas. However, in a few jurisdictions these factors are changing. In some provinces, such as Alberta and Ontario, surplus generation is rapidly declining. In addition, the recently announced production incentive allows wind-based

electricity generation to be more competitive with conventional forms, particularly in those regions where the provincial governments choose to contribute.

5.6 ECONOMICS

Trends in Investment

The budget for the WERD program of Natural Resources Canada is about 550,000.00 CAD with contributions of about 1.5 million CAD from contractors, research institutions, and provinces.

The Canadian government's Technology Early Action Measures (TEAM) program provides funds for activities falling under the Climate Change Initiative, which include renewable energy deployments. The funds from this program can be accessed for wind energy projects that involve nearly developed technologies ready for field trial in the short term. So far, about 2 million CAD has been accessed to leverage projects sponsored by WERD in the last three years.

The WPPI program is an incentive on production given directly to the developers of wind farms. It represents about 0.01 CAD/kWh for a ten-year period.

Trends in Unit Costs of Generation and Buy-Back Prices

Electricity deregulation in Alberta resulted in the restructuring of government-owned utilities into a free-market system. Full retail competition between power generators began on 1 January 2000. This process has allowed wind generators freer access to the electrical grid. In Ontario, a similarly deregulated system commenced on 1 May 2002. However, a few short months later, the provincial government, under political pressure for rising electricity prices, capped the generation component of the cost to small consumers, effectively freezing the

rates for four years. This is viewed as a set-back to private generators, some of which have been considering wind power projects. Nevertheless, incentives for renewables, now being finalized, are expected to offset the impacts of the rate cap.

In all other Canadian jurisdictions, the buy-back price is generally set by the local utility and based on avoided costs. On the other hand, the large Le Nordais project in Quebec pre-negotiated special buy-back rates from Hydro Quebec, which are believed to be above the utility's avoided costs.

5.7 INDUSTRY

Manufacturing

The following five companies manufacture wind energy components in Canada:

1. Dutch Industries produces water pumping units in Regina, Saskatchewan.
2. Wenvor-Vergnet of Guelph, Ontario, and Plastique Gagnon of Quebec develop small, 20-kW to 30-kW wind turbines.
3. Vergnet Canada of Montreal, Quebec, develops 10-kW to 275-kW wind turbines for grid-connected, remote communities and stand-alone applications.
4. Novelek Technology of New Brunswick has developed 10-kW and 25-kW inverters for the commercial wind turbine market.
5. Bolwell Corporation of Huron Park, Ontario, manufactures blades for 10-kW to 1.5-MW wind turbines. The company produces rotor blades on spec for wind turbine manufacturers and also has a generic blade design, suitable for turbines in the 750-kW to 900-kW range.

Industry Development and Structure

Industries that are related to wind energy include manufacturers of rotor blades, control

systems, inverters, towers, and small wind turbines as well as wind resource assessment firms and wind farm developers.

5.8 GOVERNMENT-SPONSORED R,D&D

Priorities

The focus of the Canadian national wind energy program continues to be on R&D to develop safe, reliable, and economic wind turbine technology to exploit Canada's large wind potential, as well as supporting field trials. The program also supports a national test site, the Atlantic Wind Test Site (AWTS) at North Cape, PEI, for testing electricity-generating wind turbines and wind/diesel systems.

New R,D&D Developments

The program supports new technology development activities related to the following:

- Components for wind turbines in the range of 600-kW to 2-MW
- Small- to medium-sized wind turbines (10 kW to 275 kW) for use in agro-business, and to supplement diesel-electricity generation in remote communities
- Wind/diesel control systems for wind/diesel hybrids in remote communities

Offshore Siting

The government is studying the impacts and regulation of offshore wind farms in the context of large projects off the coast of British Columbia in the Pacific.

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