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Sustainable Energy Solutions

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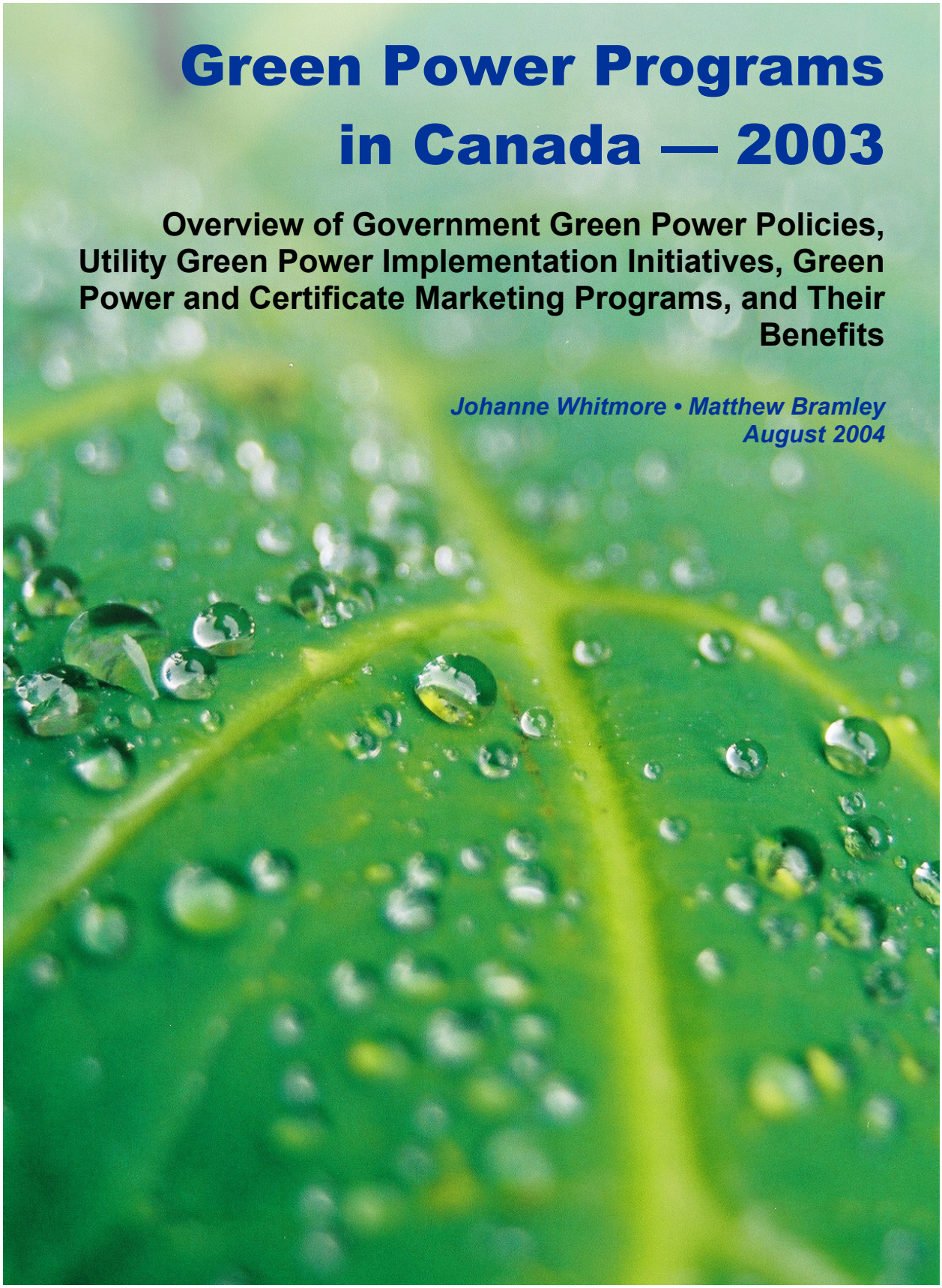
Johanne Whitmore • Matthew Bramley

August 2004



REPORT

Green Power Programs in Canada — 2003

Overview of Government Green Power Policies, Utility Green Power Implementation Initiatives, Green Power and Certificate Marketing Programs, and Their Benefits

By Johanne Whitmore and Matthew Bramley

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Pembina Institute
for Appropriate Development

About the Pembina Institute

The Pembina Institute is an independent non-profit research, education and advocacy organization that promotes environmental, social and economic sustainability through the development of practical solutions for businesses, governments, individuals and communities. The Pembina Institute provides policy research leadership on climate change, energy policy, green economics, renewable energy, and environmental governance, as well as extensive formal and public education programs. More information about the Pembina Institute can be found at www.pembina.org.

Disclosure

In November 2003 the Pembina Institute launched its own green power program, selling green power certificates that represent the environmental attributes of wind power generated by Vision Quest Windelectric (see Section 2.3.4 of this report). The program has two objectives: to support the growth of the green power sector and to support the work of the Pembina Institute. The Pembina Institute recognizes that there may appear to be a conflict of interest between promotion of its own green power certificate marketing program and maintenance of objectivity in this report. However, the authors are confident that the report's objectivity remains wholly unaffected, because the report seeks only to describe and evaluate in a transparent and standardized way the essential features of green power programs in Canada, without passing judgement on them or highlighting some programs more than others. The report also reproduces in full (edited only for clarity) the answers provided by green power program proponents to questions about barriers to the implementation of such programs.

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1. Introduction to Green Power and Green Power Programs

1.1 What is green power?

"Green power" generally refers to electricity with two key characteristics:

- it is produced from renewable sources, and
- its production has low adverse impacts on the environment, human health and communities.

Electricity production from fossil fuels, especially coal, is a major source of greenhouse gases (GHGs) that cause climate change, as well as the regional air pollutants that contribute to acid deposition and smog. Electricity production was responsible for 19% of Canada's GHG emissions in 2001,[1] and for 27% of Canada's sulphur dioxide emissions in 2000.[2] Coal-fired electricity production is also a major source of the toxic metal mercury, accounting for 25% of Canada's air emissions of mercury in 2000.[3]

Green power, on the other hand, has zero or near-zero GHG emissions. Green power sources like wind, hydro and solar power also have zero emissions of regional air pollutants. Green power therefore has an important role to play in Canada's efforts to address climate change and air pollution. Production of green power can also avoid the adverse impacts on watersheds and landscapes associated with conventional electricity generation, and prevent the pollution and other environmental impacts resulting from the production, distribution (and, where applicable, disposal) of fossil and nuclear fuels.

In addition to its environmental benefits, green power has important benefits for energy security, regional development, economic diversification and creation of skilled jobs:

- Most green power production has no need for supplies of fuel that can be subject to major price fluctuations and international disputes. Indeed, green power's lack of fuel price volatility risk can make it competitive with conventional electricity for long commercial contracts.
- Unlike conventional electricity generation, which involves a small number of very large, centralized facilities, green power development results in a network of numerous small-scale plants with a wide geographic distribution and the promise of economic stimulus in multiple, mainly rural locations.
- Green power generation projects have much shorter development times than larger centralized projects.
- Rental fees from wind turbines located on private land provide ranchers and farmers with a consistent source of revenue that supplements and supports their annual incomes.
- Wind, solar and biomass-fired facilities all generate more jobs per megawatt-hour (MWh) in the construction, manufacturing and installation sectors than do coal- and natural gas-fired facilities.[4]

Precise definitions of green power vary as a result of different views on which levels of adverse environmental, health and social impacts are considered to be sufficiently low, and on which sources are

1 Environment Canada. 2003. *1990–2001 National and Provincial GHG Emissions*; http://www.ec.gc.ca/pdb/ghg/ghg_tables_2001_e.cfm.
2 David Niemi, Environment Canada, personal communication, 2004.
3 Environment Canada. 2004. Undated. *Sources of Mercury — Canadian Releases*; http://www.ec.gc.ca/MERCURY/SM/EN/sm-cr.cfm?SELECT=SM.
4 Kammen, D., K. Kapadia and M. Fripp. 2004. *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* Renewable and Appropriate Energy Laboratory, University of California, Berkeley, p. 8; http://ist-socrates.berkeley.edu/~rael/outreach.html.

considered to be renewable.[5] The issue of certifying green power generation facilities or products, which depends on adopting particular definitions, is discussed further in Section 4. There is, however, broad agreement that green power sources include wind, solar, sustainably produced biomass, small-scale hydro, earth, tidal and waste energy. The following paragraphs provide brief summaries of the four technologies that currently dominate Canada's green power capacity: wind, small-scale hydro, wood-waste biomass and biogas.

Wind: Wind energy is one of the fastest-growing sources of energy in the world. To date, however, Canada has made little use of wind power compared to other industrialized countries. By June 2004, Canada's installed capacity was 341 megawatts (MW),[6] compared to 13,407 MW installed by late 2003 in Germany,[7] the country with the largest installed capacity. Canada's geographical characteristics result in a considerable wind resource. A very large untapped potential exists in the northern remote regions, along the west and east coasts, in lakefront areas in the Great Lakes region and in site-specific locations in the Prairies. Small wind turbines can be used for remote small-scale applications, and larger wind farms can be used for grid-connected applications.

Small-scale hydro: Canada's current small-scale hydroelectric capacity is about 2000 MW.[8] Natural Resources Canada has completed an inventory of Canadian small hydroelectric sites, identifying over 5,500 sites with a technically feasible potential of about 11,000 MW. Only about 1,650 MW of this would be economically feasible currently, but an additional 2000 MW of economically exploitable capacity would become available if capital costs could be reduced by 10–15%.[9] Given the need to conduct site-specific assessments, it is difficult to estimate the proportion of existing or potential future projects that have sufficiently low adverse impacts to qualify as green power.

Wood-waste biomass: Canada's largest biomass resource is wood. Many facilities in Canada's forest products industry now use bark, sawdust, shavings and/or other wood residues for large-scale production of electricity and heat for their own needs. Canada also has a few grid-connected wood-waste-fired power plants operational or under construction, with a maximum capacity of 60 MW.[10] It is projected that Canada will produce surplus wood residues in 2010 with an energy content of 57.6 petajoules (16,000,000 MWh) under a business-as-usual scenario.[11] Whether a given wood-waste-fired electricity generation facility can be considered to be producing green power depends on issues including sustainability of harvesting, appropriateness of waste management and emissions of air pollutants.

Landfill/digester biogas: Others sources of biomass are municipal solid wastes and livestock wastes. Anaerobic decomposition of biomass wastes in landfills or digesters produces methane-rich "biogas" that can be used as fuel for electricity generation. By 1999, Canada was generating 85.3 MW of electricity

[5] For the Pembina Institute's views on what constitutes green power, see Raynolds, M. and A. Pape-Salmon. 2002. *Pembina Institute Green Power Guidelines for Canada*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=23.
[6] Canadian Wind Energy Association. 2004. *Canada's Wind Farms*; http://www.canwea.ca/en/CanadianWindFarms.html.
[7] German Wind Energy Association. Undated; http://www.wind-energie.de/englischer-teil/english.htm.
[8] Natural Resources Canada. 2000. *Hydroelectric Energy Resource Assessment*; http://www.canren.gc.ca/resou_asse/index.asp?CaId=54&PgId=274.
[9] *Ibid.*
[10] Pape-Salmon, A., J. Dogterom, C. Wieler and M. Anielski. 2003. *Low-Impact Renewable Energy Policy in Canada: Strengths, Gaps and a Path Forward*. Drayton Valley: Pembina Institute, p. 22–23; http://www.pembina.org/publications_item.asp?id=150.
[11] National Climate Change Process Forest Sector Table. 1999. *Options Report: Options for the Forest Sector to Contribute to Canada's National Implementation Strategy for the Kyoto Protocol*, p. 24; http://www.nccp.ca/html/tables/pdf/options/Final_Options_Report_English.pdf.

from captured municipal landfill gas,[12] and there are significant opportunities for increasing this amount.[13] Whether a biogas-fired electricity generation facility can be considered to be producing green power depends on a number of factors, including emissions of air pollutants, and whether biogas production is tied to the ongoing operation of a waste management system that fails to maximize recycling and composting.

It is also worth noting that **solar power** is now finding niche applications in Canada, despite the fact that its cost remains relatively high (although falling). For example, in the northern Yukon solar power systems are being used to power telecommunication sites, highway maintenance camps and park facilities. Even though northern countries have a poor solar resource relative to tropical countries, Canada's potential solar resource for heating and electricity is enormous. A solar power assessment conducted in the United Kingdom (located at a similar latitude to Canada) showed that solar photovoltaic (PV) cells could produce an output equivalent to current national electricity generation from 2% of the land area. It was calculated that this output could be achieved by integrating PV modules into roofs and walls, without any additional demand for land.[14]

1.2 Categories of green power programs

A certain amount of green power capacity has been developed autonomously in Canada without specific intervention by governments or major electric utilities. But in the absence of such intervention, green power remains, in most cases, more costly in purely monetary terms than conventional power. A broadening of the concept of cost to include damage to the environment and human health could lead to green power being seen as generally less costly than conventional power. Indeed, to guide its purchases of green power, the federal government uses a comparison of its price with the "full" price of conventional power, where the latter is calculated using a full environmental net cost accounting model.[15] However, in the absence of broad market instruments[16] to adequately incorporate environmental and health impacts into all energy prices, specific policies and programs are required to stimulate green power development.

The following three sections describe the categories of programs responsible for most of the green power development currently occurring in Canada.

1.2.1 Government green power policies

Key government policies used in various countries to directly stimulate significant green power development include the following:

- "renewable portfolio standards" that require a minimum percentage of electricity to be green power
- financial incentives (e.g., tax credits) paid to green power producers per kilowatt-hour (kWh) generated
- other tax benefits such as accelerated depreciation of green power generating equipment for tax purposes

[12] Landfill Gas Industry Alliance. Undated; http://www.lfgindustry.org/Landfill.asp.
[13] National Climate Change Process. 1998. *Municipalities Issue Table Foundation Paper*, p. 75–76; http://www.nccp.ca/NCCP/pdf/mun_found.pdf.
[14] Royal Commission on Environmental Pollution. 2000. *Energy — The Changing Climate*. London: Royal Commission, p. 132; http://www.rcep.org.uk/newenergy.htm.
[15] Welsh, L. 2003. *The Government of Canada's Incentive Programs*. Presentation to the Conference "How to Profit from the Business of Renewable Energy," Toronto, 20–21 October.
[16] For example, renewable energy portfolio standards, emissions trading systems, or environmental taxes.

- guaranteed prices per kWh for green power producers
- financial incentives paid to green power customers
- energy or carbon taxes providing a relative advantage to green power over conventional power
- allocations (sometimes called "set asides") of emissions allowances or credits to green power facilities in emissions trading schemes
- "public benefits funds" to fund green power projects from charges levied on electricity purchases
- grants, loans or loan guarantees to green power project developers or green power marketers
- construction of green power generation facilities by government agencies
- directives to electric utilities by electricity sector regulatory authorities
- procurement of green power by governments
- measures to support voluntary green power markets (e.g., facilitating rules and labelling regulations for marketing programs).

Procurement of green power by governments has been a key factor in stimulating the launch of green power marketing programs in Canada. The federal government has purchased green power from ENMAX, SaskPower, Maritime Electric[17] (with provincial government participation in the latter two cases) and Energy Ottawa.[18] These purchases are in partial fulfillment of its commitment to meet 20% of its electricity requirements with green power[19, 20] and have been pioneering examples of green power procurement. Another major forthcoming initiative is the government of Alberta's commitment to meet more than 90% of its electricity requirements from green power sources, beginning in 2005.[21] Government green power procurement is not explicitly included among the government green power policies described in Section 2.1, but this is only because it is included implicitly in the categories of utility green power implementation initiatives (Sections 1.2.2 and 2.2) and green power marketing programs (Sections 1.2.3 and 2.3).

Apart from government procurement, relatively few examples of the policies listed above have been implemented to date in Canada. For example, no governments in Canada have yet implemented mandatory renewable portfolio standards or public benefits charges levied on electricity purchases. This is in contrast to 15 and 16 US state governments respectively that have done so.[22] However, governments in Canada do now seem to have begun a trend towards implementing major green power policies. For example, the governments of New Brunswick, Nova Scotia, Ontario and Prince Edward Island are now close to implementing mandatory renewable portfolio standards (see Appendix A). Perhaps the most notable green power policy that has been implemented is the Wind Power Production Incentive, a major financial incentive at the federal level.

[17] Natural Resources Canada. 2004. *Government Purchases of Electricity from Renewable Sources*; http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=464.
[18] Public Works and Government Services Canada began purchasing green power from Energy Ottawa for government buildings in Ontario in May 2004; the purchases will ramp up to 90,000 MWh a year of hydro power per year by fiscal year 2005–06 (Deirdre Hetherington, Natural Resource Canada, and Leslie Welsh, Environment Canada, personal communications, 2004).
[19] Government of Canada. 2000. *Government of Canada Action Plan 2000 on Climate Change*, p. 8; http://www.climatechange.gc.ca/english/whats_new/action_plan.shtml.
[20] Government of Canada. 2002. *Climate Change Plan for Canada*, p. 33; http://www.climatechange.gc.ca/plan_for_canada/plan/.
[21] Government of Alberta. 2003. *Alberta Leads Country In Purchase Of Green Power*. News release, 12 March; http://www.gov.ab.ca/acn/200303/14035.html.
[22] Union of Concerned Scientists. 2003. *Clean Energy — What's Happening in Your State?*; http://www.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=96.

Key drivers for the implementation of government green power policies in Canada include the following:

- the need to comply with Canada's Kyoto Protocol target to reduce net national GHG emissions to 6% below the 1990 level during 2008–2012
- reduction of the electricity sector's contribution to regional air pollution (smog and acid rain) — smog in particular being a major public concern, especially in Ontario
- governments' desire to secure additional, publicly acceptable electricity supplies to forestall shortages (again, especially in Ontario)
- governments' interests in energy security, regional development, economic diversification and creation of skilled jobs (see Section 1.1)
- public preference for energy sources that have low environmental impacts.

1.2.2 Utility green power implementation initiatives[23]

Several large Canadian electric utilities have begun voluntarily establishing green power generation facilities and/or purchasing green power from independent producers. These initiatives are sometimes described as "voluntary portfolio standards." In some cases the green power is blended with conventional power in the electricity product offered to all consumers, with any cost premiums being recovered from the entire consumer base. While these initiatives are not primarily driven by green power marketing, in other cases the utilities seek to sell the green power at a premium through green power or certificate marketing programs (Section 1.2.3).

When evaluating utilities that are crown corporations, it can be difficult to distinguish utility green power implementation initiatives from government green power policies (Section 1.2.1), as provincial governments often use their wholly owned electric utilities as instruments of policy. There is therefore some arbitrariness in Section 2 in classifying such programs. There is also some arbitrariness in judging which initiatives are not primarily driven by green power marketing.

Key drivers for utility green power implementation initiatives include

- the desire by provincial governments that own utilities to develop green power, for reasons outlined in Section 1.2.1
- companies' desire to be seen as environmentally responsible
- companies' desire to gain experience with green power technologies, with the expectation that these technologies will become increasingly important in future
- companies' desire to reduce their exposure to potential future regulated constraints such as GHG emissions limits
- customers' desire for utilities to develop green power, revealed through market research
- customers' (including governments') willingness to pay for green power through green power or certificate marketing programs.

1.2.3 Green power and certificate marketing programs

Several electricity providers in Canada now offer a specific green power product as an alternative to conventional electricity. These products are usually offered at a higher price than conventional supplies to cover the cost premium associated with generating green power. The advantage for utilities is that the premium does not have to be borne by the entire consumer base, and the advantage for customers that

[23] These were referred to as "utility green power development programs" in the 2003' edition of this report. See Bramley, M., S. Boustie, J. Vadgama, C. Wieler and A. Pape-Salmon. 2003. *Green Power Programs in Canada — 2002*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=162.

they can choose to purchase the amount of green power they wish. This type of offering is commonly referred to as "green power marketing" or "green pricing." Some green power marketing programs target residential customers, some target business customers, and some both. Governments are also important customers in green power marketing programs.

Experience is showing that a significant number of consumers are willing to pay a green power premium in exchange for receiving a product of higher environmental quality. Their primary motivation is reductions in air emissions from fossil-fuelled electricity generation. Residential customers are interested in taking actions to enhance their personal level of environmental responsibility; business customers may want to be seen as environmentally responsible and proactive and, in some cases, meet voluntary targets for the proportion of their electricity consumption supplied by green power and/or corporate emissions targets (through ownership of the emission reductions inherent in green power). Governments, as noted above, are also setting targets for meeting a proportion of their electricity requirements from green power sources. These are all important drivers for green power marketing initiatives.

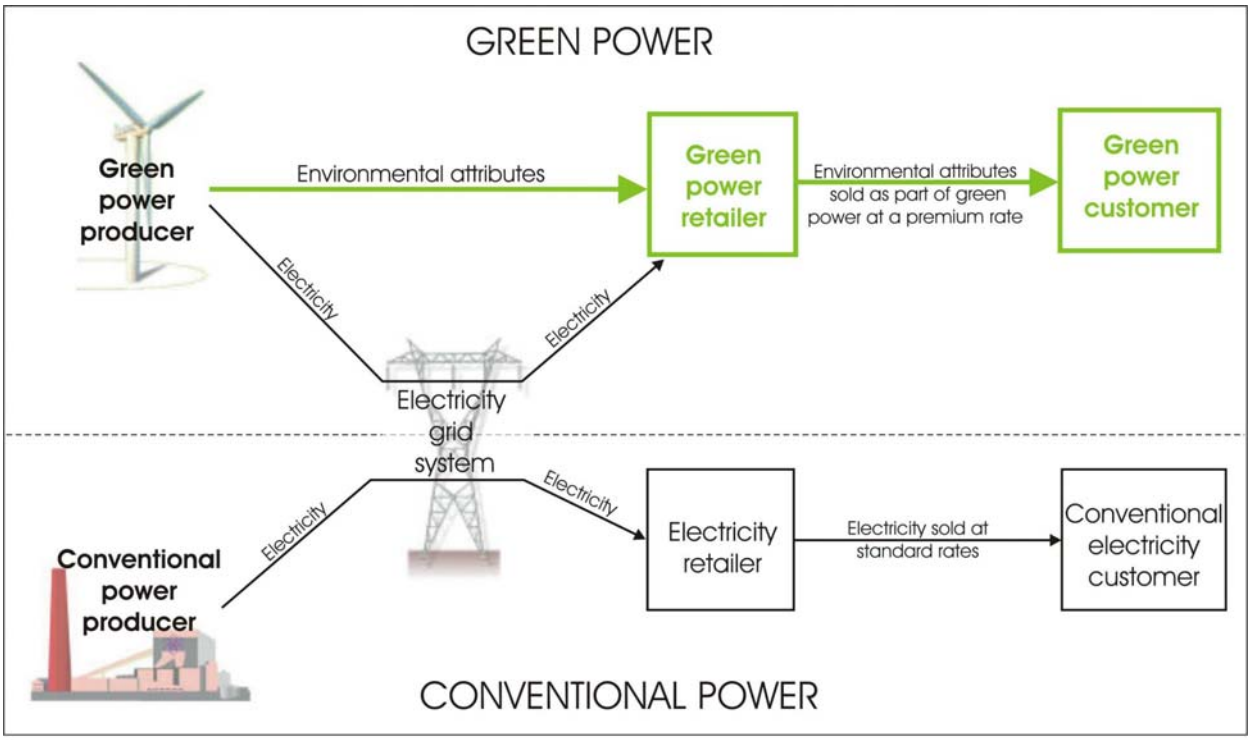
In some cases, the power sold under green power marketing programs comes from generation facilities that were established many years ago, either for economic reasons or as a result of past government policies. Utilities are now having such facilities certified as green power facilities and selling their products through new green power marketing programs. This is the case with Ontario Power Generation's Evergreen Green Power program, which depends at present almost entirely on small hydro facilities dating back as far as 1900. It is also the case with EPCOR's Green Power ECO-PACKs and Canadian Hydro Developers' Renewable Energy Certificates, which depend in part on green power facilities established as a result of Alberta's Small Power Research and Development Act (1988). In these cases, it can be said that a driver for utilities for establishing green power marketing initiatives is the opportunity to secure a higher price than was previously paid for electricity produced by these facilities. In such instances, the part of the price premium corresponding to pre-existing facilities does not contribute to the development of new green power facilities, create any new displacement of conventional power, or produce any new reductions in adverse environmental impacts.

Green power can be considered a combination of two distinct products: electricity plus a bundle of "environmental attributes." Some companies are using this concept to market certificates that represent the environmental benefits of green power, separate from the electricity itself. The various programs that currently exist in Canada refer to these attributes as "renewable energy certificates," "green power certificates," "green tags," or "green energy tags." Green power certificates are a new paper commodity representing the reductions that green power generation brings about in emissions of GHGs and regional air pollutants, impacts on watersheds and landscapes, and impacts resulting from the life cycle of fuels.[24]

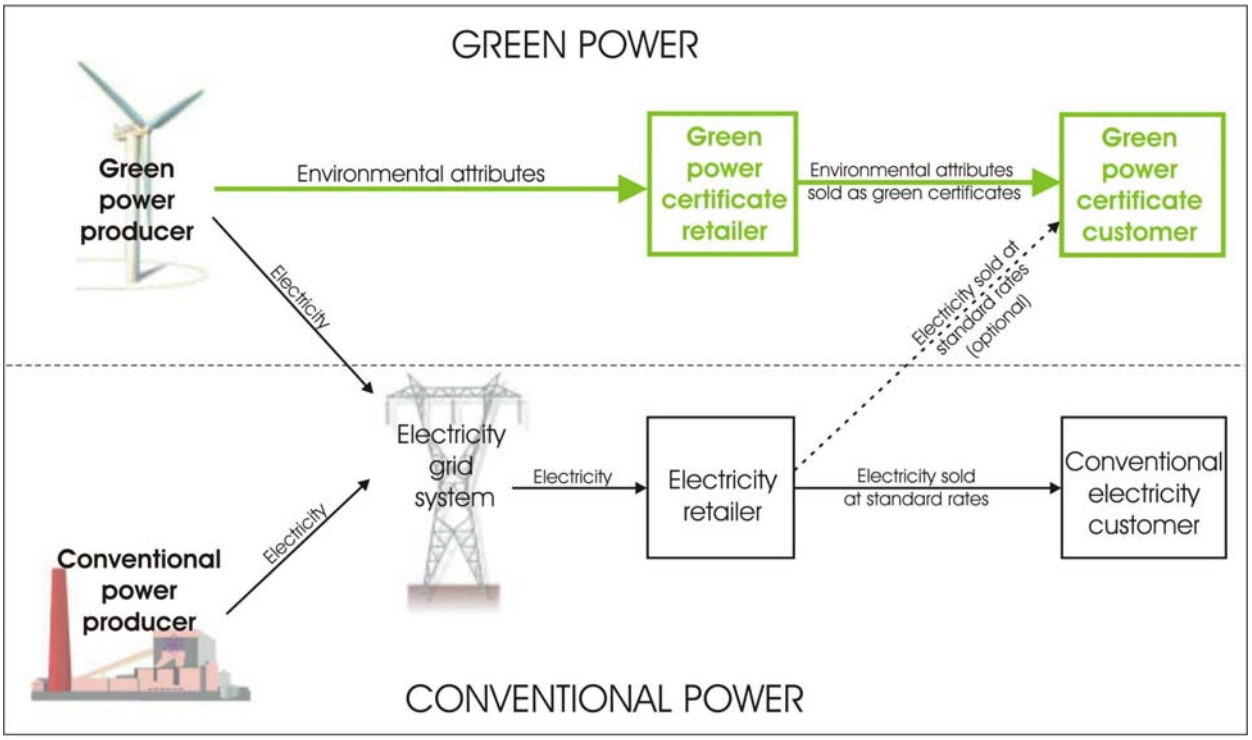
Green power and green power certificate marketing programs are treated together in this report because both products can only be created if a corresponding amount of green power has been generated. The difference between the two types of programs lies in the way the customer purchases the environmental attributes. In green power marketing, the environmental attributes and the electricity are sold together (Figure 1A) at a price usually above standard electricity rates, while certificates allow the environmental attributes to be purchased separately and apart from the electricity itself (Figure 1B). The price of certificates corresponds to the price difference (or "premium") between green power and standard electricity.[25]

[24] Green power and green power certificates are often said to represent also the socio-economic benefits of green power, such as energy security, regional development, economic diversification and creation of skilled jobs. However, it is worth noting that EcoLogo-certified green power, for example (Section 4.2.1), is only required to include environmental attributes.

[25] This obviously no longer applies in cases such as long commercial contracts where, as noted in Section 1.1, green power's lack of fuel price volatility risk can make it competitive with conventional electricity, i.e., green power is not being sold at a premium.



A. How green power marketing works



B. How green power certificate marketing works

Figure 1. How green power marketing and green power certificate marketing work

Certificates have both advantages and disadvantages. An electricity consumer wishing to support green power is at liberty to purchase certificates from any certificate marketer, rather than needing to have access to an electricity provider offering a green power product. Indeed, many electricity consumers in Canada do not yet have access to electricity providers offering a green power product. It is also generally easier for small organizations to market certificates than to market green power. In addition, green power certificates are more flexible than green power in that they can be purchased by anyone, not just electricity consumers. A business may, for example, want to buy green power certificates to offset corporate GHG emissions, irrespective of its electricity needs.

On the other hand, the offset concept, and the separation of the electricity and the environmental attributes, may be unattractive or too abstract to customers whose primary concern is simply to satisfy their electricity needs with green power. However, when green power certificates are sold to a customer who is buying at least an equivalent amount of power on a grid interconnected with the originating green power generation facility, green power certificate marketing becomes indistinguishable from green power marketing. This is made evident in Figure 1.

A risk associated with both green power and certificate marketing is that environmental attributes of the green power that is generated could be sold to multiple consumers, paid for more than once, and/or claimed by multiple parties as evidence of their environmental performance. This issue is also known as "double counting" of the environmental attributes. This risk needs to be eliminated through product auditing programs that track the source and destination of each unit of green power or green power certificate, and guarantee that all attributes have been either (i) explicitly transferred to customers or (ii) "retired" on the customers' behalf *without use* — that is, without being claimed in any way by the vendor.

1.3 The scope of this report

The scope of this report is green power activities related to the three categories of programs outlined above in Sections 1.2.1–1.2.3. As stated above, those categories of programs are responsible for most of the green power development currently occurring in Canada.

Some green power activities are not covered by this report because of difficulties in quantifying them and/or determining whether the power generated can actually be considered to be green power:

- **Generation of green power not certified or identified by the generator as green power**. As mentioned in Section 1.2.3, some electric utilities have recently been seeking green power certification for generation facilities that predate the concept of "green power." A considerable number of mainly small hydro facilities in British Columbia, Manitoba, Newfoundland and Labrador, Québec and the Yukon remain uncertified and unidentified as green power facilities. Likewise, as noted in Section 1.1, a significant amount of electricity is generated in Canada from landfill gas, but only a small proportion of it is certified or identified as green power. There may be a few other green power facilities not identified by utilities as part of a specific green power program and therefore not covered by this report.
- **Industry or residential self-generation**. Some industrial facilities in Canada, especially in the forest products and mining sectors, generate electricity for their own needs from biomass or small hydro facilities. Some individuals also use small wind turbines or PV arrays to generate electricity for their own use. Many of these examples could probably qualify for green power certification, but are not covered by this report.
- **Net metering**. By supplying surplus power into the grid at certain seasons or times of day, some small wind, solar and hydro power generators can offset their costs of purchasing grid electricity. This is referred to as "net metering," whereby the consumer is only charged for the net amount of

electricity consumed, with the amount supplied back into the grid subtracted from the total. The only utilities allowing net metering in 2003 were Hydro One, Toronto Hydro, Nova Scotia Power and Manitoba Hydro. Utilities in other provinces and territories are currently developing net metering programs. For example, BC Hydro began allowing net metering in 2004.[26] Net metering will also be permitted throughout Ontario as part of the provincial government's efforts to reduce Ontario's energy consumption by 5% by 2007.[27] However, the amounts of power involved are very small compared to green power programs covered in this report.

- **Small government programs**. There are a number of government programs that provide some support for green power technologies but that are not covered in this report. However, Section 2 does cover all government programs of which the authors are aware that have had a significant impact on the establishment of existing green power generation facilities.

[26] See http://www.bchydro.com/info/ipp/ipp8842.html.

[27] Government of Ontario. 2004. *McGuinty Government Building Culture of Conservation*. News release, 19 April; http://www.premier.gov.on.ca/english/news/Energy041904.asp.

2. Canadian Green Power Programs Active in 2003: Descriptions

In this section descriptions are provided of all Canadian green power programs active in 2003 (i.e., resulting in or contributing to actual power generation during that year), and that fall into one of the three categories outlined in Section 1.2. Information in the following sections is based on surveys sent to each program proponent, augmented by follow-up communications and other publicly available information.[28]

Green power programs are developing rapidly in Canada. While the scope of this section and Section 3 is limited to programs active in 2003, brief descriptions of new programs operating in 2004 or currently under development are provided in Appendix A.

In Section 2.1 below, procurement of green power by governments is not explicitly included because, as noted in Section 1.2.1, it is included implicitly in the categories of utility green power implementation initiatives (Section 2.2) and green power and certificate marketing programs (Section 2.3). In Sections 2.2 and 2.3, green power development initiatives by small independent power producers are not explicitly listed except where small producers are selling their product directly to consumers. Otherwise, green power development by small independent producers is captured implicitly under large utilities' green power purchases (Section 2.2), or green power and certificate marketing initiatives (Section 2.3).

Certification schemes referred to in the following sections are detailed in Section 4.2.

2.1 Government green power policies

A summary of the programs described in this section is provided in Table 1.

2.1.1 Federal: Class 43.1 accelerated capital cost allowance rate and Canadian Renewable and Conservation Expenses (Income Tax Act and Regulations) [29]

The Class 43.1 accelerated capital cost allowance rate and Canadian Renewable and Conservation Expenses (CRCE) were introduced in the 1996 federal budget to promote energy efficiency and small- to medium-scale renewable energy through the income tax system. Class 43.1 in Schedule II of the Income Tax Act allows taxpayers an accelerated write-off at up to 30% per year of equipment generating electricity from wind, hydro (less than 50 MW capacity[30]), biomass (municipal waste, wood waste, landfill gas and anaerobic digester biogas), solar PV (over 3 kW), geothermal and certain cogeneration systems.

CRCE is a category of 100% tax-deductible expenditures associated with the start-up of projects for which at least 50% of the capital costs of the property would be described in Class 43.1. Expenses eligible under CRCE include the cost of pre-feasibility and feasibility studies of suitable sites and potential markets; costs related to determining the extent, location and quality of energy resources; negotiation and site approval costs; certain site preparation costs; service connection costs incurred to transmit power from the project to the electric utility; and wind turbines used to test energy production at the site.

[28] Additional details on information sources are available from the authors upon request.
[29] Government of Canada. 1998. *Tax Incentives for Business Investments in Energy Conservation and Renewable Energy*. Brochure. Cat. no. M92-159/1998; http://www.canren.gc.ca/app/filerepository/General-tax_incentives.pdf.
[30] The size limit was increased from 15 MW to 50 MW in 2001. See Department of Finance Canada. 2001. *The Budget Plan 2001*, p. 128–129; http://www.fin.gc.ca/budget01/pdf/bpe.pdf.

A number of small hydro facilities have been made economically viable by the Class 43.1 accelerated capital cost allowance rate alone,[31] but we have not been able to quantify them. Class 43.1 and CRCE do not appear, on their own, to have resulted in the installation of any other kinds of green power facilities. But by removing key fiscal barriers, they have been a significant factor in the establishment of such facilities in combination with other programs. The resulting green power capacity is accounted for in this report under those other programs.

The Class 43.1 accelerated capital cost allowance rate and CRCE are not subject to any explicit environmental criteria other than compliance with applicable laws and regulations. Some of the facilities supported by these measures may therefore have environmental impacts greater than those normally considered acceptable for green power.

2.1.2 Federal: Wind Power Production Incentive[32]

The Wind Power Production Incentive (WPPI), announced in the December 2001 federal budget, provides incentive payments for ten years to wind power generation facilities over 500 kW (20 kW for remote and/or Northern projects) commissioned between April 1, 2002 and March 31, 2007. Payments began at 1.2 cents per kWh, and will decline to 0.8 cents per kWh by 2007. The incentive was designed to cover half the cost premium for wind energy for facilities with good conditions, and "spur complementary actions and participation by provincial/territorial governments, retailers and power consumers."[33] Projects are receiving the incentive on a "first in construction, first served" basis, subject to restrictions to ensure balance between different regions, up to a total cumulative capacity of 1,000 MW.

This program is likely to have a major future impact, especially if it is expanded, given that by early August 2004 the government had received letters of interest from proponents of eligible projects adding up to 8,990 MW.[34]

Two wind power generation facilities benefiting from the WPPI entered into service in 2002: SaskPower's 5.9 MW Cypress facility and Huron Wind's 9 MW facility in Ontario. The Cypress facility is covered under SaskPower's GreenPower program (Section 2.3.14), and the Huron Wind facility under Ontario Power Generation's green power target (Section 2.2.5) and Evergreen Green Power program (Section 2.3.11).

Additional new wind power generation facilities benefiting from the WPPI entered into service in 2003,[35] including Canada's largest (75 MW) wind farm at McBride Lake, Alberta and several other smaller facilities throughout the country: Exhibition Place (0.75 MW) in Toronto; Summerview (1.8 MW) at Pincher Creek, Alberta; Renard (2.25 MW) at Rivière-aux-Renards, Québec; and the Aeolous (3 MW) prototype facility at Norway, Prince Edward Island. McBride Lake and Summerview are covered under ENMAX's Greenmax program (Section 2.3.1) and Vision Quest's Green Energy Tags (Section 2.3.5); Exhibition Place under Toronto Hydro/TREC's wind power development (Section 2.2.6); and Renard under Hydro-Québec's wind power development (Section 2.2.7). Aeolous was largely out of commission in 2003 and is therefore not accounted for in this report. PEI Energy Corporation and SaskPower also benefited from the WPPI in late 2003 to expand the North Cape and Cypress facilities respectively. As

[31] Leslie Welsh, Environment Canada, personal communication, July 2004.
[32] See http://www.canren.gc.ca/programs/index.asp?CaId=107&PgId=622.
[33] Natural Resources Canada. 2001. *Wind Power Production Incentive: 1,000 Megawatts over Five Years*, p. 5; http://www.canren.gc.ca/programs/index.asp?CaId=107&PgId=622.
[34] See http://www.canren.gc.ca/programs/index.asp?CaId=107&PgId=717.
[35] See http://www.canren.gc.ca/programs/index.asp?CaId=107&PgId=697.

these expansions only began generating electricity in 2004, they are therefore not accounted for in this report.

2.1.3 Federal: Market Incentive Program

In 2002, the government introduced a Market Incentive Program (MIP) for Distributors of Electricity from Emerging Renewable Electricity Sources. The program was first announced in the government's *Action Plan 2000 on Climate Change*.[36] Co-managed by Natural Resources Canada and Environment Canada, it aims to make green power more competitive in the electricity market by 2010. The first phase of MIP provides a short-term financial incentive up to 40% of the eligible costs of market-based programs undertaken to increase sales of green power in the residential and small business markets. Qualifying facilities must be newly-built, or result from expansions or modifications of existing facilities, commissioned on or after April 1, 2001.

The program's total budget is $25 million ending 2006. By October 2003, three contribution agreements had been signed, and four other proposals retained.[37] But only one distributor benefiting from the MIP, Ontario's SelectPower, was active in 2003 (see Section 2.3.12). Uptake of the program does not appear to be commensurate with the program budget. Possibilities that the government could consider for enhancement of the program in a second phase include an increase to a 50% contribution (a statuory limit), more targeted assistance to marketers, and customer rebates.

Natural Resources Canada's 2004–06 Sustainable Development Strategy commits to establish five new agreements under the Market Incentive Program by 2006.[38]

2.1.4 Alberta: Small Power Research and Development Act[39]

Alberta's Small Power Research and Development (SPRD) Act, enacted in 1988, encouraged small-scale or larger pilot wind, hydro, geothermal or biomass power projects to sell power to electric utilities at a regulated price for a contract period of ten to twenty years. The Act established a maximum total capacity of 125 MW, but in reality resulted in a total of about 108 MW[40] of biomass, wind and hydro power projects being built in the early 1990s, with the power being bought by ATCO, EPCOR and TransAlta. The 108 MW comprises 18 facilities, including Canada's first large-scale wind farm at Cowley Ridge. The contracts signed under the act expired in 2000 for three small wind facilities[41] but remain in force for the remaining 15 facilities. All 18 facilities are listed in Appendix D.

As part of Alberta's deregulation of its electricity market, in 1998 the provincial government established the Balancing Pool,[42] which meets any obligations associated with both sold and unsold Power Purchase Arrangements dating from before deregulation. This includes the 15 remaining SPRD contracts. When the power pool prices are lower than the guaranteed price established under the contracts, the Balancing Pool

[36] See http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=457.
[37] Welsh, L. 2003. *The Government of Canada's Incentive Programs*. Presentation to the Conference "How to Profit from the Business of Renewable Energy," Toronto, 20–21 October.
[38] Natural Resources Canada. 2004. *Sustainable Development Strategy — Moving Forward*, p. 58; http://www.nrcan-rncan.gc.ca/sd-dd/pubs/strat2004/english/toc_e.html.
[39] See http://www.qp.gov.ab.ca/Documents/acts/S09.CFM.
[40] Government of Canada. 1995. *National Action Program on Climate Change*; http://www.ec.gc.ca/climate/resource/cnapcc/c3part09.html.
[41] These facilities, which total 0.26 MW, have not been included in Table 1 or Section 3.
[42] See http://www.balancingpool.ca.

pays the difference to the small power producers. Currently, TransAlta administers all these contracts for the Balancing Pool.

In its corporate GHG emissions inventory, TransAlta appears to be claiming ownership of the environmental attributes of the electricity produced under all the 15 remaining SPRD contracts.[43] This is problematic for two reasons: only some of this electricity is contracted for sale to TransAlta, and the contracts are silent on the ownership of environmental attributes. This appears to have resulted in double counting, since a portion of these attributes is also now being sold by EPCOR and Canadian Hydro Developers through their green power and certificate marketing programs (Sections 2.3.1 and 2.3.3). Since the corresponding facilities and green power products have received EcoLogo certification, which contains provisions for avoiding double counting, this apparently disputed ownership of attributes should be investigated by TerraChoice Environmental Services, which is responsible for administering the certification (see Section 4.2.1).

2.1.5 British Columbia: BC Utilities Commission Resource Planning Guidelines

The British Columbia Utilities Commission (BCUC)[44] is a regulatory agency of the government of British Columbia, operating under and administering the Utilities Commission Act. In 1993, the BCUC issued guidelines for "integrated resource planning," which it defined to include consideration of "not just costs and benefits as they appear in the market but also other monetizable and non-monetizable social and environmental effects."[45] To the authors' knowledge, the only new low-impact renewable electricity facility of significant size that resulted from the guidelines was the 66 MW Williams Lake wood-waste-fired power plant, now operated by TransCanada.

In December 2003 the BCUC issued new Resource Planning Guidelines[46] as part of the government's implementation of its Energy Plan, which includes the "BC Clean Electricity" target (see Section 2.1.6).

2.1.6 British Columbia: "BC Clean Electricity" target

In November 2002, the government of British Columbia released its Energy Plan. A key element of the plan was to "increase opportunities for the private sector" by assigning independent power producers the task of developing new electricity generation, with BC Hydro "limited to undertaking efficiency improvements at existing plants."[47] The Plan also set a voluntary goal for electricity distributors (BC Hydro and Fortis) to acquire 50% of new supply between 2002 and 2012 from "BC Clean Electricity," defined as "alternative energy technologies that result in a net environmental improvement relative to existing energy production."[48] BC Hydro is interpreting this as any source that "is renewable or results in

[43] TransAlta. 2003. *Seventh Annual Progress Report: In support of Canada's Climate Change Voluntary Challenge and Registry Program*, p. 10; http://challenge.vcr-mvr.ca/cha_client_e.cfm?No=58. The emission reductions listed under "Renewable power purchased" correspond approximately to total output from all 15 SPRD facilities, adjusted by appropriate capacity factors, and displacing coal-fired electricity.
[44] See http://www.bcuc.com.
[45] British Columbia Utilities Commission. 1993. *Integrated Resource Planning ("IRP") Guidelines*. Vancouver: British Columbia Utilities Commission, p. 1.
[46] British Columbia Utilities Commission. 2003. *Resource Planning Guidelines.* December; http://www.bcuc.com/Documents/Guidelines/RPGuidelines_12-2003.pdf.
[47] Government of British Columbia. 2002. *Energy for Our Future: A Plan for BC*, p. 9; http://www.gov.bc.ca/em/popt/energyplan.htm.
[48] *Ibid.*, p. 33.

a net environmental improvement over gas-fired generation."[49] "Clean electricity" is therefore a much broader category than green power, and could include, for example, large hydro facilities not generally considered to qualify as green power. (The Energy Plan does, however, make clear that nuclear power is not considered "clean electricity."[50])

BC Hydro's voluntary green power target (Section 2.2.2) is a key component of the broader "BC Clean Electricity" target established by government, with BC Hydro's progress in meeting its green power target contributing to attainment of the broader "BC Clean Electricity" target. The government of British Columbia has also taken the following additional steps towards meeting its "BC Clean Electricity" target, although it is likely that more will be needed to meet the target:

- The Energy Plan restructured BC Hydro's transmission business into a separate, publicly owned corporation, the British Columbia Transmission Corporation (BCTC). The BCTC "will ensure open and non-discriminatory access to the BC transmission system for all electricity producers,"[51] therefore allowing independent power producers greater right of entry to the grid.
- The Utilities Commission Act has been amended to "provide the [British Columbia Utilities] Commission with a mandate to implement the policy actions" of the Energy Plan.[52] In consequence, in December 2003 the Commission issued new Resource Planning Guidelines. Under the Guidelines, "The Commission requires consideration of all known resources for meeting the demand for a utility's product, including those which focus on traditional and alternative supply sources (including "BC Clean Electricity" as referred to in the Energy Plan)."[53]
- Since June 2003, manufactured penstock and related equipment used in the development of small hydro facilities has benefited from the provincial sales tax exemption already provided to other hydro, wind and solar power generating equipment.[54]

2.1.7 Ontario: "Set aside" of tradable emissions allowances for renewable energy projects[55]

Under Ontario's regulated electricity sector emissions trading system (under Regulation 397/01) for sulphur dioxide (SO_2) and nitrogen oxides (NO_x), which has been operating since the beginning of 2002, a pool of emissions allowances of four kilotonnes (kt) per year of SO_2 and one kt per year of NO[56] is reserved for approved new conservation and renewable energy projects that displace electricity produced from coal- or oil-fired plants. Eligible renewable energy projects are wind power, solar PV and run-of-river hydro power generation facilities, as well as projects to increase production from existing hydro reservoirs (with no change in reservoir size), of which, in all cases, construction began after January 24, 2000. These allowances can be sold to Ontario Power Generation (OPG), to the owners of other facilities, or to other interested parties who may formally retire them without use; unclaimed allowances revert to

[49] BC Hydro. 2003. *BC Hydro Greenhouse Gas Report*, p. 8; http://www.bchydro.com/rx_files/environment/environment9777.pdf.
[50] While setting the "BC Clean Electricity" target, the Energy Plan also stipulates a "fair evaluation of coal-fired power plants" for the remaining 50% of new generation, although it rules out nuclear power. Earlier BC Hydro policy and practice was that no new electricity would come from these sources.
[51] See http://www.bctransco.com/about/who.shtml.
[52] British Columbia Utilities Commission. 2003. *Resource Planning Guidelines*. December, p. 1; http://www.bcuc.com/Documents/Guidelines/RPGuidelines_12-2003.pdf.
[53] *Ibid.*
[54] British Columbia Ministry of Energy and Mines. 2003. *Tax Exemption to Encourage Clean Energy*. News release, 14 August; http://www2.news.gov.bc.ca/nrm_news_releases/2003EM0012-000724.htm.
[55] Ontario Ministry of Environment. 2004. *Ontario Emission Trading Registry Introduction*; http://www.ene.gov.on.ca/envision/air/etr/.
[56] The system quantifies NO_x in NO equivalent terms.

OPG at year end. This represents a limited financial incentive to such projects, depending on the market value of the allowances. Alternatively, retirement of allowances transferred to green power customers provides the latter with a formal mechanism to reduce SO_2 and NO_x emissions.[57]

One green power facility received "set aside" allowances for 2002: the 660 kW Port Albert wind turbine.[58] This facility was covered under the Green Tags Ontario program (Section 2.3.8) in 2002, but not in 2003. For 2003, the 9 MW Huron Wind facility received 38 tonnes of SO_2 and 11 tonnes of NO set aside reductions (convertible into allowances),[59] while Energy Ottawa's application for 186 tonnes of SO_2 and 59 tonnes of NO set aside reductions from its 15 MW Chaudière hydro facility for 2003 is currently under review.[60] The Huron Wind facility is also covered by the Wind Power Production Incentive (Section 2.1.2) as well as Ontario Power Generation's green power target (Section 2.2.5) and Evergreen Green Power program (Section 2.3.11). The Chaudière hydro facility is covered under Energy Ottawa's green power program (Section 2.3.8).

It is critical that retailers of green power and green power certificate products in Ontario ensure that applications are made for "set aside" SO_2 and NO allowances for the source facilities, and then transfer the allowances to their customers (or retire them on customers' behalf without use). If this is not done, the unclaimed allowances will revert to OPG, which can then use them to emit additional emissions. This has two negative consequences:

- ownership of the SO_2 and NO_x emission reductions associated with the green power will be given by default to OPG, and customers will be deprived of a part of the environmental benefits they are under the impression they are receiving
- those emission reductions will be cancelled out by increased emissions by OPG.

In 2003, three green power products and one green power certificate product were sold in Ontario (Sections 2.3.8–2.3.12): Energy Ottawa's green power, Green Tags Ontario, OPG Evergreen Green Power (also resold as Oakville Hydro Green Light Pacts) and Select Power Selectwind. Evergreen Green Power and Green Light Pact customers have not received any "set aside" SO_2 and NO allowances because the power sold to those customers in 2003 was sourced entirely from facilities not eligible for "set aside" allowances.[61] In the case of the EcoLogo-certified source facility for Select Power Selectwind, "set aside" allowances have not been applied for. As a result, customers are deprived of a part of the environmental benefits they are purchasing, in apparent contravention of EcoLogo certification criteria (see Section 4.2.1). This situation should be investigated by TerraChoice Environmental Services, which is responsible for administering the certification. Green Tags Ontario, whose product is not certified, should also ensure that applications are made for "set aside" allowances for its source facility (the same one as for Select Power Selectwind) to ensure customers receive all environmental benefits.

[57] Public Works and Government Services Canada's Request for Proposals for green power in Ontario, issued in October 2003, required that SO_2 and NO allowances be provided for non-biomass-based green power bids, and gave a price-bid advantage of 0.499 cents per kWh for such bids over biomass-based bids (Leslie Welsh, Environment Canada, personal communication, July 2004).
[58] See http://www.oetr.on.ca/oetr/search/account_details.jsp?AccountNumber=40.
[59] See http://www.oetr.on.ca/oetr/search/account_details.jsp?AccountNumber=42.
[60] See http://www.oetr.on.ca/oetr/search/account_details.jsp?AccountNumber=83, http://www.oetr.on.ca/oetr/search/noer_details.jsp?iNERID=7.
[61] Although facilities eligible for "set aside" allowances, such as Huron Wind, are covered by the Evergreen Green Power program, only a small portion of the total power generated by the facilities covered by the program is currently sold as green power. That portion was sourced in 2003 entirely from facilities not eligible for "set aside" allowances (John Sawler, Ontario Power Generation, personal communication, September 2004).

2.1.8 Ontario: Tax regulations package

In July 2003, the government of Ontario filed new regulations that provide a 100% corporate income tax write-off for facilities used to generate electricity from "clean, alternative or renewable energy sources;" a sales tax rebate on building materials incorporated into such facilities; and a ten-year property tax holiday on the same facilities. The regulations applied to facilities or materials acquired, purchased or that begin generating electricity between November 25, 2002 and January 1, 2008.[62] Although these measures helped green power producers in 2003, the authors are not aware that they contributed to the installation of any new green power facilities during a period of turmoil and uncertainty for the Ontario electricity sector. The government announced in its 2004 budget that the corporate income tax write-off and the property tax holiday would be repealed,[63] in light of its "new vision" for the electricity sector, including targets for green power, unveiled in April 2004 (see Appendix A).

2.1.9 Prince Edward Island: PEI Energy Corporation wind power development

The government of Prince Edward Island, acting through the PEI Energy Corporation, owns and finances, in partnership with the federal government, the Atlantic Wind Test Site at North Cape, established in 1980. In 2001, the PEI Energy Corporation installed a 5.2 MW EcoLogo-certified wind farm adjacent to the site in response to commitments by the provincial and federal governments to purchase most of the facility's output for use in government buildings on the island.

The North Cape wind farm's output is marketed by Maritime Electric, with the premiums passed on to PEI Energy Corporation. Maritime Electric currently purchases the power under a 10-year contract and sells 13,000 MWh annually to federal government facilities and 3,000 MWh annually to provincial government facilities.[64] In 2003, 17,400 MWh of electricity was produced. The portion remaining after the sales to government facilities is marketed to business and residential customers through Maritime Electric's Green Power program (Section 2.3.13).

In January 2004, an additional 5.2 MW of wind turbines was installed at the North Cape wind farm, supported by the federal Wind Power Production Incentive (Section 2.1.2).[65]

2.1.10 Québec: Fonds pour l'accroissement de l'investissement privé et la relance de l'emploi[66]

Québec's November 2001 provincial budget made wind power projects eligible for funding by the Fonds pour l'accroissement de l'investissement privé et la relance de l'emploi (FAIRE; Private Investment and Job Creation Promotion Fund), which provides grants, loans and loan guarantees to new projects that, over a two-year period, involve an investment of at least $2 million and create at least 50 jobs. Only one new wind facility was installed in Québec since 2001— the Parc éolien du Renard (2.25 MW). This

[62] Ontario Ministry of Energy. 2003. *Eves Government Encourages Development of New Electricity Supply from Clean, Alternative and Renewable Energy Sources*. News release, 8 July; http://www.energy.gov.on.ca/index.cfm?fuseaction=archives.news2&body=yes&news_id=38.
[63] Government of Ontario. 2004. *2004 Ontario Budget: Budget Papers*, p. 135; http://www.ontariobudget.fin.gov.on.ca/bud04e/pdf/papers_all.pdf.
[64] Natural Resources Canada. 2001. *Wind Power Project in Prince Edward Island*. Media backgrounder; http://climatechange.nrcan.gc.ca/english/View.asp?x=35&oid=71.
[65] PEI Government. 2004. *Province Doubles Wind Energy Capacity*. News release, 7 January; http://www.gov.pe.ca/news/getrelease.php3?number=3447.
[66] See http://www.invest-quebec.com/fr/que/doc/faire.jsp.

facility did receive funding from the Government of Québec[67] but it is unclear whether this was through FAIRE or another program.

FAIRE was abolished by the new provincial government, effective March 31, 2004. It will be replaced by the Programme d'appui stratégique à l'investissement (PASI; Strategic Support for Investment Program), the terms of which have yet to be determined.[68]

2.1.11 Yukon: Green Power Initiative

In December 1999 the Yukon Development Corporation (a crown corporation controlled by the territorial government) published the *Yukon Green Power Initiative Implementation Strategy*, described by the responsible minister as "an important component of the Yukon government's comprehensive energy program."[69] The Initiative consists of four implementation components:

- green power information and training
- green power research and development
- tendering and constructing green power projects
- green power marketing and consumer choice.

The third of these four components resulted in the expansion of the Whitehorse Haeckel Hill wind facility from 150 kW (installed in 1993) to 810 kW in September 2000.[70] In February 2000, the green power marketing component received seed funding that was allocated for market studies and wind monitoring projects. However, no further green power facilities have yet been installed or a marketing program implemented as a result of the Green Power Initiative.

Table 1. Summary of Government Green Power Policies Active in 2003

Program	Program Type	Program Lifetime	Resources Installed by the End of 2003 as a Result of the Program[71]
Federal: Class 43.1 accelerated capital cost allowance rate and Canadian Renewable and Conservation Expenses	Tax benefits	1996–indefinite	*Not quantified / accounted for under other programs*

[67] Canadian Wind Energy Association. 2004. *Parc Éolien du Renard, Québec*; http://www.canwea.ca/downloads/fr/PDFS/Parc_eolien_du_RenardFR.pdf.
[68] *Ibid.*
[69] Yukon Development Corporation. 1999. *The Yukon Green Power Initiative Implementation Strategy*. Whitehorse; http://www.yec.yk.ca/literature/gpower.pdf.
[70] The 2003 edition of this report inadvertently omitted the original 0.15 MW component of this facility. See Bramley, M., S. Boustie, J. Vadgama, C. Wieler and A. Pape-Salmon. 2003. *Green Power Programs in Canada — 2002*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=162.
[71] Some green power facilities are accounted for under more than one program in the final columns of Tables 1–3. Where multiple programs have contributed to the installation of a particular facility, it seems more informative to account for such facilities under all contributing programs, rather than make arbitrary decisions apportioning fractions of facilities to single programs. To make Tables 1–3 fully transparent, Appendix D includes a list of all facilities installed under Alberta's Small Power Research and Development Act, and Appendix E includes a list of all wind power facilities installed in Canada by the end of 2003, showing under which programs each has been accounted for in Tables 1–3. In Tables 4–7 (Section 3), on the other hand, rigorous quantification has required that each facility (or fraction of a facility) be accounted for under a single program, as specified in the notes accompanying Tables 6 and 7.

Program	Program Type	Program Lifetime	Resources Installed by the End of 2003 as a Result of the Program[71]
Federal: Wind Power Production Incentive	Subsidy per kWh	2002–2017	Wind: 94.7 MW *(also accounted for under Ontario's "set aside" of tradable emissions allowances; Ontario Power Generation's green power target, Toronto Hydro/TREC's wind power development and Hydro-Québec's wind power development (all Table 2); and ENMAX's Greenmax program, Vision Quest's Green Energy Tags and SaskPower's GreenPower program (all Table 3))*
Federal: Market Incentive Program	Grant to marketers	2002–2006	Wind: 1.8 MW (*also accounted for under Select Power's Selectwind program (Table 3))*
Alberta: Small Power Research and Development Act	Guaranteed price per kWh	1988–various	Hydro: 48.7 MW *(6.9 MW of this is also accounted for under Canadian Hydro's Renewable Energy Certificates program (Table 3) and the remainder, possibly, under TransAlta's renewable energy target (Table 2))* Wood waste: 38.5 MW *(18 MW of this is also accounted for under EPCOR's Green Power ECO-PACKs (Table 3) and the remainder, possibly, under TransAlta's renewable energy target (Table 2))* Wind: 20.9 MW *(18.9 MW of this is also accounted for under Canadian Hydro's Renewable Energy Certificates (Table 3) program and the remainder, possibly, under TransAlta's renewable energy target (Table 2))*
British Columbia: BC Utilities Commission Resource Planning Guidelines	Directive by regulatory authority	1993–?	Wood waste: 66 MW
British Columbia: "BC Clean Electricity" target	Various / yet to be determined	2002–2012	*Accounted for under BC Hydro's green power target (Table 2)*
Ontario: "set aside" of tradable emissions allowances for renewable energy projects	Allocation of emissions allowances	2002–indefinite	Wind: 9 MW *(also accounted for under the Wind Power Production Incentive and Ontario Power Generation's green power target (Table 2))* Hydro: 15 MW *(also accounted for under Energy Ottawa's green power program (Table 3))*
Ontario: tax regulations package	Tax benefits	2001–2004	*Accounted for under other programs*
Prince Edward Island: PEI Energy Corporation wind power development	Construction of facility by government agency	2001–indefinite	Wind: 5.2 MW *(also accounted for under Maritime Electric's Green Power program (Table 3))*
Québec: Fonds pour l'accroissement de l'investissement privé et la relance de l'emploi	Grants, loans and loan guarantees	2001–2004	*Unclear whether the program contributed to the installation of any facilities*
Yukon: Green Power Initiative	Construction of facility by government agency	1999–indefinite	Wind: 0.81 MW

2.2 Utility green power implementation initiatives

A summary of the programs described in this section is provided in Table 2.

2.2.1 Alberta: TransAlta renewable energy target

In 2003, TransAlta announced the goal of "having 10% of [its] generation capacity from renewable energy by 2010."[72] This goal apparently excludes hydro power, but appears to include TransAlta's facilities outside Canada[73] (the company has facilities in the US, Australia and Mexico). In October 2002, TransAlta took a significant step towards meeting this goal in becoming Canada's largest wind energy developer and owner after purchasing Vision Quest Windelectric. At the end of 2003, Vision Quest owned 82 MW of installed wind power capacity, all in Alberta and all EcoLogo-certified. Vision Quest is currently proposing to install a further 71 MW of capacity in Alberta, including the 68 MW Summerview facility (an addition to the existing 1.8 MW turbine) expected to be commissioned in fall 2004,[74] and 34.5 MW in Ontario.[75]

It should be noted that TransAlta counts Vision Quest's wind power capacity towards the TransAlta renewable energy target, while at the same time Vision Quest sells the environmental attributes of that power under its Green Energy and Green Energy Tags programs (Section 2.3.5). There is a risk that this could amount to double counting of those attributes. Indeed, TransAlta is seeking to recover the costs associated with meeting its renewable energy target through Vision Quest's programs. It is therefore important that TransAlta in no way claim ownership of the attributes associated with Vision Quest wind power production. Additionally, in all discussions of the proportion of its generating capacity accounted for by green power, it should include a clear acknowledgement of the role played by customers in progress towards its renewable energy target and of their ownership of the environmental benefits.

TransAlta also administers, for Alberta's Balancing Pool, the 15 outstanding contracts signed under the province's Small Power Research and Development Act (see Section 2.1.4). TransAlta has given no indication that it is counting the corresponding facilities towards its renewable energy target.

2.2.2 British Columbia: BC Hydro green power target

In 2000, BC Hydro adopted a voluntary portfolio standard under which it committed to meet 10% of incremental demand for electricity between 2000 and 2010 from green power sources.[76] In November 2002, the government of British Columbia set a voluntary goal for electricity distributors to acquire 50% of new supply between 2002 and 2012 from "BC Clean Electricity" (see Section 2.1.6). BC Hydro's 10% "green" target has therefore now become a subset of the provincial government's 50% "clean" target (where "clean electricity" is a much broader category than green power, and could include, for example, large hydro facilities not generally considered to qualify as green power).

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[72] TransAlta. 2003. *Seventh Annual Progress Report: In support of Canada's Climate Change Voluntary Challenge and Registry Program*; http://challenge.vcr-mvr.ca/cha_client_e.cfm?No=58.
[73] TransAlta. 2003. *Vision Quest announces new $95 million, 68-MW wind farm in southwest Alberta*. News release, 16 December; http://www.greenenergy.com/pdf/Summerview_Announcement_Dec_16_03.pdf.
[74] Vision Quest Windelectric. 2004. *Summerview Wind Farm — Now Under Construction*; http://www.visionquestwind.com/existing.asp?pg=summerfarm.
[75] Vision Quest Windelectric. 2004. *Proposed Facilities*; http://www.visionquestwind.com/facilities.asp?pg=proposed.
[76] BC Hydro. 2003. *BC Hydro Greenhouse Gas Report*, p. 7; http://www.bchydro.com/rx_files/environment/environment9777.pdf.

BC Hydro has issued two calls for tenders from independent power producers in fulfillment of its green power target. The first call resulted in contracts being signed in 2001–02 with 18 small hydro projects and one landfill gas project.[77] The second call, issued on March 31, 2003, has resulted in successful bids by 14 hydro, one wind and one landfill gas project.[78] Contracts were offered to these projects in September 2003. The projects producing electricity by the end of 2003 amounted to 94 MW of small hydro capacity, 7 MW of landfill gas capacity and 20 MW of wood-waste biomass capacity. All the capacity from the two calls for tenders that remains to be installed will come on line by September 2006.

To date, BC Hydro's green power purchases have been screened according to the company's own "green criteria." However, in April 2004 the company announced that it would seek EcoLogo certification for both its existing and new green power supply contracted from independent power producers.[79]

BC Hydro makes clear that any green power of which the environmental attributes are sold through its Power Smart Green Power Certificates program (Section 2.3.6) is not counted towards the 10% target,[80] thereby avoiding any form of double counting (see similar discussions in Sections 2.2.1, 2.2.3 and 2.2.5).

2.2.3 Nova Scotia: Nova Scotia Power renewable energy target[81]

In 2001 Nova Scotia Power agreed with the provincial government to "create a short-term voluntary renewable energy target for new IPP [independent power producer] renewable generation totalling 2.5 per cent of the company's current generation capacity, or approximately 50 MW. The parties will monitor the voluntary renewable target for three years and then establish a longer term renewable energy portfolio standard."[82] The future mandatory renewable portfolio standard is discussed in Appendix A.

Nova Scotia Power has taken the following steps towards meeting its voluntary target. In fall 2002 the company installed two EcoLogo-certified wind turbines at Grand Étang and Little Brook with a combined capacity of 1.2 MW. In November 2003, the company announced an agreement to purchase the output of Atlantic Wind Power Corporation's planned 30 MW facility at Pubnico Point, completed in June 2004.[83] In April 2004, Nova Scotia Power announced an agreement with Eskasoni Band Council to provide additional wind power development in the province. The first project expected to be undertaken under the agreement is the installation of three commercial wind turbines of unspecified size within the Eskasoni community, with the output to be sold to Nova Scotia Power.[84,85]

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[77] See http://www.bchydro.com/info/ipp/ipp966.html.
[78] See http://www.bchydro.com/info/ipp/ipp958.html.
[79] BC Hydro. 2004. *EcoLogo — The new mark of green energy*; http://www.bchydro.com/rx_files/info/info10433.pdf.
[80] Brenda Goehring, BC Hydro, personal communication, May 2004.
[81] In the 2003 edition of this report, this was referred to as Nova Scotia Power Green Power Program. See Bramley, M., S. Boustie, J. Vadgama, C. Wieler and A. Pape-Salmon. 2003. *Green Power Programs in Canada — 2002*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=162.
[82] Government of Nova Scotia. 2001. *Seizing the Opportunity — Nova Scotia's Energy Strategy*, p. 29; http://www.gov.ns.ca/energy/inside.asp?cmPageID=140.
[83] Nova Scotia Power. 2003. *Agreement Propels More Wind Power in Nova Scotia*. News release, 14 November; http://www.nspower.ca/AboutUs/WhatsNew/detail3668.html.
[84] Nova Scotia Power. 2004. *Eskasoni & NSPI to Pursue Wind Development*. News release, 15 April; http://www.nspower.ca/AboutUs/WhatsNew/detail3808.html.
[85] Nova Scotia Power also purchases electricity from the Brooklyn biomass facility commissioned in 1995 (28 MW) and two small hydro facilities, one (0.22 MW) pre-1990 and the other (0.5 MW) commissioned in 1995. Currently, these facilities are not EcoLogo-certified and contribute neither to the company's renewable energy target (as they are not post-2001 facilities) nor to its green power marketing program (Section 2.3.7). These facilities are not given

Nova Scotia Power is seeking to recover the costs associated with meeting its renewable energy target through green power marketing (Section 2.3.7). If the company counts all its wind power production towards its renewable energy target, while at the same time selling the environmental attributes of some of that power through green power marketing, there is a risk that this could amount to double counting of those attributes. It is therefore important that Nova Scotia Power in no way claim ownership of the attributes and that, in all discussions of the proportion of its generating capacity accounted for by green power, it include a clear acknowledgement of the role played by customers in progress towards its renewable energy target and of their ownership of the environmental benefits.

2.2.4 Nunavut: Nunavut Power Corporation wind power generation

Nunavut Power Corporation has made a voluntary commitment to produce wind power to gain experience with the technology, in anticipation that capital costs will decline. In 1996 and 2000 respectively, the company installed two wind turbines in Rankin Inlet, with a total capacity of 145 kW.[86] The facilities are not certified and costs are recovered through territory-wide electricity sales.

2.2.5 Ontario: Ontario Power Generation green power target

In 2001, Ontario Power Generation (OPG) adopted the target of increasing its supply of green power to 500 MW by 2005.[87] At the end of 2003, the company's green power portfolio was about 141 MW, dominated by hydro (29 facilities installed since 1900), but with 7 MW of wind power (comprising 50% of the 9 MW Huron Wind facility[88] installed in November 2002 and the older turbines at Pickering and Tiverton), 3 MW of landfill gas combustion (Waterloo, installed in 1999), 3 MW from an anaerobic digester for commercial organic waste (Newmarket, installed in 2002) and a small amount of solar power. Six per cent of this portfolio is currently purchased from independent producers, and all facilities are EcoLogo-certified.

OPG's green power supply was slightly smaller at the end of 2003 compared to one year earlier, due to only 50% of the Huron Wind facility being counted in 2003. Indeed, OPG's green power target has now been called into question with the March 2004 recommendation from the OPG review committee (Manley committee) that the company "withdraw from non-core businesses including wind-power, solar, biomass and small hydro projects in an orderly fashion to allow room for others better suited to these businesses."[89]

OPG is seeking to recover the costs associated with meeting its green power target through its Evergreen Green Power marketing program (Section 2.3.11). If the company counts all its green power production

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further consideration in this report as they are not identified by the company as green power facilities (see Section 1.3).

[86] The 1996 turbine (79 kW) was inadvertently omitted from the 2003 edition of this report due to an error in the company's survey response. See Bramley, M., S. Boustie, J. Vadgama, C. Wieler and A. Pape-Salmon. 2003. *Green Power Programs in Canada — 2002*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=162.

[87] Ontario Power Generation. 2002. *Ontario Power Generation Greenhouse Gas Action Plan — 2001*, p. 8; http://www.opg.com/envcomm/GreenhouseActionPlan_2001.pdf.

[88] The other 50% of the facility is owned by a consortium consisting of BPC Generation Infrastructure Trust, Cameco Corporation and TransCanada Pipelines Limited. The consortium's share of production is marketed by Bruce Power. However, Bruce Power does not currently have a green power marketing program. See Huron Wind. 2003. *Fact File — Project History*; http://www.huronwind.com/huronwind/hw_pdfs/30.pdf.

[89] OPG Review Committee. 2004. *Transforming Ontario's Power Generation Company*, recommendation II.4; http://www.energy.gov.on.ca/english/pdf/electricity/opg/Recommendations.pdf.

towards its renewable energy target, while at the same time selling the environmental attributes of some of that power through green power marketing, there is a risk that this could amount to double counting of those attributes. It is therefore important that OPG in no way claim ownership of the attributes and that, in all discussions of the proportion of its generating capacity accounted for by green power, it include a clear acknowledgement of the role played by customers in progress towards its renewable energy target and of their ownership of the environmental benefits.

2.2.6 Ontario: Toronto Hydro/Toronto Renewable Energy Cooperative wind power development

In 2002, Toronto Hydro installed a 750 kW wind turbine at Toronto's Exhibition Place in a 50/50 joint venture with the Toronto Renewable Energy Cooperative (TREC), as part of the Cooperative's WindShare project. Windshare, a separate cooperative, has over 400 residential and business members who are investing directly in community-based green power projects.[90, 91] The EcoLogo-certified turbine is the first wind power facility in North America to be located in a downtown urban area. For the first three years of the turbine's operation, the entire output is being purchased by Toronto Hydro.

Although Toronto Hydro has not defined a green power target, the company is seeking to expand its green power initiative in the future. TREC is also planning to build a second turbine on the grounds of the Ashbridges Bay Treatment Plant in the east end of Toronto,[92] and is in the early stages of developing a 10–20 MW community-owned wind farm.[93] However, many green power projects were shelved when the price of electricity was frozen in November 2002 under Bill 210,[94] the 4.3 cent per kWh price cap for residential customers and small businesses making it difficult to maintain existing operations. As a result, Toronto Hydro postponed its plans to implement a green power marketing program that would recover the costs of its urban wind projects. The price cap was raised on April 1, 2004, and the Ontario Energy Board is to implement a new price structure to take effect no later than May 1, 2005.[95]

2.2.7 Québec: Hydro-Québec wind power development[96]

Hydro-Québec began exploring wind power in 1975, and installed a number of experimental wind turbines beginning in 1977. The projects currently operating are all in the Gaspésie region: a 2.25 MW farm installed in 1998, the two phases of the Le Nordais project, with respective capacities of 57 MW and 43 MW, installed in 1998–99, and the Parc éolien du Renard (2.25 MW), installed in 2003. Until July 2003, the Le Nordais facilities were Canada's two largest wind farms. Both Le Nordais and the Parc éolien du Renard are independently owned, but sell their entire output to Hydro-Québec.

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[90] WindShare. 2004. *About the Co-op*; http://www.windshare.ca.

[91] Note also that TREC and WindShare received more than $330,000 of funding for the pursuit of the co-operative model of wind turbine development from Environment Canada under the Technology Early Action Measures program (Leslie Welsh, Environment Canada, personal communication, July 2004.)

[92] WindShare. 2004. *About the Co-op*; http://www.windshare.ca.

[93] CanWEA. 2004. *Canadian Wind Energy Case Studies: Toronto, Ontario*; http://www.canwea.ca/downloads/en/PDFS/Toronto_Case_Study.pdf.

[94] Electricity Distributors Association. Undated. *Bill 210 and "Beyond 210 Project"*; http://www.eda-on.ca/eda/edaweb.nsf/0/e609cb4ef81cdc3f85256d4e004520a8?OpenDocument.

[95] Government of Ontario. 2004. *Ontario's New Interim Electricity Prices Take Effect April 1*. News release, 31 March; http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&body=yes&news_id=57.

[96] Hydro-Québec. Undated. *Historique du dossier éolien à Hydro-Québec*; http://www.hydro.qc.ca/production/eolien/historique.html.

In 2003 the Québec government adopted a regulation requiring the installation of a further 1,000 MW of wind power capacity by the end of 2012, and announced aid to facilitate the creation of an additional 108 MW of capacity. Hydro-Québec subsequently issued a request for proposals for the 1,000 MW, and will announce the successful bids by September 2004 (see Appendix A).

Table 2. Summary of Utility Green Power Implementation Initiatives Active in 2003

Program	Cost-recovery Mechanism	Facility Certification	Resources Installed by the End of 2003 Under the Program[97]
TransAlta renewable energy target	General electricity sales and green power and certificate marketing	EcoLogo	Wind: 82 MW *(also accounted for under Vision Quest's Green Energy Tags (Table 3) and, in part, under the Wind Power Production Incentive (Table 1))* *(it is not clear whether TransAlta is additionally counting resources accounted for under the Small Power Research and Development Act (Table 1) towards this target)*
BC Hydro green power target	General electricity sales	BC Hydro "green criteria" (soon EcoLogo)	Hydro: 94 MW *(15 MW[98] of this is also accounted for under Canadian Hydro's Renewable Energy Certificates (Table 3))* Wood waste: 20 MW Biogas: 7 MW *(all of the above are also accounted for under BC Hydro's Power Smart Green Power Certificates program (Table 3))*
Nova Scotia Power renewable energy target	Green power marketing	EcoLogo	Wind: 1.2 MW *(also accounted for under Nova Scotia Power's Green Power program (Table 3))*
Nunavut Power Corp. wind power generation	General electricity sales	None	Wind: 0.145 MW
Ontario Power Generation green power target	Green power marketing	EcoLogo	Hydro: 127.5 MW Wind: 7 MW *(4.5 MW of this is also accounted for under the Wind Power Production Incentive and Ontario's "set aside" of tradable emissions allowances (Table 1))* Biogas: 6 MW *(all of the above are also accounted for under Ontario Power Generation's Evergreen Green Power program (Table 3))*
Toronto Hydro/TREC wind power development	General electricity sales[99]	EcoLogo	Wind: 0.75 MW *(also accounted for under the Wind Power Production Incentive (Table 1))*
Hydro-Québec wind power development	General electricity sales	None	Wind: 104 MW *(2.25 MW of this is also accounted for under the Wind Power Production Incentive (Table 1))*

[97] Some green power facilities are accounted for under more than one program in the final columns of Tables 1–3. Where multiple programs have contributed to the installation of a particular facility, it seems more informative to account for such facilities under all contributing programs, rather than make arbitrary decisions apportioning fractions of facilities to single programs. To make Tables 1–3 fully transparent, Appendix D includes a list of all facilities installed under Alberta's Small Power Research and Development Act, and Appendix E includes a list of all wind power facilities installed in Canada by the end of 2003, showing under which programs each has been accounted for in Tables 1–3. In Tables 4–7 (Section 3), on the other hand, rigorous quantification has required that each facility (or fraction of a facility) be accounted for under a single program, as specified in the notes accompanying Tables 6 and 7.

[98] This is fifty per cent of the Pingston facility near Revelstoke, British Columbia.

[99] The company intends to recover costs through green power marketing when Ontario's regulatory context permits (see Appendix A).

2.3 Green power and certificate marketing programs

A summary of the programs described in this section is provided in Table 3. As noted in the table, "resources installed" include a considerable amount of double counting. That is, many of these resources are also accounted for under government green power policies and utility green power implementation initiatives as listed in Tables 1 and 2. Green power and certificate marketing program proponents are largely unwilling to disclose the amounts of electricity sold through their programs as green power. It has therefore not been possible to list the green power resources supplying these programs' actual sales. Instead, the resources listed in Table 3 reflect program proponents' views of "installed capacity for the program" as stated in their survey responses.

In the following sections, "price premium" refers to the difference between the price of green power offered in a green power marketing program and the price of standard electricity. This can be directly compared to the price of green power certificates. The "marketing strategy" quotes below are edited extracts of survey responses given by program proponents.

2.3.1 Alberta: Canadian Hydro Developers Renewable Energy Certificates

Canadian Hydro Developers created a Renewable Energy Certificates program to sell the environmental attributes of the green power produced by its EcoLogo-certified Cowley Ridge North (19.5 MW) and Sinnot (6.5 MW) wind farms installed in 2001. The original 21.4 MW Cowley Ridge facility (mostly installed in 1993) and 51 MW of hydro facilities (installed between 1995 and 2003) also contributed to the program in 2003. At the end of 2003 the program had fewer than 100 residential customers (compared to none a year earlier), to whom certificates were sold in 1 MWh blocks at $30 per MWh (the same price as a year earlier). The proponent was not willing to disclose numbers of commercial customers or commercial prices. Facilities are EcoLogo-certified and/or satisfy BC Hydro's "green criteria." The certificates are self-certified.

Marketing strategy: "Public education, brochures, Internet resource."

Canadian Hydro Developers have four new green power facilities that have recently been commissioned or are currently under construction.[100] The 15 MW expansion to the 30 MW Pingston hydro facility (50% owned by the company) was commissioned in April 2004,[101] while the 25 MW Upper Mamquam Hydroelectric Project is expected to be commissioned in 2005. The 3.4 MW Taylor Wind Project and a new wood waste facility, the 25 MW Grande Prairie EcoPower Centre, are expected to be operational by the end of 2004. The government of Alberta will purchase 110,000 MWh annually from the wood waste facility (60% of its output) under a 20-year contract.[102] The two new hydro facilities are in British Columbia and the wind and wood waste facilities are in Alberta.

2.3.2 Alberta: ENMAX Greenmax program

ENMAX is a City of Calgary-owned utility with 396,000 residential and 26,000 commercial customers in Southern Alberta. ENMAX's Greenmax program, established in 1998 as a follow-up to ENMAX's (and Canada's) first green power sales to Environment Canada and, later, to NRCan in 1997, was the first

[100] Canadian Hydro Developers. 2004. *June 2004 Investor Update*; http://www.canhydro.com/presentation.html.
[101] Canadian Hydro Developers. 2004. *Canadian Hydro announces first quarter results*. News release, 13 May; http://www.canhydro.com/pdf/Q1%202004%20Press%20Release.pdf.
[102] Canadian Hydro Developers. 2003. *Grande Prairie EcoPower Centre*; http://www.canhydro.com/powerplants_biomass.html.

green power marketing program in Canada. Best efforts to establish a green power marketing program were, in fact, a condition of the sales to Environment Canada and NRCan.[103] Electricity was produced in 2003 from 123 MW of EcoLogo-certified wind power capacity installed between 1997 and 2003 and owned by ENMAX, as well as Vision Quest Windelectric and Canadian Hydro Developers. ENMAX and Vision Quest each own 50% of Canada's largest (75 MW) wind farm at McBride Lake, completed in July 2003 and supported by the federal Wind Power Production Incentive (Section 2.1.2).

Some 10,000 residential and 200 commercial customers were participating in the program at the end of 2003 — a more than two-fold increase in residential customers compared to a year earlier, while the number of commercial customers remained stable. Natural Resources Canada, Environment Canada and Calgary Transit are all customers in the program. Calgary Transit's C-Train light rail system is 100% powered by wind power supplied through Greenmax.

At the end of 2003, the price premium for residential participants was $20 per MWh, a dramatic reduction from the end-2002 premium of $60–67. Pricing for commercial/industrial customers is customized. In addition to the source facilities, the green power product is EcoLogo-certified.

Marketing strategy: "Bill inserts, advertising, billboards, press releases, events, mailings, newsletters, Internet, ENMAX's hybrid Greenmax publicity car."

2.3.3 Alberta: EPCOR Green Power ECO-PACKs

With more than 500,000 residential customers, EPCOR is Alberta's largest electric utility.[104] EPCOR's Green Power program was launched in 1999. In 2003, 7,000 residential customers and between 10 and 50 small commercial customers participated — compared to 5,000 residential and just one commercial customer a year earlier. Electricity was produced in 2003, just as in 2002, from the 900 kW Weather Dancer wind turbine on the Peigan Nation Reserve; the 23 MW Whitecourt waste wood-fired facility;[105] the 12.75 MW Taylor hydro plant (installed in 2000); and 13.4 kW of solar roof panels installed in 1996 at the EPCOR Centre. All facilities are EcoLogo-certified.

The Green Power program offers "ECO-PACKs" for a premium of $5, $10, $20 and $40 per month, corresponding to 55, 110, 275 or 550 kWh of green power respectively. These prices are unchanged from a year earlier. For commercial customers and small businesses, prices vary between $50 and $450 per month for blocks of 700 to 7,000 kWh. The ECO-PACKs are marketed as 10%, 20%, 50% and 100% green power use, based on an average monthly electricity consumption of 550 kWh for residential customers and 7,000 kWh for commercial customers. In addition to the source facilities, ECO-PACKs are EcoLogo-certified.

Marketing strategy: "Web site, corporate newsletter, call centre, newspaper advertisement."

[103] Leslie Welsh, Environment Canada, personal communication, July 2004.
[104] In August 2003, EPCOR announced that, starting in October 2003, it would no longer seek to sign up new residential, farm and small commercial customers, preferring to concentrate on the commercial, industrial and wholesale markets as well as generation. However, the company continues to service its existing customers "until the residential, farm and small commercial contracts business is sold to a reliable third party." EPCOR also continues to market its ECO-PACKs to existing customers.
[105] The Whitecourt facility was built in the early 1990s as a result of the Small Power Research and Development Act (Section 2.1.4), with a plant refurbishment in 1997 resulting in expanded production.

2.3.4 Alberta: Pembina Institute Green Power Certificates

The Pembina Institute, the publisher of this report, is an independent non-profit environmental research, education and advocacy organization with offices in Calgary, Drayton Valley (Alberta) and Ottawa. In November 2003 the Pembina Institute launched its Green Power Certificates program with the twin objectives of supporting the growth of the green power sector and supporting the organization's work in general.[106] The Green Leaf-certified certificates sold by the Pembina Institute are issued by Vision Quest Windelectric and originate from the latter's EcoLogo-certified wind power facilities in Alberta (see section 2.3.5). By the end of 2003, 18 residential customers and seven commercial/industrial customers were participating in the recently-launched program. The price premium for residential participants was $27/MWh, and $25/MWh for purchases over 200 MWh. Commercial pricing is customized.

In August 2004, the Pembina Institute re-branded its program under the name Wind Power Certificates.

Marketing strategy: "Reputation [of the Pembina Institute], press release, e-mail, direct mail, one-on-one discussions with companies."

2.3.5 Alberta: Vision Quest Windelectric Green Energy and Green Energy Tags

Vision Quest Windelectric, owned since October 2002 by TransAlta, is a formerly independent wind power producer that began operations in 1997 as a result of Canada's first ever green power sale, by ENMAX to Environment Canada (see Section 2.3.2). It increased its installed capacity, all in Alberta and all EcoLogo-certified, from 44 MW at the end of 2002 to 82 MW in July 2003, with a 50% share in the new 75 MW wind farm at McBride Lake. (The other 50% share of this facility is owned by ENMAX.) Vision Quest has plans to further increase its installed capacity both in Alberta and Ontario (see Section 2.2.1).

In 2002, fewer than 100 residential customers and two business customers participated in Vision Quest's Green Energy green power marketing program. In 2003, Vision Quest launched a new Green Energy Tags (certificates) program, to which the residential customers were transferred. The company is now no longer promoting the Green Energy Tags to residential customers, preferring instead to sell the product through its resellers (ENMAX, Section 2.3.2; and the Pembina Institute, Section 2.3.4). It expects to transfer existing residential customers to these resellers.

In 2003 Vision Quest offered both Green Energy and Green Energy Tags to businesses. The proponent was not willing to disclose numbers of business customers participating in these programs at the end of 2003. The Green Energy price premium was approximately 40% of the conventional electricity price. Green Energy Tags were sold in blocks of 100, 200 and 500 kWh at 42$/MWh. Green Energy is EcoLogo-certified and Green Energy Tags are Green Leaf- and Green-e-certified.

Marketing strategy: "Partnership with resellers and paid advertising."

2.3.6 British Columbia: BC Hydro Green Power Certificates

BC Hydro's Green Power Certificates were launched in September 2002 as a cost-recovery program for green power left over after BC Hydro has met annual objectives under its voluntary green power target (10% of incremental demand between 2000 and 2010 from green power sources). Details of the green power facilities are provided in Section 2.2.2.

[106] See the disclosure statement on the first inside page of this report.

The program is for business and institutional customers. At the program launch, BC Hydro announced that 20 business and institutional buyers had agreed to purchase 2003 vintage certificates, but the only sale of certificates originating with power generated in 2002 was to a wholesale customer. By the end of 2003, more than 40 business customers were participating in the program, with the price set at $20 per certificate representing the environmental attributes of 1 MWh of green power (the price has not changed since the program launch). Certificates of 2002 and 2003 vintages are self-certified and audited by KPMG, but the company is considering adopting Green Leaf certification for subsequent years.

Marketing strategy: "Key account management sales activities, alignment with Power Smart programs [which provide financial incentives to encourage energy conservation and efficiency], Web site, customer promotions, targeted engagement at conferences, etc."

2.3.7 Nova Scotia: Nova Scotia Power Green Power

Nova Scotia Power is seeking to recover the costs associated with its voluntary renewable energy target (Section 2.2.3) through a green power marketing program launched in late 2002. Details of the green power facilities are provided in Section 2.2.3. By the end of 2003, over 350 of the company's 350,000 residential customers were participating in the program, compared to 161 at the end of 2002. The Green Power Program offers 125 kWh blocks of EcoLogo-certified[107] green power at a price of $5 over and above the standard electricity price (this premium is unchanged compared to a year earlier).

Nova Scotia Power is not currently planning to offer green power to commercial customers, but the company has been in negotiation with the federal government regarding the sale of green power for use by federal facilities located in the province.

Marketing strategy: "Web site, direct mail, media stories, minimal newspaper ads and TV sponsorship."

2.3.8 Ontario: Energy Ottawa green power program

Energy Ottawa, an affiliate of Hydro Ottawa, sold green power from its 15 MW EcoLogo-certified Chaudière hydro facility to one small commercial customer in 2003 (as a contract for differences). Beginning in 2004, most of the remaining output of the facility, which comprises two stations over 100 years old that were modernized and expanded in 2001, will be sold to the federal government (see Section 1.2.1). The company is not now actively pursuing further retail sales, preferring to play the role of a wholesaler, although the company's Web site was still advertising its green power product in August 2004.

2.3.9 Ontario: Green Tags Ontario

The Green Tags Ontario program was launched in early 2002 as a non-profit initiative of the Grey Bruce Energy Co-op. The program supplies green power certificates representing the environmental attributes of green power purchased from Sky Generation's EcoLogo-certified Ferndale wind turbine (1.8 MW, installed in November 2002). At the end of 2003 the program had 600 residential customers and approximately 15 small business customers, compared to 300 residential and ten small business customers a year earlier. The certificates were being sold to residential customers at an unchanged price

[107] However, in August 2004, while Nova Scotia Power was listed on the Environmental Choice Program Web site (www.environmentalchoice.com) as an electricity *producer* certified to use the EcoLogo, it was not listed as an electricity *distributor* certified to use it.

of $75 per MWh. Pricing for business customers is customized. The product is not certified but is audited by a chartered accountant.

Marketing strategy: "Public speaking, public education, brochures throughout the area."

2.3.10 Ontario: Oakville Hydro Green Light Pact program

Oakville Hydro created the Green Light Pact program in 2003 as a means to provide green power to residential and small business customers. The power is Evergreen Clean Green Power purchased from Ontario Power Generation (see Section 2.3.11 for details of the product and the generation facilities). The Green Light Pact program can be considered to be a certificate marketing program, since anyone in Ontario, and not necessarily electricity consumers, can purchase a "Green Light Pact." The Pacts (environmental attributes) are sold in 330 kWh or 660 kWh blocks at a price of $91/MWh. Oakville Hydro declined to respond to the survey sent to program proponents, but according to the company's Web site,[108] between March and December 2003, 62,700 kWh worth of Pacts were sold. This represents a maximum of 190 customers.

Oakville Hydro is also in the process of building a landfill gas-fired power plant at the Bronte Landfill Site. This facility was expected to be in operation by the summer of 2004.[109] It is not clear whether this facility will contribute to the Green Light Pact program.

2.3.11 Ontario: Ontario Power Generation Evergreen Green Power

Ontario Power Generation (OPG) is seeking to recover the costs associated with meeting its green power target (Section 2.2.5) through its Evergreen Green Power marketing program for large commercial/industrial customers. Details of the green power facilities, which are all EcoLogo-certified, are provided in Section 2.2.5. The program was launched in 2001 with the creation of OPG Evergreen Energy, a new division of the company. At the end of 2003, between ten and 20 commercial/industrial customers were participating in the program — four times as many as one year earlier. OPG provides electricity to over 100 commercial/industrial consumers in total.

The program is not offered directly to residential customers, but the latter can participate through resellers. At the end of 2003, the only reseller was Oakville Hydro (see Section 2.3.10).

Three products are offered through the Evergreen Green Power Program:

- "Evergreen Friendly Power," generated entirely from facilities built prior to 1991
- "Evergreen Clean Green Power," a 50/50 blend of power generated from facilities built both prior to 1991 and after 1990
- "Evergreen Pure Green Power," generated entirely from facilities built after 1990.

The three products are offered at an average price premium of $35/MWh (with no change since the program's inception), with prices customized depending on the size of the customer and the timing of the purchase. Evergreen Friendly Power is offered exclusively to resellers and intended to be blended with power generated by facilities built after 1990. This is necessary to meet EcoLogo certification criteria that require green power products to incorporate a minimum of 50% of power from facilities that began operations in 1991 or later (see Section 4.2.1). The other two products are EcoLogo-certified.
Marketing strategy: "Integrated marketing campaign and direct sales."

[108] See http://www.oakvillehydro.com.
[109] Ibid.

2.3.12 Ontario: Select Power Selectwind program

The Selectwind program was launched in July 2003 by Select Power, the retail affiliate of Guelph Hydro, with the support of the federal Market Incentive Program (Section 2.1.3). Like the Green Tags Ontario program (Section 2.3.9), the Selectwind program is based on green power purchased from Sky Generation's Ferndale wind turbine (1.8 MW, installed in November 2002). Unlike Green Tags Ontario, the Selectwind program is a green power marketing program. Both the source facility and product are EcoLogo-certified. The price premium is $6.53 per 75 kWh block; blocks must be purchased monthly, on a three- or five-year term. Sixty residential and six commercial/industrial customers were participating in the program at the end of 2003.

Marketing strategy: "Advertising and marketing."

2.3.13 Prince Edward Island: Maritime Electric Green Power

Maritime Electric agreed to develop and administer a green power marketing program for its customers in conjunction with the government of Prince Edward Island's development of its 5.2 MW North Cape wind farm (Section 2.1.9). The output of the facility is purchased by Maritime Electric, with the bulk of it being sold to provincial and federal government facilities. Maritime Electric can, however, use up to 20% of the facility's output for sale to business and residential customers through its Green Power program,[110] which was launched in December 2001. By the end of 2003, 396 of the company's 56,400 residential customers and 34 of the company's 11,225 commercial/industrial customers were participating in the program — very slight increases compared to a year earlier.

Under the program, EcoLogo-certified green power was sold at the end of 2003 at a premium of $1.25 per block of 50 kWh over and above the standard electricity price — a significant reduction from $1.75 per 50 kWh one year earlier.

Marketing strategy: "Media interviews, marketing through TV ads, radio ads and bill inserts."

2.3.14 Saskatchewan: SaskPower GreenPower

SaskPower's GreenPower program, launched in 2002, offers green power from the 11.2 MW SunBridge wind power project (installed in 2001 and owned and operated by Suncor Energy and Enbridge) and SaskPower's own 5.9 MW Cypress Wind Power Project (installed in October 2002 and supported by the Wind Power Production Incentive; see Section 2.1.2). Both facilities are EcoLogo-certified. At the end of 2003, about 1,000 of the utility's 312,000 residential customers were participating, as well as seven large commercial/institutional participants out of the 86,000 that the utility serves (a reduction from the 230 commercial/industrial participants the program had in early 2002[111]). The federal and provincial governments are major purchasers. The City of Saskatoon is a partner in marketing the program.[112]

[110] See http://www.maritimeelectric.com/greenpower.html.

[111] Dogterom, J., M. McCulloch and A. Pape-Salmon. 2002. *Green Power Marketing in Canada: The State of the Industry*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=147.

[112] The City of Saskatoon distributes electricity within its boundaries. The partnership between Saskatoon and SaskPower allows customers within the city to purchase SaskPower's green power, with all premiums being paid to SaskPower (Chris Dekker, City of Saskatoon, personal communication, 2004).

At the end of 2003, the program offered green power at a premium of $2.50 per 100 kWh block, a sharp reduction from $3.50 one year earlier. Large contracts are negotiated. In addition to the source facilities, the green power product is EcoLogo-certified.

SaskPower originally planned to retain the ownership of the GHG reductions resulting from its green power sales (except for sales to the federal government), and to count them towards its voluntary GHG reduction targets.[113] This meant that consumers would be purchasing only a portion of the environmental attributes of the product, something that is at odds with the EcoLogo certification criteria, which require that all environmental attributes be transferred to the customer or retired (see Section 4.2.1). SaskPower now no longer counts GHG reductions from its green power sales towards its voluntary GHG targets.[114]

Marketing strategy: "SaskPower has a multi-purpose sales force to promote renewable power. A one-to-one sales approach through our sales team has been used to build support in the large business market. With the launch of the retail mass-market product, we utilized several promotional mediums. The mass-market campaign consisted of television, billboards, newspaper inserts, bill inserts and radio components, together with participation in trade shows. This campaign was supported through our 37 regional offices, toll-free phone line and Web site."

In late 2003, SaskPower expanded the Cypress facility to 10.6 MW with the support of the Wind Power Production Incentive (Section 2.1.2). SaskPower and ATCO Power also expect to begin building a 150 MW wind farm at Rushlake Creek (near Swift Current, Saskatchewan) by the end of 2004. SaskPower will purchase all of the electricity generated from this project.[115]

[113] SaskPower. 2002. *Climate Change Action Plan Progress Report 2001*, Table 10.1; http://challenge.vcr-mvr.ca/cha_client_e.cfm?No=26.
[114] SaskPower. 2003. *Climate Change Action Plan Progress Report 2002*, p. 12, Table 10.1; http://challenge.vcr-mvr.ca/cha_client_e.cfm?No=26.
[115] SaskPower. 2004. *Second set of open houses for wind power project*. News release, 28 April; http://www.saskpower.com/aboutus/news/2004.shtml.

Table 3. Summary of Green Power and Certificate Marketing Programs Active in 2003

Program	Number of End-user Customers at Year End	Price Premium/ Certificate Price at the End of 2003 (per MWh)	Certification	Resources Installed by the End of 2003 that Contribute to the Program[116]
Canadian Hydro Developers Renewable Energy Certificates	Residential: <100 Commercial: confidential	Residential: $30 Commercial: customized	Facilities: EcoLogo, BC Hydro "green criteria" Product: self-certified	Wind: 47 MW (*18.8 MW of this is also accounted for under the Small Power Research and Development Act (Table 1))* Hydro: 51 *(6.9 MW of this is also accounted for under the Small Power Research and Development Act (Table 1) and 15 MW under the BC Hydro green power target (Table 2))*
ENMAX Greenmax program	Residential: 10,000 Commercial: 200	Residential: $20 Commercial: customized	Facilities/ product: EcoLogo	Wind: 123 MW *(47 MW of this is also accounted for under Canadian Hydro Developers Renewable Energy Certificates and the remaining 75 MW under the Wind Power Production Incentive (Table 1))*
EPCOR Green Power ECO-PACKs	Residential: 7,000 Commercial: 10–50	Residential: $73–91 Commercial $64–71	Facilities/ product: EcoLogo	Wind: 0.9 MW Hydro: 12.75 MW *(6.4 MW[117] of this is also accounted for under Canadian Hydro Developers Renewable Energy Certificates)* Wood waste: 23 MW *(18 MW of this is also accounted for under the Small Power Research and Development Act (Table 1))*
Pembina Institute Green Power Certificates	Residential: 18 Commercial: 7	Residential: $25–27 Commercial: customized	Facilities: EcoLogo Product: Green Leaf	*Accounted for under Vision Quest Green Energy Tags*
Vision Quest Windelectric Green Energy	Business: confidential	Approx. 40% of conventional electricity price	Facilities/ product: EcoLogo	*Accounted for under Vision Quest Green Energy Tags*

[116] Some green power facilities are accounted for under more than one program in the final columns of Tables 1–3. Where multiple programs have contributed to the installation of a particular facility, it seems more informative to account for such facilities under all contributing programs, rather than make arbitrary decisions apportioning fractions of facilities to single programs. In order to make Tables 1–3 fully transparent, in Appendix D a list is provided of all facilities installed under Alberta's Small Power Research and Development Act and, in Appendix E, a list of all wind power facilities installed in Canada by the end of 2003, showing under which programs each has been accounted for in Tables 1–3. In Tables 4–7 (Section 3), on the other hand, rigorous quantification has required that each facility (or fraction of a facility) be accounted for under a single program, as specified in the notes accompanying Tables 6 and 7.

[117] This is fifty per cent of the Taylor facility near Lethbridge, Alberta.

Program	Number of End-user Customers at Year End	Price Premium/ Certificate Price at the End of 2003 (per MWh)	Certification	Resources Installed by the End of 2003 that Contribute to the Program[116]
Vision Quest Windelectric Green Energy Tags	Residential: <100 Business: confidential	Business: $42	Facilities: EcoLogo Product: TerraChoice and Green-e	Wind: 82 MW *(also accounted for under TransAlta's renewable energy target (Table 2); 37.5 MW of this is also accounted for under the ENMAX Greenmax program and the Wind Power Production Incentive (Table 1); a further 1.8 MW of the 82 MW is also accounted for under the Wind Power Production Incentive)*
BC Hydro Green Power Certificates	Business: >40	$20	Facilities: BC Hydro "green criteria" (soon EcoLogo) Product: self-certified	Hydro: 94 MW *(15 MW[118] of this is also accounted for under Canadian Hydro Developers Renewable Energy Certificates)* Wood waste: 20 MW Biogas: 7 MW *(all of the above are also accounted for under BC Hydro's green power target (Table 2))*
Nova Scotia Power Green Power	Residential: >350	$40	Facilities/ product:[119] EcoLogo	Wind: 1.2 MW *(also accounted for under Nova Scotia Power's renewable energy target (Table 2))*
Energy Ottawa green power program	Commercial: 1	not known	Facilities: EcoLogo	Hydro: 15 MW *(also accounted for under Ontario's "set aside" of tradable emissions allowances (Table 1))*
Green Tags Ontario	Residential: 600 Small business: 15	Residential: $75 Small business: customized	Facilities: EcoLogo Product: self-certified	Wind: 1.8 MW *(also accounted for under Select Power Selectwind)*
Oakville Hydro Green Light Pact program	<190	$91	Facilities/ product: EcoLogo	*Accounted for under Ontario Power Generation's Evergreen Green Power*
Ontario Power Generation Evergreen Green Power	Business: 10–20	$35 on average (customized)	Facilities: EcoLogo Product: EcoLogo, except "Evergreen Friendly Power"	Wind: 7 MW *(4.5 MW of this is also accounted for under the Wind Power Production Incentive and Ontario's "set aside" of tradable emissions allowances (Table 1))* Hydro: 128 MW Biogas: 6 MW Solar: <1 MW *(all of the above are also accounted for under Ontario Power Generation's green power target (Table 2))*
Select Power Selectwind program	Residential: 60 Business: 6	$87	Facilities/ product: EcoLogo	Wind: 1.8 MW *(also accounted for under Green Tags Ontario and the Market Incentive Program (Table 1))*

[118] This is fifty per cent of the Pingston facility near Revelstoke, British Columbia.

[119] However, on the Environmental Choice Program Web site (www.environmentalchoice.com) as of August 2004, while Nova Scotia Power was listed as an electricity *producer* certified to use the EcoLogo, it was not listed as an electricity *distributor* certified to use it.

Program	Number of End-user Customers at Year End	Price Premium/ Certificate Price at the End of 2003 (per MWh)	Certification	Resources Installed by the End of 2003 that Contribute to the Program[116]
Maritime Electric Green Power	Residential: 396 Business: 34	$25	Facilities/ product: EcoLogo	Wind: 5.2 MW *(also accounted for under PEI Energy Corporation wind power development (Table 1))*
SaskPower GreenPower	Residential: 1,000 Commercial/ institutional: 7	Residential: $25 Commercial/ institutional: $25 (customized for large contracts)	Facilities/ product: EcoLogo	Wind: 17.1 MW *(5.9 MW of this is also accounted for under the Wind Power Production Incentive (Table 1))*

3. Canadian Green Power Programs Active in 2003: Quantification and Benefits

Electricity production from fossil fuels, especially coal, is a major source of GHGs and regional air pollutants. Green power, on the other hand, has zero or near-zero GHG emissions,[120] and green power sources like wind, hydro and solar power also have zero emissions of regional air pollutants. Emissions of carbon dioxide (the most important long-lived GHG) from the combustion of biomass can be considered to be zero if the biomass is produced in a sustainable manner, because the carbon dioxide will be reabsorbed by new plant growth.[121] Biomass combustion can, however, have significant emissions of regional air pollutants as well as methane and nitrous oxide, both GHGs.

Sections 3.1–3.3 provide brief background information on the environmental issues that green power can help to address. Section 3.4 then presents a quantitative analysis of the green power programs described in Section 2, in terms of their contribution in 2003 to each province or territory's electricity production, and to reductions of emissions of GHGs and regional air pollutants. Section 3.5 provides a summary of non-environmental benefits of green power.

3.1 Climate change

Long-lived GHGs emitted from human activities, especially carbon dioxide, methane and nitrous oxide, are accumulating in the atmosphere and have now become the dominant influence on global climate change. The global average temperature rose by about 0.6 ºC during the twentieth century, and, unless emissions soon begin to fall quite quickly, it is projected to rise by a further 1.4 to 5.8 ºC by 2100.[122] A wide range of adverse environmental, social and economic impacts are associated with global average temperature increases in this range, some of them severe and extensive.[123]

As a small first step towards stabilizing GHG concentrations in the atmosphere, governments adopted the Kyoto Protocol in 1997. Canada ratified the protocol in December 2002, thereby agreeing to a legally binding target of reducing national GHG emissions to 6% below the 1990 level during 2008–2012 (net of credits for carbon sinks and purchases of international emissions units). In November 2002, the federal government published the *Climate Change Plan for Canada*,[124] outlining the approach it wishes to take to comply with the Kyoto Protocol. Renewable electricity, including green power, is a prominent feature of the plan (additional information is provided in Appendix A).

[120] For national and international GHG emissions accounting purposes, hydro power is currently deemed to have zero GHG emissions. However, it is known that large hydro reservoirs can result in significant emissions of methane, a powerful GHG. These emissions can be expected eventually to be accounted for in official GHG emissions inventories. This will not apply to small hydro power projects that avoid the flooding of land.

[121] For national and international GHG emissions accounting purposes, carbon dioxide emissions from all biomass combustion is currently deemed to be zero, regardless of how the biomass is produced. This may change in future. Currently, only the (relatively small) methane and nitrous oxide emissions from biomass combustion need be accounted for.

[122] Intergovernmental Panel on Climate Change. 2001. *Summary for Policymakers.* A Report of Working Group I of the Intergovernmental Panel on Climate Change. Geneva: IPCC; http://www.ipcc.ch.

[123] Intergovernmental Panel on Climate Change. 2001. *Summary for Policymakers — Climate Change 2001: Impacts, Adaptation and Vulnerability*. A Report of Working Group II of the Intergovernmental Panel on Climate Change. Geneva: IPCC; http://www.ipcc.ch.

[124] Government of Canada. 2002. *Climate Change Plan for Canada*; http://www.climatechange.gc.ca/plan_for_canada/plan/.

3.2 Air pollution[125]

Perhaps the two most prominent aspects of regional air pollution are smog and acid rain. Smog has major adverse impacts on human health and acid rain has major environmental effects. Federal studies show that several thousand premature deaths per year can be attributed to air pollution, and, according to the Ontario Medical Association, air pollution costs more than $1 billion a year in hospital admissions, emergency room visits and absenteeism in Ontario alone.

The two main ingredients in smog that affect human health are ground-level ozone and fine airborne particles (particulate matter, or PM). Ground-level ozone is produced when NO_x and volatile organic compounds (VOCs) react in sunlight and stagnant air. About 95% of NO_x emissions from human activity come from the burning of fossil fuels in vehicles, homes, industry and power plants. VOCs come mainly from gasoline combustion and the evaporation of liquid fuels and solvents. Human activities are responsible for the increases in ground-level ozone in recent years.

PM is directly emitted to the atmosphere but a large proportion is also formed through chemical reactions involving NO_x, SO_2, VOCs and ammonia. The main sources of airborne SO_2 are coal-fired power generating stations and non-ferrous metal smelters.

SO_2 and NO_x are also the main contributors to acid rain, which can damage crops, forests and whole ecosystems. Models predict that in 2010, even after significant past and future planned emission reductions in both Canada and the US, up to one quarter of the lakes in eastern Canada will remain chemically damaged. Forests in eastern Canada receive roughly twice the level of acid they can tolerate without long-term damage.

Mercury is a highly toxic metal that can volatilize and be carried in the atmosphere all over the world. Airborne mercury in Canada comes mainly from coal-fired power plants in the US and base metal smelters and incinerators in Canada, although in 2000 coal-fired electricity production also accounted for 25% of Canada's air emissions of mercury.[126]

Key drivers for action in Canada to reduce emissions of air pollutants are the Canada–US Air Quality Agreement and its amendments, and the Canada Wide Standards (CWS)[127] agreed to by federal, provincial and territorial governments for PM, ground-level ozone and other pollutants. CWS for mercury emissions from electricity generation are under development.

3.3 Other environmental issues

Other environmental issues that green power can help address are the impacts on watersheds and landscapes associated with conventional electricity generation, and the pollution and other environmental impacts resulting from the production and distribution (and, where applicable, disposal) of fossil and nuclear fuels.

[125] Except where noted, all information in this section has been taken from Environment Canada's Clean Air Web site; http://www.ec.gc.ca/air/introduction_e.html.
[126] Environment Canada. 2004. Undated. *Sources of Mercury — Canadian Releases*; http://www.ec.gc.ca/MERCURY/SM/EN/sm-cr.cfm?SELECT=SM.
[127] See http://www.ccme.ca/initiatives/standards.html.

3.4 Quantitative analysis

This section presents a quantitative analysis of the green power programs described in Section 2, in terms of their contribution in 2003 to (i) each province or territory's electricity production, and (ii) estimated reductions of emissions of GHGs and regional air pollutants. The analysis presented here is subject to the following assumptions, approaches and caveats:[128]

1. While the numbers in Tables 4–8 represent an attempt to quantify the environmental attributes of green power produced, **they in no way represent a claim over those attributes on behalf of the program proponents**. This is an important caveat, since green power and certificate certification (see Section 4) requires attributes to be transferred or retired by producers.
2. Electricity production attributed to a particular green power program is the *total* production during 2003 from the green power generation facilities installed as a result of the program, under the program, or that contribute to the program, regardless of whether all power (or its environmental attributes) produced by those facilities was actually sold as green power (or as green power certificates).[129]
3. Care has been taken to avoid any double counting of electricity production or, in consequence, emission reductions. Avoidance of double counting is made explicit in Tables 6 and 7 below by footnotes explaining how facilities (or fractions of them) have been apportioned to single programs. These decisions have an inevitable degree of arbitrariness. Therefore, while Tables 6 and 7 give a good sense of emission reductions achieved in different jurisdictions, **they cannot be used to draw reliable conclusions about the relative contributions of individual programs**.
4. Facilities' actual power output (in MWh) in 2003 was used where disclosed by program proponents or publicly available.[130] However, output had to be calculated from capacity data (in MW) in several cases.[131]
5. The contribution of green power programs in 2003 to each province/territory's total electricity production (Table 8) was calculated using total electricity production data for 2001 taken from Statistics Canada's publication *Electric Power, Generation, Transmission and Distribution — 2001*.
6. Emissions (and consequently emission reductions) were calculated using the assumptions and sources described in Appendix C.

Table 4 presents the combined capacities of green power generation facilities installed as a result of the programs, under the programs, or that contribute to the programs described in Section 2.

[128] Further information is available from the authors upon request.

[129] Under a green power or certificate marketing program not all power (or its environmental attributes) produced by green power facilities contributing to the program may actually be sold as green power (or as green power certificates). However, as noted in Section 2.3, proponents of these programs are largely unwilling to disclose the amounts of electricity sold through their programs as green power. The authors had little choice, therefore, other than to attribute to a particular program the total production during 2003 from the contributing facilities. On the other hand, it can legitimately be argued that the facilities exist because of the program, and that therefore all power produced by the facilities can be attributed to the program.

[130] For EPCOR's small solar facility, 2002 data was used. For Hydro-Québec, output data was obtained from Hydro-Québec. 2004. *Rapport sur le Développement Durable 2003*. p. 12; http://www.hydroquebec.com/publications/fr/rapport_perf_enviro/2003/pdf/rdd_2003_fr.pdf.

[131] These cases were Small Power Research and Development Act, ENMAX, EPCOR, BCUC Resource Planning Guidelines, Green Tags Ontario, Select Power, SaskPower and the Yukon Green Power Initiative. The capacity factors used were 95% for wood waste and landfill/digester gas, 50% for hydro, and 35% for wind, except for the Yukon Green Power Initiative, where a 15% factor was used. A further adjustment was made for ENMAX to account for the McBride Lake facility's commissioning part-way through the year. In the case of BC Hydro, only total output from all facilities was provided, so output from separate resource types (hydro, wood waste, landfill gas) was estimated by using the standard capacity factors and then scaling the resulting numbers to match the total output figure.

Table 4. Combined Capacities (MW) of Generation Facilities Associated with Green Power Programs Active in 2003

Jurisdiction[132]	Hydro	Wind	Wood waste	Biogas	Solar	Total
Alberta	84.2	169	43.5	-	0.013	296.7
British Columbia	94	-	86	7	-	187
Nova Scotia	-	1.2	-	-	-	1.2
Nunavut	-	0.15	-	-	-	0.15
Ontario	142.5	14.0	-	6	<1	162.5
Prince Edward Island	-	5.2	-	-	-	5.2
Québec	-	104	-	-	-	104
Saskatchewan	-	17.1	-	-	-	17.1
Yukon	-	0.81	-	-	-	0.81
Canada	320.7	311.5	129.5	13	<1	774.7

Tables 5–7 show the electricity production in 2003 and the corresponding estimated net reductions of emissions of GHGs and regional air pollutants attributable to each of the green power programs described in Section 2. In each case, net emission reductions have been calculated as the difference between (i) the estimated emissions from green power generation and (ii) the estimated emissions from a "business-as-usual" scenario of generation of the same quantity of electricity. Generation of the green power is considered to avoid or displace generation of the electricity in the business-as-usual scenario.

As business-as-usual scenarios are "counterfactual,"[133] there can be no single correct one. In addition, business-as-usual scenarios that might be considered highly realistic will in general be very complex. Two simple but commonly used business-as-usual scenarios have therefore been used, with the aim of obtaining two sets of reasonable estimates for net emission reductions. In Table 6, net emission reductions have been calculated assuming that green power production is causing the avoidance of *grid-average electricity generation* in each province or territory. This is a reasonable assumption if green power production is displacing output from existing facilities, as opposed to preventing the building of new facilities.

If, however, green power production is preventing the building of new conventional power generation facilities, it is causing the avoidance of "*build-marginal" electricity generation* (i.e., the conventional electricity capacity that would normally be built in response to increased demand). Natural gas-fired combined cycle gas turbine (CCGT) systems are widely regarded as the current build-marginal power supply throughout Canada.[134] In Table 7, net emission reductions have been calculated assuming that green power production is causing the avoidance of *natural gas-fired CCGT electricity generation* in all jurisdictions.

As noted in Section 1.2.3, in some cases the power sold under green power marketing initiatives comes from generation facilities established many years ago. In these cases, the corresponding emission reductions shown in Tables 6 and 7 are likewise "old."

[132] Of programs, not necessarily of facilities.
[133] By definition, it does not exist in reality.
[134] This appears, however, to be no longer the case in Alberta where coal plants continue to be planned and built. In Ontario, identification of the build-marginal supply is complicated by the current uncertainty as to the future of the province's electricity system.

Table 5 shows how programs that do not appear explicitly in Tables 6 and 7 are accounted for there.

Table 5. How Programs that Do Not Appear Explicitly in Tables 6 and 7 are Accounted for in those Tables

Jurisdiction	Program	Where Accounted for
Federal	Class 43.1 accelerated capital cost allowance rate and Canadian Renewable and Conservation Expenses	Other programs
	Wind Power Production Incentive[135]	ENMAX Greenmax program Vision Quest Green Energy & Tags Ontario Power Generation green power target Toronto Hydro/TREC wind power development Hydro-Québec wind power development SaskPower GreenPower program
	Market Incentive Program	Select Power Selectwind program
Alberta	TransAlta renewable energy target	Vision Quest Green Energy & Tags
	Pembina Institute Green Power Certificates	
British Columbia	"BC Clean Electricity" target	BC Hydro green power target
	BC Hydro Green Power Certificates	
Nova Scotia	Nova Scotia Power Green Power	Nova Scotia Power renewable energy target
Ontario	"Set aside" of tradable emissions allowances for renewable energy projects	Ontario Power Generation green power target Energy Ottawa green power program
	Tax regulations package	Other programs
	Oakville Hydro Green Light Pact program	Ontario Power Generation green power target
	Ontario Power Generation Evergreen Green Power	
Prince Edward Island	Maritime Electric Green Power	PEI Energy Corporation wind power development
Québec	Fonds pour l'accroissement de l'investissement privé et la relance de l'emploi	*It is unclear whether the program contributed to the installation of any facilities*

[135] Only the half (4.5 MW) of the 9 MW Huron–Kincardine wind facility covered under Ontario Power Generation's green power target is accounted for in Tables 6–7.

Table 6. Estimated Net Emission Reductions in 2003 from Green Power Programs if Grid Electricity Displaced

Program	Electricity Produced (MWh)	Net Emission Reductions[136]				
		GHGs (t)	ADPs (kg)	GLOPs (kg)	CO (kg)	PM (kg)
Alberta						
Small Power Research and Development Act[137]	597,659	524,062	1,945,199	708,773	85,279	95,335
Canadian Hydro Developers R.E. Certificates[138]	211,830	187,956	689,444	339,723	38,632	33,790
ENMAX Greenmax program[139]	67,963	60,303	221,199	108,996	12,394	10,841
EPCOR Green Power ECO-PACKs[140]	72,302	63,343	235,321	83,523	10,106	11,533
Vision Quest Windelectric Green Energy & Tags	190,000	168,586	618,392	304,712	34,650	30,308
Totals for Alberta	*1,167,678*	*1,004,250*	*3,709,554*	*1,545,726*	*181,061*	*181,807*
British Columbia						
BCUC Resource Planning Guidelines	549,252	19,779	16,212	-401,573	-20,446	2,869
BC Hydro green power target	294,000	15,348	8,678	-23,678	5,691	1,195
Totals for British Columbia	*843,252*	*35,126*	*24,889*	*-425,251*	*-14,755*	*4,064*
Nova Scotia						
Nova Scotia Power renewable energy target	2,666	1,961	36,383	6,223	1,052	1,313
Nunavut						
Nunavut Power Corporation wind power generation	85	32	358	486	117	11
Ontario[141]						
Ontario Power Generation green power target	757,000	202,683	1,131,851	447,916	27,520	62,878
Toronto Hydro/TREC wind power development	1,000	268	1,495	592	40	84
Energy Ottawa green power program	110,000	29,456	164,470	65,087	4,352	9,215
Green Tags Ontario[142]	2,760	739	4,126	1,633	109	231
Select Power Selectwind[143]	2,760	739	4,126	1,633	109	231
Totals for Ontario	*873,519*	*233,885*	*1,306,068*	*516,860*	*32,130*	*72,639*
Prince Edward Island						
PEI Energy Corporation wind power development	19,000	8,473	113,465	25,995	1,659	1,241
Québec						
Hydro-Québec wind power development	170,300	1,434	5,989	5,488	1,172	254
Saskatchewan						
SaskPower GreenPower program	52,429	46,899	378,575	132,871	2,085	267,396
Yukon						
Green Power Initiative	1,067	54	846	1,142	292	25
Totals for Canada	***3,102,073***	***1,332,113***	***5,576,128***	***1,809,539***	***204,814***	***528,751***

[136] ADP = acid deposition precursors. ADP emissions are calculated as NO_x emissions plus 0.7 × SO_2 emissions. GLOP = ground-level ozone precursors. GLOP emissions are calculated as NO_x emissions plus VOC emissions. CO = carbon monoxide. PM = total particulate matter. t = tonnes of carbon dioxide equivalent. kg = kilograms.
[137] Includes all the facilities listed in the table in Appendix D.
[138] Excludes 18.9 MW of the Cowley Ridge wind facility and three hydro facilities (see Appendix D), covered under the Small Power Research and Development Act; also excludes the Pingston hydro facility, covered under BC Hydro.
[139] Includes only 50% of the McBride Lake wind facility. The other 50% is covered under Vision Quest; Canadian Hydro's wind facilities are covered under the Small Power Research and Development Act and Canadian Hydro.
[140] Excludes 18 MW of the Whitecourt wood-waste facility, covered under the Small Power Research and Development Act; also excludes 50% of the Taylor hydro facility (the other 50% is covered under Canadian Hydro).
[141] As explained in Section 2.1.7, since "set aside" SO_2 and NO allowances were only applied for for two facilities in Ontario, and even in those cases it is not clear whether the allowances will be transferred to customers or retired without use, the majority of the ADP and GLOP reductions calculated here will have been cancelled out by increased emissions by Ontario Power Generation.
[142] Includes 50% of Sky Generation's Ferndale wind turbine.
[143] Includes 50% of Sky Generation's Ferndale wind turbine.

Table 7. Estimated Net Emission Reductions in 2003 from Green Power Programs if Natural Gas-Fired Combined Cycle Gas Turbine Electricity Displaced

Program	Electricity Produced (MWh)	Net Emission Reductions[144]				
		GHGs (t)	ADPs (kg)	GLOPs (kg)	CO (kg)	PM (kg)
Alberta						
Small Power Research and Development Act[145]	597,659	216,166	41,836	-183,980	-5,787	35,860
Canadian Hydro Developers R.E. Certificates[146]	211,830	78,827	14,828	23,301	6,355	12,710
ENMAX Greenmax program[147]	67,963	25,291	4,757	7,476	2,039	4,078
EPCOR Green Power ECO-PACKs[148]	72,302	26,095	5,061	-24,478	-911	4,338
Vision Quest Windelectric Green Energy & Tags	190,000	70,704	13,300	20,900	5,700	11,400
Totals for Alberta	*1,167,678*	*417,083*	*79,783*	*-156,781*	*7,396*	*68,385*
British Columbia						
BCUC Resource Planning Guidelines	549,252	193,697	38,448	-367,679	-24,180	32,955
BC Hydro green power target	294,000	108,443	20,580	-5,536	3,692	17,300
Totals for British Columbia	*843,252*	*302,140*	*59,028*	*-373,215*	*-20,488*	*50,255*
Nova Scotia						
Nova Scotia Power renewable energy target	2,666	992	187	293	80	160
Nunavut						
Nunavut Power Corporation wind power generation	85	32	6	9	3	5
Ontario[149]						
Ontario Power Generation green power target	757,000	281,673	52,990	83,270	20,280	44,880
Toronto Hydro/TREC wind power development	1,000	372	70	110	30	60
Energy Ottawa green power program	110,000	40,934	7,700	12,100	3,300	6,600
Green Tags Ontario[150]	2,759	1,027	193	304	83	166
Select Power Selectwind[151]	2,759	1,027	193	304	83	166
Totals for Ontario	*873,519*	*325,033*	*61,146*	*96,087*	*23,776*	*51,871*
Prince Edward Island						
PEI Energy Corporation wind power development	19,000	7,070	1,330	2,090	570	1,140
Québec						
Hydro-Québec wind power development	170,300	63,373	11,921	18,733	5,109	10,218
Saskatchewan						
SaskPower GreenPower program	52,429	19,510	3,670	5,767	1,573	3,146
Yukon						
Green Power Initiative	1,067	397	75	117	32	64
Totals for Canada	***3,102,073***	***1,135,629***	***217,145***	***-406,899***	***18,050***	***185,244***

[144] ADP = acid deposition precursors. ADP emissions are calculated as NO_x emissions plus 0.7 × SO_2 emissions. GLOP = ground-level ozone precursors. GLOP emissions are calculated as NO_x emissions plus VOC emissions. CO = carbon monoxide. PM = total particulate matter. t = tonnes of carbon dioxide equivalent. kg = kilograms.
[145] Includes all the facilities listed in the table in Appendix D.
[146] Excludes 18.9 MW of the Cowley Ridge wind facility and three hydro facilities (see Appendix D), covered under the Small Power Research and Development Act; also excludes the Pingston hydro facility, covered under BC Hydro.
[147] Includes only 50% of the McBride Lake wind facility. The other 50% is covered under Vision Quest; Canadian Hydro's wind facilities are covered under the Small Power Research and Development Act and Canadian Hydro.
[148] Excludes 18 MW of the Whitecourt wood-waste facility, covered under the Small Power Research and Development Act; also excludes 50% of the Taylor hydro facility (the other 50% is covered under Canadian Hydro).
[149] As explained in Section 2.1.7, since "set aside" SO_2 and NO allowances were only applied for for two facilities in Ontario, and even in those cases it is not clear whether the allowances will be transferred to customers or retired without use, the majority of the ADP and GLOP reductions calculated here will have been cancelled out by increased emissions by Ontario Power Generation.
[150] Includes 50% of Sky Generation's Ferndale wind turbine.
[151] Includes 50% of Sky Generation's Ferndale wind turbine.

Table 8 summarizes the contribution made by the green power programs described in Section 2 to each province or territory's electricity production, as calculated in Tables 6 and 7, as a proportion of total provincial/territorial production.

Table 8. Green Power Programs Active in 2003 as a Proportion of Total Jurisdictional Electricity Production (in Energy Terms)

Jurisdiction[152]	Proportion of Electricity Production Attributable to Green Power Programs in 2003
Alberta	1.85 %
British Columbia	1.43 %
Manitoba	nil
New Brunswick	nil
Newfoundland and Labrador	nil
Nova Scotia	0.02 %
Nunavut and Northwest Territories	0.01 %
Ontario	0.57 %
Prince Edward Island	38.8 %
Québec	0.10 %
Saskatchewan	0.30 %
Yukon	0.36 %
Canada	0.55 %

It must be stressed that there are some large uncertainties in the results presented in Tables 6–8, and the precision with which the numbers in Tables 6 and 7 are expressed should not be taken as an indicator of absolute accuracy. Most importantly

- as noted above, in several cases the actual electricity production by green power facilities has been estimated fairly crudely using assumed capacity factors.
- emission factors for regional air pollutants from biomass- and biogas-fired facilities are provisional only. Ideally, actual emissions measurements should be made at such facilities.
- as noted above, total jurisdictional electricity production data for 2001 were used as a proxy for 2003 data.

3.5 Other benefits of green power

As noted in Section 1.1, in addition to its environmental benefits, green power has important benefits for energy security, regional development, economic diversification and creation of skilled jobs:

- Most green power production does not depend on supplies of fuel that can be subject to major price fluctuations and international disputes. Indeed, green power's lack of fuel price volatility risk can make it competitive with conventional electricity for long commercial contracts.
- Unlike conventional electricity generation, which involves a small number of very large, centralized facilities, green power development results in a network of numerous small-scale plants with a wide geographic distribution and the promise of economic stimulus in multiple, mainly rural locations.

[152] Of programs, not necessarily of facilities.

- Green power generation projects have much shorter development times than larger centralized projects, which require a lengthy and expensive permitting process. For example, the 75 MW McBride Lake wind farm in Alberta was developed in less than a year, compared to large hydro or nuclear power plants, which may take ten years or more to build. [153]
- Rental fees from wind turbines located on ranchers' and farmers' land provide these landowners with a consistent source of revenue that supplements and supports their annual incomes.
- A broad review of studies of the relative employment impacts of conventional and alternative energy investment showed that low-impact renewable energy supply provides over 50% more jobs per dollar invested than conventional energy supply.[154]
- A more recent study found that wind and solar power both provide about 43% more person-years of employment per dollar invested than coal-fired electricity production over a ten-year period. [155] Furthermore, job intensity in extractive industries is on a long-term decline. Coal production in the United States rose by 32% between 1980 and 1999, but associated employment fell by 66%.[156]
- Another recent review of studies of employment in the electricity production sector showed that wind, solar and biomass-fired facilities all generate more jobs per MWh in the construction, manufacturing and installation sectors than do coal- and natural gas-fired facilities. There is not such a clear distinction between green power and fossil-fuelled technologies in the number of jobs created in operation, maintenance and fuel processing.[157]

[153] Tampier, M. 2003. *Background Document for the Green Power Workshop Series — Workshop #5 — April 3, 2004*. Pollution Probe and Summerhill Group, p. 31; http://www.pollutionprobe.org/whatwedo/Energy.htm.
[154] Campbell, B., L. Dufay and R. Macintosh. 1997. *Comparative Analysis of Employment from Air Emission Reduction Measures*. Report for Environment Canada, Global Air Issues Branch. Drayton Valley: Pembina Institute, p. 10.
[155] Singh, V. and J. Fehrs. 2001. *The Work That Goes Into Renewable Energy*, Renewable Energy Policy Project Research Report No. 13. Washington, DC: REPP, p. 20; http://www.repp.org.
[156] Renner, M., 2000. *Working for the Environment: A Growing Source of Jobs*. Worldwatch Institute; http://www.worldwatch.org/pubs/paper/152/.
[157] Kammen, D., K. Kapadia and M. Fripp. 2004. *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* Renewable and Appropriate Energy Laboratory, University of California, Berkeley, p. 8; http://ist-socrates.berkeley.edu/~rael/outreach.html.

4. Green Power Certification

4.1 Introduction

Demand for green power from Canadian electricity consumers and the emergence of green power and certificate marketing programs has created a need for certification standards to validate and ensure public confidence in green power products, especially in the context of competition (i) between multiple providers of green power products in deregulated electricity markets and (ii) between green power certificate products independently of electricity market regulation. As a result, a number of organizations have been developing and applying certification standards. Certification systems can apply both to green power facilities themselves ("generation certification") and green power and certificate products offered to consumers ("retail product certification").

Certification can ensure that green power products meet a clear definition of low-impact renewable electricity. There are many instances where renewable energy technologies can present undesirable environmental consequences that prevent them from meeting a reasonable definition of "low-impact." The low-impact characteristics of green power go well beyond the conventional definition of renewable resources and imply a minimal adverse effect on the following:

- climate change
- air quality
- water quality
- watersheds, river systems and fisheries
- flora and fauna
- geophysical features
- noise
- visual aesthetics
- any build-up of hazardous or toxic waste.

Another important objective of green power certification is to *increase* the total installed capacity of green power generation facilities. Recent date of installation is therefore another desirable quality to capture in a green power label.

Further discussion of what should be included in or excluded from the definition of green power is beyond the scope of this report.[158]

The following sections briefly describe all the existing or emerging green power certification systems that, to the authors' knowledge, are currently relevant to Canadian green power development.

[158] The Pembina Institute has published its views on the definition of green power in Raynolds, M. and A. Pape-Salmon. 2002. *Pembina Institute Green Power Guidelines for Canada*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=23..

4.2 Certification systems

4.2.1 Environmental Choice Program EcoLogo (generation and product certification)[159]

The Environmental Choice Program (ECP) is Environment Canada's eco-labelling program, established in 1988 and now managed and delivered by TerraChoice Environmental Services under license to, and taking policy direction from, Environment Canada. It covers a large number of categories of products and services. The Program's official symbol of certification — the EcoLogo — is a registered mark of Environment Canada.

In 1996, the ECP developed interim criteria for and began certification of "alternative source or environmentally preferable" electricity generation. Following a national multi-stakeholder consultation process, these criteria were combined, along with other information pertaining to renewable electricity, into a guideline for "renewable low impact electricity," of which the first draft was released in November 1999. A draft version was released by Environment Canada for public comment in December 2001.[160] When the government has completed any further modifications, the final guideline approved by the Minister of the Environment is to be issued under the Canadian Environmental Protection Act through a notice in the *Canada Gazette*. Meanwhile, by August 2004, 41 electricity producers and five electricity distributors were already licensed to use the EcoLogo for green power as defined by ECP's *Certification Criteria Document CCD-003* issued in its most recent version on December 15, 2003.[161]

The EcoLogo certification criteria apply to "alternative-use electricity" (power generation from an existing facility not originally designed for power generation), biogas- and biomass-fired, and solar, hydro and wind power facilities. The criteria

- require that there be consultation with communities and stakeholders
- require that land use, cultural values and biodiversity loss issues be addressed
- exclude pilot-scale demonstration projects
- prohibit any adverse impacts on endangered or threatened species
- limit, for biogas- and biomass-fired facilities, the total of "load points" corresponding to emissions of CO, PM, NO_x and SO_x
- require that, for facilities fuelled by wood waste, agricultural waste or energy crops, fuel be sourced from operations that ensure the rate of harvest "does not exceed levels that can be sustained"
- include, for hydro facilities, a series of requirements addressing habitat alteration or destruction, water flows and temperature and their effect on indigenous species, water quality and fish passage
- require that, for wind facilities, facility structures do not harm birds and are not located in areas protected for endangered or threatened bird species.

It is important to note that differences exist between facility and product certification. The ECP certifies three vintages of renewable electricity facilities: those that began operation prior to January 1, 1991; those that operated between January 1, 1991 and March 31, 2001 inclusively; and those that generated electricity on or after April 1, 2001. Products may not be certified if they consist only of electricity from

[159] All information in this section has been either taken from the Environmental Choice Web site — http://www.environmentalchoice.com — or provided by Leslie Welsh, Environment Canada, personal communication, November 2003.
[160] The draft guideline was published in the Canada Gazette Part I on December 8, 2001, and is available at http://canadagazette.gc.ca/partI/2001/20011208/html/notice-e.html.
[161] This document was provided by Leslie Welsh, Environment Canada.

the first two vintages of facility. In order to meet certification requirements, the product must incorporate a minimum of 50% of the second and/or third facility vintages, and a maximum of 50% of the first type.[162]

To verify that a product meets the certification criteria, ECP auditors can review quality control and production records and perform unannounced on-site audits. Electricity sources, accounting of environmental attributes, and product compliance with the criteria are all subject to verification. However, the certification criteria do not explicitly require that products be reviewed or audited on an annual or other regular basis.

The certification criteria also contain provisions (articles 13–18) for avoiding double counting of the environmental attributes of green power, requiring that all such attributes be transferred to the customer or retired. However, these provisions do not quite provide complete assurance that all forms of double counting are prohibited, since the word "retired" (article 15 paragraph (b)) is not accompanied by the words "without use." For example, double counting would occur if GHG emission reductions associated with green power generation were used towards meeting the generating company's voluntary or mandatory corporate GHG target, while at the same time the power was sold in a manner that implied that its full environmental attributes were being transferred to the customer (which is the justification for the customer paying a premium). A company might claim it was conforming to the EcoLogo criteria in "retiring" the reductions *by using them* to meet its GHG target. The December 2001 draft EcoLogo guideline contained no prohibition against double counting at all, saying only that "It is the intention of the Environmental Choice Program to monitor the developments regarding the ownership and transfer of environmental benefits, including emission reductions arising from the generation of renewable low-impact electricity."

4.2.2 TerraChoice Green Leaf Label (product certification)[163]

In September 2002, separately from the ECP, TerraChoice Environmental Services launched its own (non-government-endorsed) Green Leaf Standard for "Tradable Renewable Electricity Certificates." To meet the Green Leaf Standard, green power certificates must be associated with renewable low-impact electricity sources that are either EcoLogo-certified or meet identical standards specified in the Green Leaf *Technical Requirements for Electricity Generation Facilities*. At least one company (Vision Quest Windelectric) is currently licensed to use the Green Leaf label (see Section 2.3.5), and TerraChoice is in contact with several others interested in using it.

Two levels of Green Leaf certification are available: Level A certificates are from facilities that began operations after April 1, 2001; Level B certificates are from facilities that began operations between January 1, 1991 and April 1, 2001.[164]

The Green Leaf Standard

- prohibits double counting of environmental attributes of green power, including prohibiting the issuance of green power certificates representing environmental attributes used to comply with any regulatory requirement or non-regulatory mandate, and assumes green power certificates to have been automatically retired when a party promotes itself in association with the certificates

[162] As noted in Section 1.2.3, marketing of green power from facilities that are not new does not produce any new reductions in adverse environmental impacts.
[163] All information and documents referred to in this section have been taken from the TerraChoice Web site — http://www.terrachoice.ca/trcs.htm.
[164] As noted in Section 1.2.3, marketing of green power from facilities that are not new does not produce any new reductions in adverse environmental impacts.

- limits creation of green power certificates to grid-connected generation facilities
- requires that certificates be sold within a year of the generation of the green power in respect of which they are issued
- requires that certificates be accompanied by information disclosing the location and type of facilities producing the green power in respect of which they are issued
- provides for unannounced verification checks by TerraChoice representatives.

In contrast to the slightly uncertain provisions against double counting in the EcoLogo certification criteria (Section 4.2.1), the Green Leaf Standard's prohibition of double counting is clear and absolute: "In no way can the environmental attributes associated with the Green Leaf [certificates] be counted more than one time."

The TerraChoice Green Leaf certification program has both initial and regular annual verification and audit processes, to ensure the reliability and compliance of certified products. The annual audits, performed by an accredited third party, involve verification of company records such as power purchase agreements, records of certificate sales, contracts and marketing material.

4.2.3 BC Hydro Green Criteria (generation guarantee of quality)

In 2000, BC Hydro adopted a voluntary portfolio standard under which it committed to meet 10% of incremental demand for electricity between 2000 and 2010 from green power sources (see Section 2.2.2). At the time, feeling that the EcoLogo certification system was not fully meeting the company's needs, BC Hydro prepared its own "Green Power Generation Green Criteria"[165] to define its compliance with its voluntary standard. However, in April 2004 the company announced that it would seek EcoLogo certification for both its existing and new green power supply contracted from independent power producers.[166] BC Hydro is also considering adopting Green Leaf certification for its Green Power Certificates (Section 2.3.6). The "green criteria" are therefore likely to cease being used in 2004. They were, however, still in use in 2003 and so are described here.

BC Hydro states that meeting the criteria does not imply compliance to any certification process. However, the criteria are being used as a form of guarantee of quality for the company's Green Power Certificates, hence their inclusion in this discussion of certification systems.

Key differences between the BC Hydro criteria and the EcoLogo certification criteria include the following:

- the BC Hydro criteria require that biomass- and biogas-fired facilities not cause a net decrease in regional air quality, while the EcoLogo certification criteria do not make such a requirement
- the BC Hydro criteria require that biomass fuels are not diverted from a more productive or efficient use, while the EcoLogo certification criteria do not explicitly address this issue
- the BC Hydro criteria contain considerably more elaborate provisions for ensuring that projects are developed in a socially responsible manner (especially respecting consultation and engagement of aboriginal communities), compared to the EcoLogo certification criteria[167]

[165] BC Hydro. 2003. *2002/03 Green Power Generation Green Criteria*; http://www.bchydro.com/info/ipp/ipp959.html.
[166] BC Hydro. 2004. *EcoLogo — The new mark of green energy*; http://www.bchydro.com/rx_files/info/info10433.pdf.
[167] It should be noted, however, the ECP intentionally focuses on environmental criteria.

- the BC Hydro criteria require that facilities must have begun operations on or after April 1, 2001, while the EcoLogo certification criteria allow green power products to incorporate up to 50% of power from facilities that began operations earlier than 1991.[168]

The "green criteria" require electricity generators to provide, "on a regular basis," a performance report that "may" include a verifiable life-cycle analysis for the facility. However, the criteria do not require an accredited third party to perform regular verification of the facilities or to monitor their environmental and social impacts as ongoing proof of compliance.

4.2.4 Green-e Renewable Electricity Certification (product certification)[169]

Canadian green power and certificate marketers selling their product to the United States can seek certification through the Green-e Renewable Electricity Certification program. The program certifies green power and green power certificate products that meet the standards established by the non-profit Center for Resource Solutions, based in San Francisco. The Green-e program is governed by a Board of Directors that includes representation from environmental non-governmental organizations, regulators and power producers.

Green-e certified green power can comprise up to 50% non-green power content, as long as its emissions per kWh of SO_2, NO_x and carbon dioxide do not exceed state or regional grid averages, and there is no nuclear content beyond than that contained in grid-average power. The green power component must come from solar, wind, geothermal, biomass or low-impact hydro[170] facilities. Annually increasing percentages of power must come from "new" facilities installed after January 1, 1997. Distributors must make full disclosure of the percentage and type of renewable resources in their product.

In contrast, green-e certified green power certificates must originate entirely from renewable facilities beginning operation after January 1, 1999. Certificates from Canada must be recognized by an approved tracking system. Each certified provider must disclose the quantity, type and geographic source of their products to residential and small business customers.

Both green power and certificate distributors/providers are subject to an annual independent "Process Audit" and semi-annual compliance reviews to verify product content and marketing claims, ensure enough renewable power has been purchased to meet customer demand or that certificates are sold only once. In the case of certificates, there are strict provisions for preventing double counting of environmental attributes, including a prohibition on using the attributes for compliance with any government mandate. These provisions do not apply to certified green power, except for a tight limit on the extent to which green power mandated by a renewable portfolio standard can be used in a certified product.

[168] As noted in Section 1.2.3, marketing of green power from facilities that are not new does not produce any new reductions in adverse environmental impacts.
[169] All information in this section has been taken from the Green-e Web site at http://www.green-e.org.
[170] Certified by the Low Impact Hydropower Institute.

4.2.5 Canadian Electricity Association "Environmentally Preferable Electricity Portfolio" and the "Environmentally Preferable Electricity Sources" Systems (generation certification)

The Canadian Electricity Association (CEA) has stated that the EcoLogo program does not adequately serve the needs of the Canadian electricity market.[171] The association is consequently testing an alternative certification system developed by Scientific Certification Systems (SCS), based in Oakland, California. SCS offers two certification programs: the "Environmentally Preferable Electricity Portfolio" (EPEP) and the "Environmentally Preferable Electricity Sources" (EPES). [172] EPEP seeks to achieve the "environmental optimization of power generation within each power production region. Optimization is accomplished through an integrated environmental accounting approach based on advanced life-cycle impact assessment. . . . Environmental performance and improvements are measured against the average performance of the regional power pool. The program does not pit one energy generation source against another, and does not artificially segment assets into 'green' and 'black' sources." EPES certification enables environmental performance of specific energy sources to be certified. To be approved, the estimated environmental performance of a power source must have lower environmental impacts than the "average performance of the regional power production pool, under a series of impact categories."

The CEA has initiated five pilot projects for the EPEP system. The pilot projects cover nuclear, wind, and natural gas-, oil- and coal-fired generation facilities, and were expected to be complete by spring 2004.[173] The projects are supported by Natural Resources Canada with the aim of developing scientifically based information on the environmental impacts of the full range of generating technologies, and reporting the information in a way easily understood by consumers. NRCan does not, however, specifically support the development of EPEP or EPES as certification programs.[174]

Clearly, the EPEP and the EPES systems differ markedly from the EcoLogo, Green Leaf, BC Hydro and Green-e systems in that they target lower cost, non-renewable resources including fossil-fuelled and nuclear generation. In contrast, the EcoLogo, Green Leaf, BC Hydro and Green-e (certificates) systems apply only to renewable resources with low environmental impacts, while the Green-e (power) system falls in between.

[171] Tim Egan, Canadian Electricity Association, personal communication, 2002.
[172] See http://www.scscertified.com/electricity.
[173] Canadian Electricity Association. 2004. *Environmentally Preferable Power*; http://www.canelect.ca/english/managing_issues_environment_epp_response.html
[174] Michael Paunescu, Natural Resources Canada, personal communication, July 2004.

5. Summary, Comparison to Earlier Years and Conclusions

Green power programs and associated facilities

This report has sought to provide a comprehensive review of all Canadian green power programs that were active in 2003 (i.e., resulting in or contributing to actual power generation during that year). Eleven are government green power policies (compared to eight active in 2002[175]), seven are utility green power development programs (compared to five active in 2002), and fourteen are green power and certificate marketing initiatives (compared to ten active in 2002).

Green power generation facilities associated with those programs at the end of 2003 amounted to a total of 775 MW of capacity (compared to 539 MW in 2002). This capacity was dominated by hydro (41%), wind (40%) and wood waste (17%), with most of it located in Alberta (38%), British Columbia (24%), Ontario (21%) and Québec (13%). These proportions were little changed from a year earlier, except that British Columbia's proportion rose sharply while Ontario's and Québec's declined — a consequence of BC Hydro's rapid implementation of its green power target while green power implementation stagnated in Ontario and Québec. Production of electricity by these facilities as a proportion of total jurisdictional electricity production (in energy terms) was at most 1.85% (in Alberta) and 0.55% for Canada as a whole.[176]

Government green power policies

The eleven government policies continued to cover a wide range of approaches: tax benefits, subsidy per kWh, grant to marketers, guaranteed price per kWh, directive by regulatory authority, allocation of emissions allowances, construction of facilities by government agencies, and grants/loans/loan guarantees. Governments in Canada are still experimenting with different types of policies for supporting green power, and some provincial governments have yet to provide any support at all. However, as documented in Appendix A, four provincial governments (New Brunswick, Nova Scotia, Ontario and Prince Edward Island) are now close to implementing mandatory renewable portfolio standards, while British Columbia is already implementing a voluntary one through BC Hydro (Section 2.2.2), Québec has mandated 2,000 MW of wind power capacity by 2012, and Alberta is also examining how to implement a provincial green power target (see Appendix A). It therefore seems there is now something close to a consensus among provincial governments that they have a role to play in securing a quantified place for green power in their electricity sectors.

[175] Comparisons made to 2002 and 2001 in this section are based on previous editions of this report. For 2002 see Bramley, M., S. Boustie, J. Vadgama, C. Wieler and A. Pape-Salmon. 2003. *Green Power Programs in Canada — 2002*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=162. For 2001 see Dogterom, J., M. McCulloch and A. Pape-Salmon. 2002. *Green Power Marketing in Canada: The State of the Industry*. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=147.

[176] These figures are subject to the important qualification that there is some arbitrariness about what constitutes a green power program and what qualifies as green power. For example, a considerable number of small hydro facilities in British Columbia, Manitoba, Newfoundland and Labrador, Québec and the Yukon remain uncertified and are not associated with any green power program; therefore they have not been included in these figures. On the other hand, virtually all of Canada's wind power capacity installed by the end of 2003 is included.

Utility green power implementation initiatives

Seven utilities had green power implementation initiatives active in 2003 that did not appear to be primarily driven by green power marketing, although in four of these cases, companies are seeking to recover their costs through green power or certificate marketing. Only in two cases (Nunavut Power Corporation and Hydro-Québec) are the green power facilities not EcoLogo-certified, or in the course of being EcoLogo-certified, and in neither of these cases is it intended that green power marketing be used as a cost-recovery mechanism.

Green power and certificate marketing programs

Of the fourteen green power or green power certificate marketing initiatives existing in 2003, ten were in place in 2002 and four in 2001. Two of the four new programs were simply reselling products that already existed in 2002. This market is thus continuing to develop, although somewhat more slowly at present, with only one additional program emerging in the first half of 2004 (see Appendix A). Five of the fourteen programs are in Alberta and five are in Ontario.

As in 2001 and 2002, the price premium relative to standard electricity varied widely between programs in 2003 — between $20 and $91 per MWh, down from $30–$95 per MWh in 2002. Large variations persist within single jurisdictions, suggesting that consumers are not well informed about available products. As in 2002, by far the largest programs in 2003 in both absolute and proportional terms were the ENMAX and EPCOR programs (established in 1998 and 1999 respectively), with 7,000 (2.5% of customers) and 10,000 (2% of customers) residential participants respectively at the year's end, up from 4,000 and 5,000 respectively a year earlier. All other programs are more recent and remained at a fledgling stage, with no more than a few hundred residential participants at the end of 2003. Green power certificate marketing initiatives remain at an early stage of development for the residential sector, as the largest one had only 600 participants at the end of 2003. In light of the abstract nature of the "environmental attributes" and "emission offsets" concepts, certificate marketing may be better suited to the business sector, but it is difficult to assess its status here, as program proponents are largely unwilling to disclose relevant information.

Eight of the nine green power products offered through these fourteen programs, as well as all the associated generation facilities, were EcoLogo-certified. Of the five green power certificate products, originating facilities were in all cases EcoLogo-certified, or in the course of being EcoLogo-certified; the certificate products were in two cases Green Leaf-certified (and one of these also Green-e certified) and in three cases self-certified.

Environmental benefits of green power programs

Canadian green power programs had significant environmental benefits in 2003. GHG emissions were estimated to have been reduced by 1,004 kilotonnes of carbon dioxide equivalent (kt CO_2e) in Alberta and 234 kt CO_2e in Ontario compared to grid-average electricity (417 and 325 kt CO_2e respectively compared to natural gas-fired combined cycle gas turbine (CCGT) electricity). In British Columbia and Québec, the GHG benefits were small compared to grid-average electricity (which has a very low GHG intensity) but were estimated to have been 302 and 63 kt CO_2e respectively compared to CCGT electricity — which, in both provinces, is the "build-marginal" technology that would conventionally be added in response to increased demand. Overall, Canada's GHG emissions in 2003 were estimated to have been reduced by 1.1

to 1.3 megatonnes (Mt) CO_2e compared to business-as-usual scenarios, compared to 0.96–1.06 Mt CO_2e in 2002.[177]

On the whole, green power programs also create significant reductions in emissions of regional air pollutants. However, when the capacity contains a significant wood-waste biomass component, there may be significant increases in such emissions. Specifically, green power programs in Alberta and British Columbia, where biomass figures prominently, may be causing net increases in emissions of some regional air pollutants.[178] The results calculated in this report show increases in both provinces in emissions of ground-level ozone precursors (as well as CO in British Columbia) compared to natural gas-fired CCGT. (In Alberta, the increases become reductions when the comparison is made instead to grid-average electricity.) These results should not be considered definitive, as the emission factors used for biomass-fired facilities are provisional only. Ideally, actual emissions measurements should be made at such facilities. Nonetheless, it is clear that close attention needs to be paid to regional air pollutant emissions from wood-waste power as the Canadian green power sector develops further.

Reductions in emissions of regional air pollutants in 2003 cannot be compared to the reductions calculated in last year's edition of this report for 2002, as there were major changes in the emission factors used. The 2003 results can be considered more reliable.

Green power certification

This report also reviewed the five existing or emerging systems of certification or quality guarantee that, to the authors' knowledge, are currently relevant to Canadian green power development. Certification standards are needed to validate and ensure public confidence in green power products, and can ensure that green power products meet a clear definition of low-impact renewable energy.

EcoLogo certification, BC Hydro's "green criteria" (which, strictly speaking, are used for screening, not certification), the Green Leaf Standard for green power certificates and the US Green-e certification system were all used by green power or certificate marketing programs active in Canada in 2003. As BC Hydro has now announced it will seek EcoLogo certification for both its existing and new green power supply, its green criteria are likely to cease being used in 2004. The EcoLogo certification criteria still do not quite provide complete assurance that all forms of double counting are prohibited, but the Green Leaf Standard's prohibition of double counting is clear and absolute. The Environmentally Preferable Electricity Portfolio/Sources (EPEP/EPES) programs being piloted by the Canadian Electricity Association go well beyond green power to include nuclear and fossil-fuelled electricity generation.

Comments by green power program proponents[179]

Proponents of green power programs surveyed for this report identified most often the following barriers to implementation of such programs, in decreasing order of volume of comments:

- **financial constraints**, including the cost of marketing and resource assessment, in a context of regulatory and demand unpredictability

[177] This comparison should be treated with care, given some differences in methods of calculation and changes in grid-average electricity between 2002 and 2003.
[178] It is therefore of significance that BC Hydro's Green Criteria (Section 4.2.3) require that *new* biomass-fired facilities that began operation on or after April 1, 2001 not cause a net decrease in regional air quality.
[179] See Appendix B for all comments received.

- **the regulatory environment**, including inconsistency in the definition of green power, Ontario's electricity price cap, insufficient government support/incentives, and environmental assessment requirements
- **lack of public awareness** and understanding of renewable energy.

Proponents also identified most often the following types of "most important actions that governments, NGOs and other stakeholders could take to enhance the success of green power programs," in decreasing order of volume of comments:

- **provide additional support** (governments) by, *inter alia*, implementing renewable portfolio standards, production and marketing subsidies and public awareness programs, resolving product definition conflicts, and clarifying regulation of emission reduction credits
- **increase public awareness**
- **increase procurement** of green power.

Appendix A. Emerging Canadian Green Power Programs

Section 2 includes, in its descriptions of existing green power programs, notable developments of new green power facilities or other features of those programs that did not result in power generation during 2003 but that are expected to in subsequent years. In addition to those new developments under existing programs, the authors are aware of the following new programs that were not active in 2003 in the sense of resulting in actual power generation during that year, but that can be expected to fall within the scope of future years' editions of this report.

A.1 Government green power policies

A.1.1 Federal

- The government's *Climate Change Plan for Canada* (November 2002) "sets the target of at least 10 per cent of new electricity generating capacity in Canada to come from emerging renewable sources. This could be achieved in a number of ways, including expanded production incentives, renewable energy portfolio standards in provinces, increased efforts to develop market demand, as well as the stimulus provided by the proposed emissions trading system."[180] The government has not yet implemented any new programs to meet this commitment, although it has proposed two (see two following bullets). It is also possible that the target could be met entirely through provincial initiatives, notably those in Alberta (Section A.1.2), British Columbia (Section 2.2.2), Nova Scotia (Section A.1.5), Ontario (Section A.1.6) and Québec (Section A.1.8).
- The platform of the new minority Liberal government elected in June 2004 commits to expand the Wind Power Production Incentive (Section 2.1.2) from 1,000 MW to 4,000 MW; the New Democratic Party and Bloc Québécois platforms also call for a major increase in government support for wind power.
- The government is suggesting that it will provide tradable "offset credits" to renewable electricity generation projects under 200 MW capacity[181] as part of its proposed emissions trading system for "Large Final Emitters." The value of credits could be equivalent to up to 0.54 cents per kWh.[182] It is important to note that emission reductions credited in this way would normally become part of the reductions allocated to the emissions trading system and could therefore not contribute to the reductions allocated in the *Climate Change Plan for Canada* to the 10% green power target for new electricity generating capacity.[183]
- Under its Pilot Emission Reductions, Removals and Learnings (PERRL) Initiative,[184] the government will spend $2.5 million on purchasing GHG emission reductions from renewable energy projects. An auction process to identify projects launched in September 2003 initially

[180] Government of Canada. 2002. *Climate Change Plan for Canada*, p. 34; http://www.climatechange.gc.ca/plan_for_canada/plan/index.html.
[181] Mike Beale, Environment Canada, personal communication, August 2004.
[182] Environment Canada. 2004. *Offsets System Policy Development — Current Status*; http://www.climatechange.gc.ca/english/offsets/nfsc_presentation.asp.
[183] If offset credits are issued for electricity sold through green power or certificate marketing, the credits should be transferred to the customer or retired on the customer's behalf without use, as they represent part of the environmental attributes of the electricity. This has two consequences. First, since the green power price premium will likely be higher than the expected offset credit value, retailers will still have an interest in pursuing green power marketing. Second, where credits are retired without use as a result of green power or certificate marketing, the associated emission reductions will *not* become part of the reductions allocated to the emissions trading system.
[184] See http://www.ec.gc.ca/perrl/.

failed to find any qualifying offers, but a second auction process was initiated, closing on May 31, 2004. An earlier auction process resulted in $3 million being committed to four landfill gas capture and combustion projects, although it is unclear whether any of the four projects involves electricity generation.

A.1.2 Alberta

- The provincial government's change action plan (October 2002) set a goal for "increasing the renewable and alternative energy portion of total provincial energy capacity by 3.5 per cent by 2008. This equals about 560 Megawatts of new capacity."[185] The specific framework for reaching this target is to be established by the Clean Air Strategic Alliance (CASA), a multi-stakeholder group. In November 2003 the CASA Board of Directors agreed to establish a Renewable and Alternative Energy Implementation Team charged with refining mechanisms to implement the target and establishing a further target beyond 2008.[186]

A.1.3 New Brunswick

- The new Electricity Act,[187] which comes into effect in October 2004 and creates an open wholesale market for municipal distribution utilities and the largest industrial electricity users, empowers the government to implement a mandatory renewable portfolio standard. The government expects to put in place the regulation establishing the standard by early 2005.[188]

A.1.4 Northwest Territories

- In July 2003 the government of the Northwest Territories released its Energy Strategy,[189,190] according to which "the NWT will increase the use of renewable energy sources. Medium and long-term targets are to provide 10% of the energy supplied to our communities (excluding industrial energy supply) from renewable energy sources by 2010 and 25% by 2025." The Strategy does not specify the kinds of facilities that will be included in these targets, although it does say that "the [government] will not support massive reservoirs or significant environmental damage that has been associated with large-scale hydro development historically." The Strategy commits to "develop policies and programs to accelerate the use of renewable energy and co-generation technologies . . . [including] implementing installation incentives and/or grant programs."

[185] Government of Alberta. 2002. *Albertans & Climate Change: Taking Action*, p. 34; http://www3.gov.ab.ca/env/climate/actionplan/docs/takingaction.pdf.
[186] See http://casahome.org/electricity/finalreports.asp.
[187] See http://www.gnb.ca/acts/acts/e-04-6.htm.
[188] Government of New Brunswick. 2004. *Province moving forward on renewable energy*. News release, 7 May; http://www.gnb.ca/cnb/news/ene/2004e0544en.htm.
[189] Government of Northwest Territories. 2003. *Premier Releases NWT Energy Strategy*. News release, 31 July; http://www.horizons.gov.nt.ca/Thisweek/prDetails.asp?varPR_ID=517.
[190] Northwest Territories Resources, Wildlife and Economic Development. 2003. *NWT Energy Strategy*, p. 8, 23; http://www.gov.nt.ca/RWED/library/publications.htm.

A.1.5 Nova Scotia

- The key advisory body to government on electricity issues, the Electricity Marketplace Governance Committee (EMGC), recommended in its second interim report (April 2003) that the province adopt a mandatory renewable portfolio standard to take effect in 2006. The EMGC recommended that the standard should require that, by 2010, green power from facilities installed post-2001 should represent 3.2% of electrical energy supplied.[191] The Nova Scotia Department of Energy has since confirmed that "a renewable portfolio standard will be implemented in 2006."[192]

A.1.6 Ontario

- In April 2004 the new provincial government unveiled a "new vision" for the Ontario electricity sector,[193] including "targets of generating 5 per cent (1,350 MW) of Ontario's total energy capacity from renewable sources by 2007, and 10 per cent (2,700 MW) by 2010."[194] As an initial step towards these targets, the Ministry of Energy initiated a request for proposals for 300 MW of new renewable electricity capacity under 20-year contracts, with facilities limited to 100 MW and bids to be submitted by August 25.[195] By June 24, expressions of interest had been received for approximately 4,400 MW.[196] In June 2004, the government also introduced the Electricity Restructuring Act,[197] which would authorize the Ministry of Energy to set mandatory targets for renewable energy.[198] The targets would be met through procurement of renewable electricity by a new Ontario Power Authority.

A.1.7 Prince Edward Island

In June 2004 the provincial government released its *Energy Framework and Renewable Energy Strategy*,[199] which contains the following commitments to aggressively pursue the development of wind power on the Island:

- implement a mandatory renewable portfolio standard of at least 15 per cent by 2010 (representing 40 MW of wind capacity over and above currently existing facilities), and to "evaluate opportunities for having 100 per cent of [the Island's] electrical capacity acquired by renewable energy by 2015"
- analyze the impact of removing the sales tax from all components of wind turbines
- provide access to net metering for small wind systems

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[191] Government of Nova Scotia. 2003. *Electricity Marketplace Governance Committee*. News release, 16 April; http://www.gov.ns.ca/petro/energystrategy/emgc/newsdetails.asp?itemID=8.
[192] Nova Scotia Department of Energy. 2004. *Nova Scotia's Energy Strategy: Progress Report II*, p. 7; http://www.gov.ns.ca/energy/documents/EnergyStrategyProgressReportII.pdf.
[193] Government of Ontario. 2004. *New Vision For Electricity Sector Will Mean New Supply, Increased Conservation, Stable Prices*. News release, 28 April; http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&body=yes&news_id=59.
[194] Government of Ontario. 2004. *McGuinty Government to Increase Supply of Renewable Energy*. News release, 28 April; http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&body=yes&news_id=60.
[195] See http://www.ontarioelectricityrfp.ca.
[196] Government of Ontario. 2004. *McGuinty Government Sparks Interest In Green Electricity.* News release, 24 June; http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&body=yes&news_id=64.
[197] See http://www.ontla.on.ca/documents/Bills/38_Parliament/Session1/b100_e.htm.
[198] Government of Ontario. 2004. *McGuinty Government Unveils Bold Plan To Restructure Electricity System*. News release, 15 June; http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&body=yes&news_id=63.
[199] Prince Edward Island Department of Environment and Energy. 2004. *PEI Energy Framework and Renewable Energy Strategy*; http://www.gov.pe.ca/photos/original/ee_frame_rep_e.pdf.

- guarantee community and cooperative wind facilities a selling price of up to 85% of the retail electricity rate
- table, in the fall of 2004, a *Renewable Energy Act* to put into effect the 15% renewable portfolio standard, net metering access and mechanisms to enable community and cooperative wind facilities.

A.1.8 Québec

- In March 2003, the government adopted a regulation mandating the installation of 1,000 MW of wind power capacity by the end of 2012, linked to a requirement for the establishment of wind turbine assembly facilities in the province. The same regulation also requires the installation of 100 MW of biomass-fired electricity capacity by 2010.[200] Hydro-Québec issued a request for proposals in May 2003 to meet the wind power requirement, and bids totalling 4,000 MW were accepted. The successful proposals will be announced in September 2004.[201,202]
- In July 2003, the government announced aid to facilitate the construction of the Mont Copper and Mont Miller wind farms (54 MW each) near Murdochville.[203] Construction is expected to proceed in the summer of 2004.[204]
- In July 2004, the government announced that it had asked Hydro-Québec to acquire a second 1,000 MW tranche of wind power capacity "as quickly as possible."[205]

A.1.9 Saskatchewan

- In its March 2003 Throne Speech, the government of Saskatchewan announced that SaskPower would be implementing a new Green Power Portfolio of initiatives.[206] The Portfolio, intended to "meet load growth over the next several years without creating new GHG emissions,"[207] contains two green power development initiatives: The first is a partnership between SaskPower and ATCO Power to construct a 150 MW wind farm at Rushlake Creek that could commence operations as early as 2004–05 and be fully operational by March 2007. Under the second initiative, SaskPower is issuing an annual Request for Proposals (RFP) for up to 15 MW of Environmentally Preferred Power in 2003/04, 2004/05 and 2005/06.[208] Proponents are invited to develop small-scale generation projects "that could include flare gas, wind, low-impact hydro, biomass, biogas, heat recovery from an existing waste heat source and solar." The first RFP was

[200] See Décret 352-2003 at http://www.regie-energie.qc.ca/regie/reglements.html.
[201] Hydro-Québec. 2004. *Nine promoters propose projects in response to Hydro-Québec Distribution's Request for Proposals to provide wind energy.* News release, 16 June; http://www.newswire.ca/en/releases/archive/June2004/16/c5614.html.
[202] See http://www.hydroquebec.com/distribution/en/marchequebecois/pdf/inv_finale_soumissions.pdf.
[203] Chouinard, T. 2003. Un million de plus pour garder Murdochville ouverte. *Le Devoir*, July 17, On-line edition; http://www.ledevoir.com/2003/07/17/31997.html.
[204] Canadian Wind Energy Association. 2004. Wind industry moving ahead in 2004. *WindSight*, vol.17, No.1, March, p. 3; http://www.canwea.ca/en/WindSight.html.
[205] Ressources naturelles, Faune et Parcs Québec. 2004. *Dans une perspective de développement durable le gouvernement du Québec prend des décisions pour améliorer la sécurité énergétique des Québécois*. News release, 5 July; http://www.mrnfp.gouv.qc.ca/presse/communiques-detail.jsp?id=3115.
[206] SaskPower. 2003. *Green Power Portfolio Overview*; http://www.saskpower.com/aboutus/news/epp_backgrounder.pdf.
[207] SaskPower. 2003. *Environment Review 2003*, p. 12; http://www.saskpower.com/environment/rpp/envreview.shtml.
[208] See http://www.saskpower.com/environment/initiatives/epp/epp.shtml.

issued in January 2004, with the first set of projects to be selected "by the summer of 2004."[209] The 12 bidders for the first RFP encompass 25 MW of wind, 5 MW of heat recovery, 0.72 MW of biomass/biogas and 3.5 MW of solar.[210]

A.2 Utility green power implementation initiatives

A.2.1 Alberta

- In April 2004 the City of Medicine Hat Electric Utility launched its "Going Green" program,[211] a voluntary portfolio standard. Under the program the company is purchasing 13,050 MWh of Vision Quest's Green Energy Tags (see Section 2.3.5) annually. The costs associated with the program are recovered through the following charges added to customers' monthly bills: $0.33 per month for residential customers; $0.59 per month for small businesses; and $5.90 per month for large commercial customers.

A.2.2 British Columbia

- The South Meager Geothermal project, 170 km north of Vancouver, with a capacity up to 192 MW, is a particularly noteworthy initiative by an independent power producer, Western GeoPower Corp. In June 2004, the British Columbia Ministry of Energy and Mines approved the drilling of pilot wells to confirm the commercial viability of the project. If the feasibility study is successful, the company hopes to negotiate a power sales contract in 2005 and start commercial generation in 2007.[212] This would be Canada's first commercial geothermal power facility.

A.2.3 Manitoba

- It was announced in April 2004 that Manitoba Hydro was in the final stages of negotiating the purchase of the output of Sequoia Energy's proposed 99 MW wind farm near St. Leon.[213] Manitoba Hydro "has committed to developing up to 250 MW of windpower and has embarked on an aggressive program to access possible sites within the province."[214]

A.2.4 New Brunswick

- In the context of New Brunswick's electricity sector restructuring and forthcoming mandatory renewable portfolio standard (Section A.1.3), New Brunswick Power has announced an "objective to acquire 100 MW from renewable energy projects by 2010." An initial RFP for wind

[209] SaskPower. 2004. *SaskPower issues Request for Proposal for environmentally preferred power generation*. News release, 20 January; http://www.saskpower.com/aboutus/news/2004.shtml.
[210] SaskPower. 2004. *SaskPower Environmentally Preferred Power Program Summary of Proposals — 2003/2004 Solicitation*; http://www.saskpower.com/environment/initiatives/epp/SummaryofProposals.pdf.
[211] See http://www.city.medicine-hat.ab.ca/cityservices/electric/goinggreen.html.
[212] Western GeoPower Corp. 2004. *Drilling Permits Granted and Work Commences on South Meager Geothermal Project Site*. News release, 1 June; http://www.geopower.ca/newsreleases/2004/01jun2004.htm.
[213] Government of Manitoba. 2004. *Budget Paper A — The Economy*, p. A14; http://www.gov.mb.ca/itm/invest/busfacts/economy/economy.pdf.
[214] Manitoba Hydro. 2003. *Voluntary Challenge and Registry Program 2003 Update*, p. iv; http://www.hydro.mb.ca/environment/mh_vcr_report_2003.pdf.

power projects was issued in December 2003,[215] and the successful bid, a 20 MW facility at Dark Harbour, was announced in June 2004.[216] It is expected to be operational by as early as fall 2005.

A.2.5 Newfoundland and Labrador

- Newfoundland and Labrador Hydro issued an RFP for a Wind Demonstration Project in late 2000. The NeWind Group mounted a successful bid, and has since undertaken feasibility studies. Negotiations on a power purchase agreement began in August 2003, and the current schedule calls for completion of the 25 MW project by fall 2005.[217]

A.3 Green power and certificate marketing initiatives[218]

A.3.1 Alberta

- In January 2004, Nexen Inc. entered into a multi-year agreement with Canadian Hydro Developers to purchase 40,000 MWh per year of Renewable Energy Certificates (see Section 2.3.1) in support of Nexen's contract to sell electricity to Alberta Urban Municipalities Association (AUMA).[219] Under its Energy Aggregation Program, the AUMA makes collective purchases of electricity with a 20% green power component on behalf of 154 municipalities (as of June 2004).[220]

A.3.2 Ontario

- As a result of the cap imposed on the price of electricity by Bill 210 in November 2002, Toronto Hydro has postponed its plans to implement a green power marketing program that would recover the costs of its urban wind projects (see Section 2.2.6). However, the company still intends eventually to implement such a program. Power would be supplied from the 750 kW wind turbine at Exhibition Place and the proposed 1 MW (approximately) Thackeray landfill gas capture project.[221]

A.3.3 Yukon

- The Yukon Green Power Initiative (see Section 2.1.7) involves a green power marketing component that remains to be developed.

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[215] New Brunswick Power. 2003. *NB Power Issues Request for Proposals for Wind Generation*. News release, 11 December; http://www.nbpower.com/en/media/press_rel/.
[216] New Brunswick Power. 2004. *NB Power and Eastern Wind Power Inc. Begin Wind Energy Project*. News release, 18 June; http://www.nbpower.com/en/media/press_rel/.
[217] Professional Engineers and Geoscientists of Newfoundland and Labrador. 2004. *The Proposed 25 MW St. Lawrence Wind Demonstration Project*; http://www.apegn.nf.ca/dialogue/issues/january_2004/article_10.htm.
[218] The information here is based on surveys sent to program proponents, augmented by other publicly available information.
[219] Canadian Hydro Developers. 2004. *Canadian Hydro to Sell Green Power in Support of Alberta Urban Municipalities Association Contract with Nexen marketing*. News release, 2 March; http://www.canhydro.com/pdf/News%2003%2002%2004%20AUMA%20Green%20Power.pdf.
[220] See http://www.munilink.net/utilities/default.asp#ElectricAgg.
[221] Bramley, M., S. Boustie, J. Vadgama, C. Wieler and A. Pape-Salmon. 2003. *Green Power Programs in Canada — 2002*, p. 40. Drayton Valley: Pembina Institute; http://www.pembina.org/publications_item.asp?id=162.

Appendix B. Comments by Green Power Program Proponents

The surveys sent to green power program proponents that were used to gather information used in this report asked two questions focusing on barriers to the implementation of green power programs. All answers received are presented here (edited only for clarity and anonymity), grouped by theme.

Question #1: What have been the largest barriers encountered when implementing your green power program(s)?

Answers:

Financial constraints

- "Financing/high risk capital to support systematic planning and development over a period of years without assurances of regulatory acceptance."
- "Cost of green power is the number one barrier. In addition it is hard to increase and sustain the costs of public awareness and education."
- "The need to complete multi-year resource assessments (hydro, wind, geo-thermal, wood) on a comprehensive and systematic basis without knowledge of the resource potential and the feasibility of the development."
- "The lack of stability in the demand that increases the risk of investing in new generation."
- "Lack of full cost accounting — we would not need a regulatory regime if full cost accounting was present."
- In northern Canada: "The cost of installing a wind turbine is six times greater than installing one unit of diesel capacity; therefore all of the utility's budget would be wiped out with one wind farm installation."
- "The costs to reach the general public."
- "The cost of green power compared to conventional electricity."
- "The cost relative to the electricity market prices, which are low in the Alberta retail electricity market. A competitive barrier is pricing that does not result in increased investment in green power, companies that are not committed to growing, but rather just achieve more revenue for a given time period."
- "Limited marketing budget."
- "The cost to build and maintain awareness is very high."
- "Total electricity prices affect a customer's propensity to pay more for a voluntary green power program."

Regulatory environment

- "Conflict in acceptable product definition between the federal and Ontario regulatory bodies."
- "Consistency in national standards and industry nomenclature."
- "The province of Ontario changed the rules in November 2002, essentially nullifying the opportunity for retailers to sell green power. Retailers could no longer sign up new customers and everyone paid 4.3 cents/kWh. This obviously made it impossible to sell green power, as retailers were the only entities allowed to do so, and, without the ability to sign up customers, that rendered planned programs impossible. It has only become clear in recent months that it would still be possible to sell green credits/tags in Ontario, but there is no program yet devised here."
- "We do not have a supportive regulatory regime and adequate incentives, because the provincial and federal governments, and the regulatory bodies, have vested interests in traditional technologies and have insufficient money resources to develop the market. The developers cannot be expected to cover the complete costs of developing the emerging market and creating awareness about it."

- "Complex, costly and uncertain environmental assessment regimes, including Fisheries Act, land use and protected area planning processes."

Lack of public awareness

- "Consumer education."
- "Lack of understanding."
- "General lack of understanding of voluntary program details, the complexity of subject matter and the fact that renewable energy is already part of the generation mix."
- "Lack of knowledge of renewable energies."
- "Level of awareness."

Nature of the market

- "Complete lack of a renewable energy market."
- "There is no clear benefit for commercial customers to buy green power unless there is a trading market for emission reduction credits or industry specific regulations around greenhouse gas emissions."
- "Uncertainty regarding the electricity market."
- In British Columbia: "Differentiation against a large hydro system base."

Technical issues

- "Technology specific challenges in the North, such as cold climate and rime icing conditions for wind turbines; limited technical capacity/experience; understanding of what some of the technologies can offer in northern applications (e.g., air-to-air heat pumps and geoexchange possibilities)."
- "Technical issues (one of the turbines was struck by lightning and decommissioned; require better metering and monitoring system; wind turbine estimated capacity is only 20% or less because wind facility not well maintained)."
- "Currently the largest barrier to implementing a green power program is technology. This utility chose, at this time, to have a green energy program by purchasing the energy from a green electricity supplier. It currently does not make economic sense to set up our own green electricity generating facilities. However, in a survey of our customers, 66% preferred that the utility own the green generation. Until there is a change in technology, we will continue to purchase green electricity from a contracted green electricity generator."

Other

- "Like any product you offer customers, the participation rate fluctuates, often because of things that are outside the program's control. An example would be industry restructuring. When there are other issues that demand attention for both the customer and the company, sometimes the resources required to implement or maintain a program are pulled away, affecting the success."

Question #2: What are the most important actions that the Government of Canada, provincial/territorial governments, NGOs and other industry stakeholders could take to enhance the success of your green power program(s)?

Answers:

Governments should provide additional funding / incentives / policy certainty / regulated standards

- "Governments should implement a renewable portfolio standard, provide a better production incentive and purchase green power for their own use."
- "Further subsidize the green production costs, and implement a federal communication program for enhancing public awareness and education about green power."
- "In British Colombia, the government needs to agree on harmonized certification/verification processes for determining green/clean energy."

- "Canada needs to develop a standard tracking system (see North American Association of Issuing Bodies)."
- "The most important action is clarity on the regulation of emission reduction credits (ERCs). This will assist in the use/benefit of ERCs, the Kyoto effect, and provide an additional incentive for companies to voluntarily increase their participation in a green power program."
- "The government of Canada could provide financial assistance in the marketing of green power programs."
- "Green energy programs require better financial support from the government."
- "Subsidies to green power to lower the cost (green power should receive as much subsidy per unit of production as conventional energy)."
- "Resolve conflict in product definition between federal and Ontario regulatory bodies so that we can sell the product without consumer confusion and in compliance with the Market Implementation Program, Environmental Choice certification, Ontario Consumer Protection Act and Ontario Electricity Retailer Code of Conduct."
- "Long-term partnerships including funding in such areas as resource assessments, improvements in the efficiency and appropriateness of regulatory processes, northern-specific research and development investments, collaboration on capacity building, clarity on the GHG emission regulatory regime including treatment of early action, sale/verification of credits, etc."

Increase public awareness

- "Public education."
- "Create awareness of the opportunity for customers to participate in green power programs. The EcoLogo provides third party certification that a company is offering a certified product. Therefore, awareness/education of green power program availability is key."
- "Canadians need a way to express our political will to our government and get across the idea that there is broad-based interest in green power."
- "Do more awareness building so the public is better informed about voluntary green power programs."
- "Increase native community public support and awareness."
- "Government and NGOs need to help with public awareness."
- "Educate the public on the current sources of electricity generation."

Increase procurement

- "Governments should actually purchase green power to offset 20% of their energy use in Canada, as stated in Action Plan 2000."
- "Governments should be prepared to procure green power on long-term contracts (i.e., 10+ years)."
- "Purchase for their own use in a manner that results in new development that does not lock up existing supply."

Other

- "NGOs should promote green power purchases to their memberships."
- "Lobby to confirm that federal and provincial sales tax should not apply to green power/certificates."

Appendix C. Calculation of Emissions

Section 3 presents a quantitative analysis of green power programs in terms of their contribution in 2003 to (i) each province or territory's electricity production, and (ii) estimated reductions of emissions of GHGs and regional air pollutants. Emissions (and consequently emission reductions) were calculated using the following assumptions and sources:[222]

1. GHG emission factors per MWh of grid-average electricity in each province and territory were calculated from emissions data for 2001 from Canada's national GHG inventory[223] and electricity production data for 2001 from Statistics Canada's publication *Electric Power Generation, Transmission and Distribution 2001*.
2. Emission factors for regional air pollutants per MWh of grid-average electricity in each province and territory were calculated from emissions data for 2000 provided by Environment Canada[224] and electricity production data for 2002 taken from Statistics Canada's publication *Electric Power Generation, Transmission and Distribution 2001*.
3. Emissions factors for all emissions per MWh of grid-average electricity in Prince Edward Island were taken as equal to those for New Brunswick, since more than 95% of electricity consumed on the Island is imported from the New Brunswick grid.[225]
4. Emission factors for all emissions per MWh of electricity produced by natural gas-fired combined cycle gas turbine plants were taken from Spath, P. and M. Mann. 2000. *Life Cycle Analysis of a Natural Gas Combined Cycle Power Generation System*. Golden, CO: National Renewable Energy Laboratory.
5. Emission factors for all emissions per MWh of electricity produced by wood-waste-fired power plants were taken from US Environmental Protection Agency. 1998. *Compilation of Air Pollutant Emission Factors (AP-42), 5th Edition, Vol.1, Chapter 1: External Combustion Source; Section 1.6 Wood Residue Combustion in Boilers*. For particulate matter, the emission factor for wood residue combustion using "all fuel" in "all controls/no controls" PM devices (p. 1.6–7) was used, as this offered the most generic factor for all technologies used in electricity production from wood waste facilities. For $NO_{x,}$, the emission factor for "bark/bark and wet/wood/wood-fired boiler" was utilized, as "bark is the major type of residue burned in pulp mills . . . [and] may contain more than 70 weight per cent moisture" (p. 16.1–2). For SO_2, VOCs and CO, this publication only gives a single emission factor. The emission factors were converted from lb/MMBtu to (metric) t/GWh by multiplying by the conversion factor of 1.524 and dividing by an efficiency factor of 35%.[226]
6. Emission factors per MWh of electricity produced by biogas-fired power facilities were derived as follows: GHG emissions were assumed to be identical to the methane emissions from a natural gas-fired combined cycle gas turbine plant (see above); and, using the simplification that landfill/digester gas is pure methane, emissions of NO_x and SO_2 were assumed to be zero while emissions of non-methane hydrocarbons, particulate matter and carbon monoxide were assumed to be equal to those of a "natural gas average" power plant, as taken from US Environmental Protection Agency. 1996. *Compilation of Air Pollutant Emission Factors (AP-42), 5th Edition, Vol.1*.
7. Wind, hydro and solar power facilities were assumed to have zero emissions.

[222] Further information is available from the authors upon request.
[223] Environment Canada. 2003. *1990–2001 National and Provincial GHG Emissions*; http://www.ec.gc.ca/pdb/ghg/ghg_tables_2001_e.cfm.
[224] David Niemi, Environment Canada, personal communication, May 2004.
[225] Statistics Canada. 2003. *Electricity Power Generation, Transmission and Distribution — 2001*. Cat. No. 57-202-XIB, Ottawa, ON, p. 37.
[226] Peter Westlin, US Environmental Protection Agency, personal communication, May 2004.

8. Biogas was assumed to be being captured and combusted in the business-as-usual scenarios, i.e., no GHG reductions were counted as a result of conversion of methane to carbon dioxide.
9. For the purpose of calculating emissions of ground-level ozone precursors, volatile organic compound (VOC) emissions were assumed to be equal to non-methane hydrocarbon emissions.

Appendix D. Facilities Installed under Alberta's Small Power Research and Development Act[227]

Alberta's Small Power Research and Development Act, enacted in 1988, resulted in the building of 18 green power projects in the early 1990s. The contracts signed under the act expired in 2000 for three small wind facilities: Willabar Ranch (0.065 MW); Silver Top Dairy (0.130 MW); and Jennifer Butterfield (0.065 MW). The contracts remain in force for the remaining 15 facilities, which are listed below.

	Facility	Owner	Allocated Capacity (MW)
Hydro	Belly River	Canadian Hydro Developers	2.5
	Dickson Dam	Algonquin Power	12.8
	St. Mary Dam	Canadian Hydro Developers	2.0
	Waterton Dam	Canadian Hydro Developers	2.4
	Chin	Irrigation Canal Power Coop	11.0
	Raymond	Irrigation Canal Power Coop	18.0
		Subtotal:	48.7
Wood waste	Whitecourt	Whitecourt Power	18.0
	Drayton Valley	Algonquin Power	10.5
	Dapp	Primary Power	10.0
		Subtotal:	38.5
Wind	Pincher Creek	Dutch Valley Produce	0.220
	Pincher Creek	Sinnot Farm Services	0.065
	Pincher Creek	Talon Energy	1.5
	Cowley	G&P Johnson	0.175
	Cowley Phase 1	Canadian Hydro Developers	9.0
	Cowley Phase 2	Canadian Hydro Developers	9.9
		Subtotal:	20.86
		Total:	**108.06**

[227] Bevan Laing, Alberta Energy, personal communication, May 2004.

Appendix E. Programs under which Wind Power Facilities are Accounted for in Section 2

Tables 1–3 in Section 2 account for significant amounts of wind power capacity under multiple green power programs. The following table is provided to make Tables 1–3 fully transparent. It lists all wind power facilities installed and generating power in Canada by the end of 2003, according to the Canadian Wind Energy Association (CanWEA)[228] and shows under which program or programs each has been accounted for in Tables 1–3. Seven small facilities totalling 2.2 MW installed under Alberta's Small Power Research and Development Act (see Appendix D), as well as Nunavut Power's 0.145 MW facility, are not included in this list. The small Lundbreck (Alberta) and Port Albert (Ontario) facilities do not appeared to have been covered by any green power program active in 2003.

Facility	Capacity (MW)	Program(s) under which the Facility Has Been Accounted for in Tables 1–3
Alberta		
Castle River	39.54	TransAlta renewable energy target (Table 2) Vision Quest Windelectric Green Energy Tags (Table 3)
Cowley Ridge	21.4	Small Power Research and Development Act (18.9 MW) (Table 1) Canadian Hydro Developers Renewable Energy Certificates (Table 3) ENMAX Greenmax program (Table 3)
Cowley Ridge North	19.5	Canadian Hydro Developers Renewable Energy Certificates (Table 3) ENMAX Greenmax program (Table 3)
Lundbreck	0.6	*none*
McBride Lake	75	Wind Power Production Incentive (Table 1) TransAlta renewable energy target (37.5 MW) (Table 2) Vision Quest Windelectric Green Energy Tags (37.5 MW) (Table 3) ENMAX Greenmax program (Table 3)
McBride Lake East	0.66	TransAlta renewable energy target (Table 2) Vision Quest Windelectric Green Energy Tags (Table 3)
Sinnot	6.5	Canadian Hydro Developers Renewable Energy Certificates (Table 3) ENMAX Greenmax program (Table 3)
Summerview	1.8	Wind Power Production Incentive (Table 1) TransAlta renewable energy target (Table 2) Vision Quest Windelectric Green Energy Tags (Table 3)
Waterton	3.78	TransAlta renewable energy target (Table 2) Vision Quest Windelectric Green Energy Tags (Table 3)
Weather Dancer I	0.9	EPCOR Green Power ECO-PACKs (Table 3)
Nova Scotia		
Grand Étang	0.6	Nova Scotia Power renewable energy target (Table 2) Nova Scotia Green Power program (Table 3)
Little Brook	0.6	Nova Scotia Power renewable energy target (Table 2) Nova Scotia Green Power program (Table 3)

[228] Canadian Wind Energy Association. 2004. *Canada's Wind Farms*; http://www.canwea.ca/en/CanadianWindFarms.html.

Facility	Capacity (MW)	Program(s) under which the Facility Has Been Accounted for in Tables 1–3
Ontario		
Ferndale	1.8	Market Incentive Program (Table 1) Green Tags Ontario (Table 3) Select Power SelectWind program (Table 3)
Huron–Kincardine	9	Wind Power Production Incentive (Table 1) "Set aside" of tradable emissions allowances for renewable energy projects (Table 1) Ontario Power Generation green power target (4.5 MW) (Table 2) Ontario Power Generation Evergreen Green Power (4.5 MW) (Table 3)
Pickering	1.8	Ontario Power Generation green power target (Table 2) Ontario Power Generation Evergreen Green Power (Table 3)
Port Albert	0.66	*none*
Tiverton	0.6	Ontario Power Generation green power target (Table 2) Ontario Power Generation Evergreen Green Power (Table 3)
Toronto waterfront	0.75	Wind Power Production Incentive (Table 1) Toronto Hydro/TREC wind power development (Table 2)
Prince Edward Island[229]		
North Cape	5.2	PEI Energy Corporation wind power development (Table 1) Maritime Electric Green Power Program (Table 3)
Québec		
Le Nordais (Cap Chat)	57	Hydro-Québec wind power development (Table 2)
Le Nordais (Matane)	42.75	Hydro-Québec wind power development (Table 2)
Matane	2.25	Hydro-Québec wind power development (Table 2)
Parc éolien du Renard	2.25	Wind Power Production Incentive (Table 1) Hydro-Québec wind power development (Table 2)
Saskatchewan		
Cypress[230]	5.9	Wind Power Production Incentive (Table 1) SaskPower GreenPower program (Table 3)
Sunbridge	11.2	SaskPower GreenPower program (Table 3)
Yukon		
Haeckel Hill (Whitehorse)	0.81	Yukon Green Power Initiative (Table 1)

[229] The Aeolous facility was largely out of commission in 2003 and is therefore not accounted for here.
[230] Excluding the Cypress expansion, installed in December 2003.