

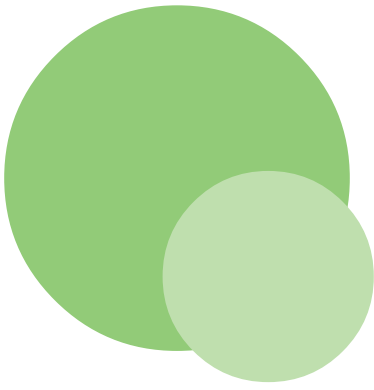
A Green Power Vision and Strategy for Canada

towards a sustainable
electricity future for Canada



POLLUTION PROBE
CLEAN AIR. CLEAN WATER.

 Summerhill Group
Transforming Markets to Sustainability



A Green Power Vision and Strategy for Canada is the result of a series of five workshops held across the country by Pollution Probe and Summerhill Group. The workshop series, which was held between October 2003 and April 2004, assessed the potential for Green Power sources, such as wind, solar, biomass, geothermal, tidal and wave, to meet Canada's electricity needs. The series actively engaged more than 300 experts in Green Power, electricity generation and policy development and included representatives from government agencies, utilities, the private sector, academia and non-profit organizations, as well as from countries that are world leaders in Green Power development.

Visit the Pollution Probe website at www.pollutionprobe.org/whatwedo/Energy.htm to view the presentations from the workshop series, along with the following background documents:

Report of the Green Power in Canada Workshop Series (2004)

Primer on the Technologies of Renewable Energy (2003)

Promoting Green Power in Canada – Green Power Policies: A Look Across Borders (2002)

For further information, contact:

Ken Ogilvie
Executive Director
Pollution Probe
kogilvie@pollutionprobe.org

Peter Love
Principal
Summerhill Group
plove@summerhillgroup.ca

A long-term Vision and Strategy is needed to guide and accelerate the development of Green Power in Canada. The Vision must be shared among all jurisdictions and have broad stakeholder and public support. Strategies with targets and timelines are essential to implementing the Vision as has been demonstrated in countries that are world leaders in Green Power development. Canada has the technology and resource potential to join these world leaders and reap the multiple benefits that Green Power offers.



MAIN MESSAGES

- 1.** Green Power is not a niche market — it can become a significant source of clean electricity across Canada. It has the potential to supply half of Canada's current annual electricity generation through concerted action over the next few decades. By moving aggressively on Green Power development now, Canada can become a full participant in the growing world market for cleaner energy technologies.
- 2.** Green Power is essential to Canada's long-term response to the challenge of climate change. It also reduces smog and other forms of pollution that are linked to respiratory problems, hospitalizations and deaths.

BENEFITS



INTRODUCTION

Electricity generation from wind, small hydro, solar, biomass and geothermal sources, once considered a niche market, is now moving into the mainstream. Ministers and government representatives from 154 countries at the June 2004 International Conference for Renewable Energies in Bonn, Germany, recognized the considerable benefits of Green Power. They committed to substantially increase, with a sense of urgency, the global share of renewable energy in the total energy supply. At the same time as the global community has been increasing its experience in the development of Green Power technologies, there has been a growing realization that now is the time for Canada to take advantage of its significant Green Power potential — to address the need for cleaner electricity and to serve both domestic and international markets.

From October 2003 to April 2004, more than 300 Green Power experts from government agencies, utilities, the private sector, academia, NGOs and several countries were actively engaged in the Green Power Workshop Series. They assessed the potential for Green Power to meet Canada's electricity needs and proposed strategies for achieving that potential.

A Green Power Vision and Strategy for Canada is the result of the workshop series. The Vision and Strategy, along with a leading-edge report on Green Power in Canada, reflects Pollution Probe's and Summerhill Group's work to turn the vast amount of information and advice received into a concise and progressive forward path.

Definition of Green Power

In this document, "Green Power" refers to sources of low-impact renewable energy that meet the criteria set by the Environmental Choice Program, currently the most commonly used definition in Canada. The Environmental Choice Program gives EcoLogo recognition to Alternative Source Electricity Generation from naturally occurring sources (such as the wind and sun) and from sources and technologies that have small environmental impacts (such as less intrusive hydro and certain biomass combustion). The criteria can be found at www.environmentalchoice.com/index.cfm?fuseaction=main.dspCompany.cfm&group=5.

There is scope for reviewing and revising these criteria to more specifically target electricity generation from Green Power sources. This Vision and Strategy does not preclude such a revision.

OUR VISION

Towards a Sustainable Electricity Future for Canada

The Vision *Towards a Sustainable Electricity Future for Canada* is an integral part of a larger Canadian vision that includes reduced air pollution and climate change impacts, improved human health, increased energy security, job creation and positioning Canadian firms among the world leaders in the manufacturing and exporting of innovative technologies.

While this Vision and Strategy focuses on Green Power, it recognizes that important contributions must be made by energy efficiency and conservation measures. There is also a role for cleaner electricity from other sources, such as ecologically sustainable larger-scale hydro and improved traditional technologies. Policy recommendations for these sources and measures are not included in this document as they were beyond the scope of the workshop series.

The following list shows sustainable electricity future options in order of priority. It highlights the importance of Green Power to the future electricity mix.

1. Energy efficiency and conservation;
2. Green Power that meets the criteria for EcoLogo certification;
3. Ecologically sustainable larger-scale hydro and other renewables;
4. Combined heat and power using natural gas; and
5. The cleanest and safest technologies among the remaining options.

TARGETS AND TIMELINES

Setting Green Power targets requires looking beyond present barriers and assessing the long-term potential for mature and emerging Green Power technologies to meet future electricity demand. Using the best information available for each technology, a portfolio of options has been used to propose a total Green Power generation target for the year 2025.

Green Power initiatives underway or announced by federal and provincial governments could represent seven per cent of electricity generation in Canada by 2010. The total technical potential of Green Power for the long-term is much higher when estimates are included for all of Canada's Green Power resources and when expected improvements in technology are considered. The total potential is at least 340 TWh, or more than half of the current annual electricity generated in Canada (~ 600 TWh).

The following table contains a potential Green Power portfolio for 2025, showing the contribution by various Green Power technologies. The capacity factor is the percentage of actual electricity output expected in a given time period (generation) compared to the maximum possible if the source ran full time at its peak potential (capacity). Generation (TWh) has been used to set the targets for Canada as it shows the actual electricity that would be produced from Green Power sources.

The mix of Green Power technologies used to meet the target in 2025 will likely differ from the portfolio presented as some technologies could generate less than expected while others could generate more. Targets have also been suggested for 2010, 2015 and 2020. The focus of the Vision and Strategy is on the total electricity generated by Green Power for each target year.

Aggressive targets for Green Power development in Canada are possible given the total generation potential available to the country.

Potential Green Power Portfolio for 2025

TECHNOLOGY	CAPACITY (MW)	CAPACITY FACTOR (PER CENT)	ELECTRICITY GENERATION (TWh)
Wind – onshore	21,000	30	55
Wind – offshore	3,400	40	12
Small hydro	10,000	50	44
Biomass	4,500	80	32
Geothermal	500	95	4
Solar	1,000	14	1
Wave	500	30	1
Tidal	500	30	1
TOTAL	41,400		150

The target for 2025 is 150 TWh of electricity generated by Green Power.

Green Power Targets for Canada

45–60 TWh of green power by 2010.

90 TWh of green power by 2015.

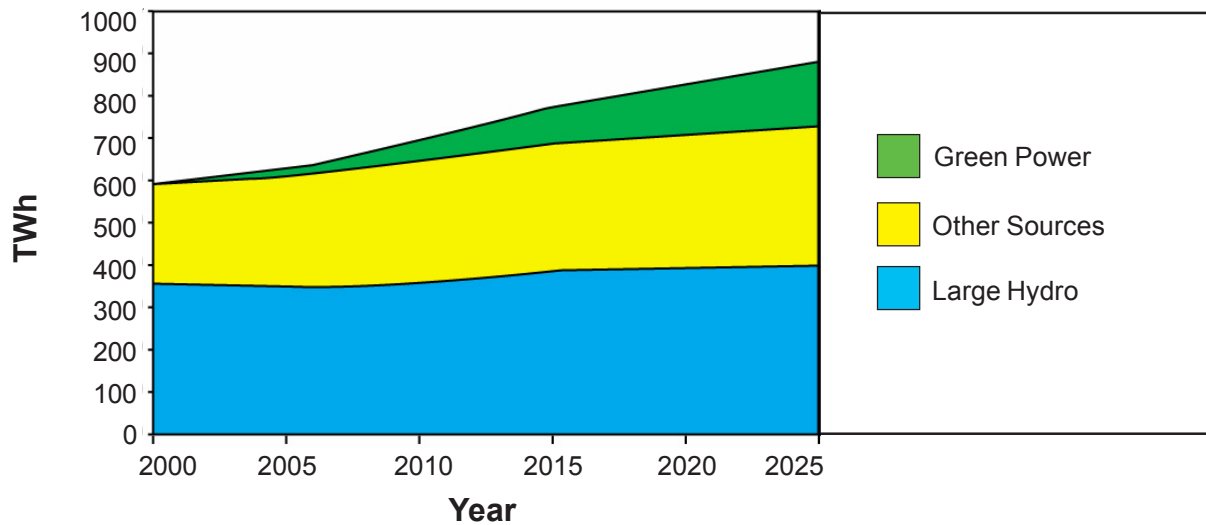
120 TWh of green power by 2020.

150 TWh of green power by 2025.

The impacts of achieving the Green Power targets are illustrated in the following graphs. The targets are shown relative to the total business-as-usual (BAU) projections for electricity generation of the National Energy Board (NEB 2003). The graphs have been modified to include Green Power generation as the targets are achieved.

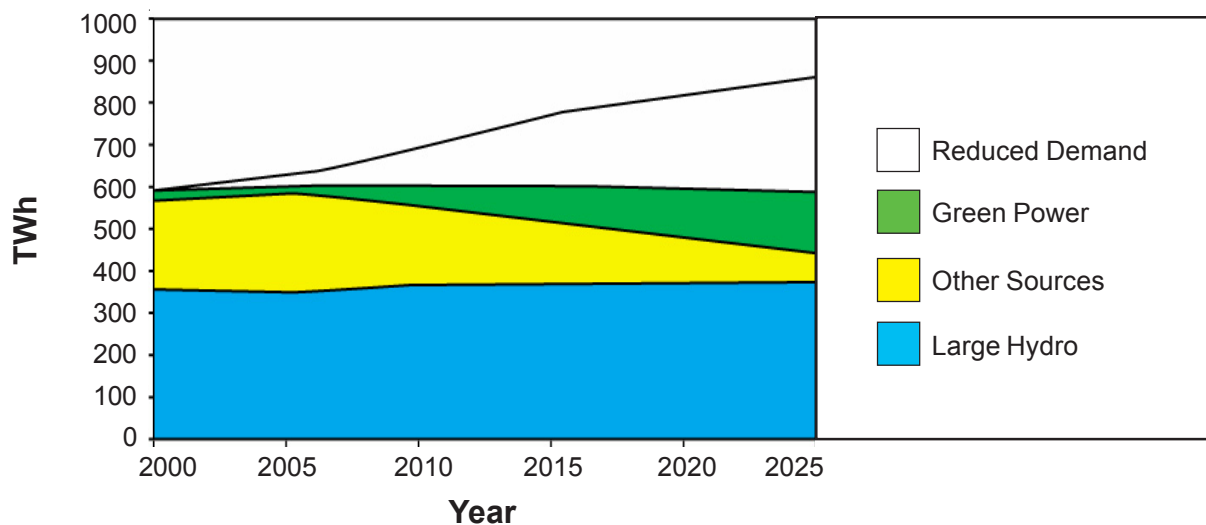
Under the Business-As-Usual Scenario, Green Power represents 17 per cent of the electricity mix by 2025. As the total demand for electricity increases, there is an increase in generation by Other Sources (e.g., fossil fuel and nuclear power).

Business-As-Usual Scenario



Under the Stable Demand Scenario, total domestic electricity demand is stabilized at the current level (600 TWh). Green Power represents 25 per cent of the mix by 2025 and there is a decrease in generation by Other Sources. To achieve this scenario, electricity demand would have to decrease 31 per cent by 2025 relative to the National Energy Board's projection for business as usual.

Stable Demand Scenario



STRATEGY

To develop Green Power to its full potential in Canada, concerted action will be required on several fronts. Three priority areas for action are identified below, complemented by seven additional areas that need to be addressed to remove the barriers to, and achieve the potential for, Green Power development and deployment.

The following strategies and recommendations do not allocate responsibilities by jurisdiction. It is expected that federal, provincial, territorial and municipal governments will select portfolios of action

that take into account their specific resource potentials, economic circumstances and the value of using combinations of initiatives. They should all develop roadmaps outlining strategies, targets and timelines and begin implementation so that by 2010 Canada has not only achieved the first shared national target, but has put in place the policies and incentives to achieve later targets.

All jurisdictions and sectors need to work together in a spirit of cooperation in order to fully implement the Vision and Strategy.

Priority 1 – Leveling the Playing Field

Billions of dollars have been invested in fossil fuel technologies and nuclear power to ensure that Canadians have reliable and low-cost supplies of electricity. It is time to invest in Green Power sufficiently over the long-term to develop viable domestic and export markets for Green Power and related technologies.

Recommendations:

- **Renewable Portfolio Standards, Targets or Equivalent Policy Commitments**, such as feed-in tariffs, should be established by provincial, territorial and key municipal governments. These should include tailored targets for each jurisdiction and specified timeframes for the development of Green Power technologies. The national targets can be achieved through a combination of regional strategies supported by federal incentives.

- **A Green Power Production Incentive** (GPPI) should be established by the federal government and complemented by the provinces and territories. It should support the development of market-ready Green Power technologies that require additional support. The existing federal Wind Power Production Incentive (WPPI) should be substantially increased and either become part of or run parallel to the GPPI.
- **Green Power Procurement.** Federal, provincial, territorial and municipal governments should lead by example by setting aggressive targets for Green Power procurement for their own use. All new public buildings should be built to strict energy efficiency standards and should obtain a set percentage of their energy needs from Green Power generation. A program should be established to encourage the private sector and institutions to procure Green Power.
- **A Renewable Energy Certificate System** should be established to support the implementation of Renewable Portfolio Standards. The system should be voluntary and flexible. Inter-provincial cooperation could reduce overall costs and support an enhanced national target for Green Power development. Provinces and territories could require that a share of their Green Power targets be generated by local sources.
- **A System Benefits Charge** (SBC), which is a small surcharge added to consumers' electricity bills, could be used to finance specific Green Power policy initiatives. There would be a cost to consumers, which would be offset by improved environmental quality and human health.

Alberta, British Columbia, New Brunswick, Nova Scotia, Ontario and PEI have implemented, or are working on, voluntary and mandatory Renewable Portfolio Standards.

Alberta has required that 90 per cent of the electricity used for public buildings be from Green Power sources by 2005.

Priority 2 – Supporting Innovative Technologies

There is an opportunity for Canada to be among the world leaders in the development of Green Power technologies. For example, Canada has tremendous resources that can be tapped for biomass and ocean-based power. Innovative technologies designed to harness this power could be marketed worldwide. Capitalizing on these opportunities will require leadership, innovation and focused support.

Recommendations:

- **A Comprehensive Strategy** should be developed for the research, development, demonstration and commercialization of emerging Green Power technologies by the federal government working in cooperation with the provinces, territories and industry. Existing R&D funding programs should be refocused or enhanced to support implementation of the strategy, and gaps should be filled through new initiatives.
- **Centres of Excellence** for various Green Power technologies should be established throughout Canada. Objectives for each Centre should be set in keeping with regional resource profiles.
- **Sustainable Development Technology Canada (SDTC)** has had its role strengthened to serve as a catalyst for the demonstration and pre-commercialization of sustainable development technologies, including Green Power. The provinces should partner with SDTC or establish similar mechanisms to develop innovative Green Power technologies to serve their regions.
- **Technology Road Maps**, such as those being developed by the SDTC, should be prepared to help the private sector select and develop the best technology options to meet future technical, environmental and market needs.

Québec has set targets for 1,000 MW of wind and 100 MW of biomass by 2010.

Ontario has proposed a Green Power target of 10 per cent of its total energy capacity by 2010.

Priority 3 — Engaging Canadians in Achieving the Vision

To achieve the Vision for Green Power development in Canada, it will be essential to gain widespread public support for national and provincial/territorial targets. Municipalities will also be important focal points for this activity.

Recommendations:

- **Community Engagement** should become a standard component of local Green Power planning by governments and industry. In areas with substantial Green Power resources, communities should be made aware of the resources in their regions and how Green Power development can offer economic benefits and contribute to the national Vision. Specific sectors should be informed of the role they can play in the development of Green Power (e.g., farmers who can lease their land for wind turbines).
- **Community-based Projects** should be encouraged through incentives and by streamlining the regulatory process to support public investment in Green Power.
- **The Market Incentive Program** should be expanded to increase funding support for the sale of electricity from emerging Green Power sources and should be extended beyond 2006 to support longer term contracts for Green Power. The provinces and territories should be engaged to develop a broader-based consumer green energy rebate program.
- **A Comprehensive Public Education and Outreach Strategy** should be developed to inform Canadians broadly about the Vision for a sustainable electricity future for Canada and to promote awareness of the benefits this future promises. Resources to support implementation of the Vision should be developed for use by community leaders, educators, NGOs and the private sector.

Windshare is a project developed by the Toronto Renewable Energy Co-operative and jointly owned with Toronto-Hydro, in which more than 400 members have invested in a wind turbine located in Toronto.

Supporting Strategies

Work will be needed in many areas to ensure that Green Power technologies become mainstream. The following recommendations address key requirements for these new technologies to successfully gain market share.

Accessing the Power Grid

A robust Green Power industry cannot develop without open and fair access to the power grid. The best locations for Green Power sources, such as wind, small hydro and geothermal, may be located far from existing transmission lines. The grid will have to be extended to appropriate areas with increased capacity.

Recommendations:

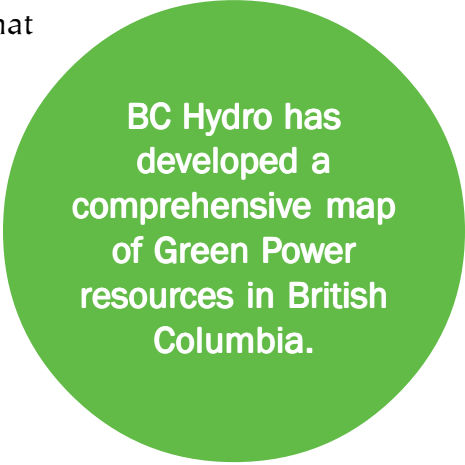
- **Expansion of power grids** to support implementation of the Green Power targets should include identification of areas that offer viable green power resources, assessment of transmission grid needs, and environmental assessments of the projects, with full consideration given to the environmental benefits of Green Power.
- **Transmission planning** should proactively support the expansion of Green Power as the aging grid is rebuilt.
- **The cost to extend transmission lines** should be shared by the overall customer base or co-funded by governments in public-private partnerships, once developers have paid a reasonable price to connect to the grid.
- **Efforts towards grid integration and coordination** should begin now among provinces and territories to facilitate interconnection and the optimal development and sharing of Green Power resources across Canada.

Saskatchewan has committed to meeting its needs for incremental power to 2010 through Green Power.

PEI is proceeding with a Renewable Portfolio Standard of 15 per cent by 2010 and is considering 100 per cent by 2015.

Mapping Green Power Resources

To fully develop Canada's Green Power resources, it is essential to know where they are located. Mapping of Green Power resources in Canada is crucial for strategic policy support and the development of Green Power industries. While some work has been done (e.g., the federal Wind Atlas that is under development), there is an immediate need to identify the location and potential of wind, solar, hydro, tidal, biomass, geothermal and wave resources in Canada.



BC Hydro has developed a comprehensive map of Green Power resources in British Columbia.

Recommendations:

- **Resource maps** should be developed for all Green Power resources across Canada through the cooperation of federal and provincial/territorial government agencies. The resource maps should be available to the private sector and the public.
- **Assessment of backup for intermittency** should be part of the mapping of Green Power resources. The assessment should include the use of multiple locations, potential synergies of various Green Power resources and the existing potential of conventional sources, such as hydro or natural gas, to serve as backup for intermittent Green Power resources.

Establishing Mechanisms for Distributed Generation

Policy frameworks for Green Power generation often overlook distributed generation (i.e., Green Power generation units located close to where the energy is used), in spite of the potential this option offers to reduce demand for central, large-scale electricity generation and to reduce peak demand for grid electricity (i.e., peak-shaving). Distributed Green Power generation also offers significant benefits to remote communities.

Recommendations:

- **Aggressive national and provincial targets** should be set for solar roofs, supported by capital buy-downs, to facilitate their widespread use (e.g., Germany has a target of 100,000 solar roofs).
- **Provincial net metering programs** should be developed to enable proponents of distributed generation to sell power back to the grid.
- **Green Power generation in remote communities** should be subsidized to be competitive with other subsidized fuels (e.g., diesel) used in electricity generation.

Streamlining Zoning, Planning and Permit Requirements

As several Green Power technologies are relatively new to Canada's electricity mix, municipal and regional planners need guidance to deal with the special needs of Green Power development. In particular, assistance is needed to address the permitting bottlenecks that prevent rapid deployment of Green Power technologies.

Recommendations:

- **Planning and permitting practices should reflect official government targets.** Provincial governments should assist municipalities in addressing bottlenecks to Green Power development on both private and Crown land. For example, they should recommend streamlined models for zoning standards and should clarify Crown land use policies. Where possible, the processing of planning applications for Green Power projects should be centralized in one provincial/territorial ministry.
- **Environmental impact assessments** for Green Power projects should be tailored to the needs of specific technologies. In addition, streamlined approval processes should be developed for technologies proven to be low-impact. These assessments should be harmonized among jurisdictions so that one process offers federal and provincial/territorial approvals.

Developing Standards to Ensure Quality and Safety

As Canada gears up to introduce new technologies for centralized and decentralized electricity generation, a broad range of standards need to be developed to ensure the most effective deployment of these technologies. The Canadian Standards Association, or comparable agencies, should be engaged to develop and oversee the development of these standards.

Recommendations:

- **An assessment should be conducted of the standards needed** to facilitate the timely introduction of a diverse mix of Green Power technologies in Canada.
- **Standards should be developed** to ensure that equipment will meet environmental performance requirements and address quality, safety and the ability to withstand Canadian weather conditions. Consideration should be given to adopting international standards that are well-developed and proven.



The Canadian Standards Association is actively developing standards for renewable energy technologies and distributed energy systems.


- **National interconnection standards for the installation of small distributed generation systems should be developed**, based on the guidelines developed under the Canadian Micropower Connect committee initiative. These standards should be adopted by all provinces and territories once they are approved by the Standards Council of Canada.

Preparing the Labour Force

International experience indicates that a lack of qualified personnel can be a significant barrier to the development of Green Power. In Ontario alone, it is estimated that approximately 2,000 additional engineers and technicians will be needed to achieve recently announced Green Power targets.

Recommendations:

- **Primary and secondary school curricula** should include the study of Green Power and energy efficiency to ensure that students learn basic information and are made aware of career opportunities in these fields.
- **Post-secondary curricula** should be developed to support the training (and retraining) of skilled staff for the emerging Green Power market. Government and industry should work with universities, colleges and technical institutes to develop curricula.
- **Training courses** should be developed to prepare utility personnel for the special needs of the Green Power market.



The Association of Canadian Community Colleges (ACCC) and Natural Resources Canada (NRCan) have teamed up to kickstart a national training program in renewable energy.

Setting Up Green Power Coordinating Bodies

For the Green Power Vision and Strategy to be implemented successfully, it must be built on strong provincial/territorial foundations. Its implementation will require a coordinated effort by governments in all jurisdictions, as well as effective engagement of stakeholders and the public.

Recommendations:

- **Provincial/territorial Green Power coordinating bodies** should be created to engage relevant ministries and stakeholders to oversee the establishment and implementation of provincial/territorial plans with targets for Green Power development and deployment.
- **A new national coordinating body or network** should be established with representation from relevant federal departments, provinces, territories and key stakeholders. Its mission should be to build support for a shared vision for Green Power, and to oversee the implementation of the Green Power Vision and Strategy in Canada. It should identify new opportunities and engage in problem-solving to overcome barriers.

Alberta's Clean Air Strategic Alliance (CASA) is a working group consisting of government, industry and ENGO representatives. It has formed a sub-group to develop strategies and programs to reach the government-set Green Power target, and to suggest solutions for related issues, such as transmission access.

The Canadian Energy Efficiency Alliance was created in 1995 as a public advocate for energy efficiency in Canada. It monitors and reports on Canada's progress on energy efficiency.

- **A Canadian Renewable Energy Alliance** should be established as a multi-stakeholder, non-governmental organization to act as a public advocate for the Vision and Strategy. It should monitor and report publicly on progress toward implementing the Green Power Vision and Strategy for Canada.

