

# **ENERGY AND SUSTAINABLE DEVELOPMENT**

Canada - Energy in the Context of Sustainable Development

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## **PREFACE**

At the 1992 United Nations Conference on the Environment and Development (UNCED—also called the Earth Summit), held in Rio de Janeiro, the international community adopted a Declaration on Environment and Development, as well as a global blueprint for action on sustainable development known as Agenda 21. To ensure effective follow-up of the Earth Summit, the General Assembly of United Nations established the UN Commission on Sustainable Development (CSD) in December of that same year.

The UNCSD is responsible for reviewing progress in the implementation of Agenda 21, and the sustainable development objectives outlined in the Declaration. The UNCSD continues its responsibility in reviewing outcomes from the 2002 World Summit on Sustainable Development (WSSD), including the Johannesburg Plan of Implementation (JPOI), as well as providing policy guidance to follow up at the local, national, regional and international levels.

As a functional commission of the UN Economic and Social Council (ECOSOC), CSD has 53 member States (about one third of the members are elected on a yearly basis). Each session of the CSD elects a Bureau, comprised of a Chair and four vice-Chairs. The CSD meets annually in New York, in two-year cycles, with each cycle focusing on clusters of specific thematic and cross-sectoral issues, outlined in its multi-year programme of work (2003-2017). At its fourteenth session, from 1-12 May 2006, the United Nations Commission on Sustainable Development (CSD) will review progress made by member countries with respect to sustainable energy development; industrial development; air pollution/atmosphere; and climate change.

The Programme of Work for CSD 14, includes the provision of information by member countries on decision-making strategies and policies; capacity building; financing and cooperation. As a contribution on the energy front, Canada has prepared this report to reflect progress on energy in the context of sustainable development highlighting actions and initiatives through the inclusion of a general annex of related case studies.

## INTRODUCTION

Since the 1987 World Commission on Environment and Development report that drew linkages between the global challenges of environmental degradation, poverty and development, and the Earth Summit in Rio de Janeiro in 1992, the Government of Canada has been actively engaged in efforts to make sustainable development a reality in Canada and around the world. Canada's position with respect to how energy issues are dealt with in the UNCSD process has been to ensure a constructive discussion on energy in support of the Summit's over-arching themes of poverty alleviation, health and sustainable production and consumption.

In the summer of 2002, Canada actively participated in the World Summit on Sustainable Development (WSSD), in Johannesburg. Canada worked together with other nations to address the barriers and challenges to the implementation of sustainable development and to create a joint plan of implementation. In the areas where the Plan of Implementation addresses energy issues, the recommendations, the goals and objectives echo many of Canada's own goals and objectives.

Post-Johannesburg, the government of Canada continues to work within its federal departments, across all levels of government and with its partners—in Canadian industry, non-governmental organizations, educational institutions, Aboriginal organizations and Canadian communities—as it delivers on its national mandate and the commitments made in Johannesburg. Experience in, and contribution to, ongoing scientific research, information sharing, and policy and program development helps to inform and shape Canadian energy-policy related resource issues, particularly where there are clear links to global concerns such as climate change and access to energy services.

It has been recognized for some time that sustainable energy practices, including improved energy efficiency, reduction of energy intensity and increased contribution of renewable energy in the overall energy mix, remain key to mitigating the impacts of climate change. Also in 1992, Canada signed and ratified the United Nations Framework Convention on Climate Change (UNFCCC). In December 1997, negotiators from all participating countries in the Framework Convention met for the Third Conference of the Parties, which resulted in the development of the Kyoto Protocol, which established a timetable for emission limitations for six most important greenhouse gases between 2008 and 2012.

The Kyoto Protocol was an important step, but covers only 35% of global emissions. Consideration needs to be given to a more inclusive international climate change regime. To this end, Canada hosted the 11th Conference of the Parties (COP11) to the UNFCCC, and the 1st Conference of the Parties serving as the Meeting of the Parties (COP/MOP1) to the Kyoto Protocol (since entry into force on February 16, 2005), in Montreal from November 28th to December 9th, 2005.

The nature of current global energy production and consumption patterns, with a heavy reliance on finite fossil fuels, presents some serious challenges to successfully achieving the goals and

objectives of sustainable development. Montreal provided an opportunity to signal a commitment to a sustainable future. In recognition of this, Canada undertook an unprecedented global initiative to consult and engage other nations to help achieve a global approach to the future as a goal of the conference. Advancing development goals in a sustainable manner was forwarded as one of the six key themes (along with broader participation, improving environmental effectiveness, realizing the full potential of technology, tackling adaptation, and building a strong global market).

The Montreal Plan of Action emerged from the conference as the roadmap for future work on addressing climate change globally (in addition to early success at the Conference through the adoption of the Marrakech Accords and agreement on a regime to ensure compliance under the Kyoto Protocol). The Action Plan is based upon the successes achieved under each of the key conference objectives - *implementing* the Kyoto Protocol, *improving* Kyoto as well as the Convention, and *innovating* the world's future approach to cooperation on climate change.

The Montreal Action Plan's five key components include:

- Initiating discussions under the Convention on long-term cooperative action to address climate change;
- Initiating discussions among Annex 1 Parties to the Protocol on the second commitment period (post 2012);
- Advancing the Kyoto Protocol through a strengthened Clean Development Mechanism;
- Moving forward the Program of Work on adaptation under the Convention and implementation of the Adaptation Fund under the Kyoto Protocol; and,
- Advancing discussions on the impacts of deforestation and technology transfer.

As the UNFCCC process serves to highlight, governments have a large role in ensuring that the development, distribution, and use of energy is undertaken in an environmentally responsible manner. There is no question that energy services are essential ingredients of all three pillars of sustainable development -- economic, social and environmental. Energy supports development at the national level by promoting industrial growth and providing access to international markets and trade. Energy facilitates economic development at the local level by improving productivity and enabling income generation.

Energy is strongly linked to the environment. Many energy sources are drawn directly from the environment requiring sound management for these sources to be sustainable. Energy extraction, production, processing and distribution have environmental impacts including air emissions, pollution, water quality and use, land use issues, soil degradation, as well as the disruption of ecosystems.

In Canada's energy context, sustainable development is interpreted as managing energy's contribution to current well-being and the development of the Canadian economy in a manner that protects environmental quality and ensures that resources to meet the needs of present and future generations.

Individual Canadians, leading Canadian companies and federal, provincial and municipal governments in Canada are coming to better understand how environmental sustainability is fundamentally important to preserving our high quality of life in Canada, to improving the bottom lines of our companies and to ensuring the competitiveness of our economy.

The Government of Canada believes that achieving environmental sustainability will be a key to Canada's competitiveness in the 21st century. This commitment is reflected in primary policy documents, such as the Speech from the Throne, which sets out the government's commitments to Canadians and outlines the policies and programs it will be implementing in the current session of Parliament, and the Budget, which is its fiscal plan.

But fully realizing the broad transformative change that is required to advance this agenda requires a comprehensive and integrated approach.

# **CANADIAN FRAMEWORK FOR THE SUSTAINABLE DEVELOPMENT OF ENERGY**

## **Evolution of Sustainable Energy Development and Management in Canada**

Canada is fortunate to have secure, reliable, and diverse sources of energy, which have played an important role in the country's economic growth; helping major industries become established and compete internationally. Over the decades, major investments in Canada's energy infrastructure have supported this economic development and contributed to the quality of life enjoyed by Canadians as well as challenges that require continuous effort.

The energy sector in Canada has grown with the economy, and the market share of different sources of energy has evolved significantly over the past 130 years. In the nineteenth century, wood was the primary energy source. At the turn of the twentieth century, coal use was on the rise and replaced wood as the primary source for the next fifty years. The advent of hydroelectricity in the early 1900s, spurred enormous improvements in the quality of life in Canada. With the advent of motor vehicles and the growing demand for gasoline and diesel fuel to power them, petroleum and its associated products became the primary source of energy in Canada. Natural gas has also become a major energy source and is used in many parts of Canada to provide heating, generate electricity, and power industrial processes. Canada has also been at the forefront in applying nuclear energy through the development of its CANDU nuclear reactor systems. Canada's energy intensity and consumption challenges have evolved with the aforementioned developments.

In Canada's constitution, jurisdiction over energy is divided between the federal and provincial governments

### *Jurisdictional Division of Responsibility*

<b>Federal Government</b>	<b>Provincial and Territorial Governments</b>
* Resources management on frontier lands	* Resource management within provincial boundaries
* Inter-provincial and/or international trade and commerce	* Intra-provincial trade and commerce
* Uranium and/or nuclear power	* Intra-provincial environmental impacts
* Trans-boundary environmental impacts	
* Policies of national interest: <ul style="list-style-type: none"><li>- Economic development</li><li>- Energy security</li><li>- Federal energy S&amp;T</li></ul>	

Provincial governments have jurisdictional responsibility for resource management within their borders, including intra-provincial trade and commerce and environmental impacts.

Federal powers in energy are primarily associated with the interprovincial and international movements of energy and energy-using equipment, and with works extending beyond a

province's boundaries. This permits the federal government to develop policies and regulate interprovincial and international trade, pipelines and power lines.

The federal government regulates virtually all aspects of uranium production, transportation and distribution. By the virtue of its peace, order and good government power, arising from the Constitution Act 1867, and the exercise of its declaratory power, uranium (the fuel for nuclear reactors) falls under the exclusive jurisdiction of the federal government.

The federal government also has broad taxation and spending powers; however, federal taxation in the energy field is currently limited to conventional corporate taxation, excise taxes and the Goods and Services Tax (GST). The federal government also leads in areas such as energy science and technology and energy efficiency research.

On Canada's frontier lands (north and offshore) the federal government maintains ownership of oil and gas resources. Some provincial governments dispute this, and in some offshore areas such as Nova Scotia and Newfoundland, the question of ownership has been put aside and the oil and gas industry is jointly managed. In each of these areas, an independent offshore petroleum board regulates oil and gas exploration, development and production on behalf of both levels of government; mirror legislation and regulation are enacted both federally and provincially.

### **Decision Making - Canada's Policy Approach to Energy and Sustainable Development**

Energy is an essential input to all Canadian economic activity - industrial, manufacturing, technology, agriculture. In 2004, the energy sector contributed 5.9% to GDP, \$46.4 billion in new capital investment, and \$67.3 billion in exports. It directly employed 241,000 skilled, well-paid workers. Between 2000-2003, revenues to governments from royalties and taxes ranged from \$10 billion to \$14 billion. This number is expected to increase significantly in the wake of surging world oil prices in recent years.

Canadian energy policy has provided the foundation upon which this solid economic performance has been built. Sustainable development is the overarching objective of Canada's current energy policy direction. Sustainable development principles are currently integrated into many Federal Government actions and initiatives, such as the Federal House in Order Initiative as the Government of Canada's plan for reducing greenhouse gas emissions within its own operations.

The Government of Canada is committed to ensuring that Canadians continue to prosper in a free, equitable, and healthy society while striving to reduce the impact of their lifestyles on the sustainability of their communities and the planet as a whole. At the market level, Canada's approach to sustainable development is to build on the strength of the markets, while addressing their limitations through selective interventions. Sustainable development requires efficient resource allocation, which is often best accomplished by competitive markets. Governments

have been fostering competitive markets by establishing essential market conditions such as institutions, laws, regulations, and the like, that ensure transparency, predictability, and fairness to all market participants, and provide a stable basis to encourage investment. Governments may also have general laws intended to promote competition and deter anti-competitive practices.

Energy infrastructure that has the characteristics of a natural monopoly, such as pipelines or electricity transmission and distribution systems, can be provided either by government enterprises, or by private companies subject to public regulation.

However, markets alone do not always ensure that all citizens have access to energy services and other basic goods. Accordingly, Canadian jurisdictions have income support and welfare programs so that all members of society can afford essential energy services along with other basic items. Direct subsidies for energy consumption are generally avoided as they can promote inefficient use and exacerbate environmental impacts. However, in some cases, Canadian jurisdictions have instituted subsidies or authorized cross-subsidies, notably for electricity, in order to ensure access, especially in rural and remote areas.

As well as a sound, market-oriented framework for energy policy, broader macroeconomic conditions are especially important for the energy sector since energy investments can often be quite capital-intensive. As such, it is important for the government to implement proper monetary and fiscal policies that provide for appropriate availability of capital and levels of interest rates as well as a fair taxation regime, and a well-functioning financial system.

There are possible adverse environmental and social consequences of energy production and use that markets do not address. To correct for such limitations, Canadian jurisdictions use a mix of policy instruments, such as information and persuasion; voluntary measures; scientific research and technological development; economic instruments, and various types of regulations to ensure high standards of environmental stewardship and social responsibility at all stages of energy development and use. Canada's experience affirms that jurisdictions require the flexibility to select policy instruments that best address their own circumstances.

There are several key fronts where Canada has made some obvious progress, demonstrating our seriousness and our desire to build momentum. One of these areas is energy efficiency and conservation in industrial processes, vehicles, commercial buildings and homes. Energy use in Canada increased by only 13 percent between 1990 and 2002 rather than the 31 percent that would have taken place without increases in energy efficiency. In addition, energy-related GHG emissions are more than 50 megatonnes lower than they would have been otherwise. A combination of regulations, incentives and government leadership by example has led to these gains. Another area has been enhancing the availability and the actual use of all forms of renewable and alternative energy sources - from the big familiar ones like hydro power to more experimental forms of solar, wind, geothermal and biomass. The Canadian government now has several programs to support renewable energy, which are detailed later in this report. There has also been an increase in co-generation projects and their effective integration into power grids, as well as smaller-scale district energy initiatives as viable and sustainable local options.

There is also focus on reducing the environmental impacts of fossil fuel development. Overall, a very important key to advancing sustainable development on the energy front is the Canadian government's continued efforts to expand and enhance research, science and technology.

Energy policy is also shaped by Canada's domestic and international commitments. A key commitment was made at Kyoto in 1997 (ratified by Canada on December 17, 2004) to reduce Canada's greenhouse gas (GHG) emissions to six percent below 1990 levels by 2008 to 2012

. Other significant commitments include the North American Free Trade Agreement (NAFTA) and similar national, bilateral and international agreements which set rules for global and regional markets and commodity trading. As well, there are agreements in other areas such as transboundary pollution (i.e. Canada-US Air Quality Agreement) which influence sustainable development within the energy sector. Domestically, Canada's constitutional division of powers requires that federal, provincial and territorial governments work together in such areas as climate change, environmental assessment and the regulation of Canada's energy infrastructure.

Industry associations, energy producers, energy users and environmental organizations are major stakeholders who contribute and help shape the policy development process.

### **Reporting Practices on Indicators for Sustainable Development at the National Level**

The Government of Canada continues to demonstrate leadership and a commitment to sustainable development in its own operations. Sustainable development strategies, submitted to Parliament every three years (since 1997) by 29 federal departments and agencies, function as important tools to guide and communicate some of the ways in which the Government intends to meet this commitment. Each strategy outlines how departments will systematically integrate the principles of sustainable development into their policies, programs, legislation and operations. Through these strategies, the Federal Government is accountable to Canadians for their decisions and actions that include energy related goals, expected results and targeted outcomes.

In addition, the position of a Commissioner of the Environment and Sustainable Development was established in part to encourage stronger performance by the federal government in environmental and sustainable development areas. The Commissioner monitors the extent to which departments have implemented the action plans and met the objectives outlined in their strategies. Encouraging the government to be more accountable for greening its policies, operations, and programs including energy, is a key to the Commissioner's mandate.

Natural Resources Canada, under its enabling legislation, is required to take sustainable development considerations into account in carrying out its mandate. In its first Sustainable Development Strategy, Natural Resources Canada undertook to develop objective means to assess progress towards sustainability in energy. A suite of indicators (economic, environmental and social) was developed that act as guideposts to the issues that will likely require attention from decision makers in developing energy policy. As we go forward, taken together these indicators will also serve to highlight the progress towards sustainability in energy.

*Economic Development Indicators:*

The economic indicators show the overriding importance of energy to the Canadian economy, both as a primary industry, and as input into the overall Canadian economy. The industry is a significant direct employer, and more importantly the jobs it provides are both better paid and more productive than the average. Energy exports contribute significantly to Canada's positive balance of merchandise trade strengthening our dollar. The energy industries are highly capital-intensive, which in turn accounts for their higher-than-average productivity. Additionally, energy is a significant user of, and contributor to, Canada's high technology industries. As the Canadian economy developed since the 19th century, its pattern of energy use changed to meet new requirements. As we move into the future, no doubt new patterns of use will emerge, especially in the context of climate change mitigation and adaptation. However, it appears that Canada will have a supply of energy in all its forms well into the future. In short, the economic indicators are generally positive.

*Environmental Stewardship Indicators:*

The indicators show improvement in energy's impact on the environment. Both greenhouse gas emissions per unit of energy consumed and the GHG emissions intensity of the economy have been declining since 1979 (NOTE: A separate report has been prepared on air quality). Energy efficiency measures were the cause of some of these declines, while changes in the energy mix, such as increased use of natural gas for electricity production, were also significant. However, economic growth has more than offset these efficiency gains, so that total GHG emissions continue to increase. Non-conventional renewable sources are still minor contributors to overall energy production, but wind power (the non-conventional renewable source closest to being commercially viable) has seen considerable growth in percentage terms. On balance, many of the environmental indicators are trending in a positive direction, but there are areas where progress needs to be accelerated.

*Social Well-being Indicators:*

Comparison over time of the amount of disposable income spent on energy by households, broken down by income quintile, shows clearly the importance of energy to modern life in Canada. The indicator not only shows that the proportion of disposable income spent by households has been relatively constant since at least the mid-1970s, but also that the poorest 20 percent of households spend 20 percent of their disposable income on energy. This means that measures which could affect energy prices, whether taken for environmental or other reasons, may need to be accompanied by measures to protect disadvantaged Canadians. It also means that governments may need to act on an ad hoc when energy prices rise sharply to protect low-income families and individuals. Other social-related energy indicators, such as energy sector wages and health-related pollutants from vehicles and power stations show positive trends. *At present all of these energy-related indicators are in the process of being updated and will be made available on Natural Resources Canada's Sustainable Development weblinks*

Overall, Natural Resources Canada's Energy Sector promotes the sustainable development and safe and efficient use of Canada's energy resources through its policies, programs, and science and technology such as outline by many of the case studies in the Annex1. It assesses the

potential economic, regional, international and environmental implications of Canada's energy production and use. It also provides technical knowledge and advice to the energy industry and to government. Its knowledge base helps the Government of Canada to formulate policies, implement regulations, enhance job and wealth creation, and meet its international commitments.

Overall, the Canada's energy sector is committed to developing and promoting economic, regulatory and voluntary approaches that encourage sustainable development of energy resources.

A major goal is to achieve environmental and economic excellence. Canadian energy policy is market-based and oriented toward sustainable development and is no longer narrowly concerned with just production and supply issues. Today, it is more aligned to the broader economic, environmental and public interest goals of the Canadian and world economies.

### **Financing - Innovative Programs and Initiatives**

In order to attract sufficient investment in sustainable development energy projects, it is important to create long-term security for investors. Irregular funding can impede investment, cause inefficiencies and result in the loss of financing. Accordingly, the Canadian Government is committed to ensuring predictability and consistency in all of its policies in support of sustainable energy development.

The Canadian Government committed in the October 5, 2004, Speech from the Throne "to respect its commitment to the Kyoto Accord on climate change in a way that produces long-term and enduring results while maintaining a strong and growing economy." The Budget 2005 announced \$3 billion in new measures to preserve the environment and address climate change. This included:

- The introduction of a Climate Fund(\$1 B over 5 yrs), complemented by a Partnership Fund (\$250 M over 5 yrs), to address climate change.
- The quadrupling of the Wind Power Production Incentive(\$920 M over 15 yrs) to 4,000 MW by 2010 and the introduction of a Renewable Power Production Incentive(\$886 M over 15 yrs) for up to 1,500MW of non-wind renewable energy.
- A \$225 M expansion of the EnerGuide for Houses Retrofit Incentiveover 5 yrs.
- A Sustainable Energy Science and Technology Strategy (\$200 M over 5 yrs).

In order to create a more competitive economy and healthier environment, the Government of Canada also has taxation measures, such as an accelerated write-off of certain equipment that either produces energy in a more efficient way, or from alternative renewable sources (Class 43.1 of the Income Tax Act). As of 2005, the provision allows taxpayers to deduct the cost of eligible equipment at up to 50% per year (up from 30%), on a declining balance basis. Without this write-off, many of these assets would be depreciated at considerably lower rates (4 or 20 %). There is also a category of fully deductible expenditures associated with the start-up of renewable energy and energy conservation projects. The Canadian Renewable and Conservation Expenses (CRCE) is applicable where at least 50% of the capital costs of the

property falls within Class 43.1 of the Income Tax Act. Under CRCE, eligible expenditures are fully deductible in the year they are incurred or can be carried forward indefinitely to later years. These expenditures can also be relinquished to shareholders through a flow-through share agreement, providing the agreement was entered into before the expense was incurred.

Sustainable energy development also supported broadly through innovative policies and programs in Canada. In most cases, these tend to be broad-oriented programs with goals for multiple benefits, not simply sustainable development. Overall, they consist of the following:

*PERD* - The Program of Energy Research and Development (PERD) promotes the development and use of Canada's non-nuclear energy resources in a clean and safe manner and the development of energy-efficient, renewable, and alternative energy sources and technologies. PERD's programs support the development of energy policy, standards and regulations, and are aimed at finding technology solutions to challenges such as climate change and energy efficiency.

Other benefits from energy R&D activities include: improved air, water and soil quality; lower costs to produce and use renewable and non-renewable energy sources; and the improved safety and security of Canada's energy supply and distribution systems.

*TEAM* - Technology Early Action Measures (TEAM) is an interdepartmental technology investment program established under the federal government's Climate Change Action Plan. TEAM supports projects that are designed to develop technologies that mitigate GHG emissions nationally and internationally, and that sustain economic and social development. TEAM provides support in five major priority areas: cleaner fossil fuels; energy-efficiency technology; biotechnology; hydrogen economy; and decentralized energy production

*SDTC* - Sustainable Development Technology Canada (SDTC) is a not-for-profit foundation that finances and supports the development and demonstration of clean technologies which provide solutions to issues of climate change, clean air, water quality and soil, and which deliver economic, environmental and health benefits to Canadians. SDTC supports clean-technology projects through the pre-commercialization points at which technologies move from the laboratory and are proved in full-scale, real-world test situations. To do so, the Foundation draws from an investment fund of \$550 million. SDTC was established by the Government of Canada in 2001. SDTC's mission is to act as the primary catalyst in building a sustainable development technology infrastructure in Canada

*The T&I R&D Initiative* - Technology and Innovation Research and Development (T&I R&D) advances promising greenhouse gas (GHG) technologies through applied energy science and technology. It focuses on five technology areas where significant gains in GHG reduction can be obtained: cleaner fossil fuels; advanced end-use efficiency; decentralized energy production; biotechnology; and hydrogen and fuel cell-related technologies. By 2008 T&I R&D aims to contribute to achieving the following outcomes: selected transformative technologies that are ready for demonstration; new and improved policies, codes, standards and regulations; increased

energy efficiency; increased awareness and acceptance of technologies to reduce GHGs and achieve other environmental benefits; and a strengthened Canadian industrial capacity.

*REDI* - The Renewable Energy Deployment Initiative (REDI), which came into existence in 1998, is a \$51 million program designed to stimulate the demand for commercially reliable, cost-effective renewable energy systems. REDI's main objective is to support the development of a more dynamic and self-sustaining renewable energy industry in Canada by using a combination of market transformation tools to create awareness of renewable energy heating and cooling technologies; develop industry infrastructure; and offer incentives to end-users in specific market segments. In conjunction with the renewable energy industry, REDI provides support to undertake market development activities, such as market assessment studies and the development of marketing strategies. Industry infrastructure initiatives such as targeted educational programs and design tools for professionals, are also developed in order to meet the demand for renewable energy systems. Significantly, REDI also offers businesses and institutions a financial incentive to reduce the purchase and installation costs of qualifying systems.

In the first six years of REDI, 196 projects were completed (as of March 1, 2004) for a total client investment of \$23,386,600 and REDI contributions of \$4,269,854. Moreover, approximately 100 projects are in progress; i.e: contribution agreements have been issued or signed and projects are under construction.

*WPPI* - The Federal Government supports electricity producers through the Wind Power Production Incentive (WPPI), which was launched in May 2002. In the 2005 Federal Budget, the Government of Canada invested an additional \$260 million over 5 years, and a total of \$920 million over 15 years, to expand WPPI's target capacity from 1,000 to 4,000 megawatts. Total installed wind energy capacity has increased by an annual average of 27% over the past five years.

As of September 2005, Canada had 591 MW of installed utility-scale wind energy capacity, spread across seven provinces and one territory. Moreover, Canada has vast untapped wind resources available. The Canadian Wind Energy Association claims that Canada has the potential to meet 20% of its electricity needs from such power. It is notable that many European wind turbine manufacturers are considering investing in Canada. Considerable interest has been shown in Quebec and Ontario. Indeed, Canada's supportive policies and favourable economic climate renders such investments commercially appealing.

*RPPI* - The 2005 Federal Budget provided for the introduction of the Renewable Power Production Incentive (RPPI). It is designed to encourage the development of as much as 1,500 MW of new emerging (non-wind) renewable energy sources, such as biomass, landfill gas and small hydro, by 2011. The budget provides \$97 million over five years, beginning in 2006-07, and a total of \$886 million over 15 years, for RPPI to achieve its target.

*Project Green and the Partnership Fund* - Project Green (2005), outlines the Government of

Canada's broad environmental vision for the country, features several market-based initiatives. It includes the domestic offset credit system and the Climate Fund, initially set at \$1 billion and potentially increasing to \$5 billion, which will provide an additional incentive for many forms of sustainable energy systems. The Partnership Fund, initially funded at \$250 million, is intended foster partnerships with Canadian provinces and territories on priority initiatives addressing climate change, including the facilitation of sustainable energy, including renewable energy.

The Government is also working on a Large Final Emitters regime to help manage and reduce industrial emissions in the longer-term. In addition, on in transportation side the Government of Canada and Canadian automobile manufacturers signed an agreement in April 2005, to reduce greenhouse gas emissions from new vehicles in Canada so that annual reductions will reach 5.3 megatonnes by 2010.

### **Regional and International Cooperation**

Canada participates in a wide range of regional and international organizations and fora involved in addressing issues of energy and sustainable development. It also engages in sustainable trade and export promotion technology transfer through Industry Canada, Environment Canada and Export Development Canada as well as strategic partnerships with industry associations, non-governmental organizations other key stakeholders.

Canada engages in international development assistance, primarily through the Canadian International Development Agency, the World Bank, other multilateral development banks, and the Global Environment Facility.

The UN is the primary multilateral forum focusing on sustainable development. Within the UN, there are number of bodies which have a sustainable development focus in which Canada is an active participant. The Government of Canada continues to participate in the United Nations annual meetings, aside from the formal UNCSD process and the UNFCCC, there have been a number of UN (Earth Summit, WSSD), and UN-supported (Bonn 2004, Beijing 2005) Conferences in which Canada has work together with other nations to address the barriers and challenges to the implementation of sustainable development in the energy sector, on a global scale.

Multilateral cooperation organizations such as the International Energy Agency (IEA), the Asia Pacific Economic Cooperation (APEC) Energy Working Group, the International Atomic Energy Agency, and the Organization for Economic Co-operation and Development's Nuclear Energy Agency all work to forge a common understanding of energy policy challenges and response options. In addition there a range of energy-related international initiatives and partnerships, of which Canada is a member, including the Carbon Sequestration Leadership Forum (CSLF), the International Partnership for the Hydrogen Economy (IPHE), the Methane to

Markets Partnership (M2M) and the Renewable Energy and Energy Efficiency Partnership (REEEP) initiative, to name a few.

APEC and a number of the partnerships and initiatives have a diverse membership from the developed and developing world. This allows for cooperation in such priority areas as capacity building, technology transfer, and, particularly, the promotion of energy efficiency and the adoption of cleaner energy processes and sources. These latter objectives are shared by all member countries and will lead to economic, social, and environmental benefits. Canada participates in ongoing scientific research, information sharing, and policy and program development. This share experience and expertise in turn, helps to inform and shape Canadian foreign policy related natural resource issues, particularly where resource issues are linked to global concerns such as climate change and access to energy services.

Bilateral discussions and cooperative activities are also important vehicles by which Canada works with other governments to address issues of energy and sustainable development.

In both developing countries and countries with economies in transition, energy solutions for sustainable development require fundamentally different approaches than might be taken in industrialized countries. Canada seeks to foster a wide range of energy options, which should be assessed and compared against the criteria of sustainable development with regard to particular circumstances. Access to flexible and diverse energy supplies is key to energy security and reliability, as well as sustainability.

Canada is viewed as a world leader in natural resources management including exploration and development of conventional and non-conventional hydrocarbon reserves, on land and offshore. Canada is recognized for its expertise in high-tech exploration methods, horizontal drilling, and various enhanced recovery methods from conventional hydrocarbon reservoirs and from reservoirs saturated with heavy oil. Canada has gained a considerable expertise in the mining and development of oil sands, oil extraction and processing technologies. Canada is also known for its successful development of its natural gas industry from exploration to end use.

Canada is also recognized for its sensible and efficient regulatory system, both provincially and federally, ensuring conservation of resources while providing for a fair return on investment. Canadian regulatory authorities are often consulted by foreign jurisdictions as they produce and develop their own regulatory frameworks, legislation, technical skills and policies in the petroleum sector.

The above are the strengths of Canada's oil and gas sector that create significant opportunities for cooperation in the oil and gas sector. The Government of Canada involvement through its bilateral and partnership branches(Canadian Industrial Cooperation and NGO Divisions) of the Canadian International Development Agency (CIDA), provides the instrument for the Canadian and oil and gas sector to play an important role in assisting developing countries. Canada emphasis on sustainable development in supporting reforms, creation of new regulatory

institutions, and institutional capacity building within the oil and gas sector will continue. This is vital if a number of broader objectives, most notably better environmental practices and resource conservation are to be reached.

### **Capacity Building - Prospects for the Future**

The energy mix in Canada will continue to evolve, as it has in the past, due to the relative prices of various energy sources, advances in science, changes in technology, and demand for new fuels.

As sustainable energy development requires different approaches, Canada seeks to foster a wide range of energy options, which should be assessed and compared against the criteria of sustainable development with regard to opportunities under particular circumstances.

Fundamental to sustainable development is a common understanding among stakeholders that development is essential to satisfying human needs and improving quality of life, but that it must be based on the efficient and responsible use of natural, human and economic resources. Sustainable development does not come down to a simple either/or equation. However, it does demand a greater scientific understanding of our environment.

At a domestic level, the federal role in natural resources complements the work of the provinces, which own and control much of Canada's land and resources. Most Provinces have clearly set as part of their mandate, the sustainable development of resources, including sustainable energy development and use. At even the individual level, the concepts of sustainable development present a very real challenge for Canadians. The increasing effect of energy costs and consumption, are driving the markets toward cleaner, more efficient consumptive and supply technologies. In the near term, promoting awareness and building capacity for technical innovation in the areas of energy efficiency and alternative energy forms will have an important part to play in their acceptance and recognition as a critical component in all aspects of sustainable development while increasing the reliability and security of our energy supply and the competitiveness of our industries.

Canada has been particularly active, both domestically (working with other levels of government, academic institutions, and non-government organizations and agencies, including Aboriginal organizations, environmental and community organizations) and as part of multilateral initiatives, in assessing changes in energy needs and demands and looking ahead to identify new, more efficient, effective, and environmentally acceptable approaches to providing energy services.

Canada has also excelled at taking new technology, applying and improving it. Technology has been important at reducing costs and increasing effectiveness - 3D, seismic, computers and horizontal drilling have been the most important technology developments in recent years. Canadian technology have been in software development, drilling, all phases of heavy oil and oil sands, sour gas operations, etc. The gas industry is one sector where Canada is fully competitive and a world leader in knowledge and experience, including extensive experience and

skills in the petroleum policy development, administration, institutional requirements, taxation and royalty regimes, and regulatory areas.

Canada's wealth of experience and expertise, including our ability to use and develop energy resources responsibly, to mitigate potential impacts from resource development, and to develop technologies that increase economic and environmental performance, can benefit resource managers worldwide. The Government of Canada demonstrates its leadership internationally by sharing its state-of-the-art knowledge and transferring technology with its global neighbors.

Much is being done by the Government of Canada at a departmental level to build capacity in creating knowledge via the development of enabling tools such as software, case studies and training manuals (e.g. Renewable Energy Project Assessment course); information dissemination (e.g. Web site and CD-ROMs) and training activities (e.g. professional workshops and university courses). The Government of Canada enables innovation in the energy sector by providing the coordination, knowledge, expertise and leadership required to accelerate progress on sustaining development - both at home and abroad. There is specific effort directed at building Canada's capacity for innovation, strengthening the research training of Canadians and promoting networking and collaboration among researchers through organizations and initiatives such as the Canada Foundation for Innovation (CFI). The CFI is an independent corporation established by the Government of Canada to strengthen the capability of Canadian universities, colleges, research hospitals and other not-for-profit institutions to carry out world-class research and technology development. Another, more sector-specific initiative is the Renewable Energy Capacity Building Program (RECAP), at the CANMET Energy Technology Centre. This initiative is directed towards sustainable development goals in seeking to promote the deployment of renewable energy systems in Canada and abroad by building the capacity of industry to implement more projects successfully.

Through work such as this, Canada is building its reputation as a world leader in sustainable development, and a quality producer of innovative resource-related products, technologies, services and research. In advancing the mandate of capacity building the Government of Canada also continues to contribute by:

- Conducting scientific research and developing leading-edge technologies, to maximize social and economic benefits for Canadians and our global neighbors while minimizing environmental risks and impacts;
- Providing ideas and information to support wise and efficient management and use of energy resources, reduce costs and create innovative products (e.g. hydrogen fuel cells), to and services for the international marketplace;
- Working to enhance the contribution of energy to the global economy (e.g. finding better ways to regulate while protecting the environment and encouraging coordination among regulators);
- Encouraging and facilitating how the energy sector and governments incorporate environmental, economic and social considerations into decision making through environmental and life-cycle assessments and creating knowledge via the development of enabling tools such as software (e.g. RETScreen®):

- Building knowledge infrastructure about geography and geology, including data on energy resources on and below the land and beneath the sea floor;
- Developing technologies to access unconventional oil resources in a sustainable/environmentally friendly manner;
- Water management for the Energy Industry;
- Maintaining access and improving uptake of energy efficient products, technologies and services and sharing our expertise on a bilateral basis, especially with other northern nations; and,
- Promoting Canada's interests in areas affecting energy resources, by providing technical support to Canadian organizations to help them implement more sustainable and renewable energy projects in high-priority markets, such as Canadian federal, provincial/territorial and municipal government facilities, Canadian remote communities; and developing countries. The Government of Canada is also promoting our national interests on an international scale through cooperation with international agencies and other nations, to meet our global commitments to assist in capacity-building.

In recognizing the needs of emerging economies and developing countries on the international front, the Government of Canada, through CIDA, has focussed on assisting developing countries in creating transparent legal, fiscal and credible regulatory frameworks to ensure sustainable resource management and development. These frameworks are required to attract and secure the type and level of investment needed to maximize recovery of existing oil and gas reserves and explore for new ones, and to invest in the development or upgrading of processing plants, refineries and transportation systems. Sound legal and regulatory frameworks and fiscal regimes are vital prerequisites for increased private sector involvement, investment and confidence in the sector. The focus is on CIDA providing technical assistance and consulting services to help develop appropriate frameworks and policies to address not only international demands, but also meet the social and economic needs of partner countries in a sustainable manner. This includes creating an enabling environment for the oil and gas industry and maximizing the benefits to the state including economic returns to the state in the form of royalties and other revenue sources.

With the restructuring of the oil and gas sector in many countries, increased responsibility for the implementation and monitoring of reforms affecting the industry falls on national organizations and institutions. These institutions in many cases are recently created impartial entities that require support to regulate the sector and carry out their mandate. These institutions must optimize benefits from the sector to the state and ensure the highest standards possible in terms of resource conservation. The Government of Canada has focussed on providing management and technical support to such institutions and organizations. Through its CIDA programs, the Government of Canada has also focussed on promoting the participation of indigenous and local communities in energy development issues. A well balanced structure of the distribution of revenues should enable communities to receive the benefits derived from the hydrocarbon exploitation in their territory. It will also enable the local communities to live in harmony with the oil industry without demanding the industry to play the role that corresponds to

the state. These regulatory institutions often act as mediators between the state and local communities.

CIDA is also supporting activities relating to ethics and transparency in the oil and gas sector. Support is being provided to state owned oil companies to ensure that their business activities include ethical commitments, transparency policies, corporate social responsibility indicators, development and sustainability reporting.

## **Key Themes and Challenges**

Canada believes that several key challenges need to be addressed by both developed and developing countries in pursuing sustainable energy paths. The range of issues within the *Energy for Sustainable Development* category in the *Request for Case Studies on CSD-14/15 Themes*, serves to highlight this.

The themes within Energy for Sustainable Development include:

- Increasing access to energy for the poor
- Renewable energy including hydro power
- Energy efficiency and demand-side management
- Fuel efficiency and cleaner fuel for transportation
- Managing transportation demand (e.g. improved city planning, promotion of public transit, intermodal shifts)
- Capacity-building in energy policy formulation and management
- Energy sector reforms (e.g. Energy laws, legal and regulatory initiatives)
- Advanced energy technologies
- Energy and rural development
- Consumer education and awareness-raising
- Innovative financing solutions and technology transfer (e.g. public-private partnerships, pricing fiscal and financial incentives)

With these themes we are well aware that pursuing sustainable development as it relates to energy will require significant technological changes in both developed and developing countries.

Governments need to foster the early adoption of energy-efficient and clean energy technologies, since energy infrastructure and equipment can affect patterns of energy production and use for many years and even decades. Enhanced R&D and the transfer of energy-related technologies between and among countries are essential and can be implemented through strategic partnerships, joint pilot projects, and training.

Developing transparent legal, fiscal and regulatory frameworks to ensure sustainable natural resource management and development an underlying requirement. These frameworks are need to attract and secure the type and level of investment needed to maximize recovery of existing oil and gas reserves and explore for new ones, or to invest in the development or upgrading of

processing plants, refineries and transportation systems. Sound legal and regulatory frameworks and fiscal regimes will also be needed as pre-requisites for increased private sector involvement and investment in the sustainable development of energy.

Developing and strengthening the capacity of institutions and organizations charged with the responsibility of regulating energy and implementing reforms in developing countries is also important. With the restructuring of the energy sector in many countries, increased responsibility for the implementation and monitoring of reforms affecting the industry will fall on national and regional organizations and institutions. These institutions in many cases are relatively new, recently created entities that require support to regulate the sector and carry out their mandate. This is vital in ensuring the state can optimize benefits from the sector and ensures the highest standards possible in terms of resource conservation. Through CIDA Canada's focus will be in providing management and technical support to such institutions and organizations.

The 1990s were marked by an evolution in development thinking on linkages between energy and the environment. They were also marked by increased recognition for the need to transfer environmental management skills and technologies to developing countries. Many countries, and the international community as a whole, are rapidly adopting more stringent environmental regulations and guidelines governing the oil and gas sector and how hydrocarbons are recovered and consumed. Other countries are harmonizing their environmental standards. The focus will be on increasing the knowledge base on environmental-energy management related issues and how the capacity of countries can be strengthened to develop and enforce appropriate policies and practices. A growing priority will be supporting greenhouse gas mitigating measures as a means of curbing the impacts of climate change. Canada has developed considerable expertise related to natural gas and has wide spread infrastructure and technical ability. Supporting the advancement of the natural gas capacity of the developing world is critical in terms of ensuring better environmental standards are in place. The reduction of natural gas flaring is also of considerable importance.

Strengthening institutional and commercial linkages between developed and developing countries continues to be important. Canada has an international reputation for the development, application and transfer of advanced environmental protection and conservation technologies applicable to oil and gas recovery, processing and transportation, as well as in the the creation of the necessary regulatory statutes and structures for their enforcement. Canada is also recognized, through its various training and research institutions and regulatory bodies, as having the type of expertise needed to develop and implement sustainable-based policies and reforms that govern the energy sector, including how state-owned enterprises can be privatized. Canada is looking to focus on supporting the development and strengthening of linkages between Canadian private sector firms and institutions and their counterparts overseas for the purposes of increased institutional and commercial relations and technology transfer.

The energy sector has strong links to poverty reduction through increasing income, improving health, supporting education, improving women's quality of life and reducing environmental

impact. There are very specific challenges with respect to Canada's contribution toward meeting the UN Millennium Development Goals (MDGs). Today, two billion people rely on traditional fuels such as wood, dung and agricultural residues to meet their heating and cooking needs, entrenching poverty and limiting opportunities. Access to energy is one of the key prerequisites for achieving the 8 MDGs. Though 800 million people have been connected to power grids in the last twenty years in developing countries, two billion people, mostly in rural areas, still do not have access to electricity and the services that electricity provides (lighting, mechanization, refrigeration, small agro-industries, SME activities etc). Support will be needed to ensure availability of energy services to areas without services. Many developed and developing countries are having increased interest in renewable energy, such as wind, solar, biomass and mini-hydro to improve the level of energy services to their citizens.

Working with indigenous groups and local communities to develop local energy strategies is an emerging priority. This relates to the broader objective of encouraging more programming that makes a direct link between the relationship between energy and poverty reduction. Access to dependable and affordable energy is a critical element in the fight against poverty. Better energy infrastructures and services for the poor is one of the major challenges of development. Growth in the oil and gas sector can lead to economic growth and more resources for social spending. Hence, the aim is to encourage growth in the oil and gas and to ensure that all initiatives occur in the most environmentally and socially sound manner possible. CIDA's work on energy (Ref Annex 2) will increasingly form an integral part of country and regional strategies to address poverty and promote access.

In the promotion of access to safe, reliable and affordable energy, Governments can establish an enabling environment for R&D for technology transfer by eliminating economic and institutional barriers in both supplier and recipient countries. A vital starting point for creating a successful R&D/technology transfer strategy is a fundamental assessment of a given country's particular energy and technology needs and circumstances and a willingness to explore new approaches to providing energy and energy services. This fundamental needs assessment is critical to establishing long-term strategies and approaches to sustainable development.

Canada believes that technology transfer is an additional complimentary area essential to global improvements in energy-related sustainable development in which increased international cooperation is called for, particularly between the private sector (which develops most technologies) and governments (which can help to facilitate the transfer process).

## SELECTED READINGS

Government of Canada. 2000. Energy and Sustainable Development: Canada's Submission to Preparations for the Ninth Session of the United Nations Commission on Sustainable Development. Government of Canada, Ottawa. Available on the Internet at <http://nrcan.gc.ca/es/epb/eng/international.htm>

International Energy Agency. 2000. Energy Policies of IEA Countries: Canada 2000 Review. Organisation for Economic Co-operation and Development/International Energy Agency, Paris. Summary available on the Internet at <http://nrcan.gc.ca/es/epb/eng/international.htm>

Energy in Canada 2000. Natural Resources Canada, Energy Sector, Ottawa. Available on the Internet at <http://www.nrcan.gc.ca/es/ener2000>

National Round Table on the Environmental and the Economy. 2005. *The State of the debate on the environment and the economy: economic instruments for long-term reductions in energy-based carbon emissions.*

International Energy Agency. 2004. *Energy Policies of IEA Countries: Canada 2004 Review.* OECD Publications, Paris.

Organisation for Economic Co-operation and Development. 2004. *Environment Performance Reviews: Canada.* Organisation for Economic Co-operation and Development/International Energy Agency, Paris.

## WEBSITES

<http://nrcan.gc.ca/es/epb/eng/international.htm>

<http://nrcan.gc.ca/es/epb/eng/international.htm>

[http://www.climatechange.gc.ca/english/whats\\_new/pdf/gofcdaplan\\_eng2.pdf](http://www.climatechange.gc.ca/english/whats_new/pdf/gofcdaplan_eng2.pdf)

<http://www.retscreen.net>

<http://www2.nrcan.gc.ca/es/oerd>

<http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=68>

<http://www.fhio.gc.ca/default.asp?lang=En&n=A78D906F-11>

<http://www.canren.gc.ca/programs/index.asp?CaId=107&PgId=622>

[http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/funding\\_programs\\_retp\\_e.html](http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/funding_programs_retp_e.html)

<http://www.iisd.org/cgsdi/dashboard.asp>

## **ANNEX 1**

CASE STUDIES	
PROGRAM/INITIATIVE	Website/Contact Information
<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Capacity-building in energy policy formulation and management</b></p> <p><b>RETScreen International Clean Energy Decision Support Centre</b></p> <p><b>Natural Resources Canada</b> (CETC-Varenes), in partnership with technical support from a large network of experts from domestic and international industry, government and academia.</p> <p><b>Status: Ongoing</b></p> <p><b>Funding:</b> Since 1996, CETC-Varenes (54%) and its' partners (46%) have invested \$5.8 million in RETScreen International and related activities.</p> <p><b>Description:</b> The Centre seeks to build the capacity of planners, decision-makers and industry to implement renewable energy and energy efficiency projects through a core tool - the RETScreen International Clean Energy Project Analysis Software. The Project Analysis Software consists of a standardized and integrated project analysis software which can be used world-wide to evaluate the energy production, life-cycle costs and greenhouse gas emission reductions for various types of proposed energy efficient and renewable energy technologies compared to conventional energy projects.</p> <p><b>Objective:</b> To build the capacity of planners, decision-makers and industry to implement renewable energy and energy efficiency projects by:  <ul style="list-style-type: none"> <li>developing decision-making tools that reduce the cost of pre-feasibility studies;</li> <li>disseminating knowledge to help people make better decisions; and by</li> <li>training people to better analyse the technical and financial viability of possible projects.</li> </ul> <b>Excellent transferability.</b></p>	<p><a href="http://www.retscreen.net">http://www.retscreen.net</a></p> <p><a href="http://www.retscreen.net/ang/impact.php">http://www.retscreen.net/ang/impact.php</a></p>

<p><a href="http://www2.nrcan.gc.ca/es/es/sdi/English/index.cfm?fuseaction=SDI.Article&amp;ArticleID=SchemaA">http://www2.nrcan.gc.ca/es/es/sdi/English/index.cfm?fuseaction=SDI.Article&amp;ArticleID=SchemaA</a></p> <p><a href="http://www2.nrcan.gc.ca/es/es/sdi/English/SD_Indicators_web.pdf">http://www2.nrcan.gc.ca/es/es/sdi/English/SD_Indicators_web.pdf</a></p>	<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Capacity-building in energy policy formulation and management</b></p> <p><b>Energy Indicators for Sustainable Development</b></p> <p><b>Natural Resources Canada</b>  <b>Status: Ongoing</b>  <b>Funding: N/A</b>  <b>Description:</b>  Sustainable development strategies outline departmental objectives and action plans to integrate sustainable development into policies, programs, legislation, and operations. These strategies are useful in guiding both the Government of Canada's in-house operations and its services to Canadians. Natural Resources Canada, in its first Sustainable Development Strategy, undertook to develop objective means to assess progress towards sustainability in energy. These indicators are individually tailored to reflect the unique mandates of the energy sector and thus cover a broad range of interests that change over time. As progress is assessed against the targets outlined in each strategy, new issues may arise, calling for flexibility and setting the stage for continuous improvement.</p> <p><b>Objective:</b>  Monitor a suite of indicators (Economic Development, Environmental Stewardship, and Social Well-being) that taken together highlight progress towards sustainability in energy, and serve as guideposts to the issues that will likely require attention from decision makers as energy policy is developed.</p>
<p>Liza Tanczyk  Natural Resources Canada  Tel.: 613-996-7836  E-mail: Liza.Tanczyk@NRCan.gc.ca</p> <p>Lesley Dawes  Natural Resources Canada  Tel.: 613-947-3481  E-mail: Lesley.Dawes@NRCan.gc.ca</p>	<p><b>CLIMATE CHANGE - Technology innovations and transfer</b></p> <p><b>Technology and Innovation Research and Development (T&amp;I R&amp;D)</b>  <b>Natural Resources Canada</b> (in partnership with provinces, private sector and universities)  <b>Status: Ongoing</b>  <b>Funding: Variable</b>  <b>Description:</b>  This applied R&amp;D program supports five (cleaner fossil fuels; advanced end-use efficient technologies; decentralized energy production; biotechnology; and hydrogen and fuel cell-related technologies) priority technology areas where significant gains in</p>

	<p>greenhouse gas reduction can be obtained by further developing S&amp;T.</p> <p>Requests for T&amp;I R&amp;D funding are referred to program managers working in the relevant technology areas referred to above and are considered in the context of current R&amp;D activities and priorities.</p> <p><b>Key Features:</b>  Programs must meet the following criteria to receive funding:</p> <ul style="list-style-type: none"> <li>· support climate change technology development;</li> <li>· work in partnership with provinces, private sector and universities;</li> <li>· leverage cash or in-kind resources; and</li> <li>· have deployment/dissemination strategies.</li> </ul> <p><b>Objective:</b>  Create a collaborative approach to investing in research in order to focus federal capacity on emerging issues and opportunities  To support fundamental S&amp;T activities, as well as market uptake.</p>
<p>Lesley Dawes  Natural Resources Canada  Tel.: 613-947-3481  E-mail:  Lesley.Dawes@NRCan.gc.ca  Web Site:  <a href="http://www2.nrcan.gc.ca/es/oerd">http://www2.nrcan.gc.ca/es/oerd</a></p>	<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Advanced Energy Technologies</b></p> <p><b>Program of Energy Research and Development (PERD)</b></p> <p><b>Natural Resources Canada</b> (in direct conjunction with 12 partner departments and agencies, as well as industry associations, the provinces, and universities)  <b>Status: Ongoing</b>  <b>Funding: Variable</b>  <b>Description:</b>  PERD provides funds directly to partner departments and agencies to support early-stage and applied energy R&amp;D in six technology areas: diversified oil and gas production; cleaner transportation; energy efficient buildings and communities; energy-efficient industry; reducing the environmental impacts of Canada's electricity infrastructure; and climate change.  Federal laboratories across Canada perform the R&amp;D and supplement the money they receive from PERD with funding from their own organizations. PERD also works in partnership with and leverages additional funds from industry and industry associations, the</p>

	<p>provinces, universities and other funding programs.  Requests for PERD funding are referred to program managers working in the relevant technology areas referred to above and are considered in the context of current R&amp;D activities and priorities.</p> <p><b>Objective:</b>  to increase R&amp;D funding an activities to enhance:</p> <ul style="list-style-type: none"> <li>· Scientific knowledge base for energy-related codes, standards, test procedures and regulations (including the development of testing equipment and planning tools);</li> <li>· The development of equipment, systems and processes e.g. engineering development and operational systems development - includes technical field trials, pilot plants and prototypes;</li> <li>· Applied scientific research e.g. field experiments, bench scale, pilot plants and technical field trials;</li> <li>· Science and technology assessment (of a specific activity/technology) for the purpose of further advancement of the science or development of the technology or spinoff applications; and</li> <li>· Data collection and literature reviews where they are integral and necessary to the research project.</li> </ul>
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## ENERGY FOR SUSTAINABLE DEVELOPMENT - Advanced Energy Technologies

### Technology Early Action Measures (TEAM)

#### Natural Resources Canada

##### **Status:** Ongoing

**Funding:** One of four blocks funded under the Climate Change Action Fund (CCAF) - the \$150-million Fund established by the Government of Canada in the 1998-99 federal budget and is built into the existing fiscal framework. Initial allocation of \$60 million for TEAM .

##### **Description:**

As a demonstration and late-stage development program, TEAM plays a key strategic role in the technology innovation process. Projects are funded in five technology areas: fuel cells and hydrogen; advanced end use efficiency; decentralized energy; cleaner fossil fuels; and biotechnology.

By supporting late-stage development and first demonstration of GHG-reducing technologies, TEAM enables the federal government to support a wide range of technology options and pathways towards the reduction of GHGs. Many companies that have been involved in TEAM partnerships have subsequently received further private and public financing or have commercially replicated their technology in the marketplace.

TEAM measures a project's eligibility for funding against the following criteria:

- the company's commitment to validating its technology performance and GHG benefits;
- the risks to success;
- the probability that the technology can be replicated in Canada or internationally;
- opportunity to leverage partnerships with other federal or arm's-length funding agencies or other levels of government;
- potential environmental and health benefits to implementing the technology;
- the projects' need for incremental government investment to succeed;
- repayment options for profitable projects; and
- accessibility of the technology to small- and medium-sized enterprises.

##### **Objective:**

##### Web Site:

[http://www.climatechange.gc.ca/english/team\\_2004/](http://www.climatechange.gc.ca/english/team_2004/)

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<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Advanced Energy Technologies</b></p> <p><b>Hydrogen, Fuel Cells and Transportation Energy Program</b></p> <p><b>Natural Resources Canada (in partnership with industry, provincial governments, research organizations, universities, other federal departments, the U.S. Department of Energy and the International Energy Agency)</b></p> <p><b>Status: Ongoing</b></p> <p><b>Funding:</b></p> <p><b>Description:</b>  Applied R&amp;D program which works in cooperation with stakeholders in the domestic and international transportation industries, including original equipment manufacturers, industry associations, fleet managers, transit authorities, utilities, provincial governments, research organizations, universities, other federal departments, the U.S. Department of Energy and the International Energy Agency. Program areas include alternative fuels and advanced propulsion systems, advanced energy storage systems, emissions control technologies, vehicle transportation systems efficiency, and fueling infrastructure.</p> <p>Program activities eligible for funding include:</p> <ul style="list-style-type: none"> <li>R&amp;D toward the development of technologies with short- to medium-term commercial and market potential;</li> <li>Technology assessments conducted in the lab and through technical demonstration projects and field trials to provide data on factors such as fuel economy, reliability, safety, environmental impacts and cost benefits;</li> <li>Development of technical and safety standards; and</li> <li>Technology transfer through sponsorship of workshops and seminars, publication of technical reports, and information exchanges with public and private sector organizations.</li> </ul> <p>Criteria for project funding include: environmental considerations; technological merit; leveraging; Canadian content; and potential for widespread adoption.</p> <p><b>Objective:</b>  to develop and deploy leading-edge transportation technologies that minimize environmental impacts, increase the potential for job and wealth creation and extend the lifespan of the energy resource base.</p>	<p>Web Site: <a href="http://www.cetc.nrcan.gc">http://www.cetc.nrcan.gc</a></p> <p>Nick Beck  Natural Resources Canada  Tel.: 613-996-6022  E-mail: Nick.Beck@NRCan-RNCan.gc.ca</p>
<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Advanced Energy Technologies</b></p>	<p>Web Site: <a href="http://ctfca.nrcan.gc.ca">http://ctfca.nrcan.gc.ca</a></p>

<p><b>Canadian Transportation Fuel Cell Alliance (CTFCA)</b></p> <p><b>Natural Resources Canada &amp; Partners (includes technology developers, fuel providers, auto manufacturers, federal and provincial governments, academia and non-governmental organizations).</b></p> <p><b>Status:</b> Ongoing</p> <p><b>Funding:</b> \$33 million, seven-year demonstration program for hydrogen infrastructure (funded to 2008).</p> <p><b>Description:</b></p> <p>The Canadian Transportation Fuel Cell Alliance (CTFCA) demonstrates and evaluates the technical feasibility as well as the economic and emissions implications of hydrogen refueling options for fuel cell vehicles. The initiative also establishes a supporting framework for hydrogen refueling by assisting in the development of codes and standards as well as certification and training programs.</p> <p>Evaluation criteria for funding demonstration projects include:</p> <ul style="list-style-type: none"> <li>· Canadian content and leveraging;</li> <li>· technical merit;</li> <li>· management and technical capabilities of project team;</li> <li>· economic considerations e.g. benefits to Canada, barriers to commercialization;</li> <li>· community impacts; and</li> <li>· uniqueness/first of its kind in Canada.</li> </ul> <p><b>Objective:</b></p> <p>To demonstrate and evaluate various options for providing the hydrogen to power fuel-cell vehicles in Canada. Investments in hydrogen and fuel-cell technologies are helping Canada reduce greenhouse gas (GHG) emissions and build a more innovative, efficient and sustainable economy poised for future growth.</p>	<p>Richard Fry Natural Resources Canada Tel.: 613-943-2258 E-mail: Richard.Fry@NRCan-RNCan.gc.ca</p>
<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Advanced Energy Technologies</b></p> <p><b>Community Energy Systems Program (CES)</b></p>	<p><a href="http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/research_programs_ces_e.html">http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/research_programs_ces_e.html</a>.</p> <p>Chris Snoek</p>

<p>Natural Resources Canada  Tel.: 613-992-1832  E-mail: Chris.Snoek@NRCan-RNCan.gc.ca</p>	<p><b>Natural Resources Canada</b>  <b>Status: Ongoing</b>  <b>Funding: On a revolving, repayable basis.</b>  <b>Description:</b>  The Community Energy Systems Program (CES) helps Canadian communities meet their energy needs more efficiently and cost-effectively. The program identifies and develops opportunities for the use of district heating and cooling, combined heat and power (co-generation), waste heat recovery, thermal storage, and local sources of renewable energy, particularly biomass. Interests include: planning and implementing projects in both urban centres and remote communities; developing software for system design; improving performance of district cooling systems; and promoting and fostering the adoption of integrated energy systems. CES operates a laboratory to test and develop district energy technologies. This enables systems to be simulated and quick responses to clients' problems. In addition to serving all three levels of government, the CES's clients also include engineering firms, energy equipment manufacturers and utilities.</p> <p><b>Objective:</b>  To develop and transfer technology and to stimulate interest in community-based energy systems.</p>
<p><a href="http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/funding_programs_etp_e.html">http://www.nrcan.gc.ca/es/etb/cetc/cetc01/htmldocs/funding_programs_etp_e.html</a></p> <p>Norm Benoit  Natural Resources Canada  Tel.: 613-996-6165  E-mail: Norm.Benoit@NRCan-RNCan.gc.ca</p>	<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Advanced Energy Technologies</b></p> <p><b>Emerging Technologies Program (ETP)</b></p> <p><b>Natural Resources Canada</b>  <b>Status: Ongoing</b>  <b>Funding: Repayable from revenue or cost savings resulting from the project.</b>  <b>Description:</b>  ETP supports the development and implementation of technological solutions that contribute to a cleaner environment, improved energy efficiency and productivity, higher quality products, reduced waste, and a stronger market position for Canadian companies. In particular, the program focuses on energy-efficient technologies that offer the highest rate of return on R&amp;D investment for Canada's industrial sector. Industry sets the strategic direction and ETP provides coordination, bringing together interested companies and industrial stakeholders. Activities are developed, managed and funded in cooperation with industry and other partners, including gas and electric utilities, other</p>

	<p>levels of government, and equipment manufacturers. ETP provides funding assistance for:</p> <ul style="list-style-type: none"> <li>· sector studies;</li> <li>· technical assessments;</li> <li>· prototype development;</li> <li>· field trials; and</li> <li>· follow-on R&amp;D activities.</li> </ul> <p><b>Objective:</b> To identify and develop emerging energy-efficient technologies with significant potential to reduce energy consumption, limit emissions of greenhouse gases, improve manufacturing competitiveness and reduce the environmental impact of manufacturing processes.</p>
<p>Web Site: <a href="http://www.nrcan.gc.ca/es/etb/">http://www.nrcan.gc.ca/es/etb/</a></p> <p>Rudy Lubin Natural Resources Canada Tel.: 613-996-6220 E-mail: Rudy.Lubin@NRCan-RNCan.gc.ca</p>	<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Advanced Energy Technologies</b></p> <p><b>CANMET Energy Technology Centre (CETC)</b></p> <p><b>Natural Resources Canada</b> (CETC works in partnership with other federal, provincial, territorial and municipal government departments and agencies, as well as industry, universities, utilities, associations, and a wide variety of private sector companies in Canada and abroad).</p> <p><b>Status: Ongoing</b></p> <p><b>Funding:</b> The Program of Energy Research and Development (PERD) provides about half of its funding to CETC. CETC also receives R&amp;D funding from NRCan's Technology and Innovation Research and Development (T&amp;I R&amp;D) initiative (described above).</p> <p>CETC's technology development activities are performed on a cost-shared basis through either in-house R&amp;D work at CETC laboratories or by providing funding support to their technology partners.</p> <p><b>Description:</b> Natural Resources Canada's CANMET Energy Technology Centre (CETC) is one of the main energy science and technology arms of the Government of Canada. CETC develops and delivers knowledge and technology-based programs for the sustainable production and use of Canada's energy supply.</p>

<p>CETC's national energy S&amp;T programs and services are delivered through three laboratories located in Devon, Alberta, Ottawa, Ontario, and Varennes, Quebec. Key R&amp;D areas include: advanced combustion; greener buildings; sustainable hydrocarbons; energy-efficient industrial technologies; sustainable communities; renewable energy; and distributed power.</p> <p><b>Objective:</b> CETC activities focus on reducing the costs of existing technologies by performing applied research or by undertaking more fundamental research where new technologies and concepts offer significant future market potential. Deployment and commercialization activities serve to increase market penetration of proven, cost-effective technologies, through support for standards development, technical workshops, training and full-scale implementation. The result of these technologies is reduced environmental impact, increased productivity and generated economic growth in Canada.</p>	
<p><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Renewable Heating and Cooling</b></p> <p><b>The Renewable Energy Deployment Initiative (REDI)</b></p> <p><b>Natural Resources Canada</b>  <b>Status: Ongoing since April 1998</b>  <b>Funding: \$51-million, nine-year program.</b></p> <p><b>Description:</b>  The Renewable Energy Deployment Initiative (REDI) is a unique program that focuses on green heating and cooling (GH&amp;C) and its benefits to Canadians, the GH&amp;C industries and all levels of government. Its vision is to become a leading catalyst for GH&amp;C deployment in Canada. REDI contributes to reductions in air pollution and greenhouse gas (GHG) emissions as well as to sustainable energy use, sustainable jobs and a better quality of life. REDI aims to reduce 0.284 megatonnes of carbon dioxide between 2004 and 2007 in addition to the 0.086 Mt avoided between 1998 and 2004. This will translate into a total of 0.37 Mt from 1998 to 2007.</p> <p><b>Objective:</b>  To stimulate renewable energy deployment from GH&amp;C sources, which can help Canada diversify its energy supply mix, reduce its greenhouse gas emissions and contribute to a future of sustainable energy.</p>	<p><a href="http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=455">http://www2.nrcan.gc.ca/es/erb/erb/english/View.asp?x=455</a></p> <p><a href="http://www2.nrcan.gc.ca/es/erb/CMFiles/EN_REDII73JWL-31082005-6991.pdf">http://www2.nrcan.gc.ca/es/erb/CMFiles/EN_REDII73JWL-31082005-6991.pdf</a></p> <p>Eugène Omboli  Renewable and Electrical Energy Division  Electricity Resources Branch  Natural Resources Canada  Tel.: (613) 995-3051  E-mail: <a href="mailto:eugene.omboli@nrcan.gc.ca">eugene.omboli@nrcan.gc.ca</a></p> <p>Toll free 1 877 722-6600</p>

REDI will pursue its vision, mission and target for GH&C market take-off through the following four strategic thrusts:

1. Market Stimulation as the high priority aimed at stimulating demand for GH&C products among end-users within targeted market segments;
  - Strategic Partnerships/Alliances as the medium to high priority aimed at sustaining collaboration with existing GH&C industry partners and fostering strategic alliances with target audiences including Northern communities;
3. Infrastructure Support as the medium priority aimed at strengthening the capacity of industries in the supply, delivery and servicing of GH&C products; and
  - Information, Knowledge and Outreach as the low to medium priority aimed at improving the understanding of the markets and benefits of GH&C technologies.

The above four strategic thrusts will be completed through REDI's operational action plan. The latter combines key activities, relevant and targeted outputs, and outcomes for the period of April 1, 2004 to March 31, 2007, as articulated in the REDI Strategic Business Plan.

## ENERGY FOR SUSTAINABLE DEVELOPMENT - Renewable Energy

### Wind Power Production Incentive (WPPI)

#### Natural Resources Canada (in conjunction with industry and the provinces)

**Status:** Ongoing

**Funding:** The original WPPI provided financial support for the installation of 1,000 MW of new wind-energy capacity by March 2007. In the February 2005 Budget, the Government of Canada quadrupled the WPPI target to 4,000 MW, and also provided \$200 million over 5 years 2005-2010 (total of \$920 million over 15 years). WPPI is currently consulting stakeholders on the expansion of the program.

**Description:**

The Government of Canada's Wind Power Production Incentive (WPPI), announced in the December 2001 budget, is intended to encourage electric utilities, independent power producers and other stakeholders to gain experience in this emerging and promising energy source.

As of October 2005, Canada has installed about 590 megawatts of wind energy capacity. WPPI will provide financial support for the installation of new capacity over the next five years. This incentive will be available to electricity producers for the first ten years of a project. The incentive will cover approximately half of the current cost of the premium for wind energy in Canada compared to conventional sources. To encourage regional participation, the program has set a minimum and maximum capacity for every province and territory, which will be reviewed on an ongoing basis.

To be eligible for the incentive, the prospective producer must negotiate and sign a contribution agreement with NRCan. The agreement contains the following criteria, among others, for setting up a wind farm:

The wind farm must be commissioned between April 1, 2002, and March 31, 2007;

The wind farm must be independently metered at the point of interconnection with the electricity grid; and

The wind farm must have a minimum nameplate capacity of 500 kilowatts (minimum capacity of 20 kilowatts in northern and remote locations.)

**Objective:**

The WPPI was created to help Canada reduce its direct greenhouse gas (GHG) emissions by encouraging the development of wind energy, which does not produce emissions. The incentive is also designed to help establish wind energy as a full-fledged competitor in the electricity marketplace.

By displacing other electricity sources and through continued momentum, wind power capacity installed under WPPI, is projected to

<http://www.canren.gc.ca/programs/index.asp?Cald=107>

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<p style="text-align: center;"><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Innovative Financing Solution and Technology Transfer</b></p> <p style="text-align: center;"><b>Renewable Energy Technologies Program (RETP)</b></p> <p style="text-align: center;"><b>Natural Resources Canada</b>  <b>Status:</b> Ongoing  <b>Funding:</b> Repayable</p> <p><b>Description:</b>  The Renewable Energy Technologies Program (RETP) is an applied R&amp;D program that supports the continued improvement of the economics and efficiency of renewable energy technologies. Technologies include: bioenergy (combustion, biochemical conversion of biomass to ethanol, thermochemical conversion of biomass to biooil and biogas, and biomass preparation and handling); small hydro projects (less than 20 megawatts); active solar applications; and wind energy.  Technology transfer is also a key component, with workshops and seminars helping to raise industry's awareness of new technologies. Technical support and advice is provided to industry associations and government programs that promote the increased use of renewable energy.  Stakeholders in the energy industry, such as manufacturers, developers, consultants, utilities, provincial governments and other federal departments are all eligible. Some of the criteria include:</p> <ul style="list-style-type: none"> <li>· innovativeness;</li> <li>· environmental impact;</li> <li>· societal benefits; and</li> <li>· contributions toward meeting Canada's clean energy requirements.</li> </ul> <p><b>Objective:</b>  Support efforts by Canadian industry to develop and commercialize advanced renewable energy technologies, such as active solar, wind power, bioenergy and small hydro with industry that can serve as cost-effective and environmentally responsible alternatives to conventional energy generation.</p>	<p style="text-align: center;"><a href="http://www.nrcan.gc.ca/es/etb/cetcc/cetcc01/htmldocs/funding_programs_retp_e.html">http://www.nrcan.gc.ca/es/etb/cetcc/cetcc01/htmldocs/funding_programs_retp_e.html</a>.</p> <p style="text-align: center;">Mark Riley  Natural Resources Canada  Tel.: 613-996-8151  E-mail: Mark.Riley@NRCan-RNCan.gc.ca</p>
<p style="text-align: center;"><b>ENERGY FOR SUSTAINABLE DEVELOPMENT - Innovative Financing Solution and Technology Transfer</b></p> <p style="text-align: center;"><b>Industry Energy Research and Development (IERD)</b></p>	<p>Web Site:  <a href="http://www.nrcan.gc.ca/es/etb/cetcc/cetcc01/htmldocs/factsheet_industry_energy_research_and_development">http://www.nrcan.gc.ca/es/etb/cetcc/cetcc01/htmldocs/factsheet_industry_energy_research_and_development</a></p>

**Natural Resources Canada**

**Status:** Ongoing

**Funding:** Repayable financial assistance up to 50 per cent of the total estimated allowable cost of an approved project.

**Description:**

An applied R&D program, IERD supports the development and use of new energy-efficient processes, products, systems and equipment proposed by industry. Projects contribute to a cleaner environment and help Canadian companies increase their market competitiveness. Technologies can be applied to all Canadian industrial sectors, including the transportation and buildings sectors. IERD's funding assistance is repayable.

The program forges links between technology developers and end-users to encourage the widest possible application of technologies. Project criteria include:

- a sound technical basis and a reasonable chance of success;
- a significant amount of development work;
- general applicability of the technology to one or more industrial sector; and
- sufficient potential energy savings.

The cost of technology development is shared with industry and other project participants. Funding is dependent on technical risk, potential energy savings, and the degree to which the technology can improve Canada's economic competitiveness. Overall, the average level of IERD's repayable contribution is 35 per cent of total project costs.

**Objective:**

To promote the development of products, processes or systems that will increase the efficiency of energy use throughout industry, and encourage the use of technologies developed under the IERD program.

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