Canadian Electricity and the
environment

Investing in a Sustainable Electricity Future

Brief to the Council of Energy Ministers

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Canadian Electricity Association

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Association canadienne de l'électricité

Overview

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Secure, reliable, affordable supplies of electricity are at the heart of our prosperity and our economic security. But the production, transmission and distribution of electricity carry consequences for the environment which are to some degree unavoidable. It is essential that efforts to mitigate environmental effects not unduly compromise the security, reliability or affordability of power supplies. Therefore, the continued movement toward a sustainable electricity future entails a careful balancing of multiple objectives and a policy based fundamentally on the merits of continuous incremental improvement.

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On the evidence, Canada's electricity system is making good progress toward such a sustainable future. We are making steady gains in our efficiency of electricity use, performance on air emissions is improving, and impacts on habitat and local communities are being steadily reduced. Emerging technologies hold promise of greater and faster gains.

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Canada's electricity industry, is working with governments and communities to accelerate this progress. Industry initiatives cover the spectrum of environmental issues and they are demonstrating the potential of partnerships and collaboration.

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Progress, especially accelerated progress depends on one fundamental factor - the ability to attract investment – and that ability can be compromised by unrealistic expectations about the rate of change, unnecessary regulatory costs and risks, outdated tax treatment and policies based on command and control rather than collaboration. All of these have the effect of slowing progress and stifling innovation.

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The most efficient and speediest path to a sustainable electricity future therefore needs to rest on what is, in effect, a new contract between industry and government. The Canadian Electricity Association calls on governments to join with the industry in a dialogue aimed at developing such a contract.

I Introduction

Electricity is one of the foundations of the modern economy, accounting for about one-third of all non-transportation energy end-use. Electricity is clean and flexible at point of use but, most importantly, in the majority of applications it has no substitute. The effects flowing from disruptions such as the recent events in California or the 1998 ice storm in Ontario and Québec amply demonstrate how dependent we are on reliable electricity supply.

The future economy will likely be more electricity dependent. Although electricity's share of end-use energy has been stable for a decade it is the newest areas of economic activity – the service economy – which are most dependent on the interconnected electricity grid, on its reliability and increasingly, on the quality of the power delivered. Some long-term visions of a clean energy future see much higher dependence on electricity, in industrial applications and most importantly in transportation where electricity would provide the underpinning of the hydrogen economy.

But the generation, transportation and delivery of electricity pose challenges to society. Among the greatest of these challenges is managing for environmental sustainability.

Considerable progress has been made in managing the environmental consequences of electricity production, transmission and distribution. However, some of those consequences are inherent in the nature of the electricity system, including factors such as resource availability and scale, extent and interconnectedness. Some technologies such as hydro and nuclear which make up the majority of Canada's current generation mix are virtually free of air emissions. Some technologies can minimize the generation of hazardous wastes. But, for the present at least, no technology capable of delivering electricity at the scale society requires in the way it requires can be deployed without having some impact on land, water, air, habitat, and local communities.

Against this backdrop it is vital that any approach to environmental sustainability be founded as well on the other core characteristics that Canadian society seeks from its electricity system – reliability and affordability. These are characteristics that Canadians have enjoyed for many years and they are fundamental to any economically, socially and politically sustainable vision of the future. Approaches to environmental management which compromise these characteristics – disconnected from business and technological realities, seeking speed of change unjustified by objective environmental needs or based on ideological judgments about certain fuels and technologies – risk engendering unnecessary conflict and slowing the rate of environmental progress.

Complicating the equation is the fact that most technologies have some inherent locational limitations and, therefore, the optimum choices will often vary from location to location. Different technologies also have different attributes that affect power availability and reliability, potential to be deployed in a decentralized manner, the need for interconnection and degree of reliance on other energy systems.

The challenge we face in managing the environmental sustainability of electricity is, therefore, one of balancing multiple objectives and multiple attributes. In this context, the fundamental question for policy is what management models will best enable us to achieve the needed outcomes.

II Progress Toward Environmental Sustainability

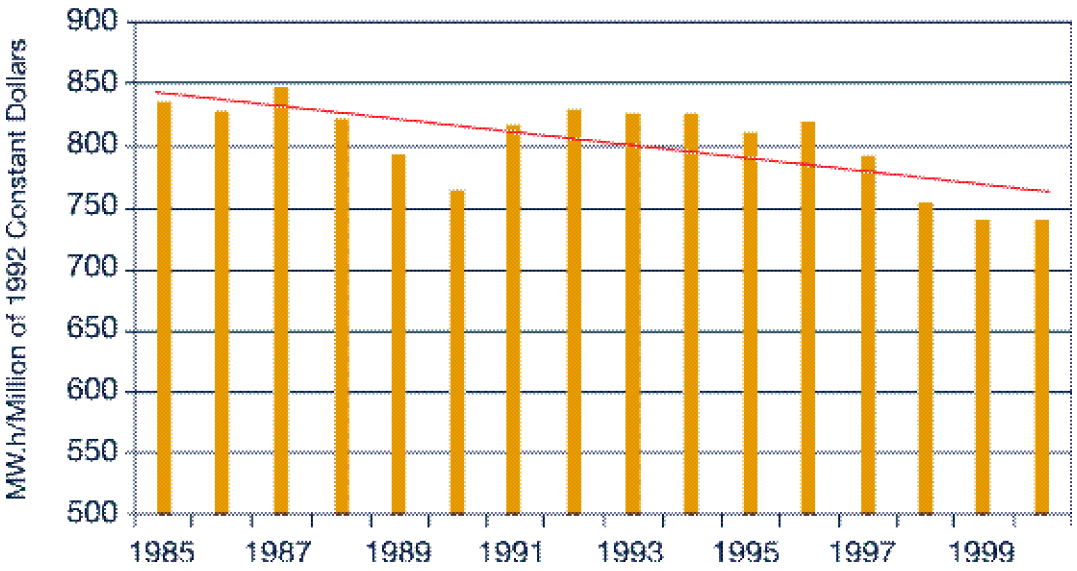
It is a fact that we are making steady progress toward a more environmentally sustainable electricity economy. It is for debate where, how and to what degree we can accelerate that progress. But the progress is demonstrable.

Demand Growth and Efficiency

There is evidence that the electricity intensity of the economy, that is, the amount of electricity needed to support a given level of economic activity, is now in a period of steady decline. As a consequence, between 1985 to 2000, electricity consumption per unit of GDP decreased from 840MW.h of to 740MW.h per million dollars of output in constant 1992 dollars.

Several factors are at work. Ongoing changes in technology and market responses to those changes are steadily improving the efficiency of buildings, equipment and machinery in industrial processes. Government energy efficiency programs and electric utility demand side management (DSM) and customer energy efficiency programs appear to have also contributed significantly to these gains.

Canadian Electricity Consumption per unit of GDP, 1980 to 2000



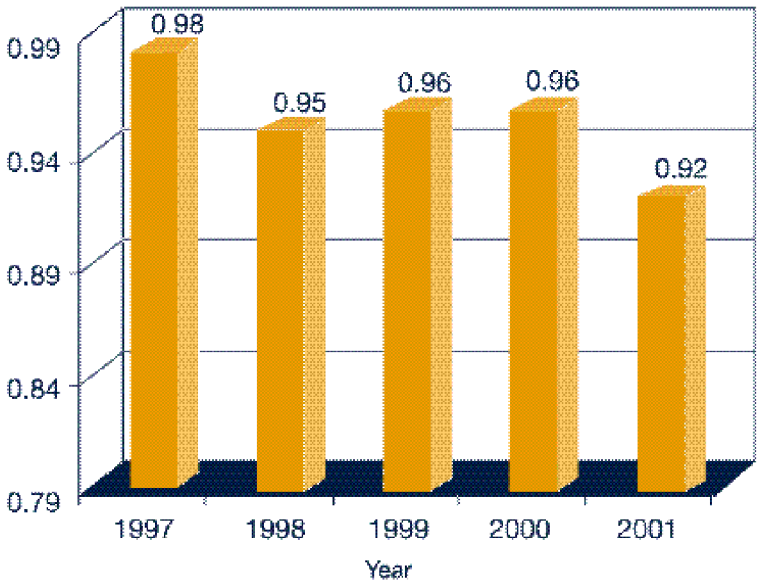
Source:A Bird's-Eye View of Electricity Supply and Demand to 2020 (GCSI), July 2001.

Climate Change

Greenhouse gas emissions have grown substantially and are continuing to grow, but a look at the underlying reasons gives cause for optimism. By far the largest factor behind the increase in emissions in the 1990's was the lay-up of the Ontario nuclear reactors in 1997 and the consequent increase in fossil fired production required to meet demand. The return to service of the laid-up reactors and possible reactor life extension in the next decade provide a strong base of zero GHG power in Ontario. Significant new hydro potential in several provinces provides an additional very large increment of near-zero GHG power.

In the fossil fuel powered component of the industry, emissions per unit of production both physical and net of offsets are declining. This is because of an increasing proportion of natural gas-fired power,

Mass of Gross $C0_2$ Emitted Per Unit of Net Fossil Generation (kg/kWh)



Source: Environmental Commitment and Responsibility Program Report 2001.

improved efficiency and significant investment in offsets. Looking forward, much more significant gains are in prospect because of the advent of new cleaner coal including CO_2 sequestration technologies. In Saskatchewan, for example, a pilot project is being conducted demonstrating the capture of CO_2 from the Boundary Dam Power Station, and another project is assessing the potential of geological formations to sequester CO_2 used in enhanced oil recovery.

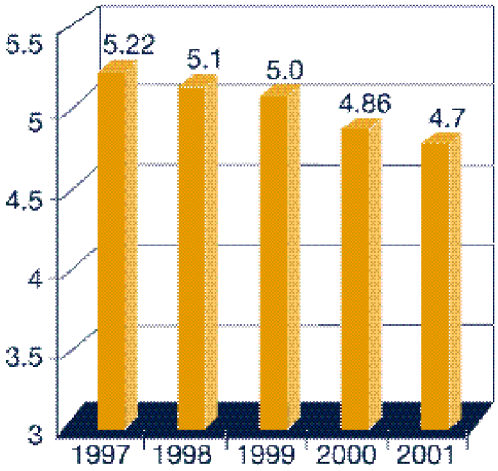
Progress in the real world does not always match the results flowing from international negotiations. In the Kyoto timeframe we will see net growth, not a decline from 1990 levels in emissions from electricity. What is important to note is that the potential exists to move to a very low GHG future in Canadian electricity in the following decade and beyond, provided appropriate policy is in place to promote investment efforts directed at real solutions.

Air Emissions

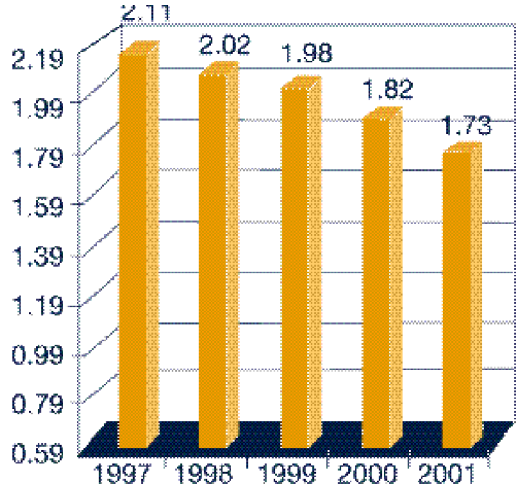
The application of technologies to improve combustion, fuel preparation and emissions control together with a growing share of natural gas in the fuel mix, contribute to improved performance with respect to other air emissions. Such efforts have resulted in a decline in the rate of emission of sulphur dioxide (SO_2) and nitrogen oxides (NO_x) per unit of power produced in the electricity sector. As better measurement and control technologies are steadily deployed, similar results can be expected for particulate matter and mercury, two of the other key emissions from the sector.

Looking forward, the effects of the application of new technology will result in further declines in emission rates and eventually start to turn overall emissions steadily downward. In Ontario, the retrofit of units at Nanticoke with selective catalytic reduction (SCR) technology will bring Ontario Power Generation well within compliance with the

Mass SO_2 Emitted Per Unit of Net Fossil Generation (g/kWh)



Mass NO_x Emitted Per Unit of Net Fossil Generation (g/kWh)



Source: Environmental Commitment and Responsibility Program Report 2001.

Ozone Annex to the Canada/U.S. Air Quality Accord and make the affected units among the cleanest burning coal-fired units in North America. In Alberta, the expansion at Genesee will employ more efficient super-critical combustion technology, low NO_x burners, flue gas desulphurization and bag houses for particulate control, thereby providing significant improvement across the board compared to existing units.

Hazardous Materials

Over the past decade, the effective management of hazardous materials and wastes has become the norm for electric utilities. Until the early 1980's, polychlorinated biphenyls (PCBs), were routinely used as insulating oil in electrical equipment. Although this practice has been discontinued, there remains significant equipment in service that contains PCBs. Utilities have been aggressively removing PCBs from their systems for a number of years, and have plans in place to continue this practice until they are PCB free. Likewise, the electricity sector is addressing the issues associated with managing treated wood poles. The sector has taken a lead role in Environment Canada's Wood Preservatives Strategic Options Process (SOP). Implementation of the SOP's recommendations will ensure treated wood is used, stored and disposed of in an environmentally sound manner.

One of the most pressing waste issues is high-level radioactive waste from nuclear reactors. Despite the short-term effectiveness and safety of on-site storage, the industry knows that a sustainable nuclear future depends on a long-term solution. With the recent passage of the Nuclear Waste Management Act, the nuclear power industry now has a path forward to a permanent solution that will meet the needs of Canadians and create conditions for the potential emergence of new nuclear power.

Impacts on Habitat

Reducing impacts on habitat, especially aquatic habitat has become a core part of the business of all generators, but hydro generators in particular. Fish habitat management is an essential element in

the building and operation of hydro generation facilities. Flow regimes are closely regulated to ensure habitat is neither flooded nor exposed. Hatcheries are under management by utilities to contribute to fishery development. Intake screens are closely monitored to keep fish juveniles from harm. Water use planning programs are under development in several jurisdictions, and joint research efforts between government and industry continue to evolve.

Habitat management is also the business of thermal generators. At coal-fired plants in Alberta and Saskatchewan, the adjacent mine sites are always reclaimed after mining so that the agricultural capability of resulting land is at least as high as before mining. In some provinces, displaced farmers have a first right of refusal on the land when it is released.

Technology Diversity

Technology diversity is growing and set to accelerate. Wind power is starting from a small base in Canada compared to other countries but it is on a growth trajectory. Installed capacity in Canada is now just over 200 MW and response to the federal government's recently announced wind power production incentive suggests that capacity could grow dramatically over the next few years. The growing presence of independent power producers and the actions of traditional utilities are bringing on new biomass and natural gas-fired cogeneration.

Community Engagement

Finally, high levels of community engagement are an essential underpinning to a sustainable future, and are increasingly the standard practice. Both Manitoba Hydro and Hydro-Québec have signed agreements with aboriginal communities bringing them into partnership arrangements to support development of new hydro facilities. Ontario Power Generation invested heavily in a dialogue with the people of Pickering, which was essential to supporting the nuclear restart program.

III Industry Action to Accelerate Progress

Members of CEA recognize that despite the progress made to date, the communities in which they operate and the governments that represent those communities will continue to demand higher standards. Members believe the key to accelerating progress is to make steady, incremental gains and for industry to take positive action in partnership with others to ensure those gains are forthcoming.

All CEA member environmental activities are anchored in the Environmental Commitment and Responsibility (ECR) Program, a condition of CEA membership for corporate utility members. The ECR Program is now five years old and the industry is approaching its first major milestone with all members having ISO 14001 equivalent environmental management systems in place. Systematic, transparent management and measurement is the foundation on which action must be built, and that is now fully in place among CEA members. The following section outlines some of the key action steps being pursued by the industry.

Action on Climate Change

Over two years ago the Canadian Electricity Association membership became the only sector in Canada to bring forward a specific proposal for creating binding commitments to reduce net greenhouse gas emissions growth. This proposal, with the strong support of the great majority of CEA members, is still under discussion with governments. It would create obligations based on a performance standard applied to existing generation facilities as they reach their forty-year anniversary of start-up and all new facilities after 2008. It would not achieve Kyoto-like reductions but it can achieve reductions consistent with all of the realities in which companies operate and create a realistic framework within which to realize the long-term vision of a very low GHG emissions future. TransAlta, for

example, has set a goal of zero net emissions from Canadian operations by 2024.

Action on Mercury

On the air emissions front, the most difficult emission issue remains that of mercury from coal-fired power. CEA members clearly recognize that mercury emissions must be steadily reduced, but at present the technology is not available even to accurately measure, far less reliably capture, such emissions. For this reason CEA members have undertaken an extensive voluntary program to improve mercury measurement and control designed to ensure accurate, widely available information essential to developing and implementing a mercury standard in Canada. The program is complemented by offset programs such as that supported by Ontario Power Generation, and by longer-term research into clean coal technologies supported by the Canadian Clean Power Coalition. CEA intends to carry out its mercury program in close cooperation with the Canadian Council of Ministers of the Environment (CCME) and is seeking to develop a cooperative arrangement with CCME to this effect.

Action on Fish Habitat

In July of this year CEA, on behalf of its members, became the first association to sign a Memorandum of Understanding (MOU) with the Department of Fisheries and Oceans. Building on the cooperation between the department and CEA on a variety of projects over the last several years, the MOU lays out a multi-pronged strategy for continued cooperation, including a commitment to work on a compliance framework aimed at bringing more clarity and consistency in the application of the Fisheries Act, continued cooperation on research, education and training projects, stewardship initiatives, and close senior level dialogue. CEA believes this is the type of initiative that can demonstrate that the need for improvements in the efficiency of regulatory processes is a problem susceptible to practical, incremental steps in the right direction.

Action on Energy Efficiency

CEA and its members are actively engaged with government to develop practical approaches on energy efficiency. Two initiatives have recently been launched with important implications for energy efficiency. Along with Natural Resources Canada, CEA is managing the Canadian Geo-exchange Coalition designed to accelerate the introduction of ground source heat pumps in Canada. The Electricity Metering Accuracy Program (EMAP) is an initiative jointly with Industry Canada that will accelerate the introduction of electronic meters into the Canadian marketplace thereby laying critical groundwork for effective energy management at the consumer level.

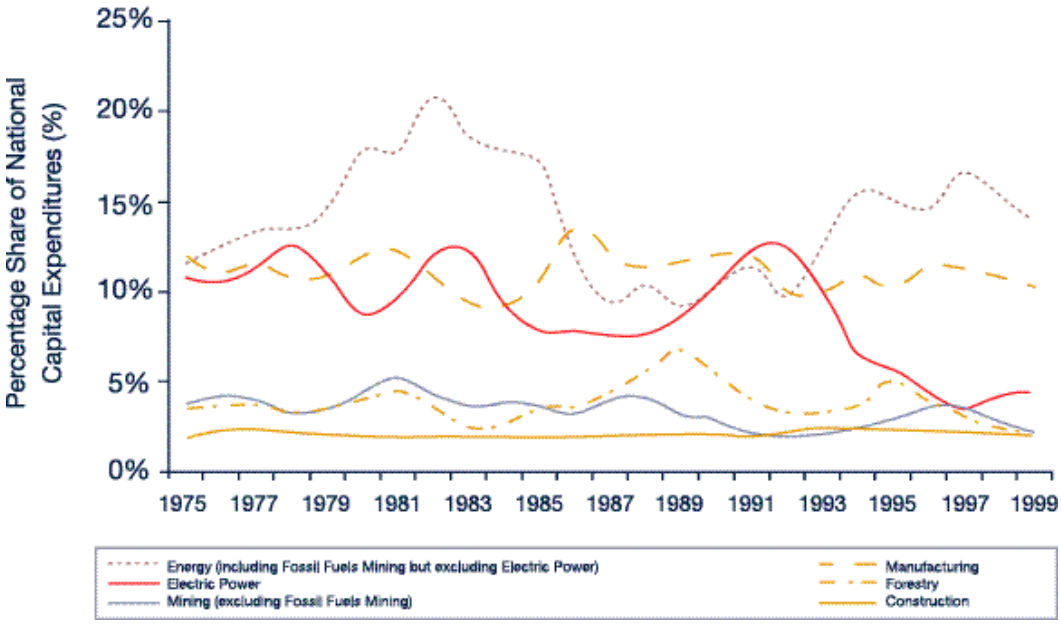
A recent survey conducted by CEA in partnership with NRCan's Office of Energy Efficiency on energy efficiency programs being implemented in the Canadian electricity industry reveals that considerable program activity is being undertaken and that far more could be achieved with the appropriate policy framework and incentive structures in place.

IV Next Steps: Investing in a Sustainable Electricity Future

Job one for the electric power industry is to supply affordable, secure and reliable power to Canadians. In order to do that job the industry needs to meet the expectations of multiple stakeholders – investors, employees, customers, governments, communities and public interest advocates. Those expectations include solid and constantly improving environmental performance.

The essential condition for meeting those multiple expectations is to create the right conditions for the right kind of investment: to build the capacity to respond to demand growth, to continue to improve performance in all aspects of the business and to develop the technologies to provide the foundation for the future.

Sector Contributions to Total Canadian Capital Expenditures



Source: ECONBASE, Natural Resources Canada, 2000. (Service and agricultural industries not included in graph)

Over the past 20 years investment in electricity has averaged $7.3bn per year (in current dollars), or 7.3% of all captial investment in Canada over that period. During the mid-1990s investment in electric power declined due to the over-capacity that developed in the early 1990s, but recently, spending on capital has begun to recover. While investment levels have begun to pick up, adequate investment is by no means assured. Current conditions of market and regulatory turmoil combined with large and often irreconcilable environmental pressures and the need for long term, patient capital create a daunting challenge.

Investment requires healthy companies dealing with risks and earning returns that are acceptable to capital markets. Many factors influence both risk and the level of returns:

- market conditions including access to wide-spread markets and fuel price and supply risk;
- for regulated segments, structures and processes for providing rates of return;
- taxation provisions;
- costs of environmental controls, mitigation, remediation and community compensation;
- lead times including time required to meet environmental approvals;
- regulatory risk including chances that projects will be delayed or stopped for unexpected and often arbitrary reasons.

Many of these factors are directly germane to the issue of environmental management. CEA and its members believe negative effects on investment can be mitigated without compromising environmental improvement – provided all parties have reasonable expectations and a shared sense of how best to move forward. In specific terms, CEA looks to government

to move forward on environmental issues in the following manner:

- **On climate change:** Create the policy conditions now that will ensure long-term investment in a low GHG future while minimizing economic disruption and regional imbalance.
- **On other air emissions:** Tailor approaches to regional circumstances including ambient environmental conditions, market conditions and a clear assessment of the most cost-effective ways to achieve real health benefits.
- **On habitat and species:** Take into account cost-effectiveness, proportionate costs and benefits and mitigation opportunities in assessing projects and regulating operations.
- **On hazardous materials and waste:** Work closely with industry to determine cost-effective, risk-based approaches and build partnerships and voluntary agreements.
- **On taxation:** Improve capital cost allowances (CCA) to reflect the true economic lives of assets and competitive conditions, and to advance the policy objective of more rapid capital stock turnover.
- **On alternative generation technologies such as new renewables:** Create market conditions that provide maximum opportunities for access. Modernize the incentive rates in Class 43.1 to include a broader range of emerging options designed with a focus on performance rather than arbitrary technology choice. Avoid where possible market distorting or trade inhibiting policy and regulatory approaches.
- **On energy efficiency:** Seek out opportunities to partner with industry in the development of efficiency programs and continue working with industry to develop standards for energy efficient materials and equipment.
- **On technology development:** Move energy and environment technologies higher on the list of strategic priorities and work with industry and stakeholders to identify promising investment avenues.
- **On information concerning environmental performance:** Work to develop better, more systematic environmental information, ensure the environmental preferability of various options is systematically and scientifically assessed, and ensure that such information is readily accessible to decision-makers and consumers and taken into account in environmental assessment processes.

V Conclusion: A New Contract for a Sustainable Future

For the long-term, CEA believes it is essential that industry and government find new ways of doing business together. More often than necessary, industry and government are at cross-purposes in the short-term even though their longer-term objectives are essentially compatible. We need to build a better dialogue leading to a new contract. To start the process we offer several concepts that should underlie such a contract.

- Environmental sustainability is only one part of the sustainability equation; at each decision step it is essential to consider the full range of economic and social ramifications.
- Investment occurs in a context of business, market and technical realities; therefore, while industry needs to adapt to environmental needs, environmental rules need to be built with the other realities in mind.
- Effective environmental policy needs to take account of both relevant environmental and economic geography.

- Any fundamental transformation sought will require a large societal investment in technology that will pay off only over several decades.
- Incremental progress has to be made in short time frames and unnecessary delay and uncertainty slow environmental as well as economic progress.
- Technology and fuel diversity create both environmental and economic choices providing decision-makers with the tools to manage both environmental and economic risk.
- Engagement of industry and government needs to be based on shared understanding, on commitment to ensuring that issues are managed at a strategic level and a commitment to the timely and responsible sharing – and use – of essential information.

The member companies of the Canadian Electricity Association are taking action to move Canada's electricity industry further along the road to environmental sustainability. We are working with many governmental departments and agencies to accelerate progress and we look to energy ministers to work with us and their other government colleagues to build the new contract needed to underpin these efforts.

All references used in the production of this document can be found at the Canadian Electricity Association website located at: www.canelect.ca.

Sources used for all figures in this document:

- Environmental Commitment and Responsibility Program Report, 2001.
- "A Bird's Eye-View of Electricity Supply and Demand to 2020", Global Change Strategies Inc., July 2000.
- Natural Resources Canada, ECONOBASE, 2000.