



NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY
TABLE RONDE NATIONALE SUR L'ENVIRONNEMENT ET L'ÉCONOMIE

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Eco-Efficiency

December 20, 1996

NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY SUSTAINABLE ELECTRIC TECHNOLOGIES

DISTRIBUTION

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ECO-EFFICIENCY, COMPETITIVENESS AND THE ELECTRIC UTILITY SECTOR

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1. INTRODUCTION

1.1 Background

The electric power sector is undergoing dramatic change world-wide. The changes are occurring as a result of the user demanding more choice with respect to power sourcing and lower prices. Canadian electric utilities are restructuring in anticipation of the introduction of competition and perhaps privatization of public sector monopolies at the wholesale end, and eventually at the retail end.

This transitional period is leading to very changed opportunities for traditional electric utility sector companies in Canada and the emergence of new players.

The National Round Table on The Environment and the Economy (NRTEE) is interested in:

- ā the role that eco-efficiency will play in the restructuring of this sector;
- ā the nature of new technologies which will emerge from a restructured electric utility sector;
- ā the degree to which Sustainable Electric Technologies (SET's) would be a part of this revitalized sector;
- ā other matters arising out of this restructured activity which may be of public policy interest.

1.2 Objectives

A number of studies have been carried out on the need for restructuring and introduction of competition to the electric utility sector in Canada and abroad, as well as on emerging technology opportunities and changes which may occur in the level of use of sustainable electric technologies. Some of these studies project increased levels of eco-efficiency; others argue that it will decrease because competition will result in higher outputs from old, relatively inefficient and dirty coal plants.

This paper outlines the conclusions reached and identifies key issues raised at a recent National Electricity Roundtable on competition and restructuring of the electric industry sector. The paper is intended to serve as a basis for addressing issues in a multistakeholder workshop. The conclusions addressed include:

- ā the need to move rapidly toward restructuring and competition in the electric industry sector
- ā the basic technology areas likely to have significant market impact or high potential for Canadian use
- ā the status of SET's in the restructured sector, and
- ā the possibilities for increased levels of eco-efficiency in a restructured electric utility sector.

2. THE CONTEXT

2.1 The Evolving Electricity Structure in Canada

The Canadian electric power sector currently consists of mostly publicly owned utility monopolies. In 1995, non-utility generation (NUG's) made up 10.5% of the total electricity produced in Canada (IPPSO, 1995). Private utilities now exist in several provinces:

- ā Nova Scotia Power, Nova Scotia, privatized in 1992
- ā The Maritime Electric Company Limited, Prince Edward Island

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ä TransAlta and Alberta Power, Alberta

Increased levels of privatization and competition are expected to occur in the rest of the country as many provinces begin to open access. Natural Resources Canada predicts that within the next 10 years, most provinces will have introduced competitive markets in electricity (Torrie, 1996). In early 1996 both Alberta and British Columbia began to provide open access to their transmission systems for the wholesale wheeling of electricity (IPPSO, April, 1996). Manitoba and Quebec are preparing to allow open access in one year. The MacDonald Advisory Committee Report on Competition in Ontario's Electricity System to the Ontario Minister of Environment and Energy recommends that "full retail competition be phased in to Ontario's electricity market as soon as practicably possible".

A National Electricity Roundtable was formed in Canada as a result of the rapid change occurring in the electricity sector. The purpose of the Roundtable is to provide a focal point for the industry whereby representative member CEO's can interface with key federal ministers on national issues impacting the industry. The objectives of the Roundtable and a listing of its members may be found in Appendix A.

The National Electricity Roundtable has been studying how restructuring and competition may affect the sector in Canada, the opportunities and challenges, and new technology opportunities that may emerge.

2.2 Electricity and the Environment

The electrical utility industry restructuring is occurring within greater context of increasing public concern about the global environmental impact of industry activity.

The electrical utility industry accounts for about a third of the carbon dioxide emissions world wide. In addition, per capita emissions of carbon dioxide in North America are the greatest in the world. The combustion of fossil fuels generates other pollutants including nitrogen oxides, volatile organic compounds, sulphur dioxide and particulate matter. These pollutants impact human health and contribute to adverse environmental effects including acid rain, ground level ozone and urban smog.

The high profile accident at Chernobyl in 1986 resulted in increased concerns about the safety of the nuclear power industry in general. Associated concerns include the disposal of used nuclear fuel, the treatment and disposal of radioactive materials, and the high capital cost of nuclear facilities.

Increased public awareness of the environmental impact of large scale conventional generation and transmission facilities has increased the level of debate and political pressure around such projects, leading to long delays and possible cancellation of projects. Large-scale hydroelectric plants cause both environmental and social change as they disrupt natural ecosystems and displace populations.

In developed countries, e.g., G7 countries, increasing and stricter environmental public and regulatory pressures are motivating utilities and industry to develop and implement technologies to control and reduce emissions and/or use energy efficiently.

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2.3 Eco-efficiency

The concept of eco-efficiency was introduced in 1992, by the Business Council for Sustainable Development in the report "Changing Course". Eco-efficiency was further defined in November 1993 at the Antwerp Workshop on Eco-efficiency as being "reached by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life while progressively reducing ecological impacts and resource intensity throughout the life cycle to a level at least in line with the earth's estimated carrying capacity". Six success factors for eco-efficiency have been defined by the World Business Council for Sustainable Development.

- ä reduce the material intensity of goods and services
- ä reduce the energy intensity of goods and services
- ä reduce toxic dispersion
- ä enhance material recyclability
- ä maximize sustainable use of renewable resources
- ä increase the service intensity of goods and services

Leading companies have recognized strategic advantages of eco-efficiency, both to the bottom line and to attract valuable community support. The electric utilities recognise the importance of environmental issues in their daily operations, and are examining how eco-efficiency can play a role in the restructuring of the sector.

2.3.1 Sustainable Electric Technologies

The level of eco-efficiency of the utility sector can be increased in a number of ways. One way is to look at the degree of use of sustainable electric technologies (SET's). SET's are considered to be pollution prevention technologies in the electricity sector including both energy supply and end use technologies that:

- ä Efficiently use renewable resources such as solar, wind, small hydro and biomass to produce power;
- ä Efficiently convert non-renewable resources into energy such as cogeneration, fuel cells and efficient natural gas burning turbines;
- ä Improve end-use efficiency (e.g., high efficiency motors, lighting appliances, HVAC equipment);
- ä Offer low environmental impact with respect to emissions, toxic releases and solid waste volumes.

2.3.2 Current and Projected Use of SET's

Significant strides in energy efficiency were achieved in Canada from 1984 to 1994. Improvements in energy efficiency were achieved through more energy efficient space heating and cooling, appliances, houses, lighting and changes in technology in heavy industry including iron and steel, aluminum, cement and pulp and paper. These improvements occurred as a result of government, utility and community incentives to improve energy efficiency and because of increases in electricity prices.

The continued forecast decline in Canadian energy intensity of an average of 1.1% per year from 1992 to 2000 is not expected to make up for increased energy demand due to economic and population growth.

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On the supply side, renewable energy sources (excluding large scale hydro) in Canada represented 5.6% in 1994. This renewable energy came largely from biomass and small hydro.

There are a large number of SET initiatives underway in Canada. These initiatives are being undertaken by governments, utilities and community and non-government organizations. Nevertheless, renewables in Canada are forecast to remain at about 1994 levels by the year 2020, (excluding large hydro). There are no government targets or requirements for specific capacities in renewable energies.

Globally, many countries have sizeable SET initiatives underway. Several European countries require or target specific capacities or percentages of renewable energy by the year 2000. In several developing countries, there are innovative and substantial SET projects underway.

Only a small fraction of those renewable energies that are installed annually can be found in Canada. Canadian companies are supplying only a small fraction of renewable energy facilities that are installed globally.

3. SUMMARY OF THE ANALYSIS OF THE NATIONAL ELECTRICITY ROUNDTABLE

The restructuring of the electric industry sector has been viewed by different stakeholders as presenting either a challenge or an opportunity to improve the level of eco-efficiency of this sector. Some stakeholders feel that rapid introduction of competition will improve productivity, reduce costs and provide new technology opportunities. Others feel that prices will increase and that the life of older, relatively inefficient conventional technologies will be extended as a result of competition.

Several organisations have addressed the role that environmental concerns and eco-efficiency will play in the restructuring of the electricity sector. The National Electricity Roundtable, International Joint Commission, World Business Council for Sustainable Development and others have drawn various conclusions.

The conclusions given below are based largely on views representative of the National Electricity Roundtable. They are presented as a starting point for debate in a proposed NRTEE workshop.

3.1 The Inevitable Restructuring of the Utility Industry Will Result in Improved Eco-Efficiency

Globalization of markets is forcing all industries to re-evaluate their operational structure in order to compete in the changing economy. Precedents for the introduction of competition in the electricity sector include the UK, and now the US, pushed by the insistence on lower utility rates by large industrial customers. The push towards deregulation in the US may impose restrictions on the export of Canadian oversupply to US markets.

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The electric power industry recognizes that there exists the potential for direct cost savings by emphasizing materials conservation and energy efficiency; voluntary, pre-emptive initiatives to address environmental problems cost less than responding to mandatory clean-up orders and regulations (Torrie, 1996). Operating plants at maximum efficiency, with as little waste as possible, and where necessary, closure of older, unproductive plants will provide the costs savings necessary for competitiveness in a restructured utility sector.

Industries such as food and beverage, and packaging have shown the power of green marketing. Eco-efficient energy production may be marketed to those consumers who prefer to buy 'green power', and are prepared to pay a premium for it. Greater access and distribution flexibility on the grid would facilitate the choice and use of renewable energy sources over traditional, non-renewable sources, e.g. small-scale wind, solar and hydro projects.

3.2 A Restructured Utility Industry Would Provide Significant Opportunities for New Technologies

- a) Introduction of competition and convergence of the electronics and electric industry will lead to the need for new technologies in the restructured electricity market in Canada. The National Electricity Roundtable identifies technology opportunities in 5 areas:
- ä distributed generation
 - ä power quality
 - ä transmission and distribution control protection & metering
 - ä environmental technologies in generation
 - ä electromotive and energy storage
- b) Advances in information technology, monitoring and control technologies would facilitate the more efficient operation of an increasingly complex transmission and distribution system, including smart networks and smart buildings.
- c) At the consumer interface, the convergence of telecommunication and electricity network technologies will allow for one line service to the consumer, with economic and ecological benefits. One line service will, for example, improve eco-efficiency by reducing the number of cable installations into homes and businesses, by allowing remote control of appliances during peak energy use periods, and by permitting remote reading of meters.

3.3 The Status of SET's Would Not Significantly Change From Its Current Position

The preferred options for new supply side capacity are expected to be natural gas cogeneration and natural gas combined cycle units. Small hydro-electric and renewables would have only niche markets such as remote, off-grid communities. SET's are unlikely to be able to make a significant market impact in new energy supply, without changes in delivery infrastructure.

The need for further improvement in energy use efficiency is underscored by the fact that the decline in energy intensity over the last ten years in the residential and commercial sector was attributed to the greater penetration of more energy efficient space heating or cooling systems, lighting systems, appliances, boilers and furnaces, etc. Improvements (decline) in energy intensity are unlikely to make up for increased demand due to economic and population growth.

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3.4 Restructuring Would Provide Increased Incentives for Development of New or Emerging Technologies

Without restructuring and increased competition, current industry members feel little pressure to change the status quo and invest in R&D beyond incremental improvements in existing products/technologies. As competition is introduced, companies will be forced to invest more capital in emerging technologies in order to stay ahead of competitors.

3.5 Industry Restructuring Would Increase Opportunities for Canadian Technology Suppliers

The National Electricity Roundtable has found that there are very limited opportunities for Canadian technology suppliers within Canada, in part due to the mature electricity market, which is experiencing stable or declining demand.

Suppliers are focusing on export markets which provide opportunities for mature and incrementally improved technologies. Without market pull resulting from introduction of competition and restructuring of the electric utility sector, Canada has little to offer in emerging technologies other than fuel cells. However, with rapid restructuring, it is forecast that niche markets will speed the development of emerging technologies and offer further opportunities for Canadian technology suppliers.

4. THE KEY QUESTIONS FOR DEBATE IN THE PROPOSED NRTEE WORKSHOP

Given the extensive discussions taking place regarding the advantages and disadvantages of introduction of competition and potential privatization of the electric utility sector, the National Round Table on the Environment and the Economy is interested in assembling a multistakeholder panel to debate the issues mentioned in the preceding section. With the aim of recording assenting and dissenting views, and identifying issues of public policy concern, the proposed workshop would address the following four questions.

1. How quickly and to what degree will the introduction of competition and restructuring occur in Canada?
2. *What* Will role will eco-efficiency play in the restructuring of this sector, in the short and long term?
3. To address the issue of improved eco-efficiency, how, if at all, should existing environmental or other policy be adjusted to address eco-efficiency in a restructured electric utility sector?
4. What technological change can be expected to emerge from the introduction of competition and restructuring? Will this new technology be more or less eco-efficient than traditional technologies?

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APPENDIX A - MEMBERSHIP AND OBJECTIVES OF THE NATIONAL ELECTRICITY ROUNDTABLE

The National Electricity Roundtable is composed of members from various sectors including:

- â Industry Canada
- â International Trade
- â Natural Resources Canada
- â Export Development Corporation
- â Hydro Quebec
- â Ontario Hydro
- â B.C. Hydro
- â Transalta Utilities
- â N.B. Power
- â ABB Inc.
- â GE Canada
- â GEC Alstom
- â Rolls Royce Canada
- â CAE Electronics
- â Babcock & Wilcox
- â Westinghouse
- â AECL
- â Electrolyser
- â Ballard Power Systems
- â SNC Lavalin
- â Monenco Agra
- â Acres International

The objectives of the National Electricity Roundtable are:

- â To provide a focal point for the electric power industry whereby representative CEO's can bring before the key federal ministers, national issues impacting the industry,
- â To develop positions on these key issues via working committees staffed by government and industry members,
- â To utilize the working committee structure to achieve sectoral communication of key information and discussion of the same,
- â To convene an meeting once a year between CEOs and Ministers to present and discuss industry positions and issues,
- â To work with various associations representing segments of this industry to achieve broad communication of the issues and to utilize these associations where possible, in specific action plans, and
- â To represent the electric power industry at the federal level in response to government initiated programs such as the national sector teams.