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TABLE RONDE NATIONALE SUR L'ENVIRONNEMENT ET L'ÉCONOMIE

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Canada

ET4

NRT-1997010
Energy

Environment, Economy and Technology:

An Overview of Key Issues & Policy Responses

Surrounding

Competition & Privatization in the Electrical Utility Sector

Prepared for:

National Round Table on the Environment and the Economy

(Insert Logo)

Discussion Draft

March 1997

NRT-1997010
21pp

126

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1. INTRODUCTION

1.1 Background

The demand for lower rates by governments and major industrial users and improved efficiency and industrial competitiveness have become important drivers of the international trend toward competition and privatization within the Electrical Utility Sector (EUS). There are also growing concerns about the potentially negative environmental impact of these trends. Environmental policy objectives are not well-represented nor agreed upon in current public policy debates about the future of the Electrical Utility Sector in Canada.

This paper provides the National Round Table on the Environment and the Economy (NRTEE) with an overview of some of the key public policy issues and responses surrounding the domestic and international shift toward increased competition and privatization in the EUS. The focus is on the environmental and related economic and technological impacts of these trends and possible public policy issues and responses – *not on recommending particular solutions or supporting specific impact scenarios.* The potential environmental and associated technological and economic impacts of competition and privatization, both positive and negative, are complex. The issues, policy options and questions presented in this overview are intended to stimulate debate and discussion at a multi-stakeholder Round Table meeting to be held by NRTEE in May 1997.

2. KEY FACTORS INFLUENCING THE IMPACT OF RESTRUCTURING THE EUS

2.1 Public Policy Objectives/Perspectives

The social, economic and political forces which determine the primary public policy objectives underlying competition and privatization plans, will largely determine the environmental and associated economic and technological outcomes of EUS restructuring. As sections 3-6 of this overview will demonstrate, there are different approaches to introducing privatization and competition in the EUS. Generally, one view maintains that a deregulated, privatized, and competitive sector will maximize the efficient allocation of resources, provide more consumer choice and stimulate investment in renewable technology development and commercialization. Another major view maintains that broad social objectives, such as environmental protection and resource use efficiency, cannot be met solely by competitive markets and therefore government intervention is required. Furthermore, a number of variations on these positions exist.

There are also different mainstream views about the fundamental nature and purpose of the Electrical Utility Sector: one, in which electricity is conceived of as a commodity to be supplied as efficiently as possible; and another, more recent view, which emphasizes energy demand 'services' and the resulting economic, environmental and competitive advantages from promoting energy efficiency and conservation to meet new demand.

These different perspectives raise a number of important questions about the broad public policy objectives that currently surround restructuring exercises, and whether there is a need to address others. One of the primary roles of the NRTEE is to provide forums in which a variety of stakeholders can discuss their views on major policy issues. The following questions are offered to stimulate discussion and debate among participants in the NRTEE Round Table workshop.

What are the core environmental, economic and technological public policy objectives that should be realized through the introduction of competition and privatization in the EUS? For example, is support for the commercialization and technological advancement of renewable energy technologies a worthy public policy objective?

Should measures be taken to ensure the continued growth of Demand Side Management markets?

Are these broad objectives being evaluated against existing restructuring proposals and current restructuring initiatives?

How can these objectives be fully realized as we move toward greater levels of privatization and competition in Canada?

Where is there general agreement and discord on these issues among ~~Round Table~~ participants? stakeholders

In Sections 3-6, a number of these issues are explored and additional questions raised.~~for possible discussion among Round Table participants~~. Appendix I contains several examples of sets of principles that have been developed to guide the implementation of sustainable energy development.

2.2 *The Importance of Restructuring The Sector*

Decisions concerning the form of competition and privatization in a restructured sector are significantly more important in determining the environmental impacts and associated economic and technological outcomes than environmental protection measures imposed after-the-fact (Torrie, 1996; Margolick, 1996). Investors, electricity suppliers and customers will largely modify their behaviour according to the dictates of the new market that emerges from the introduction of competition, and the manner in which public utilities undergo privatization. The emerging market, institutional structures and government structuring of privatization impact upon the environment and related economic and technological outcomes by:

- changing the markets for Demand Side Management (DSM) products and services;
- shifting market share among traditional sources of electricity (i.e. large scale hydro, nuclear, coal and oil-fired plants);
- determining the investment climate for Non-Utility Generation (NUG) such as gas fired combined cycle turbines, co-generation, district heating and other energy supply technologies and delivery systems;
- determining direct investment in renewable energy technology;
- determining investment in a wide range of operational efficiency related technologies, among suppliers and end users of electricity and equipment manufacturers; and

- influencing the ability of governments to control and prevent pollution.

These and other key issues surrounding the introduction of competition and privatization in the EUS are discussed in more detail below.

3. Environmental, Economic and Technological Issues and Policy Responses

There are both positive and negative environmental, economic and technological impacts that have resulted from the ongoing restructuring of the EUS in Europe, Australia and the U.S. Much depends on the extent to which public policy issues are identified and addressed by government, industry, and non-governmental decision makers prior to the implementation of major reforms.

What follows in sections 4-6 is an overview of some key environmental, economic and technological issues that have been raised in national and international public policy debates about introducing competition and privatization in the EUS. Examples from jurisdictions which have already introduced major changes in this sector are used to highlight issues and possible public policy responses. While the benefits attainable through the introduction of competition do not, in and of themselves, require privatization, selected issues and policy responses are described for both competition and privatization. Three broad areas are addressed: Energy Supply, Energy Demand, and Other Related Impacts. A number of additional questions are posed for possible discussion among Round Table participants in the following sections that address these areas.

4. Potential Energy Supply Environmental Impacts

Given the many environmental impacts associated with the traditional sources of electricity supply, the impact of competition and privatization on market share is an important environmental issue. There is little consensus however, even among environmentalists, about the overall environmental impact of restructuring the EUS.

> *What are likely to be the short term (5 years), medium (10 to 20 years) and long term (over 20 years) impacts of privatization and competition in the Canadian (North American?) market on traditional supplies of energy?*

4.1 Traditional Power Generation

Calculating the impact of restructuring the EUS on the demand for traditional sources of supply will vary according to a plethora of factors and market assumptions. These include: jurisdiction, the age of existing plants, capacity surplus, energy demand trends, technological developments, regulations, operating costs and other commercial factors. For example, in regard to competition factors, the low operating costs of hydro electric stations in Quebec may make it difficult for other generators to successfully compete in this market once Quebec opens its doors to competition.

Despite these and other factors inherent in assessing the environmental impact of competition and privatization on energy supply, several general trends are emerging.

- Financially risky 'mega-projects', often built for political and regional economic development reasons, are less likely to proceed under a competitive regime than would otherwise be the case. A reduction in 'mega-projects' is regarded as having a number of positive environmental, economic and technological benefits (Energy Probe, 1994). In the United States, competition has reduced utility willingness to build costly generating capacity (Ruff, 1992). It also appears as though the construction of large scale nuclear facilities is less likely to occur under competition, due to the high capital costs of building plants, and the financing of risks associated with environmental, health and safety liabilities. In the United Kingdom (U.K.), where electric utilities were privatized and competition was introduced in 1989, it is unlikely that any new nuclear power plants will be constructed as a result of competition, despite ongoing government support (Thomas, 1994).

- Market competition, particularly across North America, may result in the extension of the life of existing old and inefficient coal-fired plants which have lower operating costs than renewables and high efficiency gas fired turbines (Margolick, 1996). The potential transboundary environmental impacts of this shift in supply in the U.S. is a concern of the International Joint Commission's Air Quality Advisory Board (IJC, 1996). In some jurisdictions, however, inefficient generators may be mothballed earlier, depending on operating costs and alternative supplies (National Electricity Roundtable, 1996). In the U.K. for example, coal and nuclear have been losing market share to high efficiency gas turbine generation and cogeneration (Thomas, 1994). The use of coal in the U.K. has declined by 21% since 1992, new generators now represent 8% of the market, and oil use went down by 19% over 1995 (Energy Probe, 1996).

- Fewer and smaller hydroelectric dams will be built to meet increasing demand and fill niche opportunities resulting from competition. Smaller hydroelectric projects result in significantly less environmental damage than large scale projects and represent opportunities for further technology improvements that will increase competitiveness and export potential of this market (Canadian Renewable Energy Guide, 1996).

- There is some agreement that in the short to medium term, new demand for electricity will largely be met by high efficiency gas fired combined cycle turbines. These are currently more competitive than many existing traditional electrical generating facilities and renewables. Continuing technological advances in gas turbine technology, it is argued, will further undermine the competitiveness of coal, oil, and nuclear generating stations (Energy Probe, 1996). Natural gas is generally considered to be the 'greenest' of the fossil fuels. The use of natural gas to generate electricity for sale on the grid remains relatively unexploited.

- Non-Utility Generators will likely be able to exploit many new opportunities to provide electricity through gas fired turbines and various cogeneration projects. Competition may also help to drive the relatively untapped potential for district/community energy systems in

Canada, if these systems can compete. The use of low grade heat, for example, from a variety of public and private sources will be facilitated through competition with resulting efficiency, economic and environmental benefits. The proximity of NUGs to their customers may also help reduce the need for costly and environmentally harmful transmission infrastructure.

- Although not a trend, there may be greater incentives for nuclear generators to implement new opportunities associated with the use of non-peak capacity. For example, under-utilized generating capacity can be used to cost effectively develop low carbon transportation fuels, such as methane (Krupp, 1997). The development of alternative fuels and the growth in their demand in the Transportation sector may provide new opportunities to improve the economic benefits and competitiveness of nuclear and other generating facilities.

There is considerable debate about the merits of using competition to allocate investments in future electrical supply, given market failures to incorporate the related environmental and social costs of electricity production, transmission and utilization. Coal, oil, large scale hydro, and nuclear facilities each exact social and environmental costs which are not currently captured through existing market mechanisms. The failure of the market to capture these 'externalities' will, in the absence of strict regulations, favour traditional generators over new, more efficient and environmentally responsible generating technologies such as renewables.

Implementing 'social costing' to capture 'externalities' in the marketplace remains in its infancy. Privatization and competition, it is argued, will likely set back initial efforts to incorporate 'social costs' into the marketplace thereby giving traditional 'brown' energy generators a continuing competitive advantage over 'greener' electrical generation technologies in the foreseeable future (Torrie, 1996). By not incorporating social costs, the market will fail to achieve an efficient balance between supply and the efficient use of electricity (Howarth, 1993). Those who favour the introduction of competition however, argue that retail competition will give consumers the opportunity to purchase 'green power' (energy supplied from renewable sources) at a small premium, and that this, combined with stricter 'polluter pays' environmental protection, will help to redress current market imbalances (Energy Probe, 1996).

What is the best way for society to allocate resources for future electricity supply?

What are the primary criteria that should be used to make this decision?

If social and environmental costs resulting from electricity supply, transmission and utilization should be better reflected in competitive markets, what is the most appropriate means of accomplishing this in the context of introducing competition?

4.2 Renewable Energy Technologies

Given the environmental impact of traditional sources of electricity and increasing concerns about the economic, social and environmental impact of air and water pollution plus global climate change and variability, governments and utilities have been promoting the development and commercialization of renewable technologies. Renewables, excluding large scale hydro electric, accounted for 5.6% of energy use by Canadians in 1994 and are forecast to remain relatively stable to the year 2020 (NRCan, 1995). Most of this power currently comes from biomass and small hydro technologies.

In addition to hydroelectric power, the major types of renewable energy used in Canada are: wind , geothermal, biomass, and solar - thermal and photovoltaic. A number of hybrid technologies have also been developed. Appendix II contains a brief overview of the status of each of these sectors based on data obtained from *The Canadian Renewable Energy Guide*.

4.3 Public Policy Options/Debate

The potential impact of introducing competition and privatizing public utilities on the renewable sector may be dependent on government interventions in the emerging market. There is considerable disagreement among advocates of competition and privatization about whether such interventions are required.

Industrial policy advocates argue that the development of competitive new energy technologies is critical to national competitiveness and economic growth. Renewables currently suffer from high capital intensity, (particularly wind and solar applications), commercial immaturity and the need for technological improvements in efficiency to improve their competitiveness. Major traditional energy technologies in the U.S, it is argued, rather than emerging from a 'level playing field', benefited, and continue to benefit, from direct and indirect subsidies (i.e. oil, nuclear and hydro) or, the creation of a favourable institutional environment (monopoly owned power stations) (Gale, 1995).

Advocates of government intervention in the market believe that such interventions are justified because they can meet social goals such as environmental protection, energy security, and job creation that would not otherwise be achieved through existing institutional and market conditions. Traditional objectives of regulators and utilities in providing support for renewables include the development of energy sources that minimize environmental impacts and the provision of intergenerational equity through the responsible supply and protection of non-renewables (Margolick, 1996).

Advocates of deregulation and open competition, however, argue that the market is best suited to determine levels of investment in renewable technologies and energy efficiency. Furthermore, the costs of subsidizing investments in renewable technologies and energy efficiency and conservation cause unnecessary increases in energy prices (Hollander, 1995). Those who support the increased commercialization of renewables, but favour a market-based approach to their promotion, argue that the application of the 'polluter pays principle' will help drive their increased commercialization (Energy Probe, 1995). Furthermore, they contend that renewables are already on the verge of becoming competitive and are best served through open competition.. Others suggest that the costs associated with pollution control are not sufficiently high to create a 'level playing field' between energy suppliers and remain skeptical about the benefit of customer subsidies for 'green power', which is discussed in more detail on page 8 (Margolick, 1996).

How much market penetration by NUGs is in the public interest in the short, medium, long term?

Can renewables successfully be promoted through the market, or is there a role for government intervention?

Does a combination of government intervention and the market offer potential as a successful approach to promoting renewables?

What are the preferred approaches in the Canadian context? In the North American context?

In addition to allowing the market to solely determine future investment in renewables, there are many examples of government and public utility market interventions in support of renewable energy technologies. An overview of some of the primary policy tools with selected examples from a variety of jurisdictions is provided below.

- *Procurement.* Renewables markets can be created through direct procurement of 'green power' (electricity generated through renewable sources) by public utilities and government departments and agencies. A number of public utilities have begun to use renewables as part of their Demand Side Management programmes over the last decade. Renewables can be a cost effective option for utilities in niche markets and contribute to an improved corporate image.

- *Tax credits and property tax exemptions.* Tax credits promote investment by lowering the effective tax rate on income from that investment. In 1976, California adopted a 10% investment credit for solar energy applied to residential or commercial premises. Property tax exemptions were provided by the State of California to the solar industry in 1980 and are regarded as key to the competitiveness of this highly capital intensive industry. These and other government incentives have resulted in a fourfold increase in renewable electricity generation in California over the past decade (Gale, 1995). Tax credits are also applied directly to R&D in Denmark's wind energy sector.

- *Removal/Neutralization of tax and subsidies.* Taxes and subsidies for fossil fuel exploration and development among Organization for Economic Co-operation and Development countries are worth billions of dollars, totaling an estimated $4 billion annually in Canada (CCME, 1995). It is argued that such subsidies create an 'uneven playing field' between traditional energy suppliers and renewables. In 1994, the International Institute for Sustainable Development estimated, that for every federal dollar spent on energy efficiency, $100 dollars are spent to promote the use of fossil fuels (CCME, 1996). In its 1996 Budget, the Federal Government announced a number of changes that are intended to create a more 'even playing field' for renewables and traditional electricity sources.

- *Production credits.* A production credit is linked to output and provides the greatest tax benefit to technologies that work the best, but involves more investor risk than tax credits. In 1992, the U.S. Federal government passed the *National Energy Policy Act* providing a 1.5 cent/kilowatt hour production credit for wind energy and close-looped biomass and a 10%

investment credit for solar and geothermal energy. This production credit is being used by utilities in conjunction with 'green power' offers to promote investment in renewables.

- *Subsidies.* Subsidies up to 50% (in the form of grants and/or loans) of the total costs of commercializing renewable energy suppliers are currently offered by the Norwegian Government. These subsidies are being used to assist a biomass supplier and solar energy provider.

The majority of jurisdictions that have given consideration to, or implemented, competition in their EUS indicate an interest in promoting the renewable energy sector (Margolick, 1996). An overview of selected policy and programme initiatives in support of renewable energy is provided below.

- *Surcharges for 'green power'.* Green power surcharge offers were first introduced in 1993. Green power surcharges are voluntary. They are applied to customers' energy bills to help finance renewable energy providers. Surcharges of up to 10% to 20% are under consideration in New South Wales, Australia. If implemented, customers will be able to pay a premium for 'green power' that will feed into a 'green energy pool'. Research in Australia suggests that 10% of the population or 680,000 customers will purchase green power resulting in sales estimated at 3,300 Gwh and potential installed capacity of 1,000 MW. A new pilot 'green power' programme in Denmark allows consumers to obtain 25%,50%,75% or 100% of their energy from renewable power. Over 10,000 customers are participating in the programme. EDON, the utility that introduced the programme, is cultivating a green image through its green energy offer and is said to be motivated by a sense of social responsibility. The Dutch government is also phasing out subsidies for renewables which the utility hopes to replace through premium green pricing (Margolick, 1996).

- Survey research conducted by Ontario Hydro on the size of the 'green power' market in January 1996 indicates that 93% of residential customers are willing to pay a premium for green energy and that the average extra cost they are willing to incur is $24.00 per month. Despite this market opportunity, Ontario Hydro recently abandoned its planned purchase of 154 Gigawatts (0.1% of total generation) of green power from renewable sources under its *Renewable Energies Technology Strategy,* largely in anticipation of future competition (Kelly, 1997). There is some question as to whether, under competition, it will be possible to secure the long term energy contracts from end users required to finance renewable energy development.

- *Anything But Coal And Nuclear* (ABCAN). ABCAN is a hybrid version of 'green power' that would give customers the option of purchasing gas, oil or hydroelectric power at lower premium surcharges than those offered under "green power" offers (Energy Probe, 1996).

- *Renewable production targets.* Since 1981, the Dutch government has had an official goal of producing 10% of its electricity from wind. An investment subsidy and electricity tax repayments have been used to promote wind technology development and commercialization. The *1992 Act for Wind Turbines* requires that utilities purchase electricity produced by wind turbine owners. Private owners sell electricity to utilities at

85% of the consumer price (excluding taxes) in the area. Wind turbine owners must pay for the costs of installations to reach the grid while utility companies pay the costs of connecting (Gale, 1995).

- *Levy on suppliers.* A levy or surcharge for the use of the grid provides another opportunity to raise funds in support of renewables or other important sector challenges such as decommissioning nuclear facilities, or managing the public debt associated with stranded assets that result from the privatization of public utilities. A levy or 'line charge' of this nature must be regulated. California has recently implemented a 'line charge' to fund environmental projects (Levy, 1997).

- *Levy on end users.* In the U.K., a levy of 10% is added to each customer's utility bill. Ninety-five percent of the funds generated are directed to a fund to finance the decommissioning of nuclear facilities. The remaining 5% is used to subsidize qualified renewable energy suppliers. Special arrangements to accommodate renewable power are also in place which effectively exempt renewables from competition. In the U.K. energy pool system, renewables are automatically dispatched when power is available. Renewable producers of less than 50 MW can dispatch directly through regional suppliers rather than the national grid. Most renewable energy providers do not dispatch through the national grid thereby avoiding the associated costs of competing in this market (Margolick, 1996).

5 POTENTIAL DEMAND SIDE MANAGEMENT/RELATED EFFICIENCY IMPACTS

Since the oil price shocks in the early 1970's, growth in the electric utilities sector has been steadily shifting from the supply of energy commodities, to the provision of services which energy provides (i.e. heat, light, mobility...). The provision of Demand Side Management (DSM) services is central to this shift. Over the past twenty years, energy services have been able to deliver considerable energy 'supply', moving from zero to 25% - 30% of the market share of the end use pie (Torrie, 1996). Energy services involve meeting customer energy related needs by providing value added combinations of information, technology, services and energy commodities. In Canada, Energy Service Companies (ESCOs) design, construct and finance efficiency improvements in commercial, institutional and industrial buildings. ESCOs have worked closely with utilities, governments and financing companies to deliver energy services, cost savings, environmental benefits, technological innovations and job creation. The City of Toronto's $30 Million *Better Buildings Partnership* pilot project, is a joint industry, government, utility partnership to retrofit commercial and institutional buildings for energy efficiency. The pilot will set the stage for a city-wide programme that is expected to generate a positive economic impact of approximately $3 Billion (City of Toronto, 1996). Energy efficiency improvements often provide incentives for customers to increase their resource use efficiency in other areas. Between 1973 and 1984, during oil price shocks, the Japanese manufacturers reduced the material *and* energy inputs within their sector by 40% during a time of considerable economic growth (EDCO, 1996).

A study by the Royal Society in 1993 indicated that the 'conservation gap' is 20% to 40% of the end user market. The 'conservation gap' refers to the difference between the level of energy efficiency improvement actually taking place, and the level that appears to be cost effective relative to fuel and electricity prices (Torrie, 1996). It is estimated that an integrated approach to energy use, including district energy systems which can tap into sources of low grade heat for space heating, could reduce fossil fuel use in Canada by as much as 1000 petajoules per year and save over $4 billion (NRCan, 1996).

Finding financial, technological and institutional ways to exploit opportunities for increased energy, water and material use efficiency and conservation constitutes a major environmental challenge to business, as well as a tremendous opportunity for the development of new products, processes and services. For example, U.S. manufacturing consultants Orr & Boss estimate that the tangible value (materials, embodied energy and labour, and waste disposal costs) of inefficiency in the U.S. manufacturing sector is worth $400 Billion annually (EDCO, 1996).

What opportunities exist to promote increased resource use efficiency under market competition and privatization in the EUS?

What conditions are most favourable for the development and diffusion of new resource efficient technologies and services?

Is there a role for government intervention? If yes, what role(s)?

5.1 Potential Demand Side Management Market Impacts

Subject to numerous assumptions about markets, rates, institutional structures and particularly, the role of government, assessing the potential impact on DSM markets resulting from increased competition is fairly complicated. Furthermore the effectiveness of both the market in promoting energy efficiency investments (Howarth, 1994) and DSM programmes by public versus private entities (Adams, 1991) is not agreed upon.

Given these complexities, some argue that there is little consensus about what the introduction of competition will do to the DSM market (Hirst, 1994). Other analysts however, argue that there is general agreement among government agencies that are considering restructuring, utilities and private analysts, that competition will result in a setback for DSM (Torrie, 1996, Margolick, 1996). For discussion purposes, a number of the principal arguments about the potential impact of competition, both positive and negative, on DSM markets are presented in brief below:

- In the absence of government intervention, the logic of competition among electricity generators will likely result in a reduction in DSM activities and a loss of the resulting technological, environmental and economic benefits. Arguments in support of this position, and counter arguments include the following:
    - Energy efficiency and conservation will be undermined by the uncertainties and short term outlook inherent in competitive markets. Uncertainty in long term rates will undermine energy resource efficiency decisions which require a fair degree of certainty in order to raise the required financing. The average performance-based

contract is roughly ten years in length, beyond which the uncertainties are currently difficult to finance (Uhera,1997).

- Open access to the grid, combined with full retail competition, would further exacerbate the long term uncertainty over energy efficiency and conservation investments, while yielding marginal economic gains over wholesale competition (Margolick, 1996).

- Without government regulation, competition will preclude spending on effective DSM programmes since utilities will be unwilling to pay for DSM in an effort to reduce operating costs , and consumers will be unwilling to pay the premiums associated with such programmes (Margolick, 1996). The expectation that some types of energy efficiency activities will be undermined through the introduction of competition is acknowledged by the MacDonald Commission in its report, *A Framework for Competition*. The report states:

  Broad-based demand-side management may prove to be less compatible with a commercially driven electricity sector if the emphasis is on maximizing volumes of electricity sold. Where undertaken, energy efficiency initiatives may focus on less expensive, softer programmes such as information services. The short term focus that drives some decisions in a competitive market may also inhibit implementation of energy efficiency programmes. Without an early pay back, customers and utilities alike may be less willing to bear the costs associated with demand side management. (pp. 90-91)

- Basic conflict between energy suppliers and demand side management will restrict the implementation of effective utility DSM programmes and therefore, these contradictory market functions should be institutionally separated (Margolick, 1996). To date, most Canadian public utilities have been scaling back or eliminating DSM initiatives in preparation for competition (Kelly,1997). The MacDonald Commission suggests that a non-profit organization could be created to help finance and implement energy efficiency programmes funded through a mandatory levy on electricity sales.

- Competition will result in lower rates for major industrial users, thereby reducing incentives to invest in energy efficiency. For example a 'price war' has been occurring in Australia since the privatization in New South Wales and this has had a detrimental impact on the energy services market (Levy, 1997). It is also argued that increases in peak rates will likely result from competition, and therefore, will stimulate energy efficiency markets. It is also argued that major industrial users will be less able to obtain preferential rate structures from public monopolies under competition (Energy Probe, 1996).

- The potential for lower electricity rates, as has occurred in the U.K., will further undermine DSM. Lower energy rates may also impede technological innovation and the diffusion of technologies that increase energy efficiency. There are, however, a number of factors in addition to energy costs that impact on energy efficiency, technology development and commercialization. For example, energy efficiency is currently not a significant driving factor in the design of most products, processes and services (Torrie, 1996). In fact, increasing energy efficiency tends to impose added costs to equipment manufacturers while lowering operating costs for end users (Howarth, 1993).

- Recent Federal and Provincial Government financing cutbacks have already resulted in a reduction in energy efficiency and R&D programmes, a trend which undermines the market for energy services. Furthermore, it is argued, this trend underscores the declining importance Canada's Provincial and Federal Governments place on energy efficiency, despite the significant job creation, cost savings and environmental benefits that are attainable from these expenditures (Torrie, 1996; FCM, 1996).

- The benefits of Integrated Resource Planning (IRP) will be negated by competition in retail markets (Margolicks, 1996). Competitive markets will not support IRP, and therefore further erode DSM, a key component of IRP. Without IRP the market will not efficiently allocate investments in new energy production and distribution. For example, in the U.K., significant investments in gas fired combined cycle turbines has taken place in the absence of IRP having been driven primarily by long term supply contracts. As a result, it is argued that investments in renewables, energy efficiency and the net efficiency benefits attainable through cogeneration have not been integrated into these new supply investment decisions (Collier, 1995). The Ontario Round Table on Environment and Economy, in its 1991 *Sectoral Report on Energy*, recommended increased competition in the energy sector and the removal of centralized planning. It also recommended that a mechanism be put in place to provide multi-stakeholder input to, and review of, Ontario's long term integrated energy requirements and their associated environmental considerations (ORTEE, 1991).

- Energy efficiency programmes targeted at large industrial users may improve as energy suppliers compete for customers on the basis of broadening their range of services beyond commodity supply (CAESCO, 1996; MacDonald Commission, 1996). Utilities in the U.S., for example, have been purchasing Energy Service Companies in order to provide more complete energy services to their large industrial consumers. These services help utilities protect themselves from more cost effective electricity generators.

- Energy efficiency and technological developments, it is argued, will increase as a result of privatization and the introduction of competition because market discipline will require that generators improve the efficiency and quality of their energy production (National Electricity Round Table, 1996; Energy Probe, 1996). These efficiency improvements are said to be extensive due to the inefficient manner in which public utilities have generally operated.

In its submission to the MacDonald Commission, the Canadian Association of Energy Service Companies expressed its support for retail competition in Ontario and recommended that regulatory measures be put in place to support investments in the DSM efficient use of energy. Others have argued that an open and unregulated market will determine the most optimum levels of energy efficiency investment and that DSM programmes unnecessarily increase the price of energy (Hollander 1996). Critics of this latter view state that it regards energy only as a commodity, and therefore undervalues the substantial social, economic and environmental benefits that can be achieved through strong DSM markets. From an employment perspective, it is also argued that investments in energy efficiency and conservation generate four times as many jobs as equivalent investments in large scale generating facilities (CCME, 1996).

What are the potential broad impacts on employment resulting from the introduction of competition in the EUS?

What are the potential short, medium and long term impacts on Canada's industrial and commercial competitiveness?

5.2 Public Policy Options

Governments have adopted a number of measures to promote DSM and related technological developments. Selected examples of public policy initiatives that are designed to promote the DSM market within the context of increased competition in the EUS include the following:

- *Revenue caps.* This measure involves the capping of generator revenues from the volume of electricity supplied in order to provide financial incentives for the continuation of Demand Side Management by large utilities.

- *Levies.* The introduction of a levy on customer bills or generators through line charges has been used to create funds that support programmes that promote energy efficiency and conservation. Funded activities can include hedging the new risks associated with DSM investments, public education programmes and a host of other potential initiatives. In the U.S. for example, the Natural Resources Defense Council and Pacific Gas and Electric Co. have jointly proposed that non-bypassable "universal system benefits charges" on electricity distribution be instituted to recover costs associated with utility energy efficiency programmes (Hollander, 1996).

- *Restrictions on specific DSM initiatives.* This measure would involve placing restrictions on single technology oriented, rapid pay-back DSM measures, in favour of a more comprehensive approach to energy efficiency and conservation which includes measures that have a longer pay back (CAESCO, 1996). By bundling measures that involve short term pay back periods with those that pay back over the longer term, the average pay back period of an integrated package of efficiency measures is improved. More longer term pay back periods for efficiency measures are therefore likely to be implemented by taking this integrated approach than if evaluated and implemented independently.

- *Energy efficiency regulations, codes etc.* This measure involves the continuing development and implementation of minimum energy efficiency regulations for appliances, buildings, equipment and other infrastructure by governments.

- *R&D and efficiency programmes.* Governments can continue to work cooperatively with industry through partnerships in R&D investments for energy efficiency technologies. The

Federal Government, for example, has been assisting industry in this regard through programmes such as the *Industrial Research Assistance Programme* (IRAP), *Industry Energy Research and Development Programme* (IERD) and the establishment of organizations such as the *Centre for the Analysis and Dissemination of Demonstrated Energy Technologies*. Local governments, many of whom have set aggressive green house gas emission reduction targets, are increasingly developing energy efficiency programmes in partnership with the private sector.

- *Consumer education*. All levels of government can also continue to promote consumer education through various programmes. Examples include programmes such as the Federal Government's "Eco Logo" product symbols, and the voluntary Energy Innovators Programme.

- *Demand side resource industry*. It has been suggested that there is an opportunity to establish a new industry that extends the basic concept of energy service companies to incorporate water and materials use efficiency. This 'demand side resource' industry would be an information and finance based sector that would provide incentives for businesses to participate by removing the technological and financial risks associated with making resource conservation investments (Torrie, 1996). A levy on customers or energy suppliers might help to finance such an industry, whose work would result in economic, technological, competitiveness and environmental benefits for Canadian society. Such an industry could develop the capacity to promote energy efficiency design and further exploit opportunities represented by the 'conservation gap'.

6. OTHER ENVIRONMENTAL, ECONOMIC AND TECHNOLOGICAL IMPACTS/ISSUES

There are a number of additional environmental and related economic and technological issues which may result from the introduction of competition and privatization in the EUS that are worth noting:

- *Increased R&D expenditures*. Competition will likely drive investment in new technologies among traditional sources of energy, particularly fossil fuel-based generators. Technological investment may also occur in areas such as distributed generation, power quality, transmission and distribution control and protection, metering, and electromotive and energy storage (National Electricity Round Table, 1996).

- *Improved environmental regulation*. The nature of government regulation of a privatized and competitive EUS may result in improved corporate environmental performance because there will no longer be a conflict of interest between regulator and those regulated. Regulation of the gas utilities in Ontario is cited as an example of how the separation of the regulator and the regulated is more effective in achieving environmental objectives (Energy Probe, 1996). The argument that this will result in improved environmental performance is countered by those who argue that the need to reduce operating costs among energy suppliers will create pressure to cut back on 'non-essential' environmental remediation expenditures.

- *Tradeable permits.* Market-based performance standards involving tradeable permits for air pollutants have become more high profile since competition has been introduced in the U.S. This approach to environmental protection can achieve more cost effective results than regulations and is regarded as more politically acceptable than regulations (Energy Probe, 1996). A competitive marketplace will allow for the introduction of new tradeable permits, needed to protect the environment and human health. "Cap and Trade" market based permitting schemes have demonstrated an ability to cost effectively reduce pollutants resulting from the burning of fossil fuels (Torrie, 1996; Energy Probe, 1996). The current costs imposed by the U.S. EPA on SO_2 and NOx, however, are insufficient to significantly influence the market in terms of driving investment renewables or energy efficiency services. Some environmentalists argue that a steady increase in the use and stringency of tradeable permit schemes is required to limit air pollutant control. The International Joint Commission for example, has recommended that there be no net increase in air emissions as a result of the introduction of competition in the United State's EUS (IJC, 1996).

- *Carbon taxes.* In addition to controls on NOx, VOC and SO_2, a number of analysts and industry representatives believe, that in the medium to long term, international negotiations on climate change will result in a binding mechanism to reduce CO_2 emissions. This, it is argued, may promote investment in energy efficiency services and renewables. Recent analysis of one option, carbon taxes, confirm that it would take very large, (and politically unacceptable) fuel and energy increases (in the order of 50% to 300%) to stimulate a demand response required for a 20% reduction in emissions (Torrie, 1996). In the context of a competitive market, concerns over green house gas emissions will likely promote a shift toward less carbon intensive fuels and possibly the introduction of carbon trading and offsetting schemes in the short term. Given the significant ongoing investment in Canada's oil industry, offsetting schemes may be the only realistic option for significantly lowering their CO_2 emissions in the face of increasing production.

APPENDIX I: EXAMPLES OF PRINCIPLES FOR SUSTAINABLE ENERGY DEVELOPMENT

The intent of providing these examples is to stimulate discussion on public policy objectives and principles for the restructuring of the EUS. The two examples cover both broad energy sector development and the sustainable development of an energy utility.

Design Guides For Sustainable Energy Development

A Demand Side Focus

Above all, sustainable development is about meeting people's needs, and an energy strategy focused on human welfare will focus on the demand-side of the energy equation. We will have more to say below about the implications of this point to business strategies for sustainable energy, but essentially, it means refocusing on the fundamental demands for services. It leads directly to a much broader definition of what constitutes the "energy sector" of the economy, with the traditional energy commodity providers representing only one component in the mix of resources, technology, information and added value that together meet demands for access and energy services.

Efficiency

In sustainable energy futures, there is a premium on efficiency, on matching both the scale and the quality of the energy source with the end use demand.

Environmentally Benign

Energy services are provided by technologies which are environmentally benign and which maintain rather than diminish the health of the ecosystems in which they operate. Technologies with the potential to cause irreversible ecological damage are rejected in favour of "safe fail" technologies which allow for the capacity of the ecosystem to recover from technology-related stress. Emissions of toxic and radioactive substances must be reduced to zero or nearly zero, and emissions of carbon dioxide and other potentially destabilising substances must be lower than the ecosystem's ability to absorb them.

Diversity

The demands for energy services are matched in both scale and thermodynamic quality by a diversity of dispersed sources so that both risks and benefits are widely dispersed and vulnerability to any single failure is minimized. All else being equal, a system composed of smaller, rather than larger units, exhibits greater reliability and is less vulnerable to massive failure, provided that units are optimally interconnected.

Flexibility, Resilience

Energy services are provided by technologies with short lead times, the elapsed time from drawing board to startup thus allowing a quick response to changes and flexibility in planning. Energy services are provided by indigenous sources, thus providing self-reliance and insulating the society from the adverse impacts of geopolitical events beyond its control. Energy services are provided by technologies that allow early failure detection and quick repair.

Equitable

The equitable distribution of costs and benefits is the defining feature of sustainable energy futures. All else being equal, decentralized technologies are preferred over centralized technologies that tend to have a disproportionate share of the costs at the upstream end of the pipeline or transmission line, often with First Nations communities bearing the brunt. Technologies and energy options are rejected unless they can be deployed in a way that eliminates the passing on to future generations of wastes, risks and costs.

Least Cost

Energy services are provided at the least cost, consistent with social, environmental and other objectives. An energy economy rife with unjustifiable subsidies and market distortions is ultimately a vulnerable energy economy, sluggish in its response to changing circumstances and prone to sudden disruptions. Among the unjustifiable subsidies, however, must be counted the one we receive from future generations every time we take an action that runs down a non-renewable resource or in some way diminishes the ability of ecosystems to provide the basis for health and prosperity.

Socially Benign

Technologies, even apparently simple technologies, contain embedded social values. If we are on the threshold of a "post-industrial" society, it is because we are formulating new values about technology. In considering technologies for our future energy systems, we must ask ourselves the question: is this a technology that is compatible with the principles of sustainable development, of human welfare, social justice and self determination, or is this a technology that may constrain society from developing in a sustainable way?

Ralph Torrie. ***Business Strategies for Sustainable Development in the Canadian Energy Sector.*** National Round Table on the Environment and the Economy, Ottawa: NRTEE, 1996.

Ontario Hydro's Five Pillars of Sustainable Development

Environmental Integrity

Environmental integrity requires the reduction of the emissions, effluents and wastes resulting from Ontario Hydro's operations, in order to minimize their impact on the environment and human health.

Increasing Energy and Resource Use Efficiency

Resource productivity gains reduce both the impact and the cost of generating and distributing electricity. Efficiency in resource conversion thus provides benefits to both the environment and economy. Ontario Hydro's focus is on internal energy efficiency, fuel productivity and commodity use, industrial ecology, and improvements in the energy efficiency of customers.

Renewable Energy: Increasing Development and Use

Expanding the use of renewable energy forms is an important long term objective for Ontario Hydro and the province. The achievement of this objective will involve increasing the GWh of electricity generated by qualifying renewable energy technologies and the percentage of primary energy sales derived from renewable energy. Ontario Hydro is planning to improve the performance of its renewable energy resources and the hydroelectric system, as well as continue to research and develop advanced renewable energy technologies.

Financial Integrity

Financial integrity allows Ontario Hydro to meet its financial obligations over an extended period of time, as well as improve its ability to make the necessary investments to manage its affairs in a sustainable manner. Implementing sustainable practices can improve the prospects of continuing long term financial health. Ontario Hydro's perspective of financial integrity includes financial performance, risk management, as well as the corporation's ability to integrate environmental and social factors into its planning and decision making processes.

Social Integrity

One of Ontario Hydro's main objectives is to undertake its activities in ways that respect the concerns of the communities in which it operates. It assesses the achievement of this objective through a number of internal measurements which include accident severity, public safety, relations with First Nations and corporate citizenship.

Ontario Hydro. ***Sustainable Development Report for 1995.*** Toronto: Ontario Hydro, 1996

APPENDIX II: OVERVIEW OF THE STATUS OF CANADA'S RENEWABLE ENERGY SECTOR

Information provided in this Appendix was obtained from *The Canadian Renewable Energy Guide: First Edition.*

Wind

By the end of 1994, wind energy accounted for 3,400 megawatts of generation capacity worldwide with major installations in Europe, the U.S. and India. The value of wind energy in 1994 was US $500 Million and the total global capacity is expected to double by 2000. In Canada, about 22 MW of wind generated capacity is installed, most of it located in Alberta. In addition to large scale wind turbines that can generate 1.5 MW, small scale wind turbines represent a major market in developed and developing countries. Continuous cost reductions in wind technology now make it close to competitive with conventional technologies. Natural Resources Canada estimates that 4,500 MW of commercially viable, technologically feasible wind energy is available in Canada. Increased R&D promises to continue to make medium and large scale wind turbines more competitive.

Geothermal

Geothermal technologies utilize the low grade energy trapped in the first few meters of the earth and upgrade it to useful temperatures through a Ground Source Heat Pump (GSHP). GSHP's can deliver 4 kilowatts of useful thermal energy for every 1 kW of electric power consumed. A total of 32,000 installations with a rated output of 416 MW have been completed in Canada. This represents a consumer investment of $324 Million, and a peak demand load saving of 188 MW. Ontario Hydro offered cash grants and low cost financing from 1990 to 1993 as part of its Demand Side Management which greatly stimulated demand for GSHP resulting in a peak sale of 7,200 units in 1992. Many Canadian made products and services in this area are considered world-class. A high sustained growth is expected from 1996-2000 due largely to a U.S. government/electrical industry initiative to increase sales from 40,000 GSHP's in 1995 to 400,000 in 2000. This sector represents potential export opportunities for Canadian firms. No major technological advances are expected in the short term.

Biomass

Biomass (plant matter) is the largest source of renewable energy accounting for about 15% of the world energy supply and over 38% in developing countries. In Canada, biomass provides approximately 7% of our energy use. The majority of Canada's biomass energy now comes from the forest as wood residues from the forest industry, or as firewood. Most of the biomass energy is used in the Pulp and Paper sector which accounts for 1000 MW of electrical capacity annually, mostly through cogeneration. In addition to industrial installations, about twenty institutional applications exist, including hospitals, district heating systems and schools. Future growth in the biomass industry is likely to come from the agricultural sector and the use of alternative fast growing crops.

Solar

There are two sub-sectors under solar: solar thermal, which involves technologies that converts solar energy to thermal energy for water and air heating; and Photovoltaics, which convert solar energy directly into electricity.

Canadian firms have developed state-of-the-art solar thermal technologies such as flat-plate collectors, solar pool heating collectors, evacuated tube collectors, and air heating systems that can withstand extreme weather conditions. The gross sales of Canadian firms is close to $6 million. Solar thermal markets are more fully developed in Europe but the only commercial solar power plants are located in the desert of southern California. The construction industry, favourable government procurement policies and consumer incentives are viewed as important contributors to the sector's future growth. In 1992, Natural Resources Canada predicted that there could be more than $600 million in economic activity for solar thermal products in Canada by 2005 and associated energy savings of 600 Gigawatt hours.

The photovoltaic (PV) industry in Canada consists of slightly less than 200 firms providing manufacturing, distribution, retail, system housing and consulting services. The industry has focused on developing and installing stand alone systems for remote environments and diesel generator hybrid systems. Sixty percent of the industry sales are derived from exports. Photovoltaics have future growth potential by bringing power to the estimated 2 billion people in rural areas of developing countries and in commercial electricity generation. It is expected that manufacturing cost reductions by a factor of two will be achieved by the year 2000. Within two decades, it is forecast that 18% to 20% efficient commercially available modules will mean that photovoltaic electricity will become competitive with electricity generated by conventional techniques sold on utility grids. In Canada, installations accounted for only 300 to 400 kilowatts in 1995. By 1994, over 500 MWp of PV systems had been installed world wide. By the year 2000, it is projected that the world wide market should exceed 250MWp annually or $3 Billion. Ongoing investment in R&D in solar technologies promises to greatly increase their competitiveness.

Small Scale Hydro

Small scale hydro is expected to grow under increased competition in the EUS. There are three basic classifications of small scale hydro: microhydro for capacities up to 100 kilowatts; minihydro, between 100 and 1000 kilowatts; and small hydro, from 1 to 15 megawatts. Canada is home to four manufacturers of microhydro equipment; six companies manufacturing minihydro equipment; and about 20 that may be described as developers of small hydro projects. Worldwide, small hydro capacity is about 20,000 MG and is expected to increase by 1000 to 2000 MW annually over the next 25 years requiring an investment of $2 to $4 Billion annually. Canadian installations are increasing by 75 to 100 MW annually representing $150 to $200 million in investment. Small hydro development is limited in Canada by the availability of sites that are close to demand. Domestic growth is expected in native communities and in recreation and tourist areas. There is a need for technical advances in turbines to improve the potential market application of small hydro.