Environmental Evaluation of Federal Energy Expenditures

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The research for this article was conducted as part of a broader analysis under contract to Southam News. The highlights were published in the Southam chain of newspapers on April 23, 1991. Their support is gratefully acknowledged.

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1. Introduction

The federal government has made deficit reduction one of its prime policy goals for several years now. This deficit is conventionally defined as that portion of the government's spending not covered by revenues, that is, in financial terms. Yet, it has become increasingly understood that Canada is accumulating an environmental deficit just as it is running up a financial deficit. This environmental deficit is evident in a continuing deterioration in environmental quality and in unsustainable forestry, fishery, and agriculture practices which deplete productive resources faster than they can be replenished. Just as Canadians are passing on a high level of financial indebtedness to future generations by living beyond their means, so are they leaving a degraded natural environment to their children by polluting it and over-exploiting its renewable resources. In both instances, future generations will face more restricted choices.

One of the ways of remedying the causes behind Canada's mounting environmental deficit is by ensuring that the federal budget not promote unsustainable practices. Jim MacNeill, the former Secretary General to the Brundtland Commission, has described the annual federal budget as the most important environmental policy statement that the government issues from year to year. This is because the decisions the government makes about how it raises money and spends it (through taxes, incentives, subsidies, and programs) have a greater potential to do environmental harm or good than any other single policy.

Up to now, these federal decisions have never been assessed systematically for their environmental impact. Recognizing the need to consider the environmental implications of major policies, the then-Minister of the Environment, the Honourable Robert de Cotret announced in June 1990 that henceforth "all new federal policy initiatives with environmental implications" would be assessed for their environmental impact and a statement about these impacts made public. This policy, which includes the federal budget, was reaffirmed in the *Green Plan* released in December of that year: "A statement of the environmental implications of new policies and programs will be made public at the time that the Cabinet initiative is announced" (Government of Canada, 1990, p.162).

Since then, the federal government has tabled two budgets, neither of which it assessed for their environmental effects because it is still developing the methodology to do so. A possible

approach to assessing the environmental implications of the government's expenditures in energy policy is offered below.[1]

The purpose of this analysis is not to pass judgement on the merit of the government's policy pronouncements but rather to comment on the environmental impact of the government's spending decisions. This distinction is important because it is the allocation of resources rather than policy statements which affect environmental quality.

2. Analytical Approach

The environmental consequences of energy use are pervasive, playing an important, if not dominant, role in many of the key environmental issues of the day. Although these consequences are most apparent as a result of catastrophe — the Chernobyl nuclear accident or the Exxon Valdez oil spill — they are present in all phases of the energy cycle, from the methods to extract energy resources to the ways these resources are transported, processed, and used for heating, transportation, and manufacturing.

Conducting a detailed environmental assessment of the government's energy spending (concentrated mainly within the Department of Energy, Mines and Resources or EMR) would be extremely challenging because different sources of energy pose different risks. No methodology exists yet to compare risks as diverse as the loss of wildlife habitat (from hydroelectric and oil and gas development), airborne pollutants (from burning fossil fuels), marine oil spills, and exposure to radioactivity. If the government, for example, decided to increase the use of nuclear power at the expense of oil consumption because of the concern over global climatic change, how would it trade off the increased production of high-level nuclear wastes against lower CO_2 emissions?

In spite of the technical complexity of the task, there are certain principles from which one can start. The application of these principles, all other things being equal, should lead to an environmentally-friendlier energy policy. Four are offered below:

Some principles to apply in evaluating environmental impacts of federal energy spending

- *Anticipating and preventing environmental problems before they occur:* A preventive approach focuses on the demand side of the supply/demand equation and aims at reducing waste. Because it addresses the causes of environmental degradation, i.e., energy use, this approach will be more effective at protecting the environment than a remedial one which assumes that energy supplies will be developed and seeks to minimize their environmental risks. The application of this principle implies an emphasis on energy efficiency and conservation.
- *Integrating environment and economy:* By and large, energy

1/ The spending figures which appear below for various programs were taken from the Public Accounts of the Government of Canada and Part III of the Spending Estimates for the Department of Energy, Mines and Resources.

prices today do not take environmental factors into account. Consumers do not pay a premium for the electricity they use, for example, even though the damming of the rivers from which the electricity is generated may have destroyed wildlife habitat, the flooding of land for reservoirs in some cases has made fish unfit for human consumption, and the construction of transmission lines has undoubted aesthetic impact. Integrating these environmental factors into energy prices — sometimes referred to as "full-cost pricing" — admittedly raises methodological problems of its own. A combination of economic approaches, however, is available, including taxes, fees, standards, etc., to resolve these problems at least in part.

- *Allowing all options to compete on an equal footing:* Economic theory says that market forces will lead to an optimal allocation of resources. This is true, however, only if the market itself works properly. The energy market, however, hardly constitutes the proverbial "level playing field." As we shall see below, the federal government has historically intervened heavily in the market to favour some energy options over others. For their part, provincial governments have also intervened in the market, mostly to favour their crown-owned electric utilities by exempting them from corporate income taxes and allowing them to borrow at preferential rates.
- *Least-cost planning:* It makes economic sense to use cheap sources of energy before expensive ones. An economically-efficient energy policy, therefore, should seek to ensure that the long run marginal cost of all energy options in use, including the cost of saving energy, is roughly similar.

What does the application of these principles reveal about the way in which the federal government spends our tax dollars? Each of them is considered in turn in Sections 3-6.

3. Anticipation and Prevention

Canada is one of the most intensive users of energy in the world. Data from the International Energy Agency show that in 1985 Canada used 70% more energy per unit of GDP than the average of the United States and four major European economies (Imperial Oil, 1987). Although some of this difference is explained by geography, economic structure, and climate, not all of it is.

As a result of government-sponsored energy conservation programs and the impact of higher prices, the energy intensity of the Canadian economy — that is, the amount of energy needed to produce one dollar of GNP — has dropped by about 14% between 1973 and 1986. Although substantial, this drop is only two-thirds of what other member states of the OECD realized over the same period (Brooks, 1987). During the second half of the 1980s, the average rate of improvement in efficiency slowed down as world

oil prices dropped.

The domestic potential for further energy efficiency gains is believed to remain very large although experts disagree about its precise scope. A recent federal government study estimates, on the basis of conservative assumptions about prices and technology, that further economically-attractive efficiency gains of 30% are feasible by the year 2020 (Peat Marwick, 1991). Such gains can make a substantial contribution to reducing atmospheric emissions from energy use. Assuming a similar fuel mix in 2020 as existed in 1990, expected emissions of CO_2, SO_2, and NO_X would fall by over 30% from forecast levels.

Over the last 15 years, the federal, provincial, and territorial governments have endeavoured to reduce household and commercial energy use in the form of heat, lighting, and motive power, through various other initiatives. These have included improved insulation standards for new building construction and subsidies to upgrade insulation in older buildings; introduction of more efficient furnaces; encouraging a shift to smaller automobiles with better fuel efficiency; and improved utilization of industrial waste heat. However, as the tables below illustrate, the federal government has allocated far more resources to developing new supplies than to increasing the efficiency with which energy is used.

4. Integrating Environment and Economy

Federal approach to integrating environmental costs focuses more on the regulation of production and transportation than on consumption

The federal government's approach to integrating environmental considerations in energy prices has focused on the application of regulations at the production and transportation levels. Although it has imposed some standards at the consumption level (e.g., the removal of lead from gasoline), it has so far resisted applying economic instruments, such as taxes, to protect environmental quality. As a result, the environmental costs of energy use by and large are not reflected in energy prices. These costs are very substantial as the examples below demonstrate:

- The cost of implementing the ten-year federal-provincial program to reduce emissions of nitrogen oxides (NO_X) and volatile organic compounds (VOCs), the primary contributors to urban smog, has been estimated at $855 million annually by the year 2005 (Federal-Provincial, 1990). In Canada, fossil fuels contribute 41% of the sulphur oxides and 85% of the nitrous oxides released, the two most important ingredients in acid rain, and 68% of the VOCs (EMR, 1987).
- The Public Review Panel on Tanker Safety and Marine Spills Response Capability has calculated that the cost of upgrading oil tanker safety, buying response equipment and conducting major research on improved clean-up technologies would require an investment between $800 million and $1 billion over the next 10 years.

- Atomic Energy of Canada Ltd. (AECL) has estimated the costs of disposing of high-level radioactive wastes at about $11 to $12 billion over a 60 year period (in constant dollars).[2]
- The federal government has not yet estimated the cost of a Canadian CO_2 emissions abatement strategy. It is generally agreed that the cost of stabilizing CO_2 emissions, as Canada has committed itself to, would be modest. The cost of a 60 to 70% cut in global CO_2 emissions, however, which scientists believe would be necessary to stabilize CO_2 concentrations in the atmosphere, would be substantial. William Nordhaus of Yale University has estimated that a 60% cut in greenhouse gas emissions (of which CO_2 is the most important) "...if efficiently engineered and phased in slowly, would cost over $300 billion annually in today's world" (Nordhaus, 1990). As Canada contributes about 2% of global greenhouse gas emissions, this estimate implies that a Canadian abatement strategy could eventually cost about $6 billion dollars a year, assuming that Canada's abatement costs were typical of those elsewhere. Such a "back-of-the-envelope" estimate is obviously subject to a large margin of error. It is included here only because it gives an indication of the magnitude of the costs of a CO_2 abatement strategy.

This list of the financial costs of remedying the environmental effects of energy use is not comprehensive as it makes no allowance for other impacts such as the destruction of wildlife habitat or natural landscapes. The costs above also represent minimum estimates, since the cost of meeting regulatory standards may bear little relation to the damage imposed on society by environmental degradation. In the absence of detailed estimates of the environmental costs of energy use, this list, however, offers a useful proxy of what some of these costs might be. It implies that Canadian energy use imposes unaccounted environmental costs of several billion dollars a year. Because they are not being borne by today's energy consumers, these costs are being passed on to future generations in the form of a degraded environment.

It will take time before these costs can be fully reflected in energy prices. A sudden adjustment would be inflationary and would adversely affect low-income consumers even after offsetting efficiency gains are taken into account. In a competitive trading environment, Canada's ability to incorporate these environmental costs into energy prices unilaterally is admittedly limited. It should be noted, however, that other countries, such as Germany, New Zealand and Denmark are moving aggressively to limit CO_2 emissions notwithstanding the additional

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2/ Personal communication from the Federal Environmental Assessment Review Office. AECL's concept is the subject of an environmental assessment. This estimate does not include the cost of disposing of low-level wastes.

costs such a strategy might impose on their economies.

The environmental costs resulting from energy use represent an implicit subsidy from the environment to energy consumers. To the extent that this subsidy is not reflected in energy prices, it gives the energy supply industry an important advantage over efficiency initiatives, which do not lead to similar environmental externalities.

5. A Level Playing Field

Energy supply subsidies maintained while conservation and efficiency programs are cut back

Federal energy policy is ostensibly market-oriented. Although the federal government has extensively deregulated energy prices and trade since 1985, it continues to intervene in the market, most noticeably through subsidies to energy megaprojects, oil and gas exploration, and the nuclear industry. Foregone tax revenues to these industries in the form of various write-offs have also been historically significant. At the same time, the government has been reducing its subsidies to energy conservation and efficiency programs. Subsidizing energy supplies while cutting back subsidies to energy conservation distorts the competitiveness of energy options and increases the environmental impact of energy policy.

Tables 1 and 2 below compare the federal government's resource allocation to increasing supply and controlling demand on the basis of the Main Estimates for 1991-92 and EMR's forecast expenditures for 1990-91. General expenditures, such as administration and policy formulation and analysis, which support both supply and demand programs, have been omitted as have small grants, such as those given to research institutes. This comparison is not meant to be exact (which will not be possible until the money has actually been spent and audited), but rather to show the relative emphasis between supply and demand management.

The government also incurs substantial expenditures related to the development and transportation of oil and gas: $16.9 million to subsidize the construction of the Vancouver Island pipeline,[3] $46 million in contributions to the Newfoundland Development Fund, $87.6 million in frontier oil and gas management,[4] and $20 million in miscellaneous other areas. Because these are not directly related to increasing supply, they have been omitted from Table 1.[5]

3/ The federal and provincial governments are each contributing $150 million to the $506 million project. Although the pipeline will reduce the risk of oil spills in Georgia Strait by eliminating barge shipments of oil to Vancouver Island and will also reduce emissions of sulphur dioxide by the pulp and paper mills switching to gas, it does not constitute the best environmental or economic option available: studies both inside and outside of government have shown that a mix of greater energy efficiency and the use of renewable sources of energy would be cheaper.

4/ DIAND pays a share of these expenditures.

5/ By comparison, it is estimated that the US spends about $50 billion annually in subsidies to energy producers. This sum does not include military spending to safeguard oil supplies from the Persian Gulf (Hubbard, 1991, p.38).

Many of these expenditures include an environmental protection component. It is worth restating that the purpose of this component is to reduce or control the adverse environmental effects of these projects. It is not to ensure energy security at the least environmental (or economic) cost. As such, these expenditures are of a remedial rather than a preventive nature.

The government earns revenues from its energy investments and lease sales which should be credited against its supply expenditures. In 1991-92, these revenues are forecast to reach $95 million.

The government's funding of demand-side programs, shown in Table 2, (including alternative sources of energy, which should be counted on the supply side but are not broken out in the estimates) is modest in comparison, amounting to 7% of the supply incentives programs above, even after the government's energy revenues are accounted for.

Table 3 puts these numbers in their historical context by showing the trends in selected supply- and demand-related expenditures over eight years. The numbers in this table are difficult to compare precisely because two departmental reorganisations and changes in policy during this period have led to several programs being discontinued or repackaged. This is particularly true for demand-side programs. Although the table shows declining expenditures for both supply and demand programs, it is clear that the former have received far greater government assistance during this period than the latter. Through its agreement to provide $3 billion in contributions and loan guarantees to the Hibernia oil development off Newfoundland, the federal government remains committed to providing large scale financial support for oil supply for several years to come — although the fate of the project is now in doubt. While the government will recover this investment in Hibernia if world oil prices average at least US$20 per barrel over the life of the project, it is not making any remotely similar commitments to promote energy conservation on a cost-recovery basis.[6]

It should be noted that investments in energy supply and demand differ in one respect that has important environmental and economic implications: energy supply investments tend to be "lumpy," requiring large upfront outlays before coming on-stream. A megaproject, such as Hibernia epitomizes this characteristic: $4 billion need to be invested over several years to build the necessary production facilities before any oil starts flowing. This makes the project financially more risky than most demand-side investments which are inherently small in scale and can show results almost immediately.

Supply orientation is clear from the historical data

The federal government's supply orientation emerges very clearly from these numbers: not only does the government inter-

6/ Personal communication from EMR.

Table 1: Supply-side Programs (1,000 $)

Programs	1990-91	1991-92
Nova Scotia Drilling Fund	3,000	13,969
Hibernia development	68,625	180,600
Lloydminster Heavy Oil Upgrader	141,900	154,800
Regional electrical interconnections	19,624	9,897
CEIP	25,000	5,000
CEDIP	60,000	0
Fuels technology R&D	22,366	20,416
Atomic Energy of Canada Ltd.	205,640	176,000
	546,155	560,682

1/ The government has invested in the Hibernia project through contributions and loan guarantees totalling over $3 billion against which it will earn a net profit interest of 10% of net revenues.
2/ As one of the equity partners in the project, the federal government is contributing 31.67% of the financing up to $401 million.
3/ The government loans money to Manitoba, New Brunswick, and Nova Scotia to assist in the financing of regional electrical interconnections.
4/ Canadian Exploration Incentive Program.
5/ Canadian Exploration and Development Incentive Program.
6/ According to Energy, Mines and Resources, "the major focus of this Sub-Activity is to assist the Canadian hydrocarbon fuel industry by developing and transferring technologies to optimize the recovery, upgrading, and efficient use of Canadian fossil fuels." As far as can be ascertained, most of these expenditures relate to the supply-side.

Table 2: Demand-side programs (1,000 $)

Programs	1990-91	1991-92
Efficiency and alternative energy programs	11,655	11,517
Efficiency and alternative energy R&D	22,972	23,213
	34,627	34,730

vene in the energy market in spite of its free-market rhetoric, but it does so in a discriminatory way, favouring oil, gas, and nuclear power over other energy options. This spending pattern creates regional winners: the oil and gas industry is almost entirely located in the West while the nuclear industry is almost entirely based in Ontario. Allowing all energy options to compete on an equal footing would thus affect some regions of the country more than others.

Table 3: Profile of Selected Energy Expenditures ($ million)

Program	84/85	85/86	86/87	87/88	88/89	89/90	90/91	91/92
Supply								
PIP	1735	1499	948	154				
CEDIP				356	611	155	60	0
CEIP					2.7	44.2	25	5
NS Drilling Fund					8	3	13.9	
Lloydminster Upgrader				35.9	141.9	154.8		
Hibernia							68.6	180.6
AECL	321	205	218	175	203	216	168	176
Demand and Alternatives								
CHIP	133.5	37.2	.087					
AECIP	.605	.831						
R-2000	.284	.734	1.147	.639				
Efficiency and alternatives					48.8	41.1	34.6	34.7

Source: Public Accounts of Canada, EMR Estimates

PIP: Petroleum Incentives Program
CEDIP: Canadian Exploration and Development Incentives Program
CEIP: Canadian Exploration Incentives Program
NS Drilling Fund: Nova Scotia Drilling Fund
AECL: Atomic Energy Canada Limited
CHIP: Canadian Home Insulation Program
AECIP: Atlantic Energy Conservation Investment Program
R-2000: Super Energy Efficient Housing
Efficiency and alternative energy programs include spending on transportation R&D and alternatives energy sources. EMR does not publish separate numbers for conservation and efficiency programs. No numbers are given before 1988/89 because these include energy substitution programs as well as conservation and alternatives.

6. Least-cost Planning

EMR has not prepared a systematic comparison of the marginal costs of various energy options. In 1988, the National Energy Board estimated the social supply price of several oil supply options (NEB, 1988).[7] The data appear in Table 4.

By comparison, EMR estimates that the world oil price will increase from an average US$19/b in 1989 to $21 in 1995 and $25 in 2000.

EMR has not calculated supply prices for providing energy services more efficiently through demand-side programs (e.g., untapped home insolation potential at various prices), but has

7/ EMR defines the social supply price as the minimum price needed over the life of a project to recover all costs, except taxes, and earn a real rate of return of 10%.

Table 4: Supply price of selected oil supply options (1988 US$/b)

Oil sands mining plants	23
Bitumen projects with upgrading	21-25
Hibernia (without federal grant)	24
Hibernia (with federal grant)	21
Amauligak (Beaufort Sea)	19

prepared estimates for particular technologies (e.g., more efficient refrigerators). When it intervenes in the market, EMR does not know whether it would earn a higher energy return from a dollar invested in a nuclear plant, offshore oil, heavy oil upgrading or a given energy retrofit — all of which it has subsidised. In 1988, EMR compared the cost of supply and conservation opportunities in the electricity sector in Ontario. This comparison showed that the supply price of several energy efficiency technologies, such as efficient lamps, electric heat pumps, high-efficiency motors, and ventilation controls was lower than the supply price of electricity generated through nuclear power, hydraulic sources, or fossil fuels.[8] Yet, as the discussion above showed, the federal government spends many times as much promoting the expensive supply options than it does the cheaper efficiency options. This pattern of subsidies is economically and environmentally irrational.

7. Conclusion

EMR is far more conscious of the importance of protecting the environment than ever before and is expending considerable effort addressing issues such as global warming. The implementation of the Green Plan will lead to further changes in EMR's activities, internal practices, and decision-making structures. But much of EMR's environmental preoccupation should be seen as an add-on to existing programs. Its chief purpose is not so much to find ways of eliminating environmentally damaging activities or subsidies, but rather to make them less harmful. This is an important and necessary focus, but it does not address the causes of environmental degradation.

The analysis above indicates that the federal government:

- favours the development of new energy supplies over the promotion of greater efficiency of energy use, notwithstanding the existence of a large economically-available conservation potential; this strategy is inherently more costly from an environmental perspective;
- does not integrate environmental factors into policy-making, except at the margin; as a result, Canadians are not paying the true cost of the energy they consume and are passing on large

8/ Presentation by Energy, Mines and Resources to a Committee of the Ontario Legislature, September 1988.

environmental costs to future generations; although no precise estimate of these costs exists, they likely amount to several billion dollars a year;

- does not allow all energy options to compete on an equal footing and, as a result, distorts the energy markets in favour of environmentally riskier options; in 1991-92, the federal government spent 14 times as much promoting energy supply programs (including offsetting revenues) as it did encouraging conservation and renewable sources of energy; and finally,
- by promoting the development of non-conventional oil sources and nuclear energy, does not give preference to the cheapest sources of energy available. As a result, Canadian energy policy imposes greater environmental and economic costs than it needs to.

Canadian energy policy imposes larger environmental and economic costs than necessary

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