Environment Canada
Atlantic Region

Environnement Canada
Région de l'Atlantique

ENERGY DEMAND/SUPPLY (1980-2000) IN ATLANTIC CANADA, ENVIRONMENTAL IMPACTS & OPPORTUNITIES FOR ENVIRONMENT CANADA

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1. INTRODUCTION

In keeping with federal and provincial energy policies, imported oil use will decrease by approximately 50% in Atlantic Canada by the year 2000. During the same period, the regional energy demand will increase by 1.7% per annum. To compensate for the decrease in foreign oil and to provide for security of supply, alternative energy resources will be developed in the region to satisfy future energy requirements. In fact, the majority of the proposed energy projects which will be developed are intended for electricity and hydrocarbon export, probably to the New England States. As these energy sources are developed, the potential for environmental impacts will raise the need for environmental information, conservation and protection activities by Environment Canada and others.

To enable the department to effectively deal with regional energy development, an analysis of electricity supply, demand and development between 1980-2000 was undertaken. It is partially based on government and industry attitudes which reflect the current economic and political climate. As such, the energy mix will need to be periodically reviewed and updated to reflect changes which will undoubtedly occur.

2. ENERGY DEMAND AND SUPPLY

The energy demand/supply forecasts prepared by the National Energy Board were used as a basis for this paper, supplemented by information from the provinces and utilities. These forecasts represent the collective views of government (federal and provincial) and industry. To account for some of the differences between forecasts presented by the various contributors, the middle case forecast scenario was used.

The following estimates of energy are similar to those projected by the provincial utilities. For the most part, the provinces have not, except in general terms, publicly outlined their future development plans.

The estimates of energy generated by major fuel type for the Atlantic Provinces over the period 1980-2000 are presented on Tables I through IV. It must be emphasized that the source of oil and gas has not, as yet, been identified and thus the contributions of foreign, Western Canadian and offshore oil in satisfying the future regional demand cannot be differentiated. It is expected OPEC's pricing policy will be a significant determining factor. In addition, tidal power potential and its contribution to the generation of electricity is not recognized which possibly reflects the need to conduct further feasibility studies. Finally, the role of renewables and energy conservation policy in satisfying demand is not presented because it has not been quantified and since it will be developed and used on an incremental basis throughout the region.

The focus of the following energy discussion is directed principally toward electricity demand and supply.

2.1 Hydro

The provinces, particularly Newfoundland, are considering the development of the remaining 7300 MW of available hydro resource potential (Nova Scotia - 100, New Brunswick - 800, Newfoundland - 6400).

2.1.1 Nova Scotia - Presently, two hydro projects are underway including Gisborne Lake in Victoria County and Fourth Lake on the Sissiboo River system in Digby County (0.2 & 2.5 MW, respectively). In addition, a low-head (i.e. short-water drop) hydro project is now under construction in

TABLE I

FORECASTS OF ELECTRICITY GENERATED IN NOVA SCOTIA BY MAJOR FUEL TYPE

(G.W.H.)

	1980	1985	1990	1995	2000
HYDRO	903	1082	1082	1082	1082
COAL	1508	4762	8259	9644	11365
OIL & GAS	4452	2689	692	712	858
NUCLEAR	-	-	-	-	-
TOTAL	6863	8588	10098	11518	13395
DOMESTIC DEMAND	6809	8838	10098	11517	13394
NET EXPORT	54	-	-	1	1
NET IMPORT	-	250	-	-	-

TABLE II

FORECASTS OF ELECTRICITY GENERATED IN NEW BRUNSWICK BY MAJOR FUEL TYPE

(G.W.H.)

	1980	1985	1990	1995	2000
HYDRO	2666	2692	2692	2692	2822
COAL	457	1482	1256	1839	1305
OIL & GAS	6160	1533	1397	2753	1594
NUCLEAR	-	4415	4408	4415	8830
OTHER	-	10	10	10	10
TOTAL	9283	10132	9763	11709	14561
DOMESTIC DEMAND	8808	10408	12142	14214	16981
NET EXPORT	475	-	-	-	-
NET IMPORT	-	276	2379	2505	2420

Source - Canadian Energy Supply and Demand, 1980-2000, National Energy Board, June 1981.

TABLE III

FORECASTS OF ELECTRICITY GENERATED IN NEWFOUNDLAND BY MAJOR FUEL TYPE

(G.W.H.)

	1980	1985	1990	1995	2000
HYDRO	44860	40724	45454	45454	56754
COAL	-	-	-	418	-
OIL & GAS	1398	2296	173	797	173
NUCLEAR	-	-	-	-	-
TOTAL	46258	43020	45627	46669	56927
DOMESTIC DEMAND	8429	10790	12984	15716	19318
NET EXPORT	37829	32230	32643	30953	37609
NET IMPORT	-	-	-	-	-

TABLE IV

FORECASTS OF ELECTRICITY GENERATED IN PRINCE EDWARD ISLAND BY MAJOR FUEL TYPE

(G.W.H.)

	1980	1985	1990	1995	2000
HYDRO	-	-	-	-	-
COAL	-	-	-	290	613
OIL & GAS	127	150	150	175	140
NUCLEAR	-	-	-	-	-
TOTAL	127	150	150	465	753
DOMESTIC DEMAND	515	687	794	983	1225
NET EXPORT	-	-	-	-	-
NET IMPORT	388	537	644	518	472

Source - Canadian Energy Supply and Demand, 1980-2000, National Energy Board, June 1981.

Inverness. The government favours the development of hydro resources and to this end is currently investigating low-head hydro potential in all municipal watersheds. It is noteworthy that according to Table I, hydro resource development will not occur, to any significant extent, beyond 1985.

2.1.2 New Brunswick - This province has recently increased the power output from Mactaquac by 100 MW and is evaluating additional sites. The New Brunswick Electric Power Corporation has earmarked $1.2 million of this year's $127 million budget to find options for increasing the outputs of several existing hydro electric facilities. In addition, they are considering the development of pumped storage capacity. The province is also considering the development of additional large-scale sites (Morrell and other sites along the Saint John River). According to projections there will be two periods of expansion in hydro electric generation between 1980-85 and 1995-2000.

2.1.3 Newfoundland & Labrador - As previously mentioned, Newfoundland has, by far, the greatest hydro resource development potential. The provincial utility has developed a number of large-scale developments (e.g. Upper Salmon, Hinds Lake) and is presently considering the development of 2 small- scale projects (Dry Rocks Brook - 7800 KW and Lake Michael - 12000 KW at Great Northern Penninsula). Before the Gull Island Muskrat Falls development can proceed, the province will have to obtain the right to establish a power corridor through Quebec so that excess electricity can be sold, possibly to the New England market.

2.2 Coal - Nova Scotia and, to a lesser extent, New Brunswick, are planning major expansions into coal-fired thermal electric power generation.

2.2.1 Nova Scotia - Coal mining for thermal electric generation will be significantly increased in Cape Breton. Cape Breton Development Corporation (CBDC) envisages a $2 billion expenditure over the next 10 years to open new coal mines in Cape Breton (e.g. Donkin-Morien and the Lingan Phalen Mines). Coal mining should increase from 2.8 to 7.8 million tonnes annually by the year 2000 through the collective efforts of CBDC, NOVACO and the private sector. The Nova Scotia Power Corporation will, according to one development scenario, add an additional 600 MW of increased capacity to Lingan and install four new 300 MW sites. By the year 2000, the electricity generated by coal will increase by one order of magnitude. The 1992 demand for thermal coal will be, according to recent projections, approximately 3.0 million tonnes/year. Of the remaining 5.0 million tonnes, 1 to 1-1/2 million tonnes will likely be used by Sydney Steel for metallurgical purposes with the remainder being exported to foreign markets.

2.2.2. New Brunswick - Coal is receiving increased attention as an important energy source to supplement provincial requirements. According to NEB forecasts, coal end use will increase by a factor of almost 3 by 1985. However, this will depend on the fate of the Coleson Cove conversion project which may be delayed, indefinitely.

2.3 Nuclear Power Generation

The only province which relies on nuclear power for electricity is New Brunswick. A 630 MW reactor was constructed at Point Lepreau and began commercial operation in 1982. Consideration, with no firm plans, has been given to constructing Lepreau II. This reactor could become operational between 1995-2000 and account for the doubling of electricity being produced by nuclear generation by 2000 (Table II).

2.4 Peat

An additional 10 GWh of other electricity will be produced, likely from peat, in New Brunswick by 1985 (Table II). Peat resources in New Brunswick approximate 40 million tonnes which is equivalent to 70 million barrels of oil. Sufficient thermal peat reserves exist in the northern part of the province to fuel a 40 MW unit for 30 years. A recent study by MONENCO found this concept to be technically feasible, environmentally attractive and economically competitive with coal. The province is now discussing construction of this facility with a United States engineering firm. Investigations are also being conducted into the use of Newfoundland's peat reserves.

2.5 OFFSHORE OIL & GAS

Offshore oil and gas reserves are significant. The most promising finds of gas and oil are found at Sable Island (Venture, Thibaud, Cinalta) and Grand Banks (Hibernia), respectively. The reserves are discussed below:

2.5.1 Offshore Natural Gas - Sable Island - While gas reserves off Sable Island at this time approximate 3.4 trillion cubic feet, some projections are as high as 25 trillion cu. ft. These reserves could be developed as early as 1987 and go into production for at least a 20 year period. The province

of Nova Scotia intends to export a significant amount of this gas to the New England States if the markets can be established. Mobil reveals that gas will be produced at a rate of 400 million cubic feet/day during the first 15 years of operation which approximates 41,000 GWh of energy/year. Mobil further reveals that half of this could be used in the region with the remainder being exported to the New England States. This would satisfy 8% of New England's 1995 energy requirements.

Nova Scotia may build its own gas pipeline to export gas to New England since the province could gross $8 billion over several decades of gas production. This possible source of revenue has encouraged the province to seriously consider building its own pipeline now that the TQ & M project has been cancelled, or at least delayed indefinitely.

2.5.2. Offshore Oil - Successful oil exploration on the continental shelf could lead, over the next 15 years, to the replacement of imported oil. Recent surveys by Mobil reveal that recoverable amounts of oil from Hibernia approximates 1900 million barrels. In 1982, it was suggested that production from Hibernia at a rate of 30,000 b/d could occur by 1990 which could assist the region in reducing its dependence on imported oil, which currently approximates 240,000 b/d.

The possibile signing of the Canada/Newfoundland agreement may increase exploratory drilling activities on the Grand Banks, however the development

of Hibernia oil in terms of timing will be delayed until the jurisdiction is resolved. The determining factors governing the development of Hibernia oil will be federal-provincial-industry revenue sharing arrangements, the world price of oil and OPEC's pricing policy.

2.6 TIDAL POWER POTENTIAL

There has been a resurgence of interest in the development of tidal power as a source of electric energy in response to the quadrupling of oil prices since 1973. Tidal fluctuations up to 16 meters in the upper part of the Bay of Fundy could generate billions of kilowatt hours, annually. The development of Fundy could produce enough energy to satisfy the combined, anticipated 1990 demands of the Maritime Provinces, Quebec and the north-eastern United States.

Three sites of different potential have been evaluated over the years in the Cumberland and Minas Basins. In 1977, the Fundy Tidal Review Board, financed by Nova Scotia, New Brunswick and Energy, Mines and Resources published a re-assessment of Fundy Tidal Power for development potential. The Fundy Task Force provided a 1982 update on the economic status and financial feasibility of the project. The Cumberland site, the preferred alternative, estimated to produce 1,085 MW of power would cost $1.9 billion (1980 figures). The second choice - Minas Basin - would produce some 4,800 MW of power at a cost of $6 billion.

In 1977, these projects were not considered to be economically feasible. Since 1977 the Nova Scotia government,

in response to increased world oil prices, has pushed for developing this project. To this end, the province suggested that the project should be built by 1995 for the following reasons:

(i) The '82 update suggests that the benefits are 2.5 to 3.0 times greater than the total project cost due, partially to the oil price increases.

(ii) A submission by the Nova Scotia government to the NEB demonstrated the project would provide necessary energy for the province and for export to New England.

(iii) Nova Scotia and New England officials have discussed funding arrangements for conducting further feasibility studies on the project.

In addition, Nova Scotia, with support from EM&R, is constructing a new 20 MW tidal installation near Annapolis Royal to test the opertion of a new low-head turbine and will use these results for determining the technical feasibility of establishing the Fundy Tidal Project. A successful evaluation here would provide further impetus for developing this major project, though the world price of oil is a key factor.

2.7 THE SOFT ENERGY PATH: ENERGY CONSERVATION/OTHER RENEWABLES

The utilization of energy conservation measures and renewable energy resources such as wind, solar and biomass are important since they can contribute to energy supply with a minimum of environmental disruption. While hydro, tidal power and forest biomass are recognized as renewable sour-

ces of energy, their impact tends to be of a greater magnitude than is the case for these other renewables. Solar radiation, wind and possibly geothermal, offer opportunities to meet a small portion of the future energy needs of the region.

2.7.1 Conservation - To date, Canadian energy production and consumption patterns have included waste and inefficiency. Production/consumption surveys, conducted in 1974 have shown that over 50% of energy produced in Canada was not effectively utilized. As such, there are considerable opportunities for conservation in every sector, particularily in residential and transportation use. To this end, the federal government has promoted conservation measures to reduce total energy demand. Energy conservation is economically attractive, since it can shift employment and investment from frontier regions to the point of use (cities, rural communities) and it provides a buffer against escalating energy prices. From an environmental perspective its most obvious role is one of displacement of more significant and environmentally disruptive forms of energy production.

2.7.2 Other Renewables - The use of renewable resources are practical alternatives to oil and other conventional energy sources and they can play a significant role in the oil substitution program. Given a concerted priority through R&D funding, tax and other financial incentives, it would not be unreasonable to see renewable energy resouces providing up to 20% of Canada's total annual energy needs by the year 2000. Prince Edward Island, which has an almost total dependence on out-of-province sources, will likely lead the region in terms of developing available renewable resource potential.

2.7.2.1 Solar - The use of solar heating to supplement hot water and space heating requirements has and will continue to increase in the region, largely because of government subsidy. The solar energy industry has advocated further expansion because it could stimulate employment in the region. The provincial and federal governments are committed to developing available solar potential in Prince Edward Island. To this end, a solar heating program to demonstrate the economic feasibility of solar heating aimed at developing the necessary data base, equipment and skills for wide-spread application has been implemented. The main program activities have focused on data collection of solar radiation data to design and evaluate solar heating potential.

2.7.2.2 Wind - The Maritime Provinces and particularly Prince Edward Island, are ideally suited for the development of wind energy conversion systems because of high average annual wind speeds. Consideration is being given to establishing a wind farm at Mount Pleasant and the Atlantic Wind Test site has been developed at Cape North. This site will evaluate wind systems from all over the world for potential use in our conditions. The province is currently evaluating wind energy resources to determine the ability of the PEI grid to absorb wind power. In providing the information necessary to develop wind energy conversion systems, Environment Canada has provided funds to establish wind sensors at the Atlantic Wind Test site.

2.7.2.3 Forest Biomass - The provinces, particularily Prince Edward Island, recognize the importance of using wood fuel to supplement domestic space heating requirements. Prince Edward Island views wood as a preferred energy alternative which will partially displace imported oil and stimulate employment. If the Prince Edward Island forests are used to their full potential 1600 people would be employed.

Presently, 145,000 M^3 of wood is used for energy generation in Prince Edward Island annually which displaces an estimated 96,000 barrels of oil and therefore saves the province $4.0 million. Projections of wood use in 1988 approximate 321,600 M^3 which will result in a savings of $8.9 million to Prince Edward Island and a displacement of approximately 212,000 barrels of oil, annually. Wood is now used to heat the O'Leary and Montague hospitals and the jail for Sleepy Hollow. The province, with support from the federal government, is currently examining the feasibility of using wood as an energy source and is also identifying and assisting in developing an infrastructure of wood fuel supply and distribution systems.

The problem which the province of Prince Edward Island now faces is one of a critical wood shortage. The combined harvest of wood approximates 336,000 M^3 which exceeds the allowable limit by 23,600 M^3.

If this trend continues the hardwood and softwood stands will be exhausted in 14 and 20 years, respectively. This is the spur for negotiations between the federal and provincial governments on entering into a forestry agreement.

Nova Scotia has also investigated wood as a source of energy and several reports are now available on the subject. Many home-owners have in fact converted to wood heating in whole or in part. The same can be said for New Brunswick and Newfoundland.

3. ISSUES & POLICIES WHICH AFFECT REGIONAL ENERGY DEVELOPMENT

The concern over energy security in Canada, particularly as it relates to oil availability, has continued to be the focus of policy makers at federal and provincial levels of government in the 1980's. The following is an overview of major decisions and issues that have an impact on energy development, electrical systems planning and resource development.

3.1 Federal Policy Developments

The most significant federal policy development which affects energy development in Canada is the National Energy Program. To accelerate the decline in oil use for electrical production, a program to assist the four Atlantic Provinces in developing their energy options was established:

(i) A utility off-oil fund amounting to $175 million to finance up to 75% of the costs to convert oil fired electricity generating plants to coal was established;

(ii) Provisions to contribute up to $200 million to support the development of the Lower Churchill River in Labrador were made;

(iii) CBDC has provided funds to assess technical and economic feasibility of new coal mines in Cape Breton; and,

(iv) $150 million has been provided to support the development of new coal-utilization technology. The majority of these funds will go to demonstrating the fluidized bed combustion technology in Cape Breton.

Other federal initiatives include the creation of the Energy Research and Development Fund to promote the development of new and more efficient technology.

3.2 Provincial Policy Developments & Issues

The Maritime Premiers have established an advisory committee of senior utility officals with federal and provincial observers, to provide technical and operational co-ordination among the utilities. The committee is responsible for co-ordinating and developing annual load growth forecasting, short and long range utility expansion plans, electrical research and development and conservation programs. It also provides a regional focus for operations involving neighbouring utility systems (Quebec and New England).

Some of the other provincial policy developments and issues which affect energy development include:

3.2.1 Churchill Falls Water Rights Reversion Act - In late 1980, the Newfoundland Government introduced

legislation for revision of water rights for Churchill Falls owned by the Churchill Fall Corporation. This corporation is 66% owned by Newfoundland and Labrador Hydro with the remaining 34% owned by Hydro-Quebec. The legislation will not be promulgated until the action is declared legal by the Newfoundland and Canada Supreme Courts (this will require 2 years). Newfoundland claims that the water lease for the project provides for Newfoundland to be given priority to the plant output. The province referred the matter to the courts after it was unable to obtain agreement with Hydro-Quebec on withdrawal of amounts of power beyond the 300 MW specified in the power contract in spite of the provisions of the water lease.

3.2.2 Transmission Corridor for Labrador Power - Running parallel to the above issue is a second one related to access of Labrador power to markets external to Quebec. Newfoundland is seeking to obtain a power corridor through Quebec so that excess electricity from power projects in Labrador (e.g. Muskrat Falls) can be sold in the Maritime and New England markets. Newfoundland feels this dispute is not unlike the free interprovincial passage of oil and gas and is calling on the federal government to provide the transmission line corridor under its constitutional powers. If Newfoundland obtains this power corridor, we will likely see, in the near future, the development of Gull Island/Muskrat Falls.

3.2.3 Development Considerations For The Fundy Tidal Project - While the most recent cost/benefit analysis was favourable there are a number of administrative and economic factors which must be resolved before

the project proceeds. Since the minimum investment would approximate either $2 or $6 billion, depending on the alternative selected, an inordinate financial burden would be placed on the utility customer in the early years of operation. In this regard, the financial viability of the project would be dependent on substantial and direct government support to subsidize consumer costs of power from this source.

In the absence of government support, joint efforts with the New England utilities would be required to proceed with the project. If this were to occur, financial arrangements would be required to offset the higher costs of borrowing money from institutions in New England. The New England utilities, which are privately owned, may not have the ability of the Nova Scotia government to raise the necessary funds since their credit ratings would be comparatively lower, and thus, their borrowing costs would be correspondingly higher. These factors would be a consideration in the development of any joint venture.

3.3 Federal/Provincial Agreements

Aside from the federal policy developments described above, the Canada/Nova Scotia Agreement on the offshore will result in the expeditious development of offshore gas reserves. Several agreements for offshore exploration have been signed with a number of oil companies totalling over 3 billion dollars. Mobil Oil is also preparing an environmental impact statement for public review later this year on bringing Venture Gas to Nova Scotia. This project could be developed by 1987. The possible signing of the Canada/Newfoundland Agreement may increase offshore

drilling activities on the Grand Banks and off Labrador. If the economic conditions are favourable, Hibernia could be developed by the early 1990's.

3.4 International Implications

The main international factors which will influence energy development in this region include the world price of crude oil and the future energy plans of the New England States.

3.4.1 World Price of Oil - The decline in the price of oil in response to the 1982 surplus world oil situation created a condition whereby future oil-to-coal conversion projects in Nova Scotia and New Brunswick may not be economically viable. This point is significant when considering that:

(i) The economic value of Hibernia oil and other oil developments in Canada, was based on an assumed world price of $45/b (U.S.). Since the world price in 1982 declined to $34/b (U.S.) and OPEC may be forced to drop the price further, (27/b) production from Hibernia could be delayed for a number of years.

(ii) The Nova Scotia Power Corporation is designing all future thermal generating facilities to use either coal or oil for fuel. Discussions with the Corporation reveal that the reason for dual firing is the direct result of the uncertainty of future oil prices which may become more attractive if the future price of oil continues to decline. This obviously has implications for the mining of coal in Cape Breton.

3.4.2 New England's Energy Plans - It is particularly significant that the economic viability of a number of mega-projects notably Sable Gas, Gull Island/ Muskrat Falls and Lepreau II is dependent on capturing the New England market. While the federal/ provincial governments and industry debate over the question on timing or on jurisdiction, New England is facing a critical energy problem and urgently requires solutions. New England is under considerable pressure from Pennsylvania to establish coal fired thermal generating plants to satisfy their long-term needs. The New England States have estimated that their energy requirements by 1995 will approximate 285,000 GWh. At a recent conference, a New England official suggested that their energy demands will be so significant and their options so few, that they could assimilate any and all of the electricity that Atlantic Canada could export.

Unless firm decisions are taken soon on developing our energy resources, New England will be forced to develop their own energy generating facilities which will focus on coal-fired thermal plants (Pennsylvania and other producing states are exerting pressure) and possibly nuclear power rather than on Sable Gas, Labrador hydro or Lepreau II power. Power from Quebec's James Bay development is also a likely source. If this were to occur, the economic viability of regional projects would be questionable.

4. ENVIRONMENTAL IMPLICATIONS

The development of energy resources can be responsible for various environmental implications. There are environmental costs and benefits associated with each option. The potential

regional as well as in some cases the international environmental implications resulting from developing hydro, coal, nuclear, peat and gas resources are discussed in this section. It must be recognized that oil and other fuels which are used for transportation feed stocks or for organic chemicals are not described, as such, as part of the following analysis. Any evaluation of the environmental risks associated with energy options would have to consider the displacement of particular, and the development of new, sources of energy in that context.

4.1 Regional Impacts

4.1.1 Hydro

Aside from the possible development of the large scale Gull Island and Muskrat Falls projects in Labrador and some additional sites in New Brunswick, the provinces favour the establishment of small-scale, low-head hydro developments. The environmental effects resulting from small and large scale hydro developments are described separately, below:

(A) Small scale - The environmental effects of small scale hydro are generally benign, if carefully designed to minimize disruption to the bio-hydrological regime. With low-head developments, for example, there would be less flooding due to impoundments and less reservoir fluctuations as compared to large development. While fish mortality would be comparable to conventional hydro in a relative sense, methods of incorporating fishways are more readily available. On the positive side, the impoundments could create new waterfowl habitat and increase recreational opportunities.

(B) Large scale - The environmental effects of large scale hydro can be far reaching through the inundation of large tracts of land, which tends to flood wildlife habitat and can eliminate the resource base currently supported by the lands (e.g. agriculture, forestry). Flooding lands tends to result in leaching of metals and nutrients which can create productivity problems (primary/secondary/tertiary). Downstream environments, used for water supply, recreation and/or fisheries can be impaired.

4.1.2 Coal - Increased mining, transportation, beneficiation and end use of coal reserves in the region could result in widespread environmental effects. The following is a brief description of potential impacts associated with each phase of the coal cycle.

(i) Mining - Mining activities can produce "acid drainage". This phenomenon which has been widely observed throughout the region, has resulted in major fish kills and has reduced recreational use and surface and groundwater supply potential. Strip mining can eliminate wildlife habitat.

(ii) Transportation - Transporting coal can be accompanied by the release of dust particles. While the nature and the magnitude of this problem is not fully known, the loss of the dust can contribute to contamination of the local environment.

(iii) Beneficiation - The major impact associated with coal preparation is the formation of acid mine drainage because of the large volumes of coal which are stockpiled at benefication plants. In addition, coal preparation plants which use sophisticated floatation techniques to wash coal and treat the effluent by adjusting the pH to precipitate heavy metals can contaminate receiving aquatic systems.

(iv) End use (thermal generation) - Coal combustion can contribute significantly to the formation of acid precipitation locally and at considerable distances away. The magnitude of the problem in this region is predicted to be significant if local coals containing high levels of sulphur are used. The effects of acid precipitation may include: acidification of aquatic environments and decrease in fish populations; a reduction in soil fertility and forest productivity; and, potential health implications due to leaching toxic elements in drinking water supplies. Also, coals in this region can contain high concentrations of contaminants such as lead, chromium, aluminum, uranium and arsenic which can either be emitted with the flue gas in part, or following combustion be concentrated in the ash, and subsequently, leach into the environment.

4.1.3 Nuclear - Under normal operating conditions, power production from nuclear reactors is responsible for small effects on the environment. Concern over

thermal pollution and site preparation plans and the disposal of high-level radioactive wastes were expressed by Environment Canada during the review of Lepreau I.

4.1.4 Peat - The use of peat for fuel can have environmental effects from both harvesting and then burning it for electric power purposes. Harvesting peat can lead to a number of effects on wildlife habitat, the hydrologic regime and local air quality (dust). As metals tend to concentrate in peat lands, combustion can emit toxic substances into the environment. Those not emitted upon combustion would tend to concentrate in the ash and could pose waste disposal problems.

4.1.5 Gas - The main environmental concern associated with drilling and transporting gas to markets are blowouts and pipeline construction, respectively.

(i) Blowout - If a gas blowout occurred in the vicinity of Sable Island, gas, along with condensates, could escape into the atmosphere and could constitute a pollution threat. Concerns have been expressed over the effects of fallout on Island vegetation. The vegetation helps to stabilize the Island. Concerns have also been expressed on potential impacts on groundwater quality which is the sole source of water supply for the AES weather station and on surface water which is used by Sable horses.

(ii) Gas Pipeline - The construction of a gas pipeline could be responsible for a number of impacts to water, wildlife and fisheries

resources. The most significant concern is the possible formation of acid drainage when the pipeline crosses sulphide rich deposits (i.e. slate). There are a number of examples which show that excavating in such deposits has been responsible for significant and adverse effects on downstream fisheries, recreational and water supply users. While fisheries and water resources can be affected by "acid drainage", technology to reduce these impacts does exist. In addition, constructing a pipeline over agricultural lands and wildlife habitats will affect these present land use practices.

4.1.6 Offshore Oil

In environmental terms, the most direct marine threat of offshore oil development is obviously that of a major oil spill, such as may result from an oil well blow-out or major accidental release of oil during storage or transshipment. These are infrequent occurrences, but because of the large volumes of oil potentially involved, they can have disasterous consequences on fish at particular times in their life cycles, wildlife (birds) and additional biological resources. Plants and animals have been shown to differ widely in their resistance and response to oil pollutants and it is, therefore, difficult to predict with precision the ultimate short and long-term effects. Commercially important species of shellfish and fish not killed outright may become tainted with petroleum hydrocarbons following a spill and fishing gear may be extensively damaged. In addition, if not properly regulated, offshore development can result in

an accumulation of debris on the seafloor which can plague other users of the marine environment for many years into the future.

Ancillary onshore and nearshore developments established to support offshore development may also impact upon marine environmental quality. Activities such as harbour dredging, infilling and industrial discharges from the expansion or operation of new refining capacity or port and transshipment facilities, would be responsible for these impacts.

4.1.7 Fundy Tidal Power

The magnitude of work required to exploit even a small portion of the energy in Fundy tides will necessarily give rise to social and environmental impacts and will require a broad appraisal. Elsewhere, tidal power is viewed as a beneficial form of energy production since it is renewable, does not produce noxious wastes and displaces other more environmentally significant forms of energy pollution. Because the Cumberland and Minas sites are potentially attractive, studies have been initiated to predict potential environmental effects. These studies have demonstrated that:

(i) There will be a general increase (20 cm) in tidal amplitude throughout the Gulf of Maine. Some of the intertidal areas may be submerged which could affect local seabird populations and additional organisms. The effect of this on food production in the Bay is not, at this time, fully known.

(ii) The establishment of a tidal barrage could responsible be for increasing salt water intrusion into coastal aquifers and impair them as a source of water supply. In addition, drainage of agricultural land located in low lying wetlands situated adjacent to the coast, could be affected and reduce agricultural productivity.

(iii) Socio-economic impacts could result particularly when providing access to large borrow pits, which may require upgrading of existing or the establishment of new transportation links to these sites. Moreover, the construction of the tidal barrier could require the movement of a large labor force into communities which may result in increasing current infrastructure levels. The Nova Scotia Power Corporation feels that the construction and operation of a tidal power plant would not likely produce effects of a magnitude which would prohibit such a development. However, they recognize a substantial program of environmental studies to provide the basis of an impact assessement would be essential.

4.1.8 Soft Energy: Energy Conservation/Other Renewables

The department recognizes the importance of energy conservation measures and the use of wind, solar and additional renewable resources in striking a balance between satisfying energy requirements and minimizing environmental disruption. In this regard, the principal role of soft energy is to displace some of the more environmentally significant forms of energy production and transmission.

While the development and use of some renewable energy resources could result in some impacts to the environment, the more significant ones can be readily mitigated through improved technological design and resource management practices. The environmental implications associated with renewable energy options cannot be regarded as constraints on their development.

Some of the more obvious environmental implications include:

(i) The diffuse nature of solar and wind energy may require large land areas for centralized energy conversion. This problem can be ameliorated by multiple land use and decentralized conversion.

(ii) The materials and energy requirements of components used in the manufacture of solar panels could be responsible for significant air emissions and waste generation elsewhere in Canada.

(iii) Increased use of wood for fuel could result in air quality impacts.

4.2 International Impacts

Any increase in the use of coal to generate electricity in New England and Nova Scotia could result in international impacts on fish, water supply, recreational potential, and could also reduce agricultural and forestry productivity as well as constitute a health concern.

4.2.1 New England - If the New England States develop coal-fired thermal generating facilities to satisfy their long term energy requirements, the already significant acid precipitation problem in this region could be further aggravated.

4.2.2 Nova Scotia - The increased emissions from coal-fired generating facilities in Nova Scotia could increase the acid rain problem on the Islands of St. Pierre and Miquelon located off the south coast of Newfoundland. The residents of these islands rely on rain water for supply purposes. They have recently re-introduced salmon into local streams and are currently developing the aquaculture potential. In this regard, any increase in the deposition of sulphate or metals could result in effects on drinking water and aquatic resources.

In addition, some researchers have identified the potential for wider tidal ranges along the New England coast which may result in the flooding of low lying coastal lands.

5. OPPORTUNITIES AND FUNDING CONSIDERATIONS FOR ENVIRONMENT CANADA IN THE ENERGY SECTOR

The principal objective of Environment Canada in the energy sector is to influence decisions in energy policy, development, production and use by ensuring that energy development proceeds in an environmentally responsible way and by supporting energy development through the provision of environmental design criteria. We have a responsibility to advise others on the environmental effects of their activities and attempt to influence and to express our views on the environmental costs and benefits of energy development proposals.

In this regard, the department cannot support or reject one energy development over another. This specific choice, in the final analysis must consider social, economic, cultural and environmental factors. To this end, we advocate the environmental case and this will change from situation to situation.

To deal with energy development in this region between now and the year 2000, the department must develop specific strategies so we can press our influence where it counts the most and expend our resources effectively. Some of the significant issues, opportunities and interventions for Environment Canada in energy are summarized on the following tables.

A number of sources of funds do exist to support energy-related studies. These however should not inhibit or replace program development for the department's A-Base resources. Those studies which focus on enhancing technological development aspects, may receive support from the Energy R&D program which is managed by Energy Mines and Resources. (For additional information on this fund the reader should refer to the paper on the Energy R&D Fund prepared by the office of the Regional Director General - Jan. 1983). Projects which deal with offshore oil and gas development and would assist in the decision-making process could be submitted to the Environmental Studies Revolving Fund managed by the Canada Oil and Gas Lands Administration. Projects which focus on data collection for general energy development can be considered under the Baseline Studies Program of Environment Canada.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
Coal Burning	Acid Rain	Atlantic Provinces	1)-The projected one order of magnitude increase in coal end use will further aggravate the acid rain problem in this region. This could give rise to practically irreversible situations which are detrimental to wise resource use and Canada's economic and social ambitions.	1)-Burn low sulphur coal	1)-We should develop a maximum permissible sulphur content for thermal coal (2%) according to a reasonable schedule -Environment Canada should meet with CBDC and get agreement on this 2% limit to be sold to NSPC. -The province should be influenced to adopt this level and request NOVACO and private coal operators to sell coal to the NSPC which meets this level. -The department should support the development of the new Lingan-Phalen mine to MSERD which will produce coal at 2%.	1)-These activities would reduce sulphur emissions and the acid rain precipitation problem in the region.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
					1)-We must expedite the approval process for the Prince mine coal preparation facility which will reduce sulphur content in thermal coal to 2%.	
				2)-Research into new coal technologies should be encouraged to permit the use of high sulphur coal in environmentally compatible ways.	2)-By stressing the social/economic implicaitons of acid rain, we should influence the FEDC's to support the development of enhanced beneficiation facilities.	2)-These techniques are potentially attractive since they can remove sulphur at low costs and thereby reduce acid rain.
					-The department should undertake or influence others, (CBDC, utilities, the Atlantic Committee on Coal) to conduct research into new coal technologies relative their ability to reduce sulphur emissions. This research should include fluidized bed combustion and coal liquefaction.	

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
			3)-Environment Canada has air emission guidelines which could, if applied to new coal-fired facilities, reduce sulphur emissions and hence, acid rain.	3)-When federal funds are used to suport coal fired thermal generating facilities, we should ensure that the air emission guidelines are satisfied.	3)-We must determine through DREE/EM & R and the provinces if federal funds are involved. If federal funds are involved, the emitters must satisfy federal air quality guidelines.	3)-This will ensure compliance with air guidelines and reduce acid precipitation
Coal Burning	Acid Rain	Inter-national	1)-The New England States face a critical energy problem and urgently require solutions. They are now under pressure from Pennsylvania to use coal fired stations. If this occurs, our acid rain problem could be further aggravated. Notwith-standing this, if New England uses coal fired stations to satisfy their needs, then the future viability of our energy projects may be questionable.	1)-We should meet with the Atlantic Provincial representatives on the NE Internat-ional Committee on Energy to determine New England's coal plans and to discuss regional implications. This could, in turn, be discussed through the Atlantic representatives to this committee.	1)-Once New England's energy plans for coal have been determined, loads to this region should be calculat-ed to demonstrate their significance. If the projected loads are signifi-cant, this should add further support to demonstrating a need to reach an agreement on reducing acid rain with the United States.	1)-We could influence the New England States to reduce the number of coal-fired generating facilities they plan to install and, in so doing, reduce SO_2 loads to this region.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
				-Irrespective, negotiations with the United States should be pursued. This could be timely now that the TVA has announced a $750 million program to reduce sulphur emissions by one-half and other assessments have supported Canada's conclusions.	-Through the manager of the LRTAP Program.	-If an agreement was reached, acid rain inputs to this region would be reduced.
				2)-The energy projects slated for development in this region and power export to the States should be encouraged as long as they don't contribute additional sulphur emissions here.	2)-We should, wherever possible, influence the FEDC's' EM&R, MSERD, DRIE and the provinces to develop energy projects.	2)-These actions would stimulate economic development, satisfy employment objectives, displace the use of coal-fired facilities in New England and reduce our acid rain and associated economic problems.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
Coal Burning	Acid Rain	Inter-national	3)-Increased emissions from coal fired generating facilities could increase the acid rain problem on the French Islands (St. Pierre and Miquelon). These islands rely on rain water for water supply purposes. They have also re-introduced salmon into a stream on Langlade and are developing aquaculture potential. Increases in the deposition of sulphate and metals could cause health problems and increase treatment costs for water supply.	3)-As a first step, we must promote interprovincial apportionment schemes.	3)-We must encourage Federal/Provincial discussions between the ministers on apportionment.	3)-This would reduce acid deposition in this region as well as to the French Islands, preserve environmental quality and reduce the potential for international conflicts.
				-If an interprov-incial appropriation agreement cannot be obtained we could seek an air quality agreement with France on the basis of international law.	-The Department could alert External Affairs to this potential problem. It could be quietly raised in future discussions between the two countries.	-This could support our negotiation stance with the US and make Section 3 of the Clean Air Act operative.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
Coal Mining	Acid Drainage	Atlantic	1)-Coal mining has long since resulted in "acid drainage" which affects water supplies, fish populations and recreational potential. Concentration of a number of mines in a given basin could heighten the cumulative nature of impacts to the environment.	1)-Specific guidelines for screening environmental effects early in the planning stages of project development must be developed. Unlike earlier guidelines, these should focus on methods to evaluate cumulative or synergistic effects. -Environment Canada, in consultation with CBDC, Fisheries and the provinces, should recommend and then implement such studies. -Research into developing alternative methods to reduce acid drainage should be promoted.	1)-We should meet with EM & R, CBDC, DFO and the provinces to develop these guidelines.	1)-We could influence the decision-making process to ensure that coal mining would proceed in an environmentally acceptable fashion by identifying and then ameliorating such problems at the feasibility stage of development. -Acid drainage problems could be idenfified and ameliorated at the feasibility stage.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
				-Draft guidelines on acid drainage prepared by NSDOE should be adopted by EC and formally applied to federal coal projects.	-The guidelines should be discussed with NSDOE to determine if they satisfy our needs and those of industry. If not, they could be modified.	-Acid drainage problems could be identified and ameliorated at the feasibility stage.
Coal Mining	Land Use	Atlantic	1)-Surface strip and to a lesser extent underground mining can scar large tracts of land which otherwise could, if managed properly, be used productively following abandonment.	1)-Ensure that mines are, after abandonment, reclaimed in a manner which benefits land use practices.	1)-Determine if the land use policy can be applied to mining activities by demonstrating advantages achieved elsewhere.	1)-Return the stripped land to a more productive state.
Coal Burning/ Mining	Toxic Chems.	Atlantic	1)-The formation of acid drainage can leach toxic substances from coal and related deposits, transport them to aquatic and marine environments and constitute health, ecosystems and is some cases economic concerns. Thermal coals can, upon combustion emit high levels of toxic substances into the environment either through atmospheric mechanisms or when the ash is disposed.	1)-Research into the types, sources, fates in the environment linked to cumulative effects on the environment and treatment options should be undertaken.	1)-These activities should be co-ordinated through the TCMP and with CBDC and the provinces to ensure that a interdepartmental and govt./ industry cooperation is optimized.	1)-Enhance our present knowledge of toxic substances associated with the coal cycle. This can be used to identify priorities for future research into abatement.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
Hydro (Small Scale)	N/A	Atlantic	1)-The environmental effects of small-scale hydro, which is preferred in this region, are generally benign, if carefully designed, to minimize disruption to the bio-hydrological regime.	1)-We should support development of small-scale hydro by determining development plans and providing relevant environmental design criteria to proponents (climatologic/ hydrologic). -Guidelines to evaluate the cumulative/ synergistic effects of establishing a number of such developments on a given system need to be developed.	1)-Environment Canada should determine hydro development plans from the power utilities and then support their development through the provision of design data. -IWD is satisfying this requirement.	1)-The incremental development of this resource could displace, partially, electricity generation from significant sources of energy. This activity would partially satisfy, with a minimal level of resources, the objectives of the Departmental Strategic plan in energy.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
Hydro (Large Scale)	Water/ Fisheries	Atlantic	1)-The environmental effects of large-scale hydro can be far reaching through the inundation of large tracts of land, subsequent leaching of metals and nutrients which can create productivity problems (primary/ secondary/tertiary). Downstream environments, used for water supply, recreation and/or fisheries can be impaired. While the likely hydro projects to proceed include Gull Island/ Muskrat Falls, some additional sites (Green River and Morrell on the Saint John River and several more in Labrador) could be developed.	1)-As in the case of small-scale hydro, we should support large-scale development through the provision of environmental design criteria. -Specific guidelines for screening environmental effects early in the planning stages of project development must be developed.	1)-EC should meet with the power corporations, determine their development plans and provide design data. -Guidelines agreeable to the Public Utilities, Environment Canada, EM&R, DF&O and the provinces should be developed.	1)-Developing large-scale hydro would displace significantly some of the more environmentally significant forms of energy production -These guidelines would ensure that the development of large scale projects would proceed in environmentally responsible ways.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
	Wild-life/ Re-source Impacts	Atlantic possibly Inter-national (St. John)	1)-As above, inundating large tracts of land, tends to flood wildlife habitat and can eliminate the resource base currently supported by that land (agriculture, forestry).	1)-An inventory of large scale projects with proposed flood lines should be conducted and potentially significant wildlife habitats, important bio-logical sites, forests and agric-ultural lands can be identified. Following this, recommedations on alternative operat-ing regimes can then be made to minimize impacts.	1) Through EM & R and the power utilities.	1)-Tradeoffs aimed at possible protection of important resources can be made.
Hydro (Large Scale)	Social Impacts	Atlantic	1)-Developing large scale hydro projects can result in significant social impacts and create additional stress on the environment (i.e. need for roads, increased water demands etc). To date, we have not dealt with social impacts.	1)-Environment Canada needs to define a policy on social impact assessment.	1)-The ORDG should request HQ to develop, in consultation with the regions and FEARO, a policy on social impact assessment.	1)-Adopting a policy on social impacts assessment would enable a more rigorous analysis of the environ-mental effects

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
						resulting from social pressures originating from related projects(i.e. townships)
Peat Mining	Wild-life Habitat /Hydro-logical Regime	Local	1)-Newfoundland now has an experimental peat mining project underway. New Brunswick is seriously considering a peat fired fuel facility. The future exploitation of peat lands could result in significant wildlife disruption and effects on the hydrologic regime (quantity and quality).	1)-An inventory of peat lands which could be affected by peat mining activities should be undertaken. This inventory should focus on identifying wild-life habitat/ hydrologic conflicts. These areas should be prioritized in terms of ecological and hydrological significance so that the provinces could be influenced to utilize peat lands which will not result in significant impacts.	1)-We should determine the peat land development plans from the New Brunswick and Newfoundland Power Utilities (location/timing). Meetings should also be organized with the New Brunswick Depart-ment of Natural Resources and the Newfoundland Department of the Environment to identify environ-mental issues of mutual concern and to identify possible coopera-tive studies.	1)-We could ensure that environmental planning is incorporated into the decision making process.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
Peat Burning	Air Impacts /Toxic Sub-stances	Regional	1)-Peat lands are considered sinks for a variety of heavy metals. Combustion of peat in a thermal unit would tend to emit metals into the environment and result in effects on aquatic and terrestrial environments and to resident organisms.	1)-Research into the types, sources, fates in the environment linked to cumulative effects on the environment and treatment options all need be undertaken.	1)-These activities should be co-ordinated through the TCMP and the provinces to ensure that intergovern-mental cooperation is optimized.	1)-These studies would enhance our knowledge of toxic substances associated with peat burning operations. This can also be used to identify priorities for future research and development of abatement schemes.
Peat - General	Air/ Water/ Wild-life	Atlantic	1)-Peat mining and thermal use could affect water supplies, fish populations and recreat-ional potential. Concentration of mining and burning operations in a given area could heighten the cumulative nature of impacts to the environment.	1)-While Env. Canada in cooperation with the pro-vinces and indus-try developed screening guide-lines for peat projects, they did not address cumulative/syner-gistic impacts which could become a problem when there are a number of peat mining operations located in a given water-shed. We should develop guidelines which address these impacts.	1)-We should develop guidelines which satisfy the con-cerns of EM & R, Fisheries, Environ-ment Canada, and the provinces.	1)-Significant impacts could be identified and mitigated at the feasibility stage of development.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
Nuclear	Radio-active Waste Manage-ment	Yet to be determined	1)-To date the AECB has not granted a permit for the disposal of nuclear waste. The short term solution to the management of such wastes is storage. Longer term solutions aimed at develop-ing suitable disposal techniques are urgently required. To this end, a surcharge price was levied under the NEB approval on the export price of Lepreau I power to develop appropriate radioactive waste disposal techniques.	1)-We need to deter-mine the size of the fund, criteria used to support studies and how to get access to it. If it is accessible, we must then encourage waste management studies.	1)-Through the New Brunswick Power Utility and NEB.	1)-The depart-ment could assist the nuclear industry in finding a solution to the current radioactive waste storage problem.
Nuclear	Lepreau II	Region	1)-The development of Lepreau II could double the problem of radioactive waste management and the emissions of radio nuclides to the environment. The cumulative impacts to the environment must be determined before Lepreau II becomes a reality.	1)-We need to quantify the effects of Lepreau I on the environ-ment, calculate increased emissions as well as wastes produced from the operation of Lepreau II and then demonstrate their signific-ance. If the projected loads are significant we must influence the AECB to develop new guidelines and quicken the pace	1)-Through the Lepreau I monitoring committee.	1)-This would ensure that the develop-ment of Lepreau II would proceed in a environ-mentally responsible way.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
				of research into developing a suitable radioactive waste disposal technique.		
Scotian Shelf Gas	Gas Pipelines (Terrestrial)	NS/NB	1)-Ensuring that this development proceeds in an environmentally acceptable manner, we must pay particular attention to the longer terms, cumulative impacts which could result from developing subsequent projects in the Sable Island vicinity.	1)-We must develop with COGLA & DF&O an environmental monitoring program and a long term strategic plan and evaluation for this region.	1)-These views should be presented to the EIS Review Panel and through discussions with COGLA and DF&O.	1)-We could influence the decision-making by ensuring that developing Sable gas reserves would be done in an environmentally responsible manner.
			2)-To transport this gas to market, a pipeline will likely be built from Canso, through Nova Scotia and New Brunswick to Calais Maine. The pipeline will, inevitably cross wildlife habitat, sensitive watersheds and agricultural lands.	2)-We must determine pipeline timing and the proposed route. In addition, a biophysical survey along the proposed route must be conducted to identify resource conflicts, their significance and influence alternative routes.	2)-Study requirements of the province, EM&R, DF&O, and industry should be identified and cooperative ventures established.	2)-We would ensure that environmental considerations would be incorporated into the decision making process.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
			3)-The integrity of the pipeline, once established, could be in jeopardy from ice scour, and sediment inducement in streams and from the formation of acid drainage.	3)-We need to identify at stream crossings, the hydrologic regime (ice scour, sediment movement, etc) and areas which could form acid drainage.	3)-The effects of the environment on the development should be identified to assist industry in the decision-making process.	3)-This will support the development of energy options through the provision of environmental design criteria.
Scotia Shelf Gas	Pipelines (Marine)	Nova Scotia	1)-It is likely that as gas reserves are proven in the offshore that additional marine pipelines will be brought ashore. Depending on the shorefall location, a number of impacts could result.	1)-A number of detailed coastal mapping/ sensitivity studies along Nova Scotia must be initiated. Specifically, we must prioritize sensitive coastal environments and influence the consideration of alternative sites.	1)-Cooperative study arrangements between the provinces and appropriate federal agencies should be established to identify the broad spectrum of environmental concerns and issues. Priorities should be established and support from the ESRF must be sought.	1)-We could influence the decision making process at the feasibility stage.
Offshore Oil	N/A	Atlantic	1)-An agreement between Canada and Newfoundland is possible. Once signed, cooperative arrangements for joint Federal/Provincial committees and EIS reviews will have to be established. In addition, exploratory drilling activities will be increased off Newfoundland which will necessitate the development of emergency planning and	1)-We must ensure that an environmental advisory panel is established and further, that Environment Canada is formally represented on this panel.	1)-Our views must be presented to the Newfoundland FEDC and COGLA (HQ) to influence the establishment of this panel and our membership on it.	1)-We could influence support for our studies through this committee.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
			response arrangements. To deal with expanding offshore activities, studies will be required and cooperative federal/provincial approaches to shore zone management and planning will have to be established.	-An analysis of future plans and drilling activities will be required to develop a regional strategy for emergency planning and response arrangements.	-This information must be compiled through COGLA and Industry. These activities must be analyzed and appropriate planning and response strategies must be developed in consultation with industry and government.	-Appropriate responses to emergency situations could be developed to maintain environmental quality.
				-As a service Department we must develop studies to assist industry in the decision making process for developing offshore resources.	-We must identify studies which assist the development of offshore resources by discussing priorities with industry and developing studies which focus on the effects of the environment on offshore oil and gas development. Funds must be sought under the ESRF.	-We could assist the development of offshore resources and satisfy our requirement in the energy sector.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
				-To maintain the quality of the shore zone, which could be affected by offshore drilling activities and, subsequently, by transportation and development, a long term federal/ provincial approach to shore zone management will be required.	-The concerns of the province and those of Environment Canada relative to coastal/ terrestrial impacts from offshore activities must be determined, co-operative studies and approaches to influence decision making must be established.	-The quality of the coastal and terrestrial environments would be maintained.
Tidal Power	Water/ Cli-mate/ Agri-culture	Nova Scotia, New Brunswick and New England	1)-The potential impacts resulting from the development of the Fundy Tidal Project could be far reaching through the establishment of the barrage which could affect climate, productivity (such as fish, agriculture) and groundwater quality in aquifers. Because of the magnitude of the project, there could also be significant socio-economic impacts. Since these effects have not been quantified, the Canadian and U.S. governments feel that an impact statement must be an integral component of the decision-making process.	1)-While a decision on this project has not yet been made, some of the studies which would be required to appreciate the impacts would have to be undertaken years in advance of the decision (i.e. fisheries, affects on ground-water etc).	1)-To ensure that we can plan studies and deploy resources if neces-sary, to conduct them, we should meet with the Fundy Tidal Power Corpor-ation and determine development plans. We should then identify schedules for doing or influencing others to do these studies. Because the provinces, DF&O and a number of universities have	1)-These activities would ensure that the project would proceed in an environ-mentally responsible way.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
					already done a number of studies, we should meet with them and develop cooperative approaches for studies of mutual interest which do not duplicate work completed, to date. -Although guidelines were issued in 1977, the results of work completed since that time has unveiled new information which may justify their revision. To this end, and when a decision is made, we must, through FEARO, influence the development of new guidelines.	
Conserv-ation/ Renew-ables	N/A	Atlantic	1)-The environmental effects of and the use of renewable resources, with the possible exception of wood, are generally benign and can be reduced or eliminated, if designed properly.	1)-With regard to conservation and the develop-ment of solar and wind energy con-version systems, we must influence their development through the pro-vision of relevant environmental	1)-Environment Canada should determine development plans for the provinces, particulary PEI, and support their development through provision of design data.	1)-The endorse-ment of conservation policy and the incre-mental development of renewable resources could partially

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
				to proponents (i.e. solar duration intensity through the		displace, electricty generation from significant sources of energy. Developing these resources will stimulate economic activity and increase employment opportunities locally.
Renewables (Wood)	Forest Management, Air Quality	Atlantic	1)-The Provinces and the Federal Government recognize the value of using wood fuel to supplement domestic space heating requirements. Problems of potential wood shortages and potential air quality impact could be significant.	1)-We need to determine the ability of our forests to support future increased harvesting for space heating purposes.	1)-The forestry agreements which we must continue to promote and recent inventories of forest lands are largely satisfying this requirement.	1)-As the use of forests for space heating is increased, we will be assured, through proper forest management, that they can support increased demands and pressures.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
				-A sequal to the ENFOR Program, with support from the energy R&D fund should be developed.	-The ORDG and CFS should develop a new regional ENFOR program for submission to headquarters.	-The development of this submission could support research and development into the use of wood to partially satisfy the long term Canadian energy demands. This would support federal and provincial energy objectives and employment programs.
				-With regard to air quality issues, we need to determine the extent of air impacts and their significance resulting from increased wood burning for space heating. If the impacts are significant, then we should consider the development and application,	-We must determine, through CFS, EM&R, the provinces and municipalities, future trends in the use of wood for fuel. Based on development scenario, the department needs to model air impacts and determine if guidelines and/or new regualtions are required.	-This would ensure that the projected increase in the use of wood fuel throughout this region would proceed in an environmentally appropriate fashion.

ACTIVITY	ISSUE	AFFECTED AREA	PROBLEM DEFINITION	SOLUTION	INFLUENCE	BENEFIT
				with the provinces of appropriate air quality guide-lines.		

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