

1985

Fundy Tidal Power: A Need to Reassess the Environmental Framework Protecting the Transboundary Environment

Robert W. Rudolph
University of Rhode Island

Follow this and additional works at: https://digitalcommons.uri.edu/ma_etds



Part of the [Natural Resources Management and Policy Commons](#), [Oceanography and Atmospheric Sciences and Meteorology Commons](#), and the [Oil, Gas, and Energy Commons](#)

Recommended Citation

Rudolph, Robert W., "Fundy Tidal Power: A Need to Reassess the Environmental Framework Protecting the Transboundary Environment" (1985). *Theses and Major Papers*. Paper 261.
https://digitalcommons.uri.edu/ma_etds/261

This Thesis is brought to you by the University of Rhode Island. It has been accepted for inclusion in Theses and Major Papers by an authorized administrator of DigitalCommons@URI. For more information, please contact digitalcommons-group@uri.edu. For permission to reuse copyrighted content, contact the author directly.

**FUNDY TIDAL POWER:
A NEED TO REASSESS THE ENVIRONMENTAL FRAMEWORK
PROTECTING THE TRANSBOUNDARY ENVIRONMENT**

BY

ROBERT W. RUDOLPH

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS
IN
MARINE AFFAIRS**

UNIVERSITY OF RHODE ISLAND

1985

MASTER OF ARTS THESIS
OF
ROBERT WILLIAM RUDOLPH

APPROVED:
Thesis Committee

Major Professor *Lawrence Jude*

Lewis W. Anderson

David D. Warner

A. A. Michel

DEAN OF THE GRADUATE SCHOOL

UNIVERSITY OF RHODE ISLAND

1985

ABSTRACT

The concept of harnessing the tides for energy is receiving renewed attention in the maritime provinces of Canada and northeastern United States where a scarcity of indigenous energy resources exists. While proposals for several small tidal power facilities are being considered in Maine, in Canada, Nova Scotia officials are moving ahead with plans for a major tidal power project (4,028 MW) in the Minas Basin in the Bay of Fundy. The vast majority of the power generated from this facility is expected to be exported to the New York and New England areas which have a greater energy demand than the maritime provinces. Although tidal power facilities have been proposed for the Minas Basin in the past, a recent update of the current economic feasibility of such a project shows the benefits far surpassing the costs. However, while tidal power is traditionally considered to have minimal impacts on the environment, there is some scientific evidence which suggests that the proposed facility may affect the tidal regime as far south as Cape Cod, Massachusetts due to the unique oceanographic conditions found in the Gulf of Maine and Bay of Fundy. A recent analysis undertaken through funding by the Maine State Planning Office indicates that such an alteration to the tidal regime could have far-reaching environmental consequences ranging from loss of terrestrial habitats to possible weather modification. In addition to these physical consequences however, this project could have significant implications for environmental law.

This thesis examines both international environmental law and the domestic laws of Canada and the United States which attempt to protect the transboundary

environment. Canadian-United States practice with prior transboundary environmental problems is examined with respect to how these disputes have been settled in the past.

The results of this analysis suggest that there are several deficiencies in the present international and domestic legal framework which do not adequately protect the transboundary environment. The Boundary Waters Treaty of 1909 and its working mechanism, the International Joint Commission do, however, appear to provide the necessary base for addressing transboundary environmental problems and need to be utilized to a greater extent in resolving environmental disputes between the two countries.

ACKNOWLEDGEMENTS

This thesis, a project which at times appeared as though it would never be finished, owes its completion to the generous assistance of many people. First and foremost, I am grateful to my thesis committee: Professor Lawrence Juda, the godfather of marine geography Dr. Lewis Alexander, and Professor David Warren. Their suggestions have helped fine tune this thesis, and their support throughout graduate school will be remembered kindly. Also deserving thanks is my thesis chair, Dr. Art Meade, who has reminded me that my education should not stop here.

Dr. Peter Larsen of the Bigelow Laboratory for Ocean Sciences was a tremendous help throughout the project, particularly during the early stages of its development. His humor is and always will be greatly appreciated. I would be remiss if I did not thank Tux Turkel, childhood friend and now ace reporter for the Maine Sunday Telegram who first interested me in the tidal power issue. My writing and research was made easier by the support of my employers and the staffs of the numerous academic institution libraries I used for my research. I am also appreciative of Frank Bevacqua of the International Joint Commission who patiently answered my many questions over the telephone in the final hectic month of completing this thesis. Also deserving mention is Candy Jenkins, whose nimble fingers on the word-processor greatly facilitated the timely completion of this thesis.

A very special thanks goes to my parents, friends, and now-fellow MAMAs, and in particular Christopher Lynch who renewed the spirit of competitiveness in me during this past summer. Chris, just remember that wherever you go, there you are.

TABLE OF CONTENTS

	Page
ABSTRACT	ii
ACKNOWLEDGEMENTS	iv
Chapter	
I. INTRODUCTION	1
Statement of the Problem	1
Background and Issues	1
Overview	5
Chapter I Notes	7
II. TIDES AND TIDAL POWER	8
Tides	8
Tides in the Ocean	9
Tidal Power Development	10
Early History	10
Modern History of Tidal Power	11
North America	14
The Bay of Fundy Proposal	16
Selection of the Minas Basin Site	16
Cost/Benefit Analysis of the B9 Barrage	18
Financial Feasibility	19
Description of the Proposed Project	19
Physical Oceanography of the Gulf of Maine/Bay of Fundy	21
Tides in the Gulf of Maine/Bay of Fundy	23
The Greenberg Model	23
Sea Level Rise	25
Anticipated Effects of Tidal Regime Alterations	25
Physical and Biological Consequences	26
Consequences of Higher High Tides	27
Consequences of Tidal Current Changes	27
Horizontal Fluxes	27
Vertical Fluxes	28
Socio-economic Consequences	29
Recent History of the Fundy Project	30
Chapter II Notes	33
III. INTERNATIONAL LAWS RELEVANT TO THE PROPOSED PROJECT	36
Definition of Transboundary Degradation or Pollution	36
International Law and Transboundary Pollution	38
The Trail Smelter Case	39
The Corfu Channel Case	41

	Page
The Stockholm Conference	41
Other Customary Law Supporting the Obligation of States as Pertains the Transboundary Environment	43
United Nations General Assembly Resolutions	43
OECD Recommendations	44
ILA Writings	45
Treaty Law	46
The Law of the Sea Treaty	47
The Obligation of Prior Consultation	49
The Nordic Convention	51
The Convention on Long-Range Transboundary Air Pollution	52
 Chapter II Notes	 54
 IV. DOMESTIC LAWS OF THE UNITED STATES AND CANADA RELEVANT TO THE PROPOSED PROJECT	 57
United States Environmental Legislation Pertaining to Transboundary Pollution	57
Executive Order 12114	58
Canadian Domestic Environmental Legislation	62
EARP	63
Comparison Between the Domestic Legislations of Canada and the United States	65
Provincial Environmental Legislation	66
Other Regulatory Bodies with Authority to Review Fundy Tidal Power	67
FERC	67
DOE	68
State Regulation - Maine	70
 Chapter IV Notes	 73
 V. UNITED STATES AND CANADIAN PRACTICE	 75
Early U.S. Practice	76
The Harmon Doctrine	76
History of the International Joint Commission (IJC)	77
The Boundary Waters Treaty of 1909	78
How the IJC Functions	81
International Environmental Dispute Settlement	84
Negotiations	87
Prior Consultation	88
Regulatory Coordination	90
Dispute Management	91
Bilateral - Non-Binding Methods	91
The Use of Third Parties	92
Dispute Settlement	92
Ad Hoc Arbitration	93
Permanent Judicial Tribunal	94
Post Settlement	95

	Page
Other Examples of Canadian-United States Practice	96
The Cherry Point Oil Spill Incident	96
Canadian Offshore Oil Drilling in the Beaufort Sea	97
United States and Canadian Practice with Respect to Flooding	97
The Gut Dam Arbitration	99
Recent Transboundary Problems	101
Garrison Diversion Problems	101
Comparison with the Potential Bay of Fundy Issue	103
Acid Rain	109
Chapter V Notes	111
VI. CONCLUSIONS AND RECOMMENDATIONS	114
Review of the Problem	114
Changes to Domestic Legislation	116
Replace Executive Order 12114	116
Revise Power Import Legislation	117
Coordinate Environmental Policies and Laws	118
Changes to International Law	119
Strengthen Enforcement Provisions	119
Limit Reservations to Environmental Treaties	120
Make Prior Consultation an Obligation	121
Changes to Dispute Settlement Mechanisms	121
Expansion of the International Joint Commission	123
Summary	125
Chapter VI Notes	126
SELECTED BIBLIOGRAPHY	127

LIST OF FIGURES

	Page
1. Principle potential sites for harnessing tidal energy	13
2. The Gulf of Maine - Bay of Fundy region	15
3. Location of proposed tidal facilities in the Bay of Fundy	17
4. A single basin tidal power layout	20
5. Operating phases of a single effect, high pool tidal power facility	22
6. Patterns of Canadian-United States dispute settlement	86

CHAPTER I

INTRODUCTION

Statement of the Problem

Assuming the construction of a proposed tidal power project in Canada on the Bay of Fundy, subsequent alterations of the marine and coastal environments have been projected to occur as a result of the dam. These alterations are believed not to be limited to just local changes, but rather, changes throughout the Bay of Fundy/Gulf of Maine region with impacts extending as far south as Cape Cod, Massachusetts. Among the possible physical effects anticipated from the project are increased tidal ranges and tidal currents and consequent modifications to the coastal and marine habitats affected by such changes.

There is an old Roman law which reads "sic utere tuo ut alienum non laedas", or roughly translated "you must not do with your property anything which can do damage to your neighbor." It would appear, at least on a rudimentary level, that this law might be broken by Canada's construction of the tidal power facility should the pursuant environmental changes be perceived as damaging by the United States. Such perceptions or actual changes could result in strained United States-Canadian relations and possibly represent a breach of international environmental legal obligations. Similarly, there may be domestic laws in Canada which protect the transboundary environment that would likewise be broken should the construction of a tidal facility result in subsequent changes to the United States environment.

Background and Issues

With demands for low-cost power in the maritime provinces of Canada and the northeastern United States increasing, and with a relative scarcity of indigenous

energy resources in these areas, officials in Nova Scotia are moving ahead with plans for a proposed tidal dam project on the Bay of Fundy. The focus of the Canadian effort centers around the Minas Basin, where a tidal power facility of 4,028 MW (roughly equivalent to four nuclear plants) is being considered. The Tidal Power Corporation of Canada has recently updated a 1977 economic study of the feasibility of Fundy tidal power. A cost-benefit analysis of the project shows the ratio of benefits to costs through the year 2050 at somewhere between 2.45 and 3.0 depending on design. Fuel cost savings would far surpass the capital and operating costs based on an allocation of 10% to the Maritimes, 45% to New England, and 45% to New York.¹ When compared with alternate energy sources, the benefits to the market areas for tidal were found similar to nuclear and superior to coal.

There are generally considered to be about only fifty sites throughout the world which are suitable for tidal power development. This lack of suitable sites is related to two criteria which must be satisfied for development to be considered practical. First, a tidal range large enough to produce a sufficient head must be present. Second, the area to be impounded should be large, while its connection to the sea should be relatively narrow to minimize construction costs. A 240 MW project on the La Rance Estuary in France and a recently (summer 1984) completed project of similar size in the Annapolis Basin of Nova Scotia are the only major tidal power facilities in operation today. While these projects are small and the environmental changes associated with them are minimal, there is the possibility that other larger projects could be developed which might result in major environmental modifications. Historically, other projects have been proposed since early in this century, but have proven infeasible following detailed cost-benefit analyses. With changes in the world economic situation, the need to

move away from fossil fuels, and the fact that tidal power is considered both non-polluting and reliable, such projects are being given renewed attention.

Although tidal power is non-polluting in the traditional sense, it does result in a number of significant environmental consequences which must be considered during the initial planning phases. These can be divided into those occurring within the impoundment area itself and those that occur on the seaward side of the barrier. David Greenberg of the Bedford Institute of Oceanography in Nova Scotia has developed a numerical model for purposes of describing and projecting the impacts occurring outside the tidal barrage.² The exact effect of the construction of a tidal barrier depends upon its size and location within the entire tidal system. The proposed Fundy tidal power development will enhance the natural tidal resonance of the Bay of Fundy and Gulf of Maine by shortening the basin, bringing its tidal period closer to the natural period of the tidal wave. Greenberg's model, which has received general acceptance throughout the scientific community, indicates that an increase in the tidal range of from 2-30 centimeters would be produced beginning at the southern portion of the Bay of Fundy and extending to south of Boston, Massachusetts.³

Little consideration has been given to the environmental consequences of this construction. Some research has been done by Canadians on the effects in Canada, but the research on the impacts likely to occur in the United States is in an infant stage.⁴ According to Dr. Peter Larsen of the Bigelow Laboratory for Ocean Sciences in West Boothbay Harbor, Maine, there is so much momentum at the present time for the development of tidal power in Nova Scotia that it cannot be stopped. Dr. Larsen and his colleagues, through funding from the Maine State Planning Office have recently completed a preliminary analysis of the tidal project as to the environmental impacts most likely to be felt in the United States.⁵

The most recognizable impact of the proposed barrier outside of the construction site is the loss of terrestrial habitats which is a function of the type, slope, and wave exposure of the shore. The increased tides may have little or no consequence on steep, rocky shores, such as those found on the northern coast of Maine, but in low-lying areas such as beaches and tidal marshes, which are finely tuned to tidal cycles and tide ranges, the changes could be substantial. These consequences are likely to affect a significant number of people living in coastal communities throughout northern New England, and may adversely affect the economies of these communities.

As the move for tidal power grows, further studies will be required to assess the true costs and benefits of developing this resource. While the benefits of tidal power development in the Bay of Fundy may outweigh the costs in the long run, the anticipated environmental modifications could result in legal and political disputes between the United States and Canada analogous to the current acid rain problem and the recently-resolved longstanding Garrison Diversion dispute.

A considerable amount of time and energy has been spent by those involved in foreign relations, law, and political science in developing and subsequently analyzing transboundary pollution law.⁶ Foremost among those laws, although only customary and therefore not binding, are the basic principles established in the United Nations Stockholm Conference on the Human Environment held in 1972.⁷ Two of these principles, Principles 21 and 22, spell out the responsibility of states towards protection of the global environment and seek a coordinated effort at developing liability and compensation regimes for victims of environmental damage caused by activities outside of their jurisdiction. These principles are supported by numerous customary and treaty laws and by a long history of practice. The United States and Canada in their longstanding relationship as neighbors have set many of the standards by which transboundary

environmental damage is viewed and have established an effective forum for dealing with these problems. Yet much still needs to be done if we hope to protect our transboundary environment, help others protect theirs, and ultimately the global environment. It has been said that technology runs very far ahead of lawyers and legislators, so the task is no small one.

Overview

In Chapter II, the history of tidal power is presented along with the development of the proposed Bay of Fundy tidal power project. Also examined are the nature of tides, the oceanography of the Bay of Fundy/Gulf of Maine region, and the projected transboundary impacts of the proposed facility. An update on the current status of the proposals and public reaction concludes the chapter.

An analysis for provisions in existing international law which address the responsibility of States to protect the transboundary environment is found in Chapter III. The Stockholm Convention and supporting customary law are examined, and a discussion of relevant treaty law which obligates States to protect the environment is presented.

In Chapter IV, Canadian and United States environmental legislation is discussed with consideration to those provisions which might be applied to the proposed Fundy situation. These include environmental assessment procedures in each country and, in the United States, the regulation of power inputs. Provincial and state legislation is also briefly mentioned.

Canadian-United States environmental practice is reviewed in Chapter V with a discussion of how disputes have been settled in the past, including an examination of the mechanisms for dispute settlement. The Boundary Waters Treaty of 1909 and the International Joint Commission are presented as the key to United States-Canadian environmental dispute resolution. The recent Garrison

Diversion conflict and current acid rain problem are discussed as examples of the complex transboundary problems which are now in the forefront of public attention. Some analogies between these problems and possible Fundy problems are discussed.

In Chapter VI, the problems with international law and United States-Canadian domestic legislation with respect to protection of the transboundary environment are summarized and some suggestions are made as to how these might be strengthened. This chapter, and the thesis, conclude with a commentary on the Fundy project and the role of the International Joint Commission as an existing successful mechanism for conflict resolution. It is hoped that the further interdependence of nations can be achieved by incorporation of some of the suggestions offered in this thesis.

CHAPTER I NOTES

1. Tidal Power Corporation, "Fundy Tidal Power Update '82," (Halifax, Nova Scotia: Tidal Power Corporation, 1982), p. 6.
2. David Greenberg, "A numerical investigation of tidal phenomena in the Bay of Fundy and Gulf of Maine," Marine Geodesy 2(2), (1979), p. 161.
3. Ibid.
4. Rudolph, R.W. and Larsen, P.F., "Transnational Legal Issues and Fundy Tidal Power," in Proceedings, Coastal Zone '83, Orville T. Magoon, ed., (New York: American Society of Civil Engineers, 1983), p. 819.
5. Peter F. Larsen, et. al., "Preliminary Evaluation of the Environmental Consequences of Fundy Tidal Power Development to the Resources of the State of Maine," Technical Report No. 35 (West Boothbay Harbor, Maine: Bigelow Laboratory for Ocean Sciences, 1983), 113 pp. + appendix.
6. See generally the following publications of the Environment Directorate of the Organization for Economic Co-operation and Development
 - o Transfrontier Pollution and the Role of States (1981)
 - o Legal Aspects of Transfrontier Pollution (1978)
 - o Economics of Transfrontier Pollution (1976)
 also see
 - o James Barros and Douglas M. Johnston, The International Law of Pollution, (New York: The Free Press, 1974)
 - o Gunther Handl, "State Liability for Accidental Transnational Environmental Damage by Private Persons," 74 American Journal of International Law (1980), p. 525-565.
7. Report of the United Nations Conference on the Human Environment, held at Stockholm, June 5-16, 1972, U.N. Doc. A/CONF. 48/14 and Corr. 1, reprinted in 11 International Legal Materials (1972), p. 1416.

CHAPTER II

TIDES AND TIDAL POWER

Tides

Throughout history man has been fascinated by the rhythm of the tides, those diurnal or semidiurnal rises and falls of sea level which are most appreciated along coasts with a substantial range in tidal height.¹ Sir Isaac Newton (1647-1727) was the first to satisfactorily explain the tides with his law of gravitational attraction, although as early as the first century, Pliny the Elder (AD 23-79) of Rome correctly attributed this rise and fall of the oceans to the effect of the sun and moon. Newton's law states that the attraction between two bodies is directly proportional to the square of the distance between them.² Therefore, all celestial bodies affect the oceans to some degree, but it is the sun and moon that are the most important; the sun, because of its large mass, and the moon, because of its proximity to the earth.

The variation in tides is caused by the fact that the gravitational attractions of the sun and moon vary from place to place on the earth.³ Although the atmosphere and even the solid earth are similarly attracted to these celestial bodies, it is only the effects on the oceans that are noticeable to the human eye. The point on earth closest to the sun is most strongly attracted, resulting in a mound of water being formed on this side. Conversely, the point on earth furthest from the sun is least strongly attracted, and water bulges at this point also, as the rest of the earth is pulled away. Although having much less mass than the sun, the gravitational attraction of the moon has a similar effect, but it is its

proximity to earth that makes it the dominant tide-producing force; its pull is more than double that of the sun.

Being cyclical in nature, tides can be predicted years in advance. Simplistically, the deformation at any given time, latitude, and longitude can be calculated by taking into consideration the rotation of the earth along with the moon's orbit. When the moon changes its position so does the orientation of the tide-generating forces and the position of the "equilibrium tide." The concept of an equilibrium tide is used to describe an ideal tide for a theoretical ocean devoid of continents. Modern methods of tidal prediction are much more sophisticated, and take into account some thirty variables altogether.⁴

When all three bodies are lined up, with either the moon and the sun on the same side (new moon), or, on opposite sides of the earth (full moon), the tides reinforce one another, creating the highest tides, referred to as "spring tides." When out of phase, the two forces cancel one another and the tides become progressively smaller, reaching a "neap tide" stage at quadrature (first and third quarters).

The moon is the dominant factor controlling the period and height of the tide. The moon passes over any given location once every 24 hours, 50 minutes, and the elapsed time between successive high or low waters is called the tidal period, typically 12 hours and 25 minutes. In some places, this tidal period occurs only once in an earth day (diurnal), but in others it may occur twice (semidiurnal).

Tides in the Ocean

Astronomical forces act primarily on large bodies of water (i.e., the oceans) and the tidal response of the open ocean forces the tides in the less deep, adjacent coastal waters. Each ocean basin responds to tidal forces in a different way due to their different shapes and sizes. Meteorological effects created by high- and

low-pressure systems may also create their own tidal responses. Tidal responses in a basin follow these general rules:

1. If the characteristic period of the standing wave in a basin is short, relative to the period of the tide-generating forces, there is sufficient time for the water level to be displaced in step with the tide-generating force. In such a basin, an equilibrium tide would exist.
2. If the characteristic period of the standing wave is very long relative to the period of the tide-generating force, there is insufficient time for the water level to keep step with the tide-generating forces, and tides are small and reversed. In other words, low tide occurs when high tide would have been predicted and vice versa.
3. When the characteristic period of the standing wave in a basin is nearly the same as the tide generating forces, high and low tide occur about when predicted, but the height of the tide is much greater than expected. The closer the correspondence between the two, the higher the tides. [This will be shown to be the key element to understanding the Gulf of Maine/Bay of Fundy projections.]⁵

Finally, while only the rise and fall of water has been mentioned here, another manifestation of this same cyclical phenomenon are the tidal currents which accompany the changing water levels. Therefore, these are also important considerations when discussing any projected alterations in the tidal regime.

Tidal Power Development

Early History

The concept of harnessing the energy of the tides has existed for centuries. Early records indicate that tide mills were being worked along the Atlantic Coast of Europe by the 11th century. One such installation in the Deben estuary in Great Britain was mentioned as early as 1170.⁶ Remains of tidal mills have been found among estuaries and inlets along the coasts of Brittany, England, and Spain.

The use of tidal power was not unique to Europe however, and in North America tide mills were also common, especially in northern New England. Tide mills were built where a cove or salt marsh creek could be dammed so as to make a basin in which the water could be kept near the high tide level. This allowed operation for about six hours of the lower stages of each of the two daily high

tides. In the early years of settlement, and extending well into the nineteenth century, small coastal communities of New England used these tide mills to grind grain and saw wood for the local populace.⁷

While tide mills were generally scarce south of Cape Cod, one tidal mill was built in Brooklyn, New York as early as 1636, and another facility in Rhode Island used impressive twenty-ton wheels, eleven feet in diameter and twenty-six feet in width.⁸ At Boston, tide mills were a principle source of energy.

A tide mill at South Harpswell, Maine, on Casco Bay was built in 1867 and is said to have been the largest in the State of Maine and probably on the Atlantic coast. The mill depended on a head created by damming Basin Cove, a basin about two miles in length, near the mouth. Corn was shipped from New York to Portland and then transhipped to South Harpswell, where the mill operated about twelve hours a day at an equivalent of 6,000 horsepower and ground some 50,000 bushels of grain annually. Rail transportation and the advent of steam power rendered the operation unprofitable and it closed in 1885.⁹

Modern History of Tidal Power

While the age of engines and inexpensive fossil fuels spelled doom for the practice of tidal energy, interest in developing tidal resources is now being renewed as uncertain markets for non-renewable fossil fuels have caused energy costs to rise. The need of many nations to become less dependent on imported oil as a source of energy, along with increasing concern about the safety of nuclear power has led to a growing interest in alternative sources of energy. This is particularly true in northeastern North America where a relative scarcity of indigenous energy resources exist.

Where oceanographic conditions are favorable, large scale tidal power development can be considered a technically viable form of energy. The advantages that tidal power has over conventional energy sources are numerous.

Unlike conventional hydropower, tidal power is not influenced by seasonal water levels, floods, or droughts. While most operational modes only produce power on an intermittent basis, necessitating integration of tidal power facilities with other systems, power production is predictable years in advance. Since water is the source of power, problems associated with fuel acquisition and waste product disposal are avoided. Tidal power plants operate on the continuously varying differences in levels between the water in the basin on the landward side of the development and the water in the sea. The basin must be filled from the sea or emptied to the sea as required by the operating mode of the power plant so that production can be coordinated with the load curve of the power network with which it is interconnected.¹⁰

There are generally considered to be somewhere between twenty-five and fifty sites throughout the world which are suitable for tidal power development (see figure 1). This lack of suitable sites is related to the two criteria which must be satisfied for development to be considered practical. First, a tidal range large enough to produce a sufficient head must be present. Second, the area to be impounded should be large, while its connection to the sea should be relatively narrow to minimize construction costs. Until recently, a 240 MW tidal plant built in the mid-1960s on the Rance Estuary in France by the National French Electric Company was the only major tidal power facility in operation. A small .4 MW plant has been operating in the Soviet Union since 1968, and a number of smaller projects exist in China with an aggregate capacity of about eight megawatts.¹¹ The South Korean government is currently spending three million dollars developing plans for a 450 MW inner basin plant and an 810 MW outer basin plant at Asan Bay.¹² The British are presently continuing their evaluation of a project on the Severn Estuary, and have already completed extensive environmental

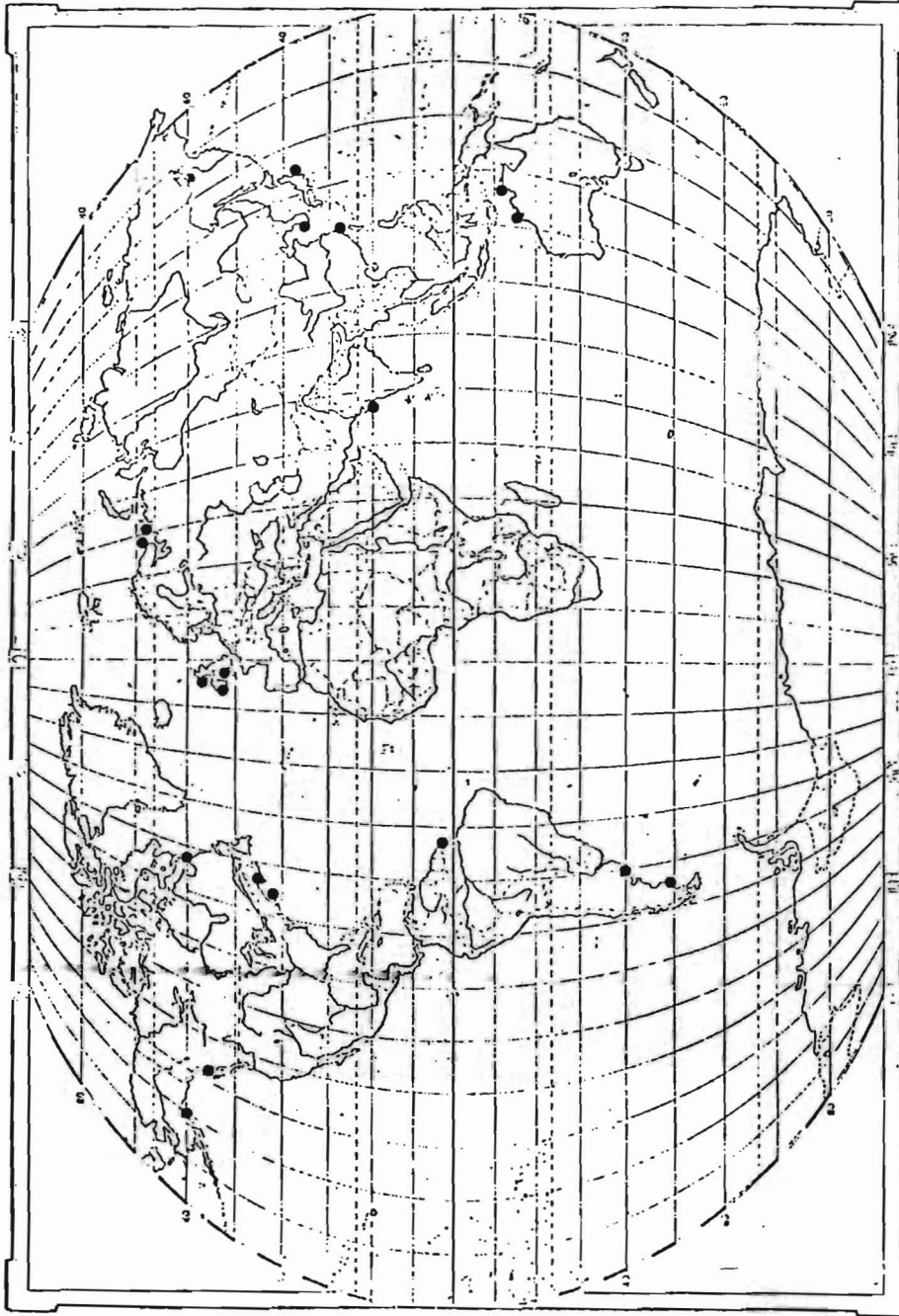


Figure 1. Principle potential sites for harnessing tidal energy

studies. Other sites in this area are presently being examined along the coasts of Brittany and Normandy.

Worldwide, other areas which have been considered for large-scale tidal power plants include the Gulf of San Jose in Argentina, the Schelde Estuary in the Netherlands, the north coast of Brazil, and sites in Germany, Portugal, Pakistan, Australia, and New Zealand.

North America

In the United States, two regions are considered especially appropriate for large-scale tidal power projects.

In the western United States, the Knik Arm and Temagen Bay in the Cook Inlet area of Alaska are considered the best areas for tidal power development. However, interest in tidal power development here is not being given serious consideration as ample quantities of other traditional regional energy resources (hydro, oil) exist in the region to meet current and projected demands.

In the Gulf of Maine-Bay of Fundy region (see figure 2), however, interest in tidal power development is high at the moment. There are at least three projects being studied on the United States side of the border. The Passamaquoddy Indian Tribe has done extensive studies on the potential for a 12 MW tidal unit on their reservation in Perry, Maine. The United States Army Corps of Engineers is also examining the Cobscook Bay area and is considering several possible tidal dam configurations and operating modes.¹³ This area has undergone studies before, and considerable interest was generated previously during the FDR administration. Further south, a very small, private initiative is underway on Vinalhaven Island in Penobscot Bay, and, if construction begins as planned, could result in the first active tidal power plant in the United States.¹⁴ In addition, the State of Maine has recently surveyed its shoreline to establish its cumulative tidal power potential.

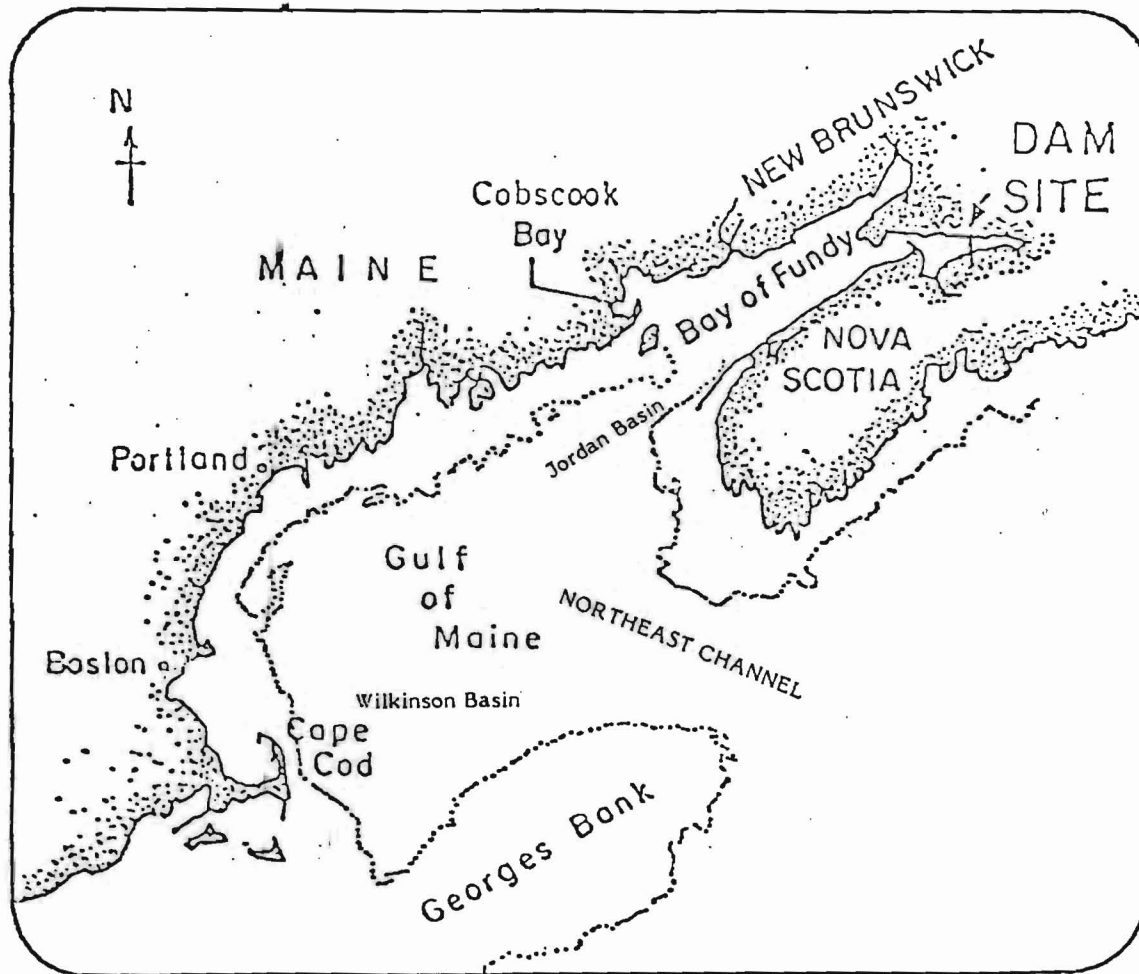


Figure 2. The Gulf of Maine-Bay of Fundy region

The Bay of Fundy Proposal

The highest tides in the world are known to exist in the upper Bay of Fundy. Therefore, it is not surprising that tidal power interest should be focused here. The first tidal power plant in the western hemisphere came on line at Annapolis Royal, Nova Scotia in the summer of 1984. This project, designed to demonstrate the utility of a Straflo turbine in the marine environment, consists of a 20 MW low-head turbine fitted into a pre-existing barrage. Construction costs using this type of turbine are 10-15% less than those associated with more conventional low head turbines. Therefore, it is expected that the success of this pilot project could have a significant impact on the feasibility of larger scale developments. Several sites for large scale tidal power developments have been studied in the upper Bay of Fundy in the past, but for the last few years extensive and intensive technical, economic, and environmental consideration has been directed at one site, in particular, designated B9, in the Minas Basin (see figure 3). This site is now considered the most likely for large scale tidal power development and its construction is being advocated by both private and governmental concerns in Nova Scotia.

Selection of the Minas Basin Site

In 1969, the Atlantic Tidal Power Programming Board, a quasigovernmental body, concluded that tidal power development in the Bay of Fundy was not economically feasible under the existing conditions, but, that it might be if (1) interest rates dropped; (2) a breakthrough occurred in construction costs or turbine costs; (3) pollution abatement requirements magnify the costs of alternative sources; or (4) alternative sources become depleted.¹⁵

By 1972, sufficient changes had occurred in these factors and a major evaluation study was instituted by the governments of Canada, New Brunswick, and Nova Scotia. The report, released in 1977, showed that at least two sites--B9

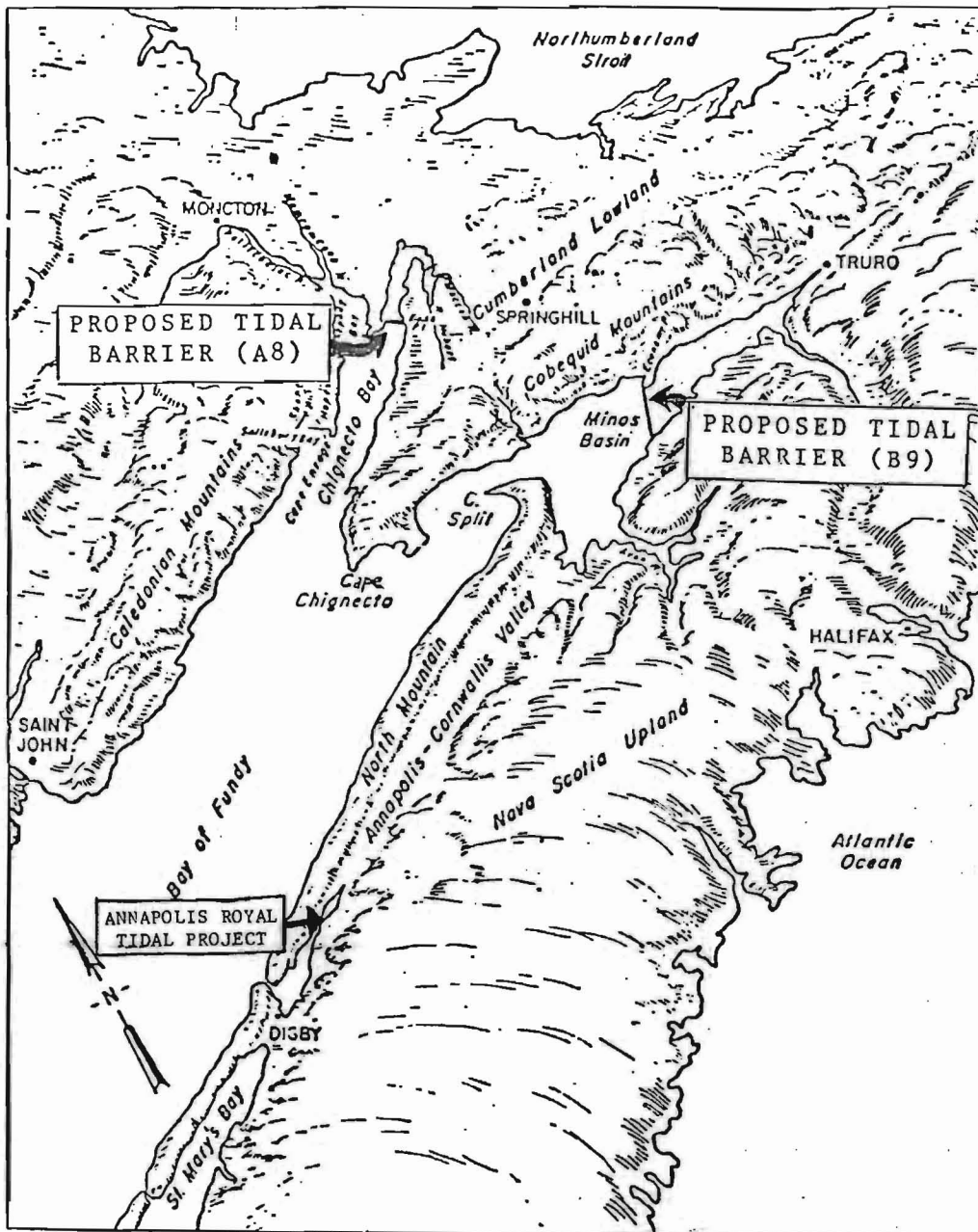


Figure 3. Location of proposed tidal facilities in the Bay of Fundy

in Minas Basin and A8 in Cumberland Basin (see figure 3)--had a benefit-cost ratio of 1.2, and, therefore, were approaching economic viability.¹⁶ Since that time, technology, energy regulation policies, and energy costs have changed even further and the interest and support for tidal power development has also shifted from New Brunswick to Nova Scotia. The need to raise capital has turned attention from the Cumberland Basin site, the one preferred by the 1977 study, to a larger Minas Basin facility which could produce excess power for export and encourage United States investment.

An update of the economic portions of the 1977 report was funded in 1981. This report, "Fundy Tidal Power Update '82," contains the most favorable economic forecast for tidal power to date, based on (1) the increased cost of alternative sources of energy (specifically, the Update used displaced fuel costs in its analysis); (2) changes in marketing strategies, which includes export of most of the energy to the United States; and, (3) design changes, principally in turbine design and construction procedures.¹⁷

Cost/Benefit Analysis of the B9 Barrage

While the typical benefit/cost ratio for hydroelectric projects which are considered good investments by the United States Government is 1.5,¹⁸ the Canadian Tidal Power Project is expected to return somewhere between \$2.45 and \$3.00 for every \$1.00 invested. These calculations are based on "an arbitrary but reasonable, allocation of 10% to the Maritimes, 45% to New England, and 45% to New York".¹⁹ The variability between projected benefits is principally due to different construction methods. The majority of this savings is expected to be in the area of saving of fuel costs, and, even under a worst case scenario which assumed no escalation of fuel costs after 1981, the benefit/cost ratio for the B9 site was still 1.29/1. Thus B9 would retain a margin of profitability even if the

real value of fuel remained at 1982 levels in 1995 (projected start up date) and for 75 years beyond.²⁰

Financial Feasibility

Two forms of financing were considered in the Tidal Power Update. The first involved investment by a single company and the second by a joint venture. Projections were made for both cases under the assumption of 10% inflation from 1981 to the commissioning date (January 1, 1995). An interest rate of 15.23%, corresponding to a 4.75% real interest was used.²¹ Using this method, capital budgeting decisions are determined by market forces in the period in which the outlays are made, thus allowing for a more accurate estimate.

The capital costs using either form of financing are high, with the joint venture showing slightly lower costs of \$21.4 billion as compared to \$23.1 billion for the single company. These amounts include the cost of transmission facilities. While these costs might appear to preclude any serious consideration of the project, it is expected that, under a wide variety of operating conditions, that these capital costs could be recovered in a period of 10 to 20 years after commissioning.²² Still, the securing of such large amounts of capital appears to be the principal obstacle to overcome before construction of the barrage begins.

Description of the Proposed Project

There are three basic elements in the construction of a tidal power plant. First, there must be a powerhouse or some type of setting for the generating units (turbines). Secondly, there need to be sluiceways with gates for filling or emptying of the controlled basins. Thirdly, dikes are needed as closures between the power houses and the sluiceways (see figure 4).²³

Tidal power facilities can operate on either the flood tide, the ebb tide, or both. In a single-effect scheme, power is generated only by the water flowing in one direction, either on the incoming tide or the outgoing tide. The optimum

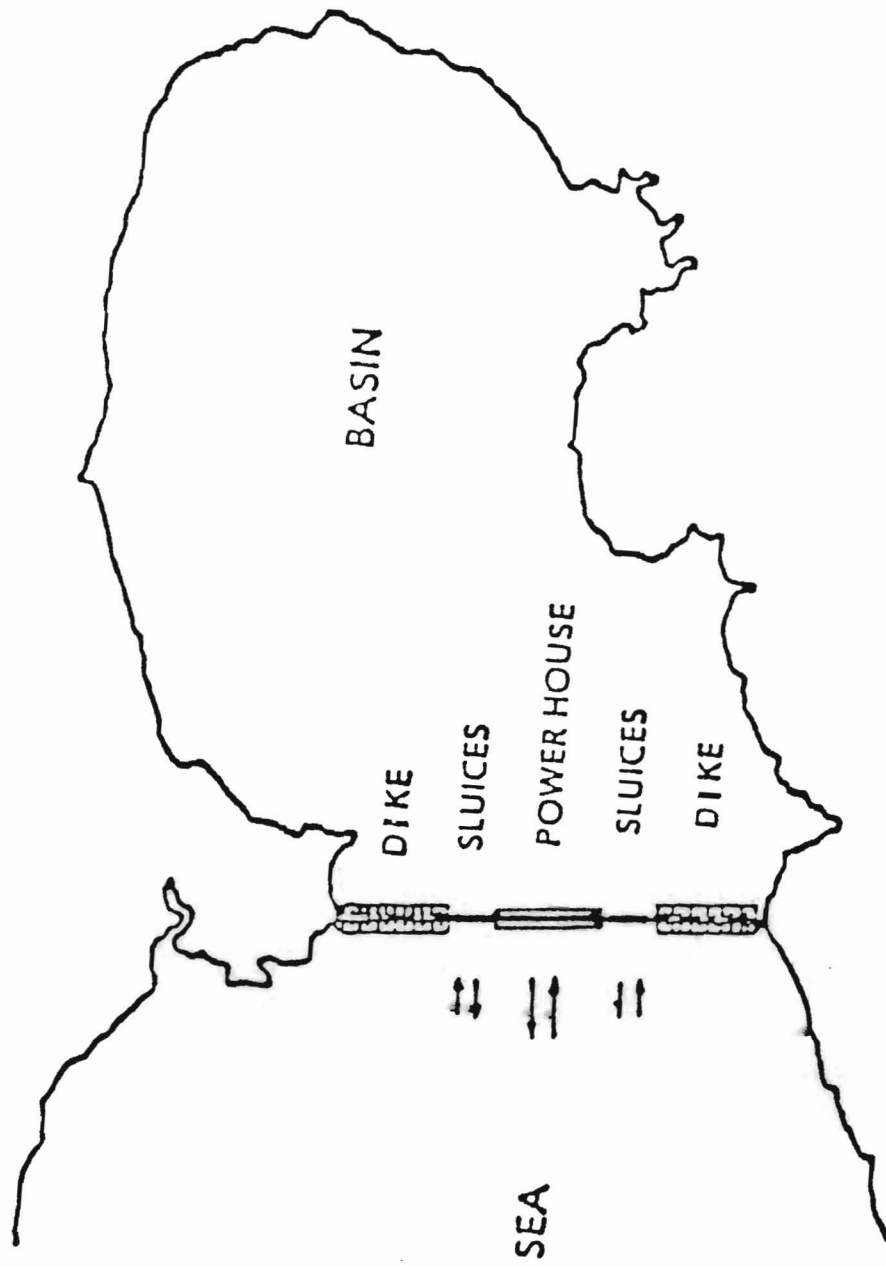


Figure 4. A single basin tidal power layout

scale of the single-effect tidal-generating station proposed for the Minas Basin, calls for 106 turbines, with a total capacity of 4,028 MW, and 60 sluices (see figure 5).²⁴

The current design calls for using caissons to replace much of the originally proposed dike system. These caissons include powerhouses, permanent sluices, concrete cribs with temporary water passages, and cribs which allow no water to pass. The short remaining gaps can be closed by dikes located for the most part on flats which are dry at low tide. Therefore, dikes can be completed by normal concrete dumping procedures within a few months of placement of the last caisson.

Large differences in water levels between the basin and the sea must be avoided in the period before permanent closure in order to keep current velocities down. The proposed design uses cribs with temporary water passages to serve as sluices until the final closure, and therefore, minimize this problem. It should be noted that any design plans are not definite at this time, although this design appears to be the preferred one, and which all subsequent calculations have been based upon.

Physical Oceanography of the Gulf of Maine-Bay of Fundy

The Gulf of Maine is basically a rectangular basin. It is bounded by the Maine and New Brunswick coasts on the west, the continental shelf on the east, Cape Cod on the southwestern edge, and the Bay of Fundy and Nova Scotia to the north. The seaward portion of it encompasses Georges Bank, where depths are as shallow as a few meters. The Northeast Channel leading into the Gulf from the continental shelf is up to 360 meters deep in places. This channel leads into two basins: the Wilkinson Basin, northeast of Cape Cod, and the Jordan Basin, southwest of the entrance to the Bay of Fundy (see figure 2). The main body of the Bay of Fundy lies in the northeastern section of the Gulf of Maine, and is

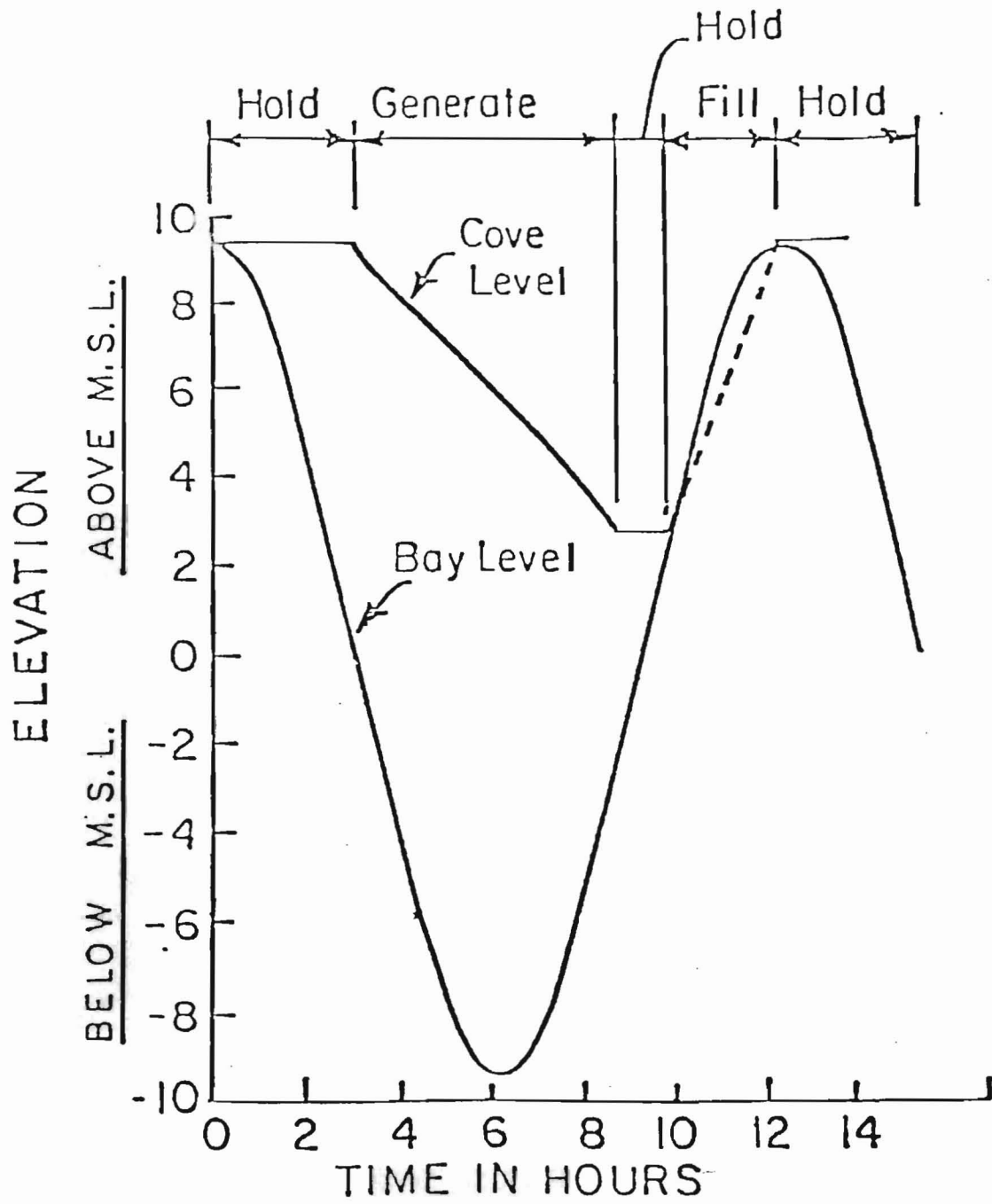


Figure 5. Operating phases of a single effect, high pool tidal power facility

about 170 km long. Its width varies from about 48 km at Cape Chignecto to 70 km as it opens out into the Gulf of Maine (see figure 3). The depths along the center line of the Bay decrease gradually from 180 meters near the Gulf of Maine to 40 meters at the head where it divides into Chignecto Bay and Minas Basin.²⁵

Tides in the Gulf of Maine/Bay of Fundy

The tides in the Gulf of Maine/Bay of Fundy (hereafter designated GOM/BOF) system are controlled by the tides on the open ocean boundary along Georges Bank. The tidal range in the Bay of Fundy varies from 9 meters near the mouth to a maximum of 15 meters at the head. Physiographic features of the Bay play a very important role in the amplification of its tides. The unique tidal response of the GOM/BOF system is, in part, due to its separation by an abrupt change in depth from the main body of the Atlantic at the edge of the continental shelf. Here, the water changes in depth from 2,000 meters to 200 meters from one side of the shelf to the other. As the heads of the Bay are approached, the dual lateral and vertical convergence results in an amplification of some 30-40%.

The Bay of Fundy tides are semi-diurnal with two high waters and two low waters each with approximately the same height. The interval between the transit of the moon and the occurrence of high water is nearly constant, and, as a result, the tides are extremely regular with two tides of nearly the same magnitude and pattern occurring each lunar day (24 hours and 50 minutes). It takes 12 hours 25 minutes for the oceanic lunar tide (designated M) to complete a cycle from one high tide to the next. The natural oscillating period of the GOM/BOF system is approximately 13 hours. This similarity in tidal periods leads to a resonance effect in which large oscillations in sea level occur.

The Greenberg Model

Dr. David A. Greenberg of the Bedford Institute of Oceanography in Nova Scotia, has studied the GOM/BOF tidal regime and the effect that tidal power

development would have on it for over a decade. A recent paper, "A Numerical Model Investigation of Tidal Phenomena in the Bay of Fundy and Gulf of Maine" updates his earlier work.²⁶

Tidal modelling is extremely difficult due to the large number of variables involved. Greenberg's model uses equations of continuity and motion through a grid with progressively smaller mesh size from the lower Gulf of Maine to the Upper Bay of Fundy, and takes into consideration such variables as Coriolis acceleration and quadratic friction terms. It is expected that if the dimensions of the Gulf of Maine system were altered (as they would be by the construction of a barrier for the purpose of hydroelectric power development), the tidal regime would also be altered. The barriers would reduce the size of the GOM/BOF tidal basin, and, therefore, the free period of the system. Since the existing free period of the system is nearly resonant and slightly greater than the natural oscillating period, the barriers would be expected to cause an increase in tidal range throughout most of the system. In order to evaluate such effects, Greenberg ran his calibrated numerical model with some modifications to simulate the changes due to proposed barriers. His model showed an increase in tidal range for the Maine coast of less than 10 cm for the A8 site, but increases of 28 cm and 30 cm (roughly a 10% increase in tidal range) at Portland Harbor and Boston, respectively, are expected with a barrier at the B9 site (see figure 3).²⁷ Other tidal modellers and oceanographers have evaluated the Greenberg model and are in general agreement with his predictions.

As the hydroelectric facility will be constructed over a period of time, this increase is expected to occur gradually over a period of approximately five years, although one scientist suggests that the tidal change could occur rapidly, as the final closure is put in place.²⁸

As tidal range is increased, tidal currents are also expected to increase as larger volumes of water are moved. While it is even more difficult to predict what these increases may be, current changes might be expected to be on approximately the same order as those for tidal range (i.e., about a 10% increase).

Sea Level Rise

These predicted changes are expected to occur within a time-frame when the New England coast is experiencing a natural rise in sea level. Sea level data derived from tidal records obtained over an approximately 50-year period for the coast of Maine indicate a mean sea level rise of about 3 mm per year,²⁹ and it should be kept in mind that any projections due to construction of the tidal barrier are only valid in the long term average, as annual and monthly sea level variations on the order of 3 cm (plus or minus) are not unusual for the New England coast.

Many scientists have predicted that in the near future, increases in sea level rise, worldwide, should be expected due to global warming trends and thermal expansion of the oceans.³⁰ However, these projections are anticipated as occurring over a much longer time frame than the one which is anticipated with the construction of the tidal power facility.

Anticipated Effects of Tidal Regime Alterations

Concerned with the consequences that a tidal change might have on the coastal resources of Maine, the Maine State Planning Office funded a small grant in 1982 to researchers working at the Bigelow Laboratory for Ocean Sciences in West Boothbay Harbor, Maine, to determine just what the effects of a 30 cm tidal alteration might be to the State of Maine. Although these effects are expected to be felt in Massachusetts and New Hampshire as well, the study was concentrated on Maine. This study attempted to take into consideration all of the major areas of concern, and although many of the findings were preceded by caveats explaining the imperfect scientific knowledge involved, a number of areas were

addressed with some degree of certainty. A summary of the more significant findings as discussed in the report by Larsen, et al., entitled "Preliminary Evaluation of the Environmental Consequences of Fundy Tidal Power Development to the Resources of the State of Maine,"³¹ (hereafter referred to as the Bigelow Report) are as follows:

Physical and Biological Consequences

1. Expansion of the intertidal area. On a slope of 1^o, intertidal areas would be expanded to the extent that a 30 cm increase in tidal range would increase the intertidal zone by almost 18 meters and push land borders back by approximately 9 meters. 1,700 acres of salt marsh may be added to Maine's existing 17,000 acres, as very small slopes are found here.
2. Restructuring of biological communities. Redistribution can be expected as there is a change in transition between the upper and lower salt marsh area. This may possibly cause some interference with shorebird activities. In the short term, biological populations can be expected to be displaced due to tidal influence as alteration does not provide sufficient time for sedimentary processes to occur.
3. Increased area for sea ice formation. The area on which ice can form increases with the expansion in the intertidal area. While ice provides protection from erosion by waves in winter, during the spring, there could be considerable erosion as blocks of Spartina are ripped up and rafted seaward. Rapid erosion can be expected in the short term as the shore attempts to stabilize.
4. Increased tidal prism of estuaries. This is a factor controlling the mixing of fresh and saline waters. In large, wide-mouthed estuaries, this effect is not expected to be significant, with the exception of some very special cases (e.g., Merrymeeting Bay, New Hampshire, a mostly freshwater estuary, where salt intrusion may change the ecological balance). Small-mouthed estuaries could experience a somewhat significant increase in flushing characteristics and, possibly, the reduction of sedimentation rates.
5. Groundwater hydrology. There is an increased likelihood of salt water intrusion into coastal wells. Areas that are now experiencing difficulties may experience greater problems.
6. Inlet stability. An increased tidal range would result in an increase in the cross-section area of an inlet. If the inlet is natural, erosion would proceed along its banks until an equilibrium is reached; if the inlet is fixed by jetties, then the channel would become deeper in response to the increased volumes of water moving through it.³²

Consequences of Higher High Tides

The Bigelow Report goes on to present some possible implications of increasing the high tide range:

1. Landward movement of high tide line/submergence. About 4,200 acres of land are expected to be lost in Maine in a narrow strip of land bordering the coast.
2. Landward movement of beach profiles/erosion. No great changes are anticipated at any one moment, but in the long-term, an increase in the net rate of beach erosion might result from the new tidal range.
3. Increased penetration of storm surges and coastal flooding. The Fundy project could increase the number of damaging storms which affect the coast by 2.5 times. With an increase of tidal amplitude of 15 cm, a 100-year storm becomes what is now classified as a 300-year storm, a 50-year storm becomes a 200-year storm, and so forth. Changes will be determined by changes in the coastal storm surge level, assuming the storm is coincident with at least one high tide. Low-lying areas will be flooded more often.³³

Consequences of Tidal Current Changes

The Bigelow Report addresses those changes which might be expected as a result of tidal current changes. Basically, these can be divided into those associated with horizontal currents and vertical currents.

Horizontal Fluxes

1. Effects of increased current on ice formation, accumulation, and transport. Increased current could result in decreased ice formation in channels and a longer "ice-free" season, allowing for a longer period where boats can be used. On the negative side, there could be greater ice movement and potential for damage from drifting chunks.
2. Reduced retention of larvae and sexual products of marine organisms. Plankton will be more greatly dispersed, and their retention within estuaries will be decreased. On the other hand, this may allow new areas to be colonized.
3. Dispersal of subtidal shellfish beds. There may be a possible dispersal of these beds so that adults may be less concentrated and therefore, more costly to harvest.
4. Development and spreading of red tide blooms. Stronger bottom currents will tend to increase the frequency and distribution of these toxic dinoflagellate blooms.³⁴

Vertical Fluxes

1. Increased mixing depths of surface waters. Greater vertical mixing in summer could bring colder water to the surface and lower surface water temperatures. This mixing may result in destratification, or possibly just an increased mixing of bottom waters.
2. Altered meteorological conditions. If surface temperatures change, corresponding changes in the atmosphere--increased fog and stronger onshore breezes--might be expected.
3. Growth and reproduction patterns of biota would be affected by temperature changes, although this will vary between species.
4. Altered fish migration patterns. For example, bluefish which enter the northern Gulf of Maine waters sporadically when summer water temperatures are high may be affected by even a slight change in temperature.
5. Altered fouling community activities. Temperature changes could increase the abundance and rate of growth of some species such as barnacles, while others, which can not tolerate low temperatures (shipworms), may decrease in abundance.
6. Vertical transport of water borne substances. Dissolved substances released to the water column will diffuse quicker.
7. The supply of nutrients to surface waters will increase, with subsequent effects on productivity.
8. Transport of pollutants to bottom sediments. Some pollutants will be transported to the bottom faster. Greater dilution rates, while considered a benefit, could be offset by quicker dispersion of pollutants reaching a much greater area. Increased bottom turbulence could maintain finer particulates, such as oil, in suspension longer than normal.³⁵

In summary, response of the biota to physical changes can be expected to vary with time. Readjustment periods can be expected, but will differ between the various species. In the short term, significant alterations in production, growth, and distribution of species could be felt. In the long term, however, biotic changes may be insignificant. Some species of marine organisms will increase, some will decline, and others will experience no dramatic impact whatsoever. Even subtle alterations are likely to be felt by many species, however.

Socio-economic Consequences

The Bigelow Report also considers a number of areas which would directly impact on man and his use of the coastal zone.

1. Coastal structures. The long-term effects on coastal structures are expected to be negative. Structures immediately adjacent to the shore will be undermined. The amount and frequency of damage during storms from flooding will be increased. For example, a 100-year flood occurrence could become a 25-year flood occurrence.
2. Federal Flood Insurance Program. Flood insurance rate maps will need to be redone.
3. Property values. Estimates using the figures of 4,200 acres of lost territorial land, at an average value of coastal property of \$3,000/acre would result in a loss of over \$12 million. State and local governments would lose this property tax.
4. Tourism. Maine's already limited beach belt area would be most greatly affected. There would be a smaller sand beach area above high tide, and the undermining of coastal structures could result in increased deposition of unwanted debris on beaches. Where there are no seawalls, the landward movement of water would proceed until a new equilibrium is reached, then some beach areas may actually become slightly larger. Where seawalls exist, there could be a permanent loss of the high tide beach area. Increased fog could result in decreased recreational beach use, with loss of revenues to Maine from state-owned beaches, and similarly, losses to coastal communities dependent on the tourist dollar. Swimmers will be faced with strong currents, and although recreationists who sail and canoe could be benefited by these stronger currents, they will be hampered by the increased fog. Maneuvering of motorboats will be affected by increased currents.
5. Low-lying roads will be washed out more frequently, perhaps necessitating their reconstruction.
6. Archaeological and historic sites. Coastal erosion is considered the worst threat to Maine archeology currently. Some 700 coastal shell heaps may be lost.
7. Sanitary and storm sewer outfalls. High tide may cause effluent to back up in sewer systems. Some of Portland's combined sewer outfalls currently experience problems at high tide now.
8. Boat ramps may need to be rebuilt to accommodate greater tidal ranges.
9. Shoreland access. The opportunity for greater access to a larger intertidal area can be considered a benefit.

10. Property boundaries. There will be a need to reconstruct municipal property maps, or at least reassess coastal property values.
11. Search and rescue. A larger area will need to be searched as a result of stronger currents. Fog may also hamper these efforts.
12. Pollution abatement. In the overall, the increased dispersion of pollutants resulting from increased currents can be considered a benefit. However, in some cases such as oil-spill containment, increased currents will adversely affect pollution control.
13. Navigational markers, moorings, and floats. These may have to be relocated, more securely moored, and may require more frequent maintenance.
14. Nautical charts, tidal charts, and current predictions will need to be changed.
15. Shellfishing, worm and mussel harvesting might all benefit from an increase in new habitat areas.
16. Fin fishing. An increase in 5-10% in tidal current strength could limit or curtail the capacity to fish, especially during spring tides, as greater horsepower will be needed.
17. Marine transportation. Stronger currents will cause costs to go up when operating against the currents, while conversely reducing costs of operating with the currents. There may be problems with maneuverability in close basins. Lower low tides will have an impact on the accessibility to docking and mooring areas.
18. Other structures such as breakwaters and jetties will require design modifications. Bridges and coastal railways may also require design changes. Some underground utilities and transmission lines may be affected. Minor coastal facilities such as boardwalks, parks, and trails are likely to be affected.³⁶

Most of the socioeconomic consequences of an altered tidal range are considered, at this point, to be costs. It is hard, if not impossible, to put a dollar value on each of these items in any preliminary analysis and any cost/benefit model would be subject to great criticism.

Recent History of the Fundy Project

Subsequent to the release of the Bigelow Laboratory report, an increased amount of public attention has been focused on the tidal power proposal. In July of 1983, U.S. Senator George J. Mitchell (D-Maine) convened a public hearing of the Senate Committee on Environment and Public Works in Augusta, Maine, to

take testimony on the matter.³⁷ Subsequent to this hearing, Senator Mitchell introduced legislation to have the Army Corps of Engineers undertake further environmental studies of the possible United States impacts of Fundy tidal power development. Senate Bill 1739, requests that the Secretary of the Army after consultation with appropriate governmental agencies undertake studies to identify potential United States impacts of Fundy tidal power development which include determining mitigation measures, and to submit such studies to the appropriate committees of the Congress. This bill, which also includes appropriations for a number of large public works projects for improvements to rivers and harbors of the United States, is currently Senate Bill 1567 and still awaits Congressional approval.

In May of 1984, the Fundy tidal power issue was discussed at the First Annual Bilateral Symposium on New England/Eastern Canadian Affairs held in Providence, Rhode Island. Several events during August 1984 focused public attention on the issue. On August 6, a major article appeared in the New York Times on the Fundy tidal power matter;³⁸ and, on August 25, the Annapolis Royal prototype plant was opened and officially became the first operating tidal power plant in North America.³⁹

As an increasing portion of the U.S. public became aware of the possible impacts, the state and federal governments in the United States have been drawn to the issue. These agencies which are now involved in the matter include the Governor's offices of the New England states and state coastal management, fisheries and energy officials, the U.S. Army Corps of Engineers, the Fish and Wildlife Service, NOAA, the Department of Energy, EPA, and the Federal Emergency Management Agency.

Recently at their June 1985 meeting, the New England Governors and Eastern Canadian Premiers resolved to bring the issue before the Secretary of

State and Minister of External Affairs for possible reference to the International Joint Commission.⁴⁰

In light of what the author and others therefore perceive as the potential for some significant environmental consequences and potential conflicts, it is important to examine the proposed Fundy project from a legal viewpoint. The following chapter examines the issue of transboundary environmental impacts in the international law framework.

CHAPTER II NOTES

1. Rhodes W. Fairbridge, ed., Encyclopedia of Oceanography (New York: Van Nostrand Reinhold Co., 1966), p. 913.
2. M. Grant Gross, Oceanography (Columbus, Ohio: Charles E. Merrill Publishing Co., 1971), p. 111.
3. Fairbridge, p. 917.
4. Tidal Predictions Office - National Ocean Survey, telephone interview, 20 June 1983.
5. Gross, p. 114.
6. F. Lawton, "Tidal Power in the Bay of Fundy," in Tidal Power, eds. T.S. Gray and O. Gashus (New York: Plenum Press, 1972), p. 3.
7. Alfred Clarence Redfield, The Tides of the Waters of New England and New York (Woods Hole, Mass: Woods Hole Oceanographic Institution, 1980), p. 79.
8. Brigitte Denaiux, "Tidal Power Generation in the French Bay of Mont-Saint-Michel: Possibilities and Problems," in Marine Affairs Journal 2 (Kingston, Rhode Island: University of Rhode Island, 1974), p. 98.
9. Redfield, p. 30.
10. Lawton p. 45.
11. Jacques Constans, Marine Sources of Energy (New York: Pergamon Press, 1979), p. 121.
12. Young, C. Kim and Orville T. Magoon, "Coastal and Ocean Resources for Energy Development," in Coastal Zone '85 ed., Orville T. Magoon, (New York: American Society of Civil Engineers, 1985), p. 2191.
13. Peter F. Larsen, et al., "Preliminary Evaluation of the Environmental Consequences of Fundy Tidal Power Development to the Resources of the State of Maine," Technical Report No. 35 (West Boothbay Harbor, Maine: Bigelow Laboratory for Ocean Sciences, 1983), p. 16.
14. Ibid.
15. Ibid., p. 22.
16. Tidal Power Corporation, "Fundy Tidal Power Update '82," (Halifax, Nova Scotia: Tidal Power Corporation, 1982), p. 5.
17. Larsen, et. al., p. 23.
18. Telephone interview, Bob Kensal - United States Army Corps of Engineers, 16 June 1983.

19. Tidal Power Corporation, p. 5.
20. Ibid.
21. Ibid., p. 6.
22. Ibid.
23. Lawton, p. 35.
24. Tidal Power Corporation, p. 17.
25. Atlantic Provinces Council on the Sciences, "Workshop on the Marine Environmental Consequences of Tidal Power Development on the Upper Reaches of the Bay of Fundy," (Moncton, New Brunswick: University of Moncton, 1972), p. 47.
26. David Greenberg, "A Numerical Investigation of Tidal Phenomena in the Bay of Fundy and Gulf of Maine," in Marine Geodesy 2 (2), 1979, p. 161.
27. Ibid.
28. Larsen, et. al., p. 30.
29. Ibid.
30. Jon Hoffman, "Projecting Sea Level Trends to the 21st Century," in Coastal Zone '83, Orville T. Magoon, ed. (New York: American Society of Civil Engineers, 1983), p. 2785.
31. Peter F. Larsen, et. al., "Preliminary Evaluation of the Environmental Consequences of Fundy Tidal Power Development to the Resources of the State of Maine," Technical Report No. 35 (West Boothbay Harbor, Maine: Bigelow Laboratory for Ocean Sciences, 1983).
32. Ibid., p. 32.
33. Ibid., p. 49.
34. Ibid., p. 59.
35. Ibid., p. 62.
36. Ibid., p. 77.
37. U.S. Senate, "The Effects of the Proposed Tidal Hydroelectric Project in the Bay of Fundy," hearing before the Committee on Environment and Public Works, United States Senate, 98th Congress, July 25, 1983, Augusta, Maine (Washington, D.C.: Government Printing Office, 1983).
38. Fox Butterfield, "Nova Scotia Dam's Effect on Coast Ecology Feared," in New York Times, August 6, 1984, p. A10.

39. George C. Baker and Robert W. Knecht, "Fundy Tidal Power," in Proceedings Coastal Zone and Continental Shelf Conflict Resolution: Improving Ocean Use and Resource Dispute Management (Cambridge, Massachusetts: Massachusetts Institute of Technology, 1984), p. 7.
40. Steve Coleman, New England Governor's Conference, telephone interview, July 8, 1985.

CHAPTER III

INTERNATIONAL LAW RELEVANT TO THE PROPOSED PROJECT

Defining Transboundary Degradation or Pollution

A key assumption of this thesis is that these projected tidal effects or at least some of them can be considered a form of transboundary environmental degradation or "pollution." Assuming this to be the case, the viability of the Minas Basin endeavor should be viewed in part with respect to current international and domestic laws which address transboundary environmental impacts. While the concept of enhanced energy (i.e., increased tidal currents and range) inputs may not appear to fit the classic definition of what most people perceive as "pollution", per se, there is some evidence to suggest that in evolving law, at least in an international sense, these forms of energy as opposed to those energy inputs more traditionally accepted (e.g., heat from cooling plants) may indeed qualify as a form of environmental degradation or pollution, assuming there are deleterious effects associated with them.

The term "pollution" has been defined in many ways, ranging from Webster's New Collegiate Dictionary (1979) definition as the "emission of semen at times other than coitus" to those that historically have come to define the word in environmental terms. While early definitions used some measures of chemical contamination to define what was meant by pollution of the environment, the past two decades have seen an expansion of this definition to include any change(s) which might adversely alter the environment. Champ, in writing on the etymology of "pollution" in a recent article states that "the variety of usage is

derived from the perspectives of (1) chemists: presence of contaminants, (2) biologists and ecologists: effects on organisms and on ecosystems, and (3) policy or decision makers: impairment of water use or benefit (resource value)."¹

These more broad-based definitions have been incorporated by a number of national and international scientific forums. Domestically, the United States President's Science Advisory Committee (1965) defined pollution as:

the unfavorable alteration of our surroundings wholly or largely as a by-product of man's actions, through direct or indirect effects of changes in energy patterns, radiation levels, chemical and physical constitution, and abundances of organisms. These changes may affect man directly, or through his supplies of water and of agricultural and other biological products, his physical objects or possessions or his opportunities for recreation and appreciation of nature.²

Similarly, the United States Congress (1978) broadly defined ocean pollution as "any short-term or long-term change in the marine environment."³

On an international basis, the most commonly recognized and widely accepted definition of pollution was formulated by the International Oceanographic Commission's (IOC) Group of Experts on the Scientific Aspects of Marine Pollution (GESAMP) (1980), and has been incorporated into the Convention on the Law of the Sea.⁴ This definition as found at 4 in Part I, Article I of that treaty states that pollution of the marine environment means:

The introduction by man, directly or indirectly, of substances or energy into the marine environment (including estuaries) which results or is likely to result in such deleterious effects as harm to living resources, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities.⁵

In conclusion, Champ states that "the scientific use of the term "pollution" [environmental degradation] appears to be losing ground to social and political connotations and, its environmental connotation is relative to social and political values and,...economic conditions of a given period."⁶ A discussion of how transboundary damage is viewed in international law in light of this expanding definition of what constitutes "pollution" follows.

International Law and Transboundary Pollution

International law is defined as "a body of principles, customs, and rules that are recognized as effectively binding obligations by sovereign states and other international persons in their mutual relations."⁷ Basically, all states are considered equals in the international legal system and no single source of law is considered to be the central law-making authority. Rather, international law is derived from several sources such as treaties or conventions and other specific agreements between states. Custom is another source of international law; where states repeatedly behave in a particular manner under the belief that they are obligated to do so, after a period of time that pattern of practice becomes a rule of customary law.

International environmental law, and in particular, as it concerns transboundary environmental damage, is largely a creation of the twentieth century. Both treaty law and customary law have been used to derive the basis by which transboundary pollution cases have been examined in the courts (and by academia), and Canada and the United States have provided much of the substance by which the current law is now based. On the whole, customary law serves as the more-widely cited basis for establishing the principles of international law with respect to the environment, as there is little general treaty law that has been established on the subject. Although there are a few bi- and multi-lateral treaties which both the United States and Canada are party to, in addition to a number of other international environmental treaties which neither are party to, the rules by which international environmental disputes should be settled remain largely nebulous due to a reticent attitude on the part of states to overstep their political boundaries and question the sovereignty of another state. Yet, the responsibility of states with regards to transboundary environmental damage has been outlined in general and while the development of international

environmental law continues to evolve to reflect man's new incursions on his environment, there is an increasing realization on the part of many that protection of the global environment will require a unified effort. A review of the evolution of transboundary environmental law follows.

The Trail Smelter Case

The authoritative statement of a state's obligation to prevent transboundary pollution damage to neighboring states is the 1941 arbitral decision in the Trail Smelter Case,⁸ the outcome of an environmental dispute between the United States and Canada. The dispute centered on the release of sulphur dioxide into the air as a by-product of the smelting process from the operation of a smelter operated by the Consolidated Mining and Smelting Company of Canada Ltd., a private corporation located in Trail, British Columbia, eleven miles north of the United States-Canada International boundary. The polluted air drifted across the border, causing damage in the State of Washington between 1925 and 1938, claimed at that time to be in excess of two million dollars. It was initially believed that the damage was limited to several hundred farmers and woodlot owners, but subsequently it was revealed that livestock were also damaged as was property in the Town of Northport, Washington and several business enterprises.⁹

In 1925, the first formal complaint was made to the Smelting Company by a United States farmer whose land was located just south of the international boundary. Upon investigation, the company acknowledged that damage had been and was being done, and they began to negotiate with those who had complained and expressed a desire to reach a settlement. Several different claims for different amounts were settled during the following two years. In June 1928, the County Commissioners of Stevens County, Washington adopted a resolution aimed at blocking any further payments by the Smelting Company, pending a long-term solution. Subsequently, the Stevens County farmers proposed a private suit

against the Consolidated Mining and Smelting Company in Canada for injunctive relief and damages but was discouraged by an 1893 ruling by the English House of Lords that would have compelled British Columbia courts to refuse jurisdiction in suits based on damage outside the province.¹⁰ While the Canadian company would have opted to obtain an easement over the farmers' and woodlot owners' property, the Washington State Constitution prohibited non-citizens from owning property rights in Washington. Therefore, the United States Federal Government formally took up the claims of Washingtonians against the Canadian Government, and, in effect, bypassed the Smelting Company.

In December 1927, the United States had requested that the dispute be referred to an international joint commission formed under the Boundary Waters Treaty of 1909 between the United States and Canada (and explored in depth later in this thesis). So done, the Commission was asked to assess the extent to which property in the State of Washington had been damaged by fumes emanating from the Trail Smelter, and to state the amount of indemnity needed to compensate for past damages. The Commission determined this sum to be \$350,000 through the first of January, 1932, exclusive of subsequent damage.¹¹

Two years later, dissatisfied with the existing conditions of the smelter operation and aware of continuing injury to property in Washington, the United States renewed diplomatic negotiations with Canada. In these negotiations, the United States persuaded Canada to sign a convention establishing an arbitral tribunal to deal with the issues of compensation and to decide the issue of injunctive relief. After its own three year investigation of the behavior of the smoke cloud from the smelter stacks, combined with the study which had already been performed by the International Joint Commission, the tribunal made its decision. Damages were awarded to the United States and controls were placed on the emission of sulphur dioxide fumes from the smelter to "remove the causes

of present controversy" and "prevent any damage of a material nature occurring in the State of Washington in the future" from occurring.¹² In the Trail Smelter Case, the tribunal issued the following interpretation which has since become the standard for transboundary environmental damage decisions:

Under the principles of international law, as well as the law of the United States, no State has the right to use or permit the use of territory in such a manner as to cause injury by fumes in or to the territory of another or the properties or persons therein, when the case is of serious consequences and the injury is established by clear and convincing evidence.¹³

More than fifty years later, the Trail Smelter decision, the only international arbitral decision directly concerning transboundary pollution, serves as the principal guideline for other international environmental disputes.

The Corfu Channel Case

The Corfu Channel Case¹⁴ is often cited in support of international environmental rulings, although it did not involve any pollution incident directly. In this 1949 International Court of Justice case, Great Britain sought compensation from Albania for injuries arising from the destruction by mines of two ships in Albanian territorial waters. After determining that the mining could not have taken place without the knowledge of Albanian authorities, the Court held Albania liable to Great Britain for damages to her ships and injuries and death to her seamen. (Albania ignored the award of compensation and has refused to pay Great Britain.) The decision was based on "every State's obligation not to allow knowingly its territory to be used for acts contrary to the rights of other States"¹⁵ and thus lends support to the principle that a State is obligated to limit its actions to the extent necessary to protect other states' rights. Subsequently, this argument has been extended to other transboundary pollution damage cases.

The Stockholm Conference

The United Nations Conference on the Human Environment held in Stockholm, Sweden in 1972, hereafter referred to as the Stockholm Conference,

was the first major multinational attempt to define the duties of states with regards to transfrontier environmental damage. At the Stockholm Conference, a set of 26 principles were drafted in a declaration to "inspire and guide the peoples of the world in the preservation and enhancement of the human environment."¹⁶ Although the basis for these principles evolved over a long period of time prior to the Stockholm Conference, the Declaration was the first attempt to explicitly spell out what the responsibilities of states were with regards to the global environment. Based largely on previously well-established principles of international law such as national sovereignty and international cooperation as embodied in the United Nations Charter, the Stockholm Declaration is not a convention and is therefore not directly binding on any state. The primary principles relevant to the subject of transboundary pollution and which have been since embodied in many agreements since their formulation are Principles 21 and 22. Principle 21 states that:

States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.¹⁷

Furthermore, Principle 22 reinforces Principle 21, requesting that:

States shall co-operate to develop further the international law regarding liability and compensation for the victims of pollution and other environmental damage caused by activities within the jurisdiction or control of such States to areas beyond their jurisdiction.¹⁸

Acceptance of these two principles involved substantial debate over a number of issues for the roughly two year period prior to the Stockholm Conference at which they were adopted. The central dispute in regard to Principle 21 concerned the extent to which state sovereignty was subject to limitations of some sort, although all states attending the Conference agreed that the exercise of that sovereignty was subject to the obligation to avoid harmful

effects to other states.¹⁹ Principle 22 was controversial because it could be interpreted as an endorsement of a principle of absolute liability, rather than basing liability on a state's negligence.

After the Stockholm Conference had adjourned, representatives from the Canadian and United States governments met to discuss protection of boundary coastal areas from environmental degradation. As a result of their meeting, both countries jointly issued a statement supporting the Stockholm Declaration and recognizing it as the basis for "the development of law and procedures for settlement of disputes of an environmental nature."²⁰

Other Customary Law Supporting the Obligation of States as Pertains the Transboundary Environment

There are other examples of state practice that indicate that the Principles concerning transboundary pollution damage which were put forth in the Stockholm Declaration have found widespread acceptance. These include General Assembly resolutions, recommendations of the Organization for Economic Co-operation and Development, and the writings of the International Law Association. Each is briefly discussed below.

United Nations General Assembly Resolutions

Shortly after the Stockholm Conference, the United Nations Assembly adopted Resolution 2996 (XXVII) in support of the obligation of states to prevent the occurrence of transboundary pollution. Although again not binding, resolutions often serve an important role in the process of formation of customary law. Resolution 2996 recognizes that Principles 21 and 22 of the Stockholm Declaration "lay down the basic rules governing this matter [transboundary pollution damage and the responsibility of states]".²¹ This resolution was adopted by a recorded vote of 112 in favor to none against, with ten abstentions.²²

In 1974, the General Assembly adopted the Charter of Economic Rights and Duties of States in Resolution 3281 (XXIX). Article 30 of that Charter states:

the protection, preservation and enhancement of the environment for the present and future generations is the responsibility of all states...All states have the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction. All States shall co-operate in evolving international norms and regulations in the field of the environment.²³

In this Resolution, the statements on state sovereignty, although adopted from the language of Principles 21 and 22 of the Stockholm Declaration appear to have been deemphasized in favor of those that recognize the broader state obligation to protect the environment despite earlier articles of the Charter which emphasize the sovereignty of states to determine their own resource policies.

OECD Recommendations

The principles set forth in the Stockholm Declaration have also been espoused by bodies outside the United Nations. Evidence for this can be found in the Guiding Principles on Transfrontier Pollution adopted by the Organization for Economic Cooperation and Development (OECD) in 1974 and many other subsequent OECD documents.

The OECD was set up under a Convention in December 1960 to promote policies designed to:

- o achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- o contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- o contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.²⁴

The twenty-four Member nations of the OECD include Canada and the United States. The Council of the OECD is not empowered to create obligations

on the part of its members, but instead have made a number of recommendations in the form of principles which OECD members "should" follow. The Guiding Principles on Transfrontier Pollution followed the adoption of an earlier OECD principle known as the "polluter-pays-principle" which generally recognized that responsibility for the costs of pollution abatement should be born by the polluter. Within these Guiding Principles, Title B-International Solidarity, presents the primary statement of obligation on the part of the state:

Without prejudice to their rights and obligations under international law and in accordance with their responsibility under Principle 21 of the Stockholm Declaration, countries should seek, as far as possible, an equitable balance of their rights and obligations as regards the zones concerned by transboundary pollution.²⁵

The Principles go on to ask members to define a long-term policy for the protection and improvement of the environment in these transboundary zones and to coordinate these policies between States as far as possible.

Here, again, the customary law aspect is reinforced by reference to the State's "responsibility under Principle 21 of the Stockholm Declaration." Other provisions of the OECD Guiding Principles go beyond the Stockholm Declaration Principles in attempting to regulate "pollution" by requiring a balancing of interests of the acting and affected States of any substance that would "impair or interfere" with other uses of the environment.

ILA Writings

Recently, the International Law Association (ILA), a non-governmental international organization, has continued to support the trend of customary law as regards transfrontier pollution. At their 1982 Conference in Montreal, the ILA attempted to codify as a body of principles the substantive and procedural rules of relevant customary law by adopting the "Rules of International Law on Transfrontier Pollution."²⁶ Articles 3 and 4 define the obligations of states with regard to existing and potential transboundary pollution.

Article 3 (Abatement)

- (1) States are under an obligation to abate existing transboundary pollution to such an extent that no substantial damage is caused in the territory of another State.
- (2) States should endeavor to further reduce existing transboundary pollution to the lowest level that may be reached by the application of the most advanced technology available to them.²⁷

Article 4 (New or increased transfrontier Pollution)

States are under an obligation to limit new or increased transfrontier pollution at the lowest level that may be reached by the application of the most advanced technology available to them.²⁸

In these writings, the ILA rules extend the Trail Smelter decision by incorporating the substantial damage concept in Article 3, but then goes on to impose a stricter obligation in Article 4 by addressing pollution which has not yet occurred. Also incorporated is the concept of using the best available technology to prevent such damage. Thus, these articles appear to go beyond existing customary law, but reflect the rapidly changing pace with which we must view our increasing and new threats to the environment.

Treaty Law

In addition to the substantive obligations imposed by customary and Conventional or Treaty law, the latter often also places procedural obligations on states which are intended to be binding. Procedural obligations in the case of potential transboundary damage-causing projects would include those obligations to notify potentially affected states and to consult and negotiate with them with a view to modifying the damaging aspects of the projects.

The United States and Canada are both party to bilateral and multilateral treaties and agreements which would place considerable obligations on them with respect to the area of international law and transboundary pollution. These agreements include:

- the Boundary Waters Treaty of 1909 between Canada and the United States²⁹ (which because of its significance in United States-Canadian disputes is discussed in a later chapter);
- the 1954 Convention for the Prevention of Pollution of the Seas by Oil,³⁰ and numerous other oil pollution agreements, including a 1978 protocol on marine pollution and a bilateral agreement on oil spill contingency plans;
- the London Dumping Convention of 1972³¹;
- the Convention on Hostile Use of Environmental Modification Techniques³²; the Convention on Long Distance Transfrontier Air Pollution³³; and, an August 1980 Canadian-U.S. memorandum of intent on transboundary air pollution, and several other treaties on certain shared water basins.

Two of these are mentioned briefly in the following discussion. In addition, the Law of the Sea Treaty³⁴, which of the two countries only Canada has ratified, and the Nordic Convention³⁵ are discussed herein because of relevant provisions which reflect the direction in which the evolving law of transboundary pollution is moving.

The Law of the Sea Treaty

The recently-concluded Third United Nations Conference on the Law of the Sea (UNCLOS III) adopted by a wide margin a Convention on the Law of the Sea which attempts to define and regulate the large majority of ocean uses. Although the United States has not signed the Law of the Sea Convention primarily because of its deep seabed mining provisions Canada has signed the Law of the Sea Treaty. During the many years in which the Law of the Sea Treaty was being formulated, both Canada and the United States supported the inclusion of articles concerning marine pollution and the responsibility of states with respect to causing it.

Relevant provisions in the Law of the Sea Convention are found in Part XII which deals with the preservation of the marine environment and contains a number of articles which are relevant to the transboundary pollution issue and which echo the principles established in the Stockholm Conference. Specifically, Article 193 notes that "States have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment."³⁶

Article 194 at paragraph (2) goes on to request that:

States shall take all measures necessary to ensure that activities under their jurisdiction and control are so conducted as not to cause damage by pollution to other States and their environment, and that pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights in accordance with this Convention.³⁷

Whether or not such a large endeavor as the Law of the Sea Treaty with all its many provisions can ever expect to be enforced, it is interesting to note that the above articles of that treaty appear to be the first time that the Principles set forth in the Stockholm Declaration have been imposed on the world community in a binding fashion.

Article 235 in Section 9 of Part XII spells out the responsibility and liability provisions:

(1) States are responsible for the fulfilment of their international obligations concerning the protection and preservation of the marine environment. They shall be liable in accordance with international law;

(3)...With the objective of assuring prompt and adequate compensation in the respect of all damage caused by pollution of the marine environment, States shall co-operate in the implementation of existing international law and the further development of international law relating to responsibility and liability for the assessment of and compensation for damage and the settlement of related disputes, as well as, where appropriate, development of criteria and procedures for payment of adequate compensation, such as compulsory insurance or compensation funds.³⁸

The Obligation of Prior Consultation

The procedural obligation of prior consultation or obligation to notify is increasingly becoming an important facet of transboundary pollution law. This obligation includes a commitment to respond to requests for information which may be construed as recognizing an obligation to perform joint studies or to submit the matter to an outside body or third party for study. The discussion on joint study commissions and third party involvement will be examined in a subsequent section on the application of dispute settlement; however, it is instructive here to point to a few examples of the growing awareness of this important facet of evolving transboundary pollution law.

During the drafting of Principles 21 and 22 of the Stockholm Declaration, another closely related principle, "Principle 20" was proposed.

Relevant information must be supplied by States on activities or developments within their jurisdiction or under their control whenever they believe, or have reason to believe, that such information is needed to avoid risk of significant adverse effects on the environment in areas beyond their national jurisdiction.³⁹

This principle was hotly debated due to an ongoing dispute between Argentina and Brazil and was not adopted, but rather referred to the General Assembly for consideration.

As a matter of reference it is interesting to note here that the United States and Canadian proposed texts for Principle 20 varied significantly as regards the obligation of prior notification and consultation. The United States recommendation was that:

Whenever a proposed activity by any State might cause grave harm to human environment beyond its territory the State or States planning such an activity should undertake appropriate consultations before proceeding with any such activity.⁴⁰

The Canadian position indicated that it considered that a lesser degree of potential danger triggered the obligation and was thus worded more strongly.

Every State has a duty to consult with other States before undertaking activities which may damage the environment of such States, and a similar duty to consult with the appropriate international organization, if any, before undertaking activities which may damage the environment in areas beyond the limits of national jurisdiction.⁴¹

The outcome of these debates over Principle 20 were eventually incorporated in General Assembly Resolution 2995 (XXVII).

The General Assembly,
Having considered principle 20 as contained in the draft text of a preamble and principles of the declaration on the human environment, referred to it for consideration by the United Nations Conference on the Human Environment,

Recalling its resolution 2849 (XXVI) of 20 December 1971 entitled "Development and Environment,"

Bearing in mind that, in exercising their sovereignty over their natural resources, States must seek, through effective bilateral and multilateral co-operation or through regional machinery, to preserve and improve the environment,

1. Emphasizes that, in the exploration, exploitation and development of their natural resources, States must not produce significant harmful effects in zones situated outside their national jurisdiction;
2. Recognizes that co-operation between States in the field of the environment, including co-operation towards the implementation of principles 21 and 22 of the Declaration of the United Nations Conference on the Human Environment, will be effectively achieved if official and public knowledge is provided of the technical data relating to the work to be carried out by States within their national jurisdiction, with a view to avoiding significant harm that may occur in the environment of the adjacent area;
3. Further recognizes that the technical data referred to in paragraph 2 above will be given and received in the best spirit of co-operation and good-neighbourliness, without this being construed as enabling each State to delay or impede the programmes and projects of exploration, exploitation and development of the natural resources of the States in whose territories such programmes and projects are carried out.⁴²

Under resolution 2995 on cooperation between States on the human environment, the General Assembly of the U.N. emphasized that, in the exploration, exploitation, and development of their natural resources, States must not produce significant harmful effects in zones situated outside their national jurisdiction. While the General Assembly did not define what they construed as significant harm, they recognized that co-operation between States in that field

would be effectively achieved if States were to provide knowledge of technical data for the work to be carried out by other States to avoid harm which might occur in the human environment of the adjacent area. The resolution was adopted by 115 votes to none, with ten abstentions.⁴³

The obligation of prior notification receives further support in two treaties which reflect the direction that transboundary environmental law is heading.

The Nordic Convention

Perhaps the most definitive attempt at a multinational agreement which deals with transfrontier pollution is the Nordic Convention on the Protection of the Environment to which Denmark, Finland, Sweden, and Norway are party. This Convention provides for many types of environmental problems, including, but not limited to, problems relating to water, sand drift, air pollution, noise, light, and changes in temperature (many of which may be appropriate to the Fundy tidal project consequences). In the Nordic Convention, a regime has been created which internationalizes environmental control and pollution abatement measures between the participating nations and seeks consultation prior to undertaking a potentially harmful transboundary activity. Article 11 of that Convention provides that:

Where the permissibility of environmentally harmful activities which entail or may entail considerable nuisance in another contracting State is being examined by the Government or by the appropriate Minister or Ministry of the State in which the activities are being carried out, consultations shall take place between the States concerned if the Government of the former State so requests.⁴⁴

Furthermore, the Nordic Convention offers the possibility for individuals who are affected or may be affected by a nuisance caused by environmentally harmful activities in another state to bring the question of permissibility of such activities to court in the offending state. Through certain provisions of the Nordic Convention, compensation is based on rules no less favorable than the rules of the offending state. The Nordic Convention, therefore, allows for far-reaching

jurisdictions and authority by allowing resort to both public and private resolutions.

The Convention on Long-Range Transboundary Air Pollution

A consultation provision similar to that found in the Nordic Convention is found in the 1979 Convention on Long-Range Transboundary Air Pollution in its Article 5 which provides that:

Consultations shall be held, upon request, at an early stage between, on the one hand, Contracting Parties which are actually affected by or exposed to a significant risk of long-range transboundary air pollution and, on the other hand, Contracting Parties within which and subject to whose jurisdiction a significant contribution to long-range transboundary air pollution originates, or could originate, in connection with activities carried on or completed therein.⁴⁵

Both the United States and Canada are parties to this Convention which was entered into force in March of 1983.

A framework enumerating the basic responsibilities of States towards protection of the transboundary environment has been established in customary law. However, substantially less law aimed at protection of the transboundary environment has been codified in treaties. While the international community, recognizes the right of States to do what they want with their resources, these States are not allowed to exploit those resources in such a manner as to cause damage to their neighbors. Furthermore, there is a an increasing amount of customary law and, to some extent, conventional law, which indicates that if there is a chance that internal exploitation of resources may cause transboundary damage, there is an obligation to inform the potential recipient of this damage of the consequences and to work towards elimination or mitigation of the potential damage.

Given this background on how transboundary damage is viewed in international law, it is now useful to examine the domestic legislation in Canada

and the United States which does or does not provide for consideration of transboundary impacts.

CHAPTER III NOTES

1. Michael A. Champ, "Etymology and Use of the Term 'Pollution,'" in Canadian Journal of Fisheries and Aquatic Sciences, Volume 40, Supplement 2, 1983, p. 7.
2. *Ibid.*, p. 6.
3. *Ibid.*
4. United Nations, The Law of the Sea: United Nations Convention on the Law of the Sea with Index and Final Act of the Third United Nations Conference on the Law of the Sea (New York: United Nations, 1983).
5. *Ibid.*, p. 2.
6. Champ, p. 7.
7. Gerhard von Glahn, Law Among Nations (New York: MacMillan Publishing Co., 1981), p. 3.
8. See "Trail Smelter Arbitration (U.S.-Canada): March 11, 1941" in 35 American Journal of International Law, pp. 684-736.
9. Kenneth B. Hoffman, "State Responsibility in International Law and Transboundary Pollution Injuries," The International and Comparative Law Quarterly 25, (July 1976), p. 513.
10. *Ibid.*, p. 514.
11. *Ibid.*, p. 516.
12. *Ibid.*
13. *Ibid.*
14. Corfu Channel Case (Great Britain-Albania), I.C.J. Report 4 (1949).
15. *Ibid.*, p. 22.
16. Report of the United Nations Conference on the Human Environment, held at Stockholm, June 5-16, 1972, U.N. Doc. A/CONF. 48/14 and Corr. 1, reprinted in 11 International Legal Materials (1972), p. 1416.
17. *Ibid.*, p. 418.
18. *Ibid.*
19. Louis Sohn, "The Stockholm Declaration on the Human Environment," 14 Harvard International Law Journal (1973), p. 423.
20. *Ibid.*, p. 492.

21. General Assembly Resolution 2996, 27 U.N. GAOR Supp. (No. 30) at 43, U.N. Doc A/8730 (1972).
22. Florence Remz, ed. Annual Review of United Nations Affairs 1971-1972, (Dobbs Ferry, New York: Oceana Publications, 1973), p. 177.
23. General Assembly Resolution 3281, U.N. GAOR Supp. (No. 31) at 50, U.N. Doc A/9631 (1974) reprinted in 14 International Legal Materials (1975), p. 260.
24. OECD, Compensation for Pollution Damage (Paris: OECD, 1981), p. ii.
25. OECD, "Council Recommendations on the Implementation of the Polluter-Pays Principle," adopted November 14, 1974, OECD Doc. C (74) 223, reprinted in 14 International Legal Materials (1975), p. 242.
26. International Law Association, Report of the Fifty-Ninth Conference, Belgrade 1980, (1982).
27. *Ibid.*, p. 534.
28. *Ibid.*, p. 538.
29. Treaty relating to the boundary waters and questions arising along the boundary between the United States and Canada. Signed at Washington, January 11, 1909; entered into force May 5, 1910. 36 Stat, 2448; TS548.
30. International convention for the prevention of pollution of the sea by oil, with annexes. Done at London, May 12, 1954; entered into force July 26, 1984; for the United States, December 8, 1961. 12 UST 2989; TIAS 4900; 327UNTS3.
31. Convention on the prevention of marine pollution by dumping of wastes and other matter, with annexes. Done at Washington, London, Mexico City, and Moscow, December 29, 1972; entered into force August 30, 1979. 26UST 2403, TIAS 8165.
32. Convention on the prohibition of military or any other hostile use of environmental modification techniques, with annex. Done at Geneva, May 18, 1977; entered into force October 5, 1978; for the United States, January 17, 1980. 31 UST 333; TIA S 9614.
33. Convention on long-range transboundary air pollution. Done at Geneva, November 13, 1979; entered into force March 16, 1983. TIAS 10541.
34. United Nations, The Law of the Sea: United Nations Convention on the Law of the Sea with Index and Final Act of the Third United Nations Conference on the Law of the Sea (New York: United Nations, 1983).
35. Convention on the Protection of the Environment, February 19, 1974, reprinted in 13 International Legal Materials (1979), p. 591.
36. United Nations, p. 70.

37. Ibid.
38. Ibid., p. 84.
39. Sohn, p. 496.
40. Ibid.
41. Ibid., p. 497.
42. General Assembly Resolution 2995, 27 U.N. GAOR Supp. (No. 30) at 42, U.N. Doc. A/8730 (1972).
43. Remz, p. 177.
44. Convention on Protection of the Environment, February 19, 1974, reprinted in 13 International Legal Materials (1974), p. 591.
45. Convention on Long-Range Transboundary Air Pollution, November 13, 1979, reprinted in 18 International Legal Materials (1979), p. 1442.

CHAPTER IV

DOMESTIC LAWS OF THE UNITED STATES AND CANADA RELEVANT TO THE PROPOSED PROJECT

Analysis of existing domestic environmental laws within the United States and Canada reveal that they are not adequate in protecting the environment across their borders. In part, this can be blamed on the federal systems under which each nation operates and in part on the recognized principle of sovereignty which inhibits adequate consultation with neighboring countries by not providing rules and standards for addressing it and the fear of overstepping political boundaries. The following sections discuss the environmental framework and relevant laws in each country which attempt to address transboundary pollution, including those laws associated with the import of electricity to the United States from Canada, and also examines some state and provincial legislation which might be relevant to the proposed Fundy project.

United States Environmental Legislation pertaining to Transboundary Pollution

In 1969, the United States Congress enacted the National Environmental Policy Act of 1969 (NEPA).¹ The purposes of this Act include:

To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.²

The Environmental Protection Agency (EPA) is the lead federal agency responsible for protection and control of pollution of the environment in the United States. EPA was established in the Executive branch of the Federal government as an independent agency in 1970 to permit coordinated and effective

governmental action on behalf of the environment. Among its many duties, EPA is responsible for reinforcing efforts of other Federal agencies with respect to the impact of their operations on the environment, and is specifically charged with publishing its determinations when those determinations hold that a proposal is unsatisfactory from the standpoint of public health, welfare, or environmental quality.

Section 102 of NEPA requires Federal agencies in the United States to prepare detailed reports (environmental impact statements) on the environmental effects of proposed major actions. However, there is nothing in this section to indicate that actions having international ramifications are to be treated any differently than others subject to the EIS requirement. The only recognition of the international environmental situation is found at 102(F) which recognizes that environmental problems can transcend national boundaries and requests that all Federal agencies:

...recognize the worldwide and long-range character of environmental problems and, where consistent with the foreign policy of the United States, lend appropriate support to initiatives, resolutions, and programs designed to maximize international cooperation in anticipating and preventing a decline in the quality of mankind's world environment.³

NEPA as originally written makes little other reference to acknowledging other nations and it has been largely felt within the foreign service community that any incursion into trying to regulate activities through the EIS process could interfere with foreign policy objectives.

Executive Order 12114

In order to address these concerns, and, at the same time meet the objectives of NEPA, a program was designed by the various federal agencies with international responsibilities and the Council on Environmental Quality. This program culminated in President Carter's approval of Executive Order No. 12114 of January 4, 1979,⁴ which although not formerly based on NEPA, is designed to

further the purposes of the Act. Structured to insure that federal decisionmakers are informed of pertinent environmental considerations of actions having effects outside the geographical boundaries of the United States, Executive Order No. 12114 asks that such considerations be taken into account when decisions are made. The Order cites the circumstances under which its requirements are applicable and also specifies procedures that must be followed. Affected agencies are further required to develop their own implementing procedures.

Prior to the signing of Executive Order 12114, federal agencies had frequently disagreed on the extraterritorial reach of NEPA's EIS requirement. Agencies such as the Departments of Commerce, State, Defense and Treasury, along with the Export-Import Bank (Eximbank) opposed the extension of the environmental impact procedure. At the same time, the Agency for International Development (AID) and the National Oceanic and Atmospheric Administration espoused the requirement.⁵

From review of the Order, it is unclear as to which category a tidal power project with extraterritorial environmental impacts would be considered under, assuming it was at all. For purposes of this discussion, Section 2-3(a) of the Order might be the most applicable to the proposed development as it considers "major Federal actions significantly affecting the environment of the global commons outside the jurisdiction of any nation (e.g., the oceans or Antarctica)."⁶ Under this classification (which assumes ocean waters not under U.S. or Canadian jurisdiction, i.e., somewhere between each nation's EEZs are subject to impacts), an environmental impact statement would have to be prepared, although it is up to the discretion of the initiating agency to determine the scope of this review. Another classification the project might be considered under is where the United States was completely responsible for the project, where it might be classified as an action under Section 2-3(b), "major Federal actions significantly affecting the

environment of a foreign nation not participating with the United States and not otherwise involved in the action",⁷ and would therefore require other types of environmental studies, assessments, and/or reviews, which may, but not necessarily, include input from the affected nation.

While specific types of actions such as intelligence activities, arms transfers, and disaster and emergency relief action have been exempted from the requirements of Executive Order 12114 to minimize bureaucracy, other projects with transboundary environmental effects may be excluded from study also. At least one provision of the Order appears to contradict the other provisions found in Section 2-3 and does not at all further the purpose of protecting the environment. Section 3-5 of the Order dealing with multiple impacts states that:

if a major Federal action having effects on the environment of the United States or the global commons requires preparation of an environmental impact statement, and if the action also has effects on the environment of a foreign nation, an environmental impact statement need not be prepared with respect to the effects on the environment of the foreign nation.⁸

Thus, the necessity for and type of environmental impact documentation to be used in reviewing each project appears to be highly ambiguous. At least from one perspective, it appears that were the United States to perform an EIS on the effects outside its EEZ, which would perhaps consider some minor tidal changes, there is no reason why it would even have to consider the impacts on the coastal environment of the adjacent nation. Therefore, we find that the Order has had little real effect since its issuance. Three reasons for this are:

1) excepted actions far outnumber the action to which the Order's requirements are applicable;

2) even those agency actions to which the Order does apply are not judicially reviewable. It allows agencies to use discretion in choosing to review an action, determining the scope of review, deciding which procedures to use, and providing

for the availability of a completed document. It bars all private enforcement of extraterritorial review requirements.

3) the Reagan Administration has demonstrated very little interest in enforcing its provisions.

Many scholars and legal practitioners have criticized Executive Order 12114 as being weak. Francis M. Allegra, in the Cleveland State Law Review, states that the Executive Order does not further the purposes of NEPA because it does not strike a proper balance between foreign and environmental policy considerations. "The excessive allocation of administrative discretion overpowers any environmental review requirements and has created a procedure which is so flexible that it is merely suggestive."⁹ Commenting on the disproportionate emphasis on the protection of foreign policy Allegra makes the valid point that "the government's basic premise seems to be that environmental review interferes with foreign nations' internal affairs. However, quite the opposite can be true. By failing to take adequate environmental precautions, the United States may cause an extreme disruption in the environment of another country. This clearly affects another nation's internal affairs."¹⁰

Glenn Pincus, in the Buffalo Law Review noted however, that in fact, past experience had indicated that undertaking impact assessment of projects in foreign nations had been a positive experience.

We have discovered that developing countries themselves have come increasingly to recognize the inter-related nature of environment and development and to seek to ensure that environmental considerations are adequately addressed in development projects. Further, the practical experience of A.I.D. has been that it is possible to undertake detailed environmental analyses of U.S.-supported projects abroad and that the results obtained are useful to us, as well as to host country planners, in making project decisions.¹¹

Allegra further points out that for NEPA to be properly extended extraterritorially, the Council on Environmental Quality would have to oversee the

agencies' implementation of NEPA foreign regulations, which, given their ties with the Executive branch is unlikely.

Canadian Domestic Environmental Legislation

Whereas domestic legislation in the United States therefore appears weak and incapable of providing for review of the extraterritorial effects of such a project as the proposed Canadian Fundy tidal project, Canadian law appears even weaker as no consideration is provided for extraterritorial environmental impacts under existing Canadian law.

As one author writes,

These border environmental issues are complicated by the fact that, on the whole, environmental constraints are less stringent in Canada than in the U.S. Larger and less crowded than the U.S., with higher unemployment and more dependent on resource development, Canada has attributed less priority to ecological protection and more to resource production...¹²

The author goes on to point out that:

Not only are Canadian federal environmental policies less demanding, but standards actually enforced vary more from province to province than from state to state. Furthermore, U.S. environmentalists are more able than Canadians to bring resource industries before courts; this often leads to costly extended litigation, greater risks and uncertainties, and sometimes defeat for producers.¹³

NEPA is the pattern for the Canadian Federal Environmental Assessment and Review Process (EARP)¹⁴ established by Cabinet decision in December 1973 and later amended in February 1977. EARP is a three stage approach to environmental impact analysis and is designed to provide a means of determining in advance the potential environmental impact of all federal projects, programs and activities. The ultimate responsibility for decisions resulting from EARP activities rests with the Minister of the Environment and his Cabinet colleagues.

The Minister of the Environment's role is further supported in the Government Organization Act of 1979 which states that the Minister

shall initiate, recommend and undertake programs and coordinate programs of the Government of Canada, that are designed....to ensure that new

federal projects, programs and activities that are found to have probable significant adverse effects, and results thereof taken into account....¹⁵

A major weakness in EARP as it relates to the proposed Fundy Project is that while all federal departments and agencies are bound by the Process, proprietary Crown Corporations (such as the Tidal Power Corporation) and federal regulatory agencies are invited rather than mandated to participate in the Process.

Federal projects are considered to be those initiated by federal departments and agencies, those for which federal funds are solicited and those involving federal property. Therefore, projects originating outside the federal government which involve a particular federal department through funding or property considerations, would be included in the EARP.

EARP

Three sequential review stages are involved in EARP, although not every stage necessarily occurs in the examination of every project. The first two stages involve self-assessment by the federal agency initiating the project, and the third step is a more formal review of projects, considered, on the basis of departmental self assessment, to have potentially significant environmental impacts. The Federal Environmental Assessment Review Office (FEARO) is: (1) responsible for the establishment of Environmental Assessment Panels to review referred projects and (2) is required to respond directly to the Minister of the Environment. In certain cases, an Environmental Review Board, external to the federal public service, may be established to conduct the formal review.

The EARP automatically begins when a project is conceived and is largely based on self-assessment by the federal departments and agencies initiating the project. These entities are then responsible for both the initial assessment and for establishing the significance of environmental impacts. The latter is largely a

subjective determination and may rely heavily on public reaction solicited during the assessment phase.

Assuming the agency or department concludes that the nature and scope of potential environmental effects cannot be determined readily by this procedure, as may be the case with the proposed Fundy project, the proposal is subjected to a more detailed examination, known as an Initial Environmental Evaluation (IEE).

The IEE normally includes a description of the project, a description of the current environment and resource use, an outline of the potential environmental effects and impacts and the details of the measures proposed to mitigate or prevent anticipated environmental effects. Additionally, it provides a judgement on the impact of the effects which remain after all known measures for prevention and mitigation have been specified. An important part of the IEE is also the examination of alternative ways of accomplishing the project and the identification of the preferred alternatives. If, upon completion of the IEE, the environmental effects of the project are deemed to be significant, the project is referred to the Minister of the Environment for a formal review under EARP.

The formal review includes the formation of an Environmental Assessment Panel, the formulation of guidelines for preparation of the Environmental Impact Statement (EIS), preparation of the EIS, and implementation of an extensive public information program. Following a period of public and technical reviews of the impact statement, panel deliberations are held to formulate recommendations to the Minister of the Environment. The Panel can recommend that a project not proceed; that it proceed as proposed; or that it proceed with modifications, or in accordance with specific conditions.

Decisions on the Panel's recommendations are made by the Minister of the Environment and the Minister of the initiating or sponsoring department. Upon agreement to accept the recommendations, the appropriate departments or

agencies are instructed to implement them. Should the two Ministers disagree, the matter would probably be referred to the federal Cabinet for resolution.

In the case of proposed federal projects with important environmental implications for provincial governments, a cooperative approach to environmental assessment is encouraged. Joint federal-provincial panels or provincial representation on the federal Environmental Assessment Panels are methods to achieve this cooperation.

In summary, Canadian federal environmental legislation does not mandate the Tidal Power Corporation to undertake environmental assessment, although there is every indication that the Corporation would submit to it. In fact, the Tidal Power Corporation contracted for some of the early studies that suggested adverse impacts from the proposed facility, and has on numerous occasions given broad assurances that it will submit to a full environmental review under EARP.

Comparison Between the Domestic Legislations of Canada and the United States

The primary difference between the two domestic legislations is that the United States environmental impact assessment is based on statute, whereas in Canada it is a matter of Cabinet directive and is not statutory. The question remains however as to whether the Canadian environment review process would include adequate review of transboundary impacts.

There are only a few examples of the environmental assessment review process which address the area of transboundary concern. One project includes the guidelines that were prepared for the EARP for a Canadian Beaufort Sea hydrocarbon production proposal.¹⁶ The Beaufort Sea is an area off the northern coast of Alaska and northwestern Canada which is divided by the international boundary (still in dispute) between the United States and Canada. While these guidelines provided for consideration of potential significant environmental

effects in the coastal waters of Alaska, it noted that possible effects in this area can not be examined by the review panel to the same degree of detail as those impacts occurring inside Canadian jurisdiction. Although Alaskans were invited to attend several public hearings on the hydrocarbon development proposals, these hearings were held in Canada only and there was little input by potentially-affected individuals in the United States as a result.¹⁷ This gives some indication that EARP may have some inherent limitations when it comes to transboundary considerations. Furthermore, the quality of the EARP cannot be tested in the courts as is possible under United States environmental assessment review.

Provincial Environmental Legislation

Provincial environmental legislation in Canada, for the most part, is even weaker than the federal environmental legislation.

Other than Ontario, Quebec, Saskatchewan, Alberta, and Newfoundland, all other provinces' existing environmental impact policies are wholly dependent upon discretionary administrative and executive decisions of the respective Cabinets, which often result in an overemphasis on political realities (particularly energy related decisions).¹⁸

Nova Scotia has a poor record environmentally. As one critic writes, "Nova Scotia has no environmental impact assessment legislation or process, but does on occasion examine many large, potentially environmentally significant projects under the Environmental Protection Act of 1973."¹⁹ However, those political realities that establish policy in Nova Scotia include the need to exploit their coal and hydro resources. In what amounted to a scandal in the mid 1970's, the Wreck Cove hydroelectric project, a 200 MW dam in the highlands of Cape Breton Island was constructed when a well-researched assessment was altered to make the environmental effects appear to be minimal in the final EIS. It is perhaps noteworthy that the Wreck Cove Project involved the Nova Scotia Power Corporation, one of the original initiators of the Fundy proposals. This points to

the all to common reality that sometimes a project comes under the EARP after the decision to proceed has been made and where it is too late for assessment.

Other Regulatory Bodies with Authority to Review

Fundy Tidal Power

Regulatory authority for a project wholly within the United States or a joint Canadian-American venture in Passamaquoddy Bay would fall under a number of environmental statutes. However, as the project is now proposed, as one which would be situated entirely within Canada, it would largely escape any type of United States environmental regulation, even if, as its primary purpose, as proposed, is to provide power to the United States and its very construction dependent on American purchase power contracts. Such regulation and environmental review may be limited to review of the economics of the power purchase and review of the transmission line siting.

FERC

Under the Federal Power Act (16 USC 205 824) the Federal Energy Regulatory Commission (FERC) regulates wholesale ratemaking by utilities and "is responsible for approving agreements between and among utilities for the sale, transmission and exchange of energy and capacity".²⁰ However, the only express authority over a purchase from a utility outside FERC jurisdiction would be in the case of a request for a wholesale rate increase in conjunction with the transmission of the power purchased.

If we assume that a purchase power contract with Fundy Tidal Power were entered into by a regulated utility prior to construction of the tidal facility and that this contract became part of a rate filing at that time, it may be that a challenger could claim that approval of the rate would be a "major federal action significantly affecting the quality of the human environment" and subsequently require FERC to prepare an EIS. However, this is highly unlikely for a number of

reasons, including: (1) it would require that the rate filing occur prior to construction, and (2) that the purview of NEPA be expanded to an entirely new area in an arguably inhospitable judicial and political climate for such action.

DOE

The Department of Energy, under the Federal Power Act, regulates the transmission of energy to a foreign country and is mandated to assure that exports of power will not "impair the sufficiency of electric supply within the United States or...impede or tend to impede the coordination in the public interest of facilities subject to the jurisdiction of the (Federal Power) Commission."²¹ However, no comparable authority regulates power imports.

It appears that the clearest authority for regulation of the power imported to the United States from Fundy Tidal Power would be Executive Order No. 10485, which provides, in part, that:

Section 1. (a) The Secretary of Energy is hereby designated and empowered to perform the following-described functions:

(1) To receive all applications for permits for the construction, operation, maintenance, or connection, at the borders of the United States, of facilities for the transmission of electric energy between the United States and a foreign country.²²

Prior to issuance of the permit the Secretary of Energy is required to make a finding that the project is "consistent with the public interest" and to consult the Departments of State and Defense. Should the three Departments disagree on a particular permit the matter is referred to the President. The permit may have certain conditions attached.

Within DOE, the Office of Utility Systems of the Economic Regulatory Administration (ERA) is the agency responsible for permit processing. ERA's regulations require the agency to make a determination of whether there is a need for an EIS when reviewing an application. Applications are reviewed for impacts of the proposed facilities on domestic energy supplies and power reliability, as well as for environmental impacts. The agency routinely prepares EIS's for major

transboundary transmission lines but impacts other than power reliability and line construction are generally not considered. These statements specifically, do not consider alternatives to construction of the line, although they may address routing alternatives. Assuming the tidal power project had already been built at the time of application for a transmission line permit, questions of impacts related to tidal power development would be moot. However, if the permit were required early enough in the process to encompass the environmental implications of the United States investment in the Fundy Tidal Power project, and therefore, the project's viability, then a NEPA review might address the coastal ecosystem effects of the project. Should guaranteed access to the New England electricity markets become a prerequisite to construction of the project and if construction of a new power line is a prerequisite to assured access, then the possibility for a NEPA review exists.

Since the economic status and financial feasibility of the Fundy proposal was based on "iron clad contracts for the sale of output" including a 90% output to the United States, the likelihood for a NEPA review is greatly increased. This is especially true if one assumes that any United States investor utilities would seek the presidential permit prior to any facility construction. Taking this logic one step further, assuming NEPA review did encompass consideration of the effects of the tidal barrage, the Secretary of Energy could deny the permit if he found the granting of the permit and the associated effects of the construction and operation of the tidal power dam to be "inconsistent with the public interest". Alternatively, he could grant the permit with conditions impacting the feasibility, design, or operation of the tidal power project if such conditions were attached to the permit.

State Regulation-Maine

The primary regulatory agency in Maine for any supporting facilities (transmission lines) which would be associated with tidal power development is the Board of Environmental Protection (BEP). Under the Site Location of Development Act, Maine's "NEPA", the BEP is charged with

controlling the location of those developments substantially affecting the local environment in order to insure that such developments will be located in a manner which will have a minimal adverse impact on the natural environment of their surroundings and protect the health, safety and general welfare of the people.²³

Since the definition of a development includes that "which occupies a land or water area in excess of 20 acres," a major new transmission line would certainly be covered under the Act. Such developments must obtain a permit from the BEP prior to beginning construction. The standards for approval of a development dictate that the developer show that:

1. he has financial capacity and technical ability to meet State pollution control standards;
2. he has made adequate provision for traffic movement;
3. he has made adequate provision for fitting the development harmoniously into the existing natural environment without adverse effect on existing uses, scenic character or natural resources in the area;
4. soil types are suitable;
5. ground water resources will not be at risk.²⁴

Specifically, however, the statute mandates that

in the case of such transmission line or pipelines, (the board) shall consider whether any proposed alternatives to the proposed location and character of such transmission line or pipeline may lessen its impact on the environment or the risks it would engender to the public health or safety, without unreasonably increasing its cost.²⁵

Among the fifteen separate considerations which define the finding of "no adverse effect on the natural environment" are those ranging from effects on air quality to preservation of historic sites to effects on climate alteration.

Expanding the language of the Act beyond the obvious impacts of the transmission line and corridor, the regulations appear to allow for some examination of the impacts of the tidal dam itself. The general Scope of Review under the statute provides:

In reviewing applications for approval of proposed developments under the Site Location Law, the Board shall consider the size, location, and nature of the proposed development in relation to:

- A. the potential primary, secondary, and cumulative impacts of land, air, and water on the development site and on the area likely to be affected by the proposed development; and
- B. the potential effects on the preservation of the public's health, safety, and general welfare.²⁶

However evident this statute appears to address the potential problem, it is unlikely that the State would broadly interpret the regulations as a basis for examination of Fundy tidal power given that:

- to date, no cases interpreting the statute have addressed secondary impacts
- State does not interpret its authority to allow consideration of alternative methods and sites to proposed projects
- a recent Maine court determination interprets the statute as being primarily concerned with very local effects.

A second regulatory body with jurisdiction over transmission lines is the Public Utilities Commission (PUC). However, the PUC lacks authority to consider environmental effects in the process of approving applications for transmission line construction. Therefore, that body will not be considered further here.

The timing for application of permits for transmission line siting and the extent of public hearings associated with any related permits are probably two of the most crucial factors in development of the Fundy tidal issue as it pertains to transmission line siting. If the dam had already been constructed prior to application, only impacts of a line itself would be considered. But assuming the

permit were needed for a preconstruction purchase power contract, which would probably be the case, then public hearings might attract a substantial amount of opposition.

In conclusion, federal environmental legislation in Canada and the United States do not allow for adequate assessment of projects with potential transboundary impacts. While United States environmental impact assessment is based on statute, the Canadian EARP is not. There is no guarantee that the Tidal Power Corporation would have to be involved in the environmental review process. On the provincial level, environmental legislation is largely influenced by resource development policies.

It is questionable whether an environmental assessment of the Fundy project would be triggered by the need to do an EIS on any new construction of power lines associated with the project. Maine State law is similarly deficient in addressing the problem.

Nonetheless, given the political pressure which the United States might impose on Canada to undertake an EIS, the long-standing amicable relationship between the two countries, and verbal assurances by the Tidal Power Corporation to submit to environmental review, it is unlikely that an environmental assessment or statement will not be prepared for such a major facility as the one proposed for the Minas Basin. It is therefore useful to review past United States-Canadian practices on a number of transboundary environmental problems to examine how each nation has historically viewed protection of the transboundary area.

CHAPTER IV NOTES

1. Public Law 91-190, United States Code 4321-4347, January 1, 1970 as amended by Public Law 95-52 (July 3, 1975) (appropriations) and (August 9, 1975) (delegation to states to prepare environmental impact statements in certain limited cases).
2. Environmental Statutes, 1983 Edition (Rockville, Maryland: Government Institutes, Inc., 1983), p. 383.
3. Public Law 94-83, National Environmental Policy Act reprinted in Environmental Law Handbook 7th Edition (Rockville, MD: Government Institutes, Inc., 1983), p. 79.
4. Executive Order No. 12,114, 44 Federal Register (1979), p. 1957.
5. Francis M. Allegra, "Executive Order 12114 - Environmental Effects Abroad: Does it Really Further the Purpose of NEPA," Cleveland State Law Review 29 (1980), p. 111.
6. Executive Order 12114 as reprinted in United States Code Service - Title 42, Public Health and Welfare (Rochester, NY: The Lawyers Co-operative Publishing Co., 1982), p. 309.
7. Ibid., p. 308.
8. Ibid., p. 311.
9. Allegra, p. 138.
10. Ibid.
11. John Gilligan, Administrator AID, Letter to C. Warren, Chairman CEQ (December 9, 1977) reprinted in Pincus, Glenn, "The 'NEPA-Abroad' Controversy: Unresolved by an Executive Order," Buffalo Law Review 30 (1980), p. 652.
12. Carl E. Beigie and Alfred O. Hero, Jr. (eds.), Natural Resources in U.S.-Canadian Relations: Volume I The Evolution of Policies and Issues (Boulder, Colorado: Westview Press, 1980), p. 601.
13. Ibid.
14. Robert T. Franson and Alastair R. Lucas, "Revised Guide to the Federal Environmental Assessment and Review Process" in Canadian Environmental Law, Volume 6 Statutes and Regulations (Toronto: Alger Press Ltd, 1979), pp. 1161-1171.
15. Ibid., p. 1161.
16. FEARO, "Guidelines for the Preparation of an Environmental Impact Statement - The Beaufort Sea Hydrocarbon Production Proposal" (Federal Environmental Assessment Review Office, 1982).

17. Paul Scott, FEARO-Vancouver, B.C., telephone interview, July 11, 1985.
18. John Swaigen, Environmental Rights in Canada (Toronto: Butterworths, 1981), p. 276.
19. Paul D. Emond, Environmental Assessment Law (Toronto: Emond-Montgomery Ltd, 1978), p. 251.
20. Federal Energy Regulatory Commission, 1979 Annual Report, p. 42.
21. Federal Power Act in United States Code Service - Title 16, Chapter 12, 824, p. 687.
22. 3 Code of Federal Regulations, p. 970 reprinted in 15 U.S.C.A. at 717.
23. 38 Maine Revised Statutes Act, 481, in Massey, Karen, United States Regulatory Authority over Canadian Tidal Power Development, An Analysis with Proposed Legislation, (Portland, Maine: Marine Law Institute, 1983), p. 11. (Working paper.)
24. Ibid.
25. Ibid., p. 12.
26. Maine Department of Environmental Protection Regulations, Chapter 372 (1979).

CHAPTER V

UNITED STATES AND CANADIAN PRACTICE

While a substantial amount has been written about transboundary pollution and the obligation of states to prevent it from occurring, it is perhaps more pertinent to examine actual practice between Canada and the United States on environmental problems they have encountered and how they have resolved their conflicts in the past.

Possibly, the most amenable method of dealing with any potential conflicts is the use of bilateral arrangements. Certainly, a new treaty could be negotiated between the United States and Canada to deal exclusively with the Fundy tidal power situation. This new treaty, could, as part of the agreement, provide for some type of mechanism to address the special circumstances of the Fundy project. In fact, however, an existing mechanism—the International Joint Commission (IJC) has been in place since early in the century and might be the ideal body to deal with the potential problems associated with the development of tidal power in the Bay of Fundy.

The Trail Smelter arbitration was discussed previously as the precedent in United States-Canadian relations for establishing the standard for the responsibility of states towards protection of the transboundary environment and will only be mentioned in passing in this chapter. The following discussion reviews a viable dispute settlement mechanism which the United States and Canada has employed in the past and looks at other prior United States and Canadian practice on a number of transboundary environmental incidents. These reveal that overall, their outcomes further support the principles of the Stockholm

Declaration. For a historical perspective on how United States environmental law has evolved, reference is also made to United States practice with its other neighbor, Mexico.

Early U.S. Practice

The Harmon Doctrine

One of the first and certainly most significant examples of United States practice in the area of international environmental law involved a dispute with Mexico over diversions of the Rio Grande river, north of the United States-Mexico border. Mexico's claim that such diversions were unlawful were countered by United States Attorney General Judson Harmon in an 1895 opinion known subsequently as the "Harmon doctrine." Harmon interpreted an applicable treaty to find that such diversions were not prohibited by its terms and that no customary law duty prevented the diversions.

"The fundamental principle of international law is the absolute sovereignty of every nation, as against all others, within its own territory."¹

Attorney General Harmon interpreted the Mexican claims to be an assertion of a right to restrict the actions of the United States within its own territory, and therefore contrary to United States territorial sovereignty. Although he recognized that the upstream diversion of water in the United States did cause injury within Mexico (insufficient water for irrigation), Harmon saw no obligation on the part of the United States to modify its actions and avoid occurrence of transboundary injury. However, Harmon did recognize an obligation to avoid causing injury by creating downstream obstructions or diverting rivers which caused flooding to a neighboring country, noting that flooding involved a physical invasion of the other state's territory and therefore a violation of international obligations.²

The fundamental logical flaw with the Harmon doctrine as it applies to the real world, and the reason it was never widely accepted, is that it contains a contradiction within itself for if a state can exercise complete control over activities within its territory free from other states, then it can also exclude the entrance of transboundary pollutants. Not overly surprising is the fact that within a year of Harmon's opinion, the United States was seeking to ensure that diversions of the waters of Boundary Creek within Canada would not be permitted to damage the lands and properties of the downstream settlers in Idaho. The United States position on upstream diversions as interpreted in the Harmon doctrine ultimately was accepted and included as Article II of the 1909 Boundary Waters Treaty³ as was the prohibition of physical invasions (i.e., flooding) which, in Article IV of that treaty prohibits downstream obstructions which raise water levels in transboundary areas without approval of an international joint commission. A discussion of the history of that treaty, its provisions, and the treaty's working mechanism--the International Joint Commission--follows.

History of the International Joint Commission (IJC)

The need to deal jointly with certain environmental conditions was recognized by Canada and the United States long before the environmental movement of the 1960s and 1970s. At the 1894 and 1895 International Irrigation Congresses held at Denver, Colorado, and Albuquerque, New Mexico, the Canadian delegate introduced a number of resolutions which are generally recognized as the genesis for the Boundary Waters Treaty of 1909 and the International Joint Commission. Unanimously adopted by the United States, Mexican and Canadian delegations, the resolutions recommended to the United States "the appointment of an international commission to act in conjunction with

the authorities of Mexico and Canada in adjudicating the conflicting rights which have arisen, or may hereafter arise, on streams of an international character.⁴

Subsequently, an International Waterways Commission was formed in 1903, between Canada and the United States. The commission functioned officially from 1905 to 1913. In 1906 and 1907 the commission made a series of recommendations to the Canadian and United States governments calling for negotiations to be undertaken to adopt principles of law governing uses of all international waters between Canada and the United States; the recommendations also called for creation of an international body with authority to study and regulate the use of these waters.⁵

Informal negotiations between two lawyers on the Waterways Commission resulted in the formation of a special commission and a draft treaty in August 1907. After a great deal of drafting and negotiating, the Boundary Waters Treaty was signed January 11, 1909 by the United States Secretary of State Elihu Root and Britain's Ambassador in Washington James Bryce, on behalf of their governments.⁶ Both countries appointed Commissioners in late 1911 and the first meeting of the IJC was held January 10, 1912 in Washington, D. C.

The Boundary Waters Treaty of 1909

The purpose of the Boundary Waters Treaty of 1909 is:

to prevent disputes regarding the use of boundary waters and to settle all questions which are now pending between the United States and the Dominion of Canada involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along their common frontier, and to make provision for the adjustment and settlement of all such questions as may hereafter arise...⁷

While there can be no argument that the Gulf of Maine-Bay of Fundy system most certainly contains boundary waters given the 200 mile exclusive economic zones which each country has recently proclaimed to be within its domain, the

preliminary article of the Boundary Waters Treaty indicates that it intended to exclude these marine waters from being subject to the treaty:

For the purposes of this treaty, boundary waters are defined as the waters from the main shore of the lakes and rivers and connecting waterways, or the portions thereof, along which the international boundary between the United States and the Dominion of Canada passes, including all bays, arms, and inlets thereof, but not including tributary waters which in their natural channels would flow into such lakes, rivers, and waterways, or the waters of rivers flowing across the boundary.⁸

It is perhaps unfortunate that the Boundary Waters Treaty as drafted was not intended to include marine waters, as there are a number of provisions within the Treaty which could be considered to be directly applicable to the proposed Fundy tidal dams and would clearly provide for an authority to regulate such activities.

For example, Article II of the BWT states that:

each [state] reserves the right to exclusive jurisdiction and control over the use and diversion, whether temporary or permanent, of all waters on its own side of the line which in their natural channels would flow across the boundary or into boundary waters; but it is agreed that any interference with or diversion from their natural channel of such waters on either side of the boundary, shall give rise to the same rights and entitle the injured parties to the same legal remedies as if such injury took place in the country where such diversion or interference occurs; (but not applicable to existing cases or special agreement).⁹

Article III, in part, contains another appropriate clause:

...in addition...no uses...affecting the natural level or flow of boundary waters on the other side of the line, shall be made except by authority of the United States or Canada within their respective jurisdictions, and with the approval, as hereinafter provided, of a joint commission, to be known as the International Joint Commission (IJC).¹⁰

Article IV of the Boundary Waters Treaty does imply that there is a ban on pollution of boundary-crossing waters as well as "boundary waters" themselves, but again is understood not to include waters which may 'flow' across an ocean boundary. It specifies that:

The High Contracting Parties agree that except in cases provided for by special agreement between them, they will not permit the construction or

maintenance on their respective sides of the boundary of any remedial or protective works or any dams or other obstructions in waters flowing from boundary waters or in waters at a lower level than the boundary in rivers flowing across the boundary, the effect of which is to raise the natural level of waters on the other side of the boundary...

It is further agreed that the waters herein defined as boundary waters flowing across the boundary shall not be polluted on either side to the injury of health or property on the other."¹¹

Article VIII delimits the jurisdiction of the IJC and provides for compensation of transboundary environmental damage:

In cases involving the elevation of the natural level of waters on either side as a result of ...dams...the Commission shall require, as a condition of its approval thereof, that suitable and adequate provision, approved by it, be made for the protection and indemnity of all interests on the other side of the line which may be injured thereby.¹²

In Article X we find what may be viewed as a mandate for the IJC to consider the Fundy situation. Its provision allows other matters of disagreement (besides specific boundary waters problems) between the two nations to be referenced to the IJC:

The High Contracting Parties further agree that any other questions or matters of difference arising between them involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along the common frontier between the United States and Canada, shall be referred from time to time to the IJC for examination and report, whenever either the Government of the United States or the Government of Canada shall request that such matters or difference be so referred.¹³

The Boundary Waters Treaty is a remarkable document. In setting out limitations on the freedom with which each country could act, it provided safeguards on water levels and flows and pioneered restrictions on transboundary pollution long before the environment became a popular concern. It provided a forum for affected publics to be heard long before public participation became a prerequisite for resources planning; it specified certain rules to govern the settlement of disputes; and finally, its terms were broad enough to cover boundary problems other than water, including those of air pollution. By far, however, the author believes that its greatest contribution is its working mechanism, the

International Joint Commission. It has withstood the test of time and has proved to be one of the most successful negotiating bodies in history.

How the IJC Functions

The International Joint Commission is composed of six members, three from the United States and three from Canada. The United States members are appointed by the President with the advice and consent of the U.S. Senate. The Canadian members are appointed by the Governor in Council of Canada. The Commission is directed by U.S. and Canadian co-chairmen who serve in their positions on a full-time basis while the other Commissioners serve part-time.

"The Commissioners conduct their business as a single body, not as separate national delegations representing their respective governments, but effectively seeking common impartial solutions in the mutual interest of both countries."¹⁴

Decisions are made by a majority of the Commissioners, irrespective of their nationality. Although the Treaty allows for separate reports to each government, the authors of the Treaty believed, as intended by the governments, that resort to this provision would be infrequent and the Commission would normally be able to function in unison to achieve equitable solutions in the common interest of both countries.

This philosophy of impartiality has been extremely evident in the seventy plus years since the Commission has been in existence. In only three of the 110 cases (as of July 9, 1985) which the Commission has dealt have the Commissioners failed to reach agreement.¹⁵

The Commission has three principle functions:

1. Regulatory - approves or disapproves applications from government, companies, or individuals for obstructions, uses or diversions of water which affect the natural level or flow of boundary water on the other side of the international boundary or raise the level of transboundary rivers at the boundary;

2. Investigative - Investigates questions or matters of difference along the common frontier. These investigations and studies which are referred to the Commission by the two Governments are called "References." In such cases the Commission reports the facts and circumstances to the Governments of Canada and the United States and recommends appropriate action by them. The Governments decide whether or not the Commission's recommendations will be accepted or acted upon.
3. Surveillance/Coordination - Monitors compliance with the terms and conditions set forth in Orders of Approval it has issued. When requested by the two governments, the IJC monitors and coordinates actions or programs that result from governmental acceptance of recommendations made by the Commission.¹⁶

Article X of the Boundary Waters Treaty also provides for the IJC to be used as an arbitration body. It permits the Governments to refer any issues to the Commission for binding decision rather than only for a report and recommendations. However, in the seventy-five years of its existence, this fourth function has never been utilized.

This can be partially explained by the fact that in almost all instances, the IJC was able to resolve any problems by merely reviewing the facts, making recommendations, and presenting them to each government in a fashion that all parties concerned reached agreement on a course of action. In fact, since 1930, only *five* disputes between the United States and Canada have been submitted for third party resolution. There appears to be a real reluctance on the part of sovereign nations such as the United States and Canada to resort to judicial dispute resolution mechanisms such as adjudication and arbitration. Given the non-compulsory nature of Article X of the Boundary Waters Treaty, and the reluctance to submit matters to third party resolution, it is questionable how effective such a provision could be in helping to settle transboundary disputes.

Twenty-four bi-national advisory boards appointed by the Commission are utilized to perform the technical studies and field work required to perform these

functions. These boards include engineers, scientists and other experts, most of them public servants whose services are supported by their agencies.

The IJC has separate headquarters in Ottawa and Washington, each staffed with a small group of advisors and a secretary for each section. A permanent binational staff is located in Windsor, Ontario to assist the Commission in its responsibilities under the Great Lakes Water Quality Agreement.

Although the Commission has worked almost exclusively on issues dealing with freshwater resource issues, that is, questions of domestic and sanitary water supply, navigation, power development, irrigation and pollution—there is precedent for the use of the IJC for other issues. Indeed, as mentioned previously, the IJC was involved in studying the Trail Smelter dispute and in 1928 completed a report on the case. Although the report was not accepted by the U.S. the tribunal which eventually decided the case made an award similar to that proposed by the IJC. In several other instance, the IJC has examined other air pollution issues and has even become involved in acid rain research to some extent.

There has even been a precedent set for the IJC to study tidal power. In 1948, the IJC completed a study on the feasibility of tidal power in Passamaquoddy Bay, located between Maine and New Brunswick. Again, in 1956, the Governments of the United States and Canada requested that the IJC investigate the possibility of a cooperative international power project in Passamaquoddy Bay. The International Passamaquoddy Engineering Board, a technical board established by the IJC, ultimately concluded in 1961 that a tidal power project would not be economically justified at that time.

International Environmental Dispute Settlement

The settlement of international environmental disputes between Canada and the U.S. has been the subject of many forums between lawyers and academicians in the past. These meetings have resulted in numerous reports and recommendations. Foremost among these are the environmental resolutions adopted by the American Bar Association (ABA) and Canadian Bar Association (CBA) in August 1979. These recommendations originate from a proposal originated at a meeting of the section of International Law of the ABA which was held in October 1974. Following approval by the CBA in December 1976, a joint group of representatives of the two bar associations met numerous times over the following two years and with substantial input from others in the field of international law were able to come to agreement.

Their conclusions and recommendations will be analyzed in this section with respect to the Fundy issue. Disputes between the two countries will be examined from its principle components--avoidance, management, and settlement.

As has been pointed out, the solution of many disputes between the U.S. and Canada has been made more difficult by the federal nature of the constitutional systems of both countries. The more governmental units that are involved, the more delays and complications of the issues occur. Any strain in the relations within one country between the federal government and the governments of one or more constituent units can also have repercussions on international issues. A system of dispute settlement for the two countries should reflect a realistic appreciation of these federal complexities. In the United States, Congress must stay within the jurisdiction given it under the Constitution, which specifically enumerates what rights the states have. In Canada it is different; a case can be brought to court if a provincial legislation impinges upon federal jurisdiction and

vice-versa. While in the United States a treaty approved by two-thirds of the Senate is binding on every part of the country, there is an inability of the Canadian government to bind provinces in international treaties.

In 1978, there were more than 200 bilateral treaties and agreements governing relations between Canada and the United States. Sixteen or eighteen arrangements establishing bilateral commissions were found to exist, however, more impressively, an American study "discovered a total of 766 agreements, understandings, and arrangements between Canadian provinces and northern states which had been arrived at without the intervention of either federal government."¹⁷ Thus some provinces have acted internationally as quasi-independent states in their relations with the U.S. government and its entities. The majority of these are entered into logically between the provinces and states (e.g., movement of firefighting equipment across international lines), to minimize delays in bureaucracy.

There are, based on the long-standing relationship between the United States and Canada, certain patterns of dispute settlement. These patterns are shown in figure 6.

The mechanisms which have been employed in the past for dispute settlement between Canada and the U.S. may be broadly divided into two categories: (1) those which are binding such as arbitration and reference to a permanent judicial tribunal; and (2) those which are non-binding. These non-binding methods may further be divided into (1) those of a strictly bilateral nature, such as negotiation and mixed commission; and (2) those which make use of third parties in some intermediate capacity--good offices, mediation, and conciliation. Sometimes these non-binding measures may also be considered a form of dispute management.

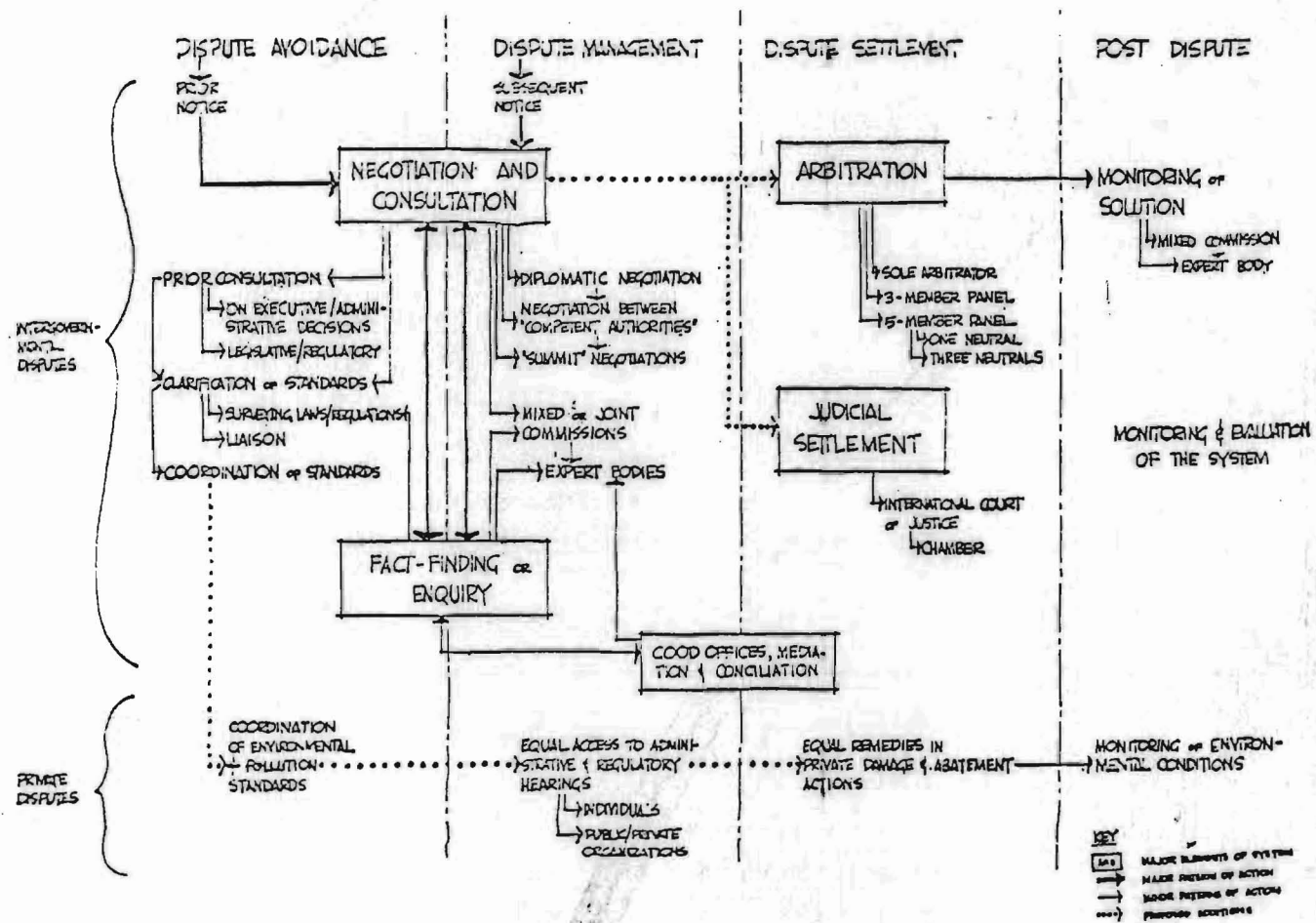


Figure 6. Patterns of Canadian-United States Dispute Settlement

Negotiation

Negotiation is the rule rather than the exception in U.S.-Canadian dispute settlement. It has become a matter of practice and habit rather than a legal obligation and there are very few areas in which the two countries are bound by a bilateral instrument.

In almost all U.S.-Canadian practice in dispute settlement, some form of strictly bilateral settlement is reached. However, not all negotiations or mixed commissions are successful and in many of the most difficult disputes between the two countries, unproductive negotiations have dragged on for years while the problem has actually become aggravated or more complex (e.g., Garrison Diversion and acid rain which are discussed later in this chapter).

"Negotiations cannot, by themselves, constitute an adequate dispute settlement system for two countries with a relationship as close, extensive, and complicated as that of the United States and Canada."¹⁸ The need for alternative mechanisms to provide answers where negotiations fail has been recognized as having the capability to increase the effectiveness of the negotiating process. The use of the IJC's fact-finding function is an example of this. However, its limitation is found in the fact that this use is only optional and cannot be effective if not used.

Where a dispute is a legal one or has legal aspects, obligatory arbitration may be the most efficient and equitable means of settlement. This may be necessary where a genuine reconciliation of legally supportable conflicting positions cannot be had through negotiations, and each side continues to escalate the legal validity of its claim. In other situations, solutions may be reached through negotiations where one side is victorious based purely on political

advantage or bargaining power. Here arbitration can help reduce tension and assure that a genuine and impartial solution is reached.

There are, however, at least two forms of negotiation to keep disputes from arising, rather than using them to manage already existing disputes--prior consultation and legislative or regulatory coordination and cooperation. Either or both of these can be employed in the Fundy situation in an attempt to avoid a dispute.

Prior Consultation

Prior consultation by the Canadian government with the appropriate officials of the United States may lead to minor adjustments or accommodations which can minimize adverse effects and thus prevent a dispute. Indeed, in the course of research for this thesis, the author was surprised to find that despite the intensity with which the Fundy proposals are being pursued in Eastern Canada there has been no apparent consultation on this issue between the U.S. Secretary of State and Canada's counterpart--the Minister of External Affairs. Yet, the need for prior consultation is certainly a minimum attempt at assuaging an ever-increasing and anxious public in New England.

Prior consultation has in a few cases--by Canada on energy plans and by the U.S. on balance of payments plans and some anti-trust enforcement matters--contributed to policy shifts which lessened the discomfort of the other nation. The absence of prior consultation in other situations seems to have aggravated matters even though settlements were eventually reached. The groundwork for consultation on the Fundy project appears to have been laid. "An exchange of letters in 1976 between the International Joint Commission and the two Governments clarified the duty of the Commission to 'alert' both Governments to any problems it sees looming ahead."¹⁹ However, at this point, this appears to be

an empty promise since although the potential problems associated with tidal power development in the Bay of Fundy have been the subject of numerous scientific forums over the past three years, the IJC has not at this point "alerted" either Government about this potential problem.²⁰ In fact the IJC may be officially alerted themselves by the respective governments in the next several months. As a result of the most recent meeting (June 1985) between the New England Governors and the Eastern Canadian Premiers, a formal request was made to ask that the President and the Prime Minister initiate a reference to the IJC with respect to the feasibility and desirability of the Fundy tidal power project.²¹ Thus while the Commission is supposed to provide a form of prior consultation, it is limited in fact by the amount of information available to it from Boards and public sources, and this necessarily presents problems.

Aside from the few examples of prior consultation, there has been little serious or sustained effort to regularize prior consultations between the two Governments. The decision as to whether or not to consult has been left to be made ad hoc by the responsible department or bureau officials. And if previous experience with prior consultation proves itself true, there is little to hope for with regard to appropriate consultation prior to significant financial investment in the development of tidal power. At this point it becomes increasingly hard to stop the momentum for such a project. It is not unlikely to think that commitments to the project, on the part of some, will strengthen to the point where some Garrison supporters were.

The Joint Working Group of the ABA/CBA when considering the need for mutual commitment to prior consultation for measures which might adversely affect the other party concluded that all of these determinations involved political, diplomatic, and technical considerations, as well as legal ones.

Therefore they did not recommend a prior consultation regime, but suggested however, that such a regime founded on legal obligation should be given serious attention.

Regulatory Coordination

The second method of dispute avoidance is the standardization of the laws in each country which attempt to protect the environment. We have seen in an earlier chapter that there are substantial differences between the environmental laws in each country. Legislative and regulatory decision-making processes as they exist today do not lend themselves to the kind of prior consultation described above. Legislative and regulatory processes are more rigidly structured. One proposed method of having disputes result from such projects with transboundary implications is to involve the other Government in the process of making decisions on the project. Each Government should enhance the possibilities for the other to put its position before the legislative or administrative agencies preparing the laws or regulations.

Actual consideration of measures through clarification of standards or meshing of laws appears to be especially appropriate in environmental regulation. A potential mechanism for this coordination is offered by the existence of the Uniform Law Conference of Canada and the U.S. National Conference of Commissioners on Uniform State Laws. Although this would undoubtedly be a major task, it should be pursued as the environment is something we all share and one must certainly conclude that dispute avoidance is preferable to any system of settlement.

Dispute Management

Bilateral - Non-Binding Methods

The most common method of dispute management is negotiation-direct bilateral consultation between Governments. However, given the nature of federal governments as discussed previously, it can also be the most complex and difficult. Not only may several departments or agencies in each government be concerned with a particular question in dispute, those on one side may differ among themselves on the same question. This is an all too common problem when it comes to questions of ocean resource use as evidenced by the continual interagency turf fights over the Outer Continental Shelf. Occasionally there also arise problems in negotiations when a United States state and a Canadian province are on one side and the two central Governments are on the other. Additionally, well-organized or large-scale private interests sometimes play a role in negotiations.

Increasingly, negotiations take place directly between what treaty clauses refer to as "competent authorities" of each party. Such negotiations in the Fundy situation might be expected between the Secretary of Interior or Secretary of Energy in the U.S. and their counterparts in Canada. The necessity of involving the Department of State or Department of External Affairs has been minimized in many instances by the fact that the two countries cooperate on a daily basis in so many areas.

Where a problem is relevant or where a situation, particularly a technical one, requires continuous oversight, negotiations may be institutionalized in the form of a mixed commission composed of an equal, often fixed, number of representatives from each Government (e.g., the IJC). After simple negotiations, the mixed commission is the device most commonly employed to handle Canadian-

United States disputes. The IJC is certainly foremost among Canadian-United States mixed commissions and has been discussed earlier in this chapter.

The Use of Third Parties

In three methods of international accommodation, third parties are used in intermediary capacities to assist disputants in reaching an agreement. These are good offices, mediation, and conciliation and represent a borderline between dispute management and dispute settlement. These third parties have no power to bind the disputants to a solution, but merely advise, accommodate, and reconcile in an effort to bring the parties to a bilateral settlement.

Both the United States and Canada are parties to the 1899 Hague Convention on the Pacific Settlement of International Disputes.²² In 1914, the United Kingdom and the United States signed an agreement which provides for an international conciliation commission of five members to which disputes (including those with Canada) could be submitted for investigation and report. A 1940 Canadian-United States amendment provided for direct Canadian appointment of its members to the commission.²³

While all of these methods remain available to Canada and the United States, none have been used. The United States and Canada have not found it necessary to use intermediaries to get bilateral negotiations started in light of their longstanding basically congenial relationship.

Dispute Settlement

Where a settlement cannot be reached through non-binding procedures, two binding methods of settlement are available: ad hoc arbitration, the most common form used, and adjudication through a permanent judicial tribunal.

Ad-hoc Arbitration

Arbitral bodies are distinguished by the ad hoc appointment of members, at least one of whom must be independent of the control of either disputant. There are four types of arbitration which are commonly used: (1) the single neutral arbitrator; (2) the three-member tribunal; (3) the five-member tribunal where one arbitrator represents each side and the three others are neutral; and (4) the five-member tribunal where each side is represented by two arbitrators and the fifth is impartial.

The differences in the composition of the arbitrators on these tribunals may produce important differences in the conduct of the proceedings and in the nature of the result reached. The single arbitrator is free to arrive at a decision which does not wholly favor either disputant. In the three-member tribunal (or five-member tribunal where one is neutral), the independent member does not have this freedom, since he must obtain the current vote of one or two national members to reach a decision. Where three of the five members on the tribunal are neutral, the influence of the national members is minimized.²⁴

Selection of the tribunal involves one of numerous selection methods and sometimes becomes a complicated process in itself.

While the 1899 and 1907 Hague Conventions both contain provisions on international arbitration, the 1907 Convention details to a greater extent the powers and procedure of the Permanent Court of Arbitration, a panel through which disputants may select an arbitral tribunal from. However, Canada does not consider itself bound by it, but has accepted the 1899 Convention. The United States ratified the 1907 convention with reservations that recourse to the Permanent Court of Arbitration could only occur by agreement to general or special treaties of arbitration which specified its use and rejected the Court's power to formulate a compromise in the absence of agreement between the disputants.

There have been four ad hoc arbitrations between the U.S. and Canada this century. The first was the North Atlantic Fisheries Controversy²⁵ which was referred to the Permanent Court of Arbitration and decided in favor of the United Kingdom (i.e., Canada). The issue involved fishing in certain bays.

The second case was the 1929 I'm Alone Case,²⁶ in which a United States revenue cutter fired upon and sank a Canadian private vessel, suspected of smuggling liquor. Several of the crew were lost. Under the 1924 Convention relating to the prevention of smuggling of intoxicating liquors, the case was referred to two commissioners who reached agreement in reports in 1933 and 1935. The latter granted compensation to Canada for the unlawful act of sinking and for damage to the captain and the crew.

The third and fourth cases were the Trail Smelter arbitration and Gut Dam arbitration, both discussed elsewhere in this thesis.

Another case, the Alaska boundary "arbitration" of 1903²⁷ was not really an arbitration but rather a mixed commission of six, with no neutral members: three United States representatives, two Canadian, and one British. However, in a controversial decision, the British commissioner did not vote with the Canadian members and the boundary between British Columbia and Alaska was drawn in favor of the United States.

Permanent Judicial Tribunal

The second and more formal method of binding settlement of legal disputes is by reference to a permanent judicial tribunal. The only general international judicial body to which the United States and Canada both have access is the International Court of Justice (ICJ) at the Hague. While both countries have accepted the compulsory jurisdiction of the Court, their acceptances are limited

by substantial reservations. Canada's reservations include those made in their 1970 Canadian Arctic Waters Pollution Prevention Act²⁸ which excludes

disputes arising out of or concerning jurisdiction or rights claimed by Canada in respect of the conservation, management, or exploitation of the living resources of the sea, or in respect of the prevention or control of pollution or contamination of the marine environment in marine areas adjacent to the coast of Canada.²⁹

The Connally Reservation made by the United States in 1946 upon accepting jurisdiction of the ICJ excludes, *inter alia*, "disputes with regard to matters which are essentially within the domestic jurisdiction of the United States of America as determined by the United States of America,"³⁰ and "disputes arising under a multilateral treaty, unless (1) all parties to the treaty affected by the decision are also parties to the case before the court, or (2) the United States of America specifically agrees to jurisdiction."³¹

Since any acceptance of the jurisdiction of the Court is subject to reciprocity, for all practical purposes, the two countries have at present no obligation to submit disputes to the ICJ. The only use of the ICJ to settle a dispute between the United States and Canada occurred in 1984 when the two countries had their maritime boundary in the Gulf of Maine delineated by a special chamber of the ICJ. This Special Chamber consisted of five judges, one each from Canada and the United States and three neutral members. The Court found neither side's boundary position justified and established a line essentially mid-way between the claims of the two states. Both parties have agreed to abide by the decision.

Post-Settlement

Finally, there is the problem of following up on dispute settlement. There presently exists no systematic monitoring procedure available for following up on a particular dispute. In the case of the Trail Smelter incident, the tribunal which

decided the matter set up a procedure for monitoring local environmental conditions, but there is no clear mandate to do so in normal arbitral proceedings. It is generally up to the parties themselves to arrange for further supervision. An analysis of the results obtained by recourse to various methods could help the governments to improve their dispute settlement procedures.

Other Examples of Canadian-United States Practice

The following are some specific examples of Canadian-United States practice in dealing with pollution or potential environmental damage problems of the transboundary area. It is suggested that the IJC might have played a more significant role in conflict resolution where it was used had it been employed at an earlier point in the dispute.

The Cherry Point Oil Spill Incident

The precedent-setting Trail Smelter decision was thrown back at the United States in the Cherry Point Oil Spill incident in 1972. A Liberian tanker leased by the Atlantic Richfield Company (ARCO) leaked approximately 12,000 gallons of crude oil into the sea while it was off-loading at the Cherry Point refinery in the State of Washington. The oil eventually spread and washed up on several miles of beaches in British Columbia. The Canadian Government took the position that the mere fact that this private activity was carried on within waters under United States jurisdiction and control, not that the United States itself was at fault, gave rise to the responsibility of the United States to see that compensation was paid. In a statement before the Canadian House of Commons, the Secretary of State for External Affairs in Canada noted:

We are especially concerned to ensure observance of the principle established in the 1938 Trail Smelter arbitration between Canada and the United States. This had established that one country may not permit the use of its territory in such a manner as to cause injury to the territory of another and shall be responsible to pay compensation for any injury so suffered. Canada accepted this responsibility in the Trail Smelter case and

we would expect that the same principle would be implemented in the present situation.³²

The United States government, however, never did admit or acknowledge any liability or responsibility in this matter, nor did it have to, as the problem was ultimately settled by the agreement of ARCO to pay the costs of clean-up and some damages. Therefore, while this incident gives us an insight into the Canadian position on liability for transboundary pollution damage, it is not a good example of customary law.

Canadian Offshore Oil Drilling in the Beaufort Sea

The acceptance of liability for transboundary pollution damage between Canada and the United States is further exemplified by the way in which the two countries approached offshore oil drilling in the Beaufort Sea in 1976. Alaska residents, concerned about potential damage from Canadian oil activities in the Beaufort Sea, requested the United States to enter into discussions with Canadian authorities to assure that adequate safety measures existed and that compensation funds would be available for pollution victims in Alaska. The negotiations resulted in an agreement by Canada to guarantee the payment of any compensation claim against the drilling companies by affected citizens in the United States. Thus, Canada explicitly accepted responsibility for transboundary pollution damage from activities within its control in accordance with customary law.

United States and Canadian Practice with Respect to Flooding

As one of the principle concerns with the proposed Fundy tidal projects is the potential for transboundary flooding damage, it is perhaps worthwhile to examine United States and Canadian state practice with regard to flooding.

On the southern border of the United States, the United States and Mexico have entered into a number of agreements which address, inter alia, flooding in each other's territory as a result of projects undertaken by each country.³³

In the 1950's, two separate border incidents between Mexico and the United States resulted in a diplomatic exchange of notes seeking corrective actions by the other in response to the threat of potential transboundary flooding damage. In the first incident, Mexico requested compensation for flooding damage which had occurred and could potentially occur again as a result of the disrepair of a drainage canal which extended across the border from Douglas, Arizona to Aqua Prieta, Mexico. While the United States requested a joint study of the problem, Mexico grew impatient and constructed a dike to prevent the canal waters from entering Mexico. The United States State Department, in explaining the Mexican action to the Douglas, Arizona local government, did admit that under long recognized principles of international law every state is obligated to respect the full sovereignty of other states and to refrain from creating such entities as the drainage canal which causes injury to another state or inhabitants.³⁴

In the other incident, the United States sought remedial actions by Mexican authorities in the construction of a highway outside Tijuana which the United States claimed could cause flooding damage due to inadequate embankments. In a note to Mexican officials the United States urged Mexico to suspend work until modifications could be made and concluded that the United States would "reserve all rights that the United States may have under international law in the event that damage in the United States results from the construction of the highway."³⁵ A special agreement between the two countries for the joint construction of an international flood control project for the Tijuana River eventually solved the problem.

The following is a specific example of United States-Canadian experience with a Canadian project which resulted in flooding of U.S. territory.

The Gut Dam Arbitration

As pointed out, only five disputes between the United States and Canada have been submitted for third party resolution. Rather, most disputes between Canada and the United States have been negotiated. In 1967, the Gut Dam arbitration³⁶ occurred and provides the second example, the Trail Smelter being the first, of an environmental dispute which was sent to arbitration. This arbitration may serve as a basis for examining how the United States and Canada might examine future transboundary flooding damage as a result of a dam project on one side of the border.

In 1901 Canada constructed the Gut Dam between Adams (Canada) and Les Galops (United States) Islands in the St. Lawrence River.

As the dam crossed the international boundary, United States approval had been sought from the Secretary of War and obtained, subject to the condition that the Canadian Government indemnify 'property owners of Les Galops Islands, or...any other citizens of the United States' for any damage or detriment incurred as a result of construction or operation of the dam.³⁷

In 1952, extensive flooding and erosion occurred on the United States side of the St. Lawrence River. Affected U.S. citizens, attributing the damage to construction of the dam, sought compensation. In October, 1952, eight of these affected U.S. property owners filed suits against Canada in the U.S. District Court for the Northern District of New York.

A note in November from the Canadian Ambassador to the Secretary of State advised that the Government of Canada recognized in principle its obligation to pay compensation for damages to the United States citizens provided they were attributable to the Gut Dam, but requested the sovereign immunity of Canada from such suits as had been filed be recognized by the United States. The Department of State rejected the Canadian request for recognition of immunity, but stated a willingness to discuss means of settling the claims.³⁸

In April of 1953 the Lake Ontario Land Development and Beach Protection Association which represented a large majority of the United States claimants advised the Department of State that settlement of their claims by an international tribunal was unacceptable and that it preferred to negotiate directly with the Canadian Government.³⁹ Finally, there was agreement to the tribunal, but the plaintiffs were unwilling to accept the Canadian conditions that they relinquish their suits in the United States District Court and accept the decision of the tribunal as final adjudication. When the hearings began in October of 1955, the Canadian Government decided to postpone further intergovernmental negotiations until the suits were resolved. In 1956, all eight suits were dismissed for lack of jurisdiction. On April 22, 1957, the United States Supreme Court refused to review judgment and issued a "Denial of certiorari." The State Department then attempted to reopen negotiations with Canada for the settlement of claims or for submission to an international tribunal for adjudication and finally on March 25, 1965, the United States and Canada agreed to an international arbitral tribunal to hear and disclose of the claims.

The Lake Ontario International Board of Engineers, a special investigative board established by the International Joint Commission, had begun an investigation of the problems created by the water levels of Lake Ontario and in 1958, six reports disclosed that a large number of factors, natural and artificial, including construction of the Gut Dam contributed in a rather complex manner to the damages in question in that they all affected the water levels of Lake Ontario.

These studies disclosed that the highest mean monthly stage ever recorded was 249.29' at Oswego for June 1952; that the effect of the Gut Dam at this stage was to raise the water level .33' or 4 inches; and that without the effects of artificial factors, including construction of the Gut Dam, the mean monthly water level in June 1952 would have been 248.77'. Eliminating the Gut effect, the level would be 248.96'.⁴⁰

When the issue of compensation reached final arbitration, it was found that the liability question had been preempted by the intergovernmental agreement made prior to the construction of the dam and the 1952 note from the Canadian Ambassador acknowledging the obligation to pay compensation, provided the damage concerned was attributable to the dam. Accepting the investigative boards' conclusion that a certain amount of damage was attributable to the dam, Canada did pay compensation to affected citizens of the United States.

This situation is again illustrative of the way in which the two nations address the liability associated with transboundary environmental damage and is indicative of the value of the IJC in a fact-finding capacity.

Recent Transboundary Problems

Garrison Diversion Incident

A prime example of Canadian-U.S. practice which may be particularly well-suited as a comparison to the potential situation which might arise from the development of Fundy tidal power is that of the recent Garrison Diversion Unit conflict. Both projects involve massive developments which could result in far-reaching environmental consequences. Although the two projects involve two very different proposals, a number of problems associated with the Garrison project may be similarly encountered in the Fundy project.

The Garrison Diversion as proposed in a 1944 compromise between the Corps of Engineers and the Bureau of Reclamation involved a massive inter-basin transfer of water originally designed to irrigate more than one million acres in the Dakotas, but later reduced in a 1965 Congressional authorization to only 250,000 acres in North Dakota. Since the diversion involved return flows from the irrigated acres that would discharge into rivers entering Manitoba and eventually Lake Winnipeg in the Hudson Bay watershed, the project became an international

transfer with environment-affecting consequences, and therefore potentially falling under the provisions of the 1909 Boundary Waters Treaty. However, sponsors of the project, failing to appreciate its ecological and international aspects, created a bitter international controversy.

Part of the problem may be explained by a lesser environmental (and particularly) ecological awareness in both countries at the time of authorization. Before the passage of NEPA with its EIS requirement, Bureau of Reclamation engineers were not obliged to tell the American public (and especially the Canadian public) all they knew about the side effects of the project. Thus, most of the opposition to the project came later as people eventually discovered how the project would affect their lives and property. Objections in the U.S. centered on the adverse effects on migratory waterfowl, while opposition in Canada concerned flooding along several rivers, degraded water quality from irrigation return water, and unwanted biota transfers from the Missouri River basin. Lack of consultation coupled with suspicions among many Canadians regarding the intentions of the United States government led to bad feelings in Manitoba, eventually becoming a national issue in Canada, while remaining politically regarded as a local matter in the United States.

A 1977 IJC report by a specially established advisory board concluded that no portions of the Garrison diversion should be constructed which would transfer any Missouri River discharge into the Hudson Bay watershed. In August 1983, an appropriation of \$22 million by Congress was given to complete Phase I of the Garrison Diversion which would not exceed 85,000 acres and would not involve any transfer of Missouri River water into the Hudson Bay watershed. The State of North Dakota and Bureau of Reclamation have maintained that as long as

reasonable doubts exist regarding the effects of the discharge, that no Missouri basin water will be discharged into Canada.

In August 1984, then Secretary of the Interior William Clark appointed a 12-member commission headed by former Louisiana governor David Treen to develop modifications to the Garrison Diversion project as authorized. Their recommendations suggested that the project be scaled back considerably. It is unclear as of yet what the final outcome of the Garrison diversion project will be, although it is highly unlikely that a project of the magnitude originally authorized will ever be constructed.

Comparison with the Potential Bay of Fundy Issue

In analyzing the Garrison Diversion controversy we see that there are four interrelating issues, at least three of which could be considered similar to those that may be shaping the Fundy tidal power project:

1. The appropriateness of public action when major conflict exists among the people affected;
2. the equity of allocating economic, social, and ecological burdens among the people affected;
3. the adequacy of criteria to evaluate the technical, economic, social, and ecological impacts of the project; and
4. the obligations of the United States [Canada] under the Boundary Waters Treaty of 1909 as related to the previous three issues.

While it is too early to say what forum will exist for conflict resolution of Fundy tidal power impacts assuming the tidal power facility proceeds toward construction and the proposed environmental damage is incurred, it is evident that a major constraint on the resolution of the conflicts associated with the Garrison Diversion was the failure to find a mutually acceptable vehicle for conflict resolution. Any resolution of the Garrison controversy to date has largely been the result of scientific information. In fact, a review of most transboundary

pollution incidents shows that scientific information plays a major role in conflict resolution.

As issues associated with such projects evolve over time, it becomes increasingly difficult for people concerned to agree upon the assumptions and values that should be given primacy in the controversies. Furthermore, agreement on the legal principles that might mediate their differences even when a consensus exists on statistical facts is hampered by different perspectives on how they should be interpreted. Thus the cumulative effect of these differences, combined with commitments formed when a project initiates, lock adversaries into positions that severely constrain resolution of their conflicts. As one academic states, "if future international controversies, such as Garrison, are to be avoided, an agreed-upon criteria for validated evidence will be necessary."⁴¹

A major factor which characterized the Garrison Diversion is that it did not appear to be controversial, or not significantly so, when the original commitments to the projects were made. In the Fundy situation, while iron-clad commitments have yet to be made for tidal power, a sizable commitment (investment) has already been made by the proponent, the Tidal Power Corporation. In the Garrison case, opposition developed as people who were previously uninformed, neutral, or even supportive, later discovered that the project entailed costs and consequences that they had not foreseen and did not like. Therefore, a conflict situation arose between the people who stood by the original commitment, and those previously unaware who now wanted the project to be reconsidered. It was undoubtedly the use of scientific findings new to the issue that affected the balance of public opinion. As new scientific evidence which invalidated the original assumptions by which the project was being developed became available, the appropriateness of public action became more questionable. Similarly, the

question of the appropriateness of action by the United States which might violate the Boundary Waters Treaty with Canada arose. However, regardless of the validity of these allegations, the political circumstances under which the Garrison project was initiated had changed.

The newly available scientific data and the prospect of an international dispute did not change the minds of the North Dakotans who felt they should be compensated by the government for lands flooded by the Garrison Dam, and who realizing that Congress had authorized the project, felt the government was obliged to promote economic growth in the region. One might speculate that Nova Scotians might feel similarly about their proposed tidal project as there currently exists a real need for economic development within the province and there have at least been some assurances from government that tidal power will be developed.

In the second issue, the equity of allocating burdens among those affected, inequity problems arose from the underhanded manner of the federal government in acquiring land for reservoirs and rights of ways and also from farmers who suddenly became part of an irrigation district they did not want to be part of and were subsequently forced to pay irrigation district tax assessments. Additionally, farmers both outside and inside the projects' boundaries threatened with loss of acreages for wildlife mitigation purposes were also angry.

The North Dakota business and government leaders saw Garrison Diversion as largely an internal matter that was no one else's concern and that the federal government was honor-bound to support. The equity issues could not, however, be contained within the state's political boundaries.

The third issue, the adequacy of criteria to evaluate the impacts, is largely a relationship between science and values. In the Garrison case, although the

criteria initially available for evaluating the consequences of the Diversion were inadequate, they were substantially more adequate than the political basis for the decision actually used.

The way in which science was used and not used in the Garrison case suggests certain propositions regarding a reciprocal relationship between science and values, and those conditions under which science may more effectively inform and guide public policy. From a public policy perspective science per se makes an inappropriate master and an unreliable servant, but a useful teacher. There is little likelihood of Americans adopting public policies solely upon the basis of the existing state of science. The common attitude has been to regard science as a servant-as a handmaid to technology. Public policies are usually adopted with little or superficial recourse to scientific information, and thereafter science is invoked selectively to reinforce a prior decision. Used this way, scientific methods are unreliable servants of truth.⁴²

Most of the active public that questioned and opposed the Garrison project resided outside the state of North Dakota, removed from the social and political constraints within that state, and therefore more affected by scientific evidence than by legal rights or government promises. Ultimately it was scientists who produced the evidence supporting conjectures regarding questions such as the risks and consequences of interbasin biota transfer and that were inconsistent with official opinion in the United States and finally through the environmental review process were able to halt the project. It has been said that "economics may be the ultimate modifier of Garrison, but science provided the delay that has given economic rationality an opportunity to prevail."⁴³

Whether the criteria for project evaluation used by the project's opponents to stall earlier completion were scientifically valid could only be proven if the project proceeded as authorized and its consequences later found. However, if the consequences proved adverse as predicted, while science would be vindicated, the environment would have already been altered. Therefore, the practical test of adequacy of the criteria was political, not scientific.

The final issue is the obligation of the U.S. under the Boundary Waters Treaty. Although the U.S. government has never denied its obligation to honor the Boundary Waters Treaty, there have in the past been ambiguities and differences between the countries over the interpretation in Article IV of the phrase "polluted on either side to the injury of the health or property of the other". It has been unclear as to what constitutes pollution and who determines when health or property have been injured and by what criteria. Inherent in the terms of the treaty are potential conflicts over the criteria for determining this "injury."

The IJC, when it was finally asked to investigate the matter, established the Inter Garrison Diversion Study Board which established a number of technical committees to study some of the uncertainties associated with the Garrison project. Their recommendations, as stated earlier, were that no portions of the diversion be constructed which could affect waters flowing into Canada. The involvement of the IJC, as a bi-national neutral party with a reputation for objectivity, was the critical event in bringing the controversy to a point of tentative agreement although not to ultimate resolution. In effect, their position was that the United States risked violation of the Boundary Waters Treaty and of international law should it proceed with the 1965 authorization of the Garrison Diversion project⁴⁴ and the effects of the return flow into Canada be found to be adverse.

The legitimacy of the original authorization in relation to the Boundary Waters Treaty of 1909 was never put to the test by the Garrison project. The mere fact of potential pollution of Canadian waters by discharge from the Garrison project was insufficient to establish a violation of treaty obligations by the United States. Although the IJC findings identified threats of injury, actual

physical injury could not have been established prior to actual occurrence. Herein, lies a major problem which has been pointed out before as a deficiency in international law.

A major question which arises in analyzing the Garrison controversy and considering its applicability to the proposed Fundy projects is could the timely and unbiased application of scientific knowledge and methodology diminish the likelihood of costly and frustrating controversies such as the Garrison Diversion case? The author suggests it could and for projects with potential effects on the United States-Canadian boundary, the IJC has proved to be a most appropriate scientific investigative forum.

Although science is used in a pre-audit capacity in environmental impact analysis and technology assessment it is often overlooked in attempting to forecast impacts from large public works projects, more often than not because of political pressures. The independence of a science pre-audit from effective political or bureaucratic pressure is essential to its credibility. Furthermore, the need for an international institutional arrangement for bi-national issues is a logical inference from the history of the Garrison Diversion controversy. International bodies are not directly politically accountable to popular constituencies but they are to member States. The IJC is such an existing institutional network with the capability to contribute to analysis of a very broad range of scientific problems. The IJC's fact-finding functions were utilized in the Garrison controversy to a greater extent than they had been in other environmental issues arising between Canada and the United States.

Controversy over Garrison had been long and costly and in retrospect a better way to have managed the conflict would have been in everyone's interest.

In the end, an institutional arrangement with non-partisan participation became necessary to overcome the constraints to conflict resolution.

Acid Rain

This section on Canadian-United States practice on transboundary environmental relations would be remiss without some mention of the current acid rain controversy.⁴⁵ It has been felt for several years now that the United States has been undermining Canadian efforts at controlling what most believe to be a man-made problem.

Research indicates that as much as 50 percent of Canadian acid deposition is of U.S. origin, but that nonetheless deposition occurs within the U.S. borders as well. Possible explanations for the more pronounced Canadian concern include that the area at risk in Canada contains more population centers than similar areas in the U.S. and that the portion of Canada's GNP threatened by acid rain is 80 percent. Canada's economy depends heavily on forestry and fishing--prime targets for acid damage.⁴⁶

In the first annual report (1983) of the Congressionally mandated National Acid Precipitation Assessment Program, science agencies for the first time under the Reagan Administration publicly stated that man-made sources of air pollution are probably the major cause of acid-rain destruction of lakes and streams in the northeast.⁴⁷ This report closely followed several blaring accusations in books on the subject, including one which attempted to compare the governmental responses to acid precipitation in Europe to those in North America. Gregory Wetstone and Arwin Rosencranz in an Environmental Law Institute Study entitled "Acid Rain in Europe and North America: National Responses to an International Problem," claim that alone among major pollution exporters, the U.S. continues to view energy and pollution abatement programs as solely domestic matters having

no impact in across-the-border environments of Canada.⁴⁸ While Canada has offered treaty language calling for a 50 percent reduction in sulfur dioxide emissions and has agreed to reduce Canadian emissions by 25 percent whether or not U.S. implements a similar program, the United States has, in the past

taken measures to thwart the negotiation progress by undermining the science. By reshuffling key scientists at crucial points in the research effort, by withdrawing support for the pivotal research area-control strategies, and by insisting on unilateral review of joint scientific documents, the U.S. is assuring 'divergent national viewpoints on what the science says'.⁴⁹

The United States continues to maintain the position that more research is needed to adequately determine the cause and effect of acid rain. Clearly, the relationship between Canada and the United States is not becoming any friendlier in light of this continued stall. One wonders if it is not entirely unlikely to consider that the Canadians may approach tidal power development with this in mind and view it as an "arm-for-an-arm and an-environmental-damage-for-an-environmental-damage" proposition.

Canadian-United States transboundary environmental conflicts have largely been avoided by negotiation and the highly successful use of the International Joint Commission, established by the Boundary Waters Treaty of 1909. On a few occasions, the countries have had to resort to third party resolution of their environmental conflicts. Large and complex projects with potential for transboundary damage, such as Fundy tidal development, present special problems for conflict resolution. It is suggested that the role of the IJC be expanded to assess these types of projects prior to authorization.

CHAPTER V NOTES

1. 21 Opinion of Attorney General (1895), 274 in Robert Taylor, Liability for Transboundary Pollution and State Responsibility, (Portland, ME: Marine Law Institute, 1983), p. 12. (Working paper.)
2. Ibid, p. 13.
3. United States - Great Britain, "Treaty relating to the boundary waters and questions arising along the boundary between the United States and Canada." Signed at Washington, January 11, 1909; entered into force May 5, 1910. 36 STAT. 2448; T.S. 548. (Hereafter noted as Boundary Waters Treaty of 1909.)
4. International Joint Commission, "70 Years of Accomplishment," Report (Ottawa, 1982), p. 10.
5. Ibid.
6. Ibid.
7. Boundary Waters Treaty of 1909.
8. Ibid., preliminary article.
9. Ibid., Article II.
10. Ibid., Article III.
11. Ibid., Article IV.
12. Ibid., Article VIII.
13. Ibid., Article X.
14. International Joint Commission, p. 5.
15. Frank Bevacqua, International Joint Commission, telephone interview, 30 July 1985.
16. International Joint Commission, p. 6.
17. Discussion Comments of Chairman von Roggen, "Settling Our Canadian-United States Differences: A Canadian Perspective," Canada-United States Law Journal 1:1 (1979), p. 28.
18. ABA/CBA Settlement of International Disputes Between Canada and the USA: Resolutions adopted by ABA/CBA 20 September 1979, p. 17.
19. Ibid., p. 20.
20. Frank Bevacqua, International Joint Commission, telephone interview, August 8, 1985.

21. Steve Coleman, New England Governors Conference, telephone interview, August 5, 1985.
22. Convention for the Pacific settlement of international disputes. Signed at the Hague, July 29, 1899; entered into force September 4, 1900. 32 Stat. 1779; TS 392.
23. Treaty amending in their application to Canada certain provisions of the treaty for the advancement of peace between the United States and United Kingdom, signed at Washington, September 15, 1914. Signed at Washington September 6, 1940; entered into force August 13, 1984. 55 Stat. 1214; TS 975.
24. ABA/CBA, p. 31.
25. Special agreement for the submission of questions relating to fisheries on the North Atlantic Coast under the General Treaty of Arbitration concluded between the United States and Great Britain on the 4th Day of April, 1908, in Wilson, George G., The Hague Arbitration Cases, (Boston: Ginn and Company, 1915), p. 134.
26. U.S. Department of State "The I'm Alone" Arbitration Series, No. 2. (1-7), 1931-1935.
27. ABA/CBA, p. 35.
28. Arctic Marine Pollution Prevention Control Act (724 UNTS 1970).
29. Ibid.
30. ABA/CBA, p. 36.
31. Ibid.
32. Statement of Canadian Secretary of State for External Affairs, House of Commons Debates, June 8, 1972, at 2955, reprinted in 11 Canadian Year Book of International Law (1973), p. 333.
33. See: Treaty between the United States of America and Mexico relating to the utilization of the waters of the Colorado and Tijuana Rivers, and of the Rio Grande (Rio Bravo) from Fort Quitman Texas, to the Gulf of Mexico. Signed at Washington on February 3, 1944, and supplementary protocol, signed at Washington on November 14, 1944.
34. M. Whiteman, Digest of International Law (1968) p. 265.
35. Ibid., p. 262.
36. "Gut Dam Arbitration" 4 International Legal Materials (1965), p. 474.
37. Gunther Handl, "State Liability for Accidental Transnational Environmental Damage by Private Persons," American Journal of International Law (July 1980) p. 538.

38. Ibid., p. 539.
39. Gut Dam, p. 474.
40. Ibid.
41. Lynton K. Caldwell, "Garrison Diversion: Constraints on Conflict Resolution," Natural Resources Journal 24, (October 1984), p. 839.
42. Ibid., p. 852.
33. Ibid., p. 853.
44. Act of August 5, 1965, Public Law No. 89-108, 79 Statute 433 (1966).
45. On this see:
 - o Robert H. Boyle and R. Alexander Boyle, Acid Rain (New York: Schocken Books, 1983), 146 pp.
 - o Gregory S. Wetston and Arman Rosencranz, Acid Rain in Europe and North America: National Responses to an International Problem (Washington, D.C.: Environmental Law Institute, 1983), 244 pp.
 - o Jon R. Luoma, Troubled skies, troubled waters: the story of acid rain (New York: Viking Press, 1984), 178 pp.
46. Karen Carter, "Is one man's power another man's poison," Journal Water Pollution Control Federation 55, (August 1983), p. 1033.
47. Lois R. Ember, "Government Study Admits Man-Made Pollution-Acid Rain Tie," Chemical & Engineering News 61, June 20, 1983, p. 27.
48. Lois R. Ember, "U.S. Accused of Hindering Progress in Acid Rain Control," Chemical and Engineering News 61, April 11, 1983, p. 20.
49. Ibid.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATIONS

Review of the Problem

A major tidal facility has been proposed for the upper Bay of Fundy in Nova Scotia to help meet the projected energy demands of northeastern North America. On the surface, this project has some very attractive features which include being a boost to the depressed Nova Scotia economy, helping to further a new technology, and replacing traditional, non-reliable "polluting" energy sources such as coal, oil, and nuclear power plants with a reliable, non-polluting energy source. While there can be little doubt that construction of this facility would entail significant environmental changes behind the tidal barrier, there is some indication that because of the unique oceanographic conditions found in the Bay of Fundy/Gulf of Maine there may also be some very significant environmental changes seaward of the tidal barrier. In fact, it has been hypothesized that the tidal regime could be altered as far south as Cape Cod, Massachusetts. Accompanying this altered tidal regime are a number of projected effects on coastal and marine habitats, some which are anticipated to be beneficial and others which could be viewed as detrimental.

Should this be the case, whether or not these changes represent a form of environmental degradation or pollution remains a question for lawyers. However, there appears to be a growing body of groups and individuals concerned with the protection of the environment that support more broad-based interpretations of the term "pollution." Even if these projected changes were not considered a form of pollution, under international law, there is a recognized obligation for a State

to prevent transboundary damage from occurring. Unfortunately, this obligation is generally not recognized as being violated until the damage actually occurs. This is an all too common reality and, in the case of Fundy tidal power, certainly an avoidable situation given the sophistication of present technology and the long history of friendly relations between the United States and Canada.

Although numerous factors should be considered in determination of a liability and compensation regime for this potential damage, such as the amount of U.S. involvement in the project and possibly previous United States-Canadian practice in other areas of transboundary pollution such as air pollution, the author has tried to examine this issue primarily from the viewpoint that current international and domestic law does not address transboundary pollution issues adequately. Subsequently there are gaps in each which need to be filled if our goal is truly to protect the environment. Furthermore, these changes need to be implemented so that our current conflict resolution mechanisms deal more efficiently and effectively with our transboundary environmental disputes. It is hoped that by implementing these changes that the move towards the interdependency of nations will be furthered. The author has suggested here that the already existing, and highly successful International Joint Commission can take the lead in implementing or aiding in many of these processes as they pertain to the Canadian-United States relationship while other dispute settlement mechanisms will require legislative changes within the respective governments. When and only when these changes occur, can the U.S. and Canada serve as a model for other nations in their resolution of transboundary environmental problems. Each of these areas will be addressed in the following sections with some recommendations as to how they might be improved.

Changes to Domestic Legislation

Replace Executive Order 12114

Existing provisions of NEPA and the Canadian EARP do not adequately address transboundary impacts of major developments such as the proposed Fundy project. While the United States environmental review process is somewhat stronger than the Canadian EARP in the respect that it is statutory, its provisions for considering international impacts are virtually worthless.

Executive Order No. 12114 fails to "further the purposes of NEPA" in several respects:

- It fails to specifically acknowledge a statutory authority;
- It does not clarify distinctions between the "environmental impact statement" it requires for impacts on the global commons and the EIS required by NEPA;
- The assessment requirement for impacts upon countries "not participating" in the agency action should not be additionally limited to countries "not otherwise involved" in the action;
- The "multiple impacts" clause providing that if an action otherwise requires an EIS and also affects the environment of a foreign country, an EIS need not be prepared with respect to the latter should be clarified; the Order should specify whether such impacts on foreign environments are therefore excluded from all environmental assessment, or alternatively, whether the situation requires two separate documents using two different evaluation standards for the same action; and
- It fails to provide for public access by citizens of the United States to the foreign assessment documents it mandates (with the exception of the EIS's required for impacts on the global commons, other

environmental studies and reviews prepared under the Executive Order are internal documents of the agency).

Executive Order 12114 should either be rescinded, amended by a new Order to correct the deficiencies addressed above, or terminated and turned over to the Council on Environmental Quality (which originally issued the "Guidelines on the Preparation of Environmental Impact Statements") to promulgate new NEPA regulations. As reads now "The Executive Order creates a new environmental policy which in many potential instances is not based on environmental concerns at all."¹

Once these changes are made, the United States should make every possible effort in international law forums to have other countries adopt the EIS principle with respect to their internal and external environment-affecting actions. Generic guidelines establishing similar mechanisms for environmental assessment review should be developed in cooperation with Canada (or any other nation) in establishing a process for evaluating projects with transboundary impacts.

Revise Power Import Legislation

Existing United States environmental review of U.S. utility participation in Fundy tidal power would be via the Presidential permit process which is required and carried out by the United States Department of Energy for transboundary transmission lines. However, while environmental impact statements are commonly prepared for such lines, it is questionable under existing law whether an EIS need be prepared to investigate the impacts of the tidal power project itself which supplies the power to be carried by the lines. This possibility exists even with the likelihood that ninety percent of the power developed at Fundy would be exported to the United States and funding may have to be provided by United States utilities. Under existing U.S. law, regulation of power exports is much more evident than regulation of power imports.

The author feels that it is side-stepping the real issue, but nonetheless supports legislation proposed by the Marine Law Institute of Portland, Maine to amend the Federal Power Act of 1920 to consider all environmental impacts of energy imports. Further support for Congressional legislation to address all policy implications of energy imports, including environmental impacts before entering into a contract for them is found in a September, 1982 General Accounting Office report titled "Clear Federal Policy Guidelines Neded for Future Canadian Power Imports." Specifically, the GAO report recommended that "the Secretary of Energy work with the Executive subcabinet working group on regulation, competition, and efficiency in the electric utility industry to establish clear Federal policy guidelines towards Canadian power imports."² However, the GAO did not give adequate consideration to potential transboundary environmental effects of the energy facility themselves.

The need for United States utilities to exercise control over energy import activities is twofold. First, it is obviously needed to protect against potential environmental damage and second it is needed because failure to exercise control could be interpreted in international law as a consent to the damage and therefore a waiving of the right to eventual compensation.

Coordinate Environmental Policies and Laws

Finally, it has also been shown that United States state and Canadian provincial legislations lack the authority to adequately consider transboundary impacts. States or provinces as a rule are only able to deal with "local" issues since the applicable law in one state or province may differ from that of a neighboring state or province on the same side of the border. However, this is not to underestimate the ability of regional agreements such as those between state governors and provincial premiers dealing with matters of transboundary importance. In fact, experience proves that numerous agreements between these

groups have been the impetus for certain necessary and logical bilateral interactions which take place daily. Furthermore, if it were not for a recent meeting between the New England governors and the Eastern Canadian Premiers, it is questionable at what point the tidal power issue might come to the attention of the respective foreign affairs leaders. This assumes that somewhere in the not too distant future, these leaders will address this issue and possibly refer it to the IJC.

It is beyond the scope of this paper, but the author feels it is not totally unreasonable to suggest that at some point in the future, in order to protect and use resources wisely that regional entities be created to deal with our resource allocation problems more efficiently and effectively. A natural precursor to this effort would be coordination of environmental policies and laws between the nations. It has been suggested that the existing Uniform Law Conference of Canada and the U.S. National Conference of Commissioners on Uniform State Laws may be a potential starting point for this coordination. This concept is supported by the fact that it would also help eliminate many of the legal jurisdiction questions that presently exist. As things now stand, because the judicial structure reflects the overall federal structure of each of our governments, on occasion, because of overlapping legislative power, a combination of national and local laws must be applied by the court in determining the jurisdiction of a case, especially in Canada. By coordinating environmental laws between the two countries, the question of jurisdiction will occupy less of the court's time and it can address the real issues.

Changes to International Law

Strengthen Enforcement Provisions

International law has gone far in improving relations between nations and establishing a body of principles and rules by which to peacefully coexist in the

world. Foremost among these principles for protection of the environment are those established in the United Nations Stockholm Conference on the Human Environment. While these principles of customary law are given much support in numerous recommendations and resolutions, they are not binding and therefore do not create a legal obligation. Thus while there is certainly a moral obligation on states to see that exploration of their natural resources does not cause damage to another state, there is really no legal basis by which to punish them should they purposely pursue such activities which would cause transboundary damage. This is not to suggest that Canada and the United States would not abide by any decision made by the International Court of Justice in the case of transboundary damage. However, ICJ compensation decisions for damage have been ignored in the past, such as in the Corfu Channel Case where Albania never paid Britain back for the damages incurred when Albanian mines destroyed British ships while innocently passing through Albanian territorial waters. Thus a deficiency of international law is the lack of enforcement, and there is a need to make sure injured states are compensated for damage incurred.

Limit Reservations to Environmental Treaties

Treaties are a second source of international law and differ from customary law in that they place a binding obligation on states. Yet, it appears that developed nations such as the United States and Canada are hesitant to have limits put on their sovereignty and therefore they often resort to attaching reservations or other amendments to treaties which in effect render them useless. Of course while it is highly unlikely to suggest that either Canada or the United States would purposely intend to cause one another environmental damage, this does illustrate that there are indeed flaws in the treaty process which tend to undermine the intents of international law. Reservations to environmental

treaties are obstacles to protection of the global environment and should be limited.

Make Prior Consultation an Obligation

Another flaw of international law is that it does not obligate states to a prior consultation regime before the authorization of a project with potential transboundary consequences. While the notion of prior notification is receiving greater consideration in environmental law forums and has found its way into a number of environmental treaties, including the Nordic Convention and the Law of the Sea (Article 198), much work needs to be done to clarify which risks or threats to the environment require pre-development consultation between potentially affected nations.

Changes to Dispute Settlement Mechanisms

Transboundary environmental disputes between Canada and the United States have been largely avoided due to the successful use of negotiations and mixed commissions. Binding mechanisms for dispute settlement, arbitration and reference to a tribunal, have only had to be used on a handful of occasions. This is good, because these methods are largely inadequate for dealing with the resolution of environmental questions. The Trail Smelter Arbitration is a classic example of this. The case found its way into international arbitration because of the unsatisfactory use of legal remedies that were otherwise available in the United States and Canada. In the end, while the tribunal did award damages, it was also asked to determine what future measures or regime should be put in place to mitigate for further damage. Therefore it became an environmental manager and to this end employed a technical staff to prepare a plan for the future, which are clearly not true judicial functions.

As in most arbitrations, the Trail Smelter Arbitration was an extremely long and drawn out process, which is typically another argument against the use of

adjudication to resolve environmental problems. Others have argued differently however:

Nor should we be influenced by the oft-repeated accusation that the Court [International Court of Justice] is slow. In general, it moves at a pace dictated by the parties and can hasten the speed of disposition in any case in which there is good will on both sides.³

However, despite these arguments against third party settlement of disputes, there is some need for a form of compulsory dispute settlement when negotiations fail. Indeed as one international lawyer points out, "the threat of compulsory adjudication is the strongest possible incentive for a rapid movement toward a negotiated settlement."⁴

To this end, a Treaty has been proposed by the Joint Working Group of the American Bar Association and Canadian Bar Association aimed at assisting in the resolution of private disputes of a transboundary environmental nature. Such might be the case should a New England coastal property owner suddenly find his property disappearing as the result of the Canadian Fundy tidal dam. Key provisions of this proposed treaty provide for equality of court access and remedies. The Nordic Convention, which among other things provides for reciprocal private and public remedies in pollution cases, helps serve as a model here. Relevant articles of the proposed Treaty include: (1) an article on definitions to assure that each country is in agreement on what pollution and other terms mean; (2) an article which defines the rights of the persons affected and which also includes resource to quasi-judicial administrative remedies; (3) an article which allows environmental groups to represent the environmental interests of their country; (4) an article which provides for advance notice to persons in the exposed country. This effort by the ABA/CBA is to be commended and such a treaty reflecting these provisions is encouraged, although as an

alternative these articles could possibly be incorporated as amendments to the existing Boundary Waters Treaty.

Expansion of the International Joint Commission

It seems plausible to believe that bi-national environmental issues crossing the Canadian-American border will continue to arise, and that it would therefore be sensible to make provision for institutional arrangements to cope with them in preference to reaching the point of suspicion and animosity which characterized the Garrison Diversion issue and is somewhat prevalent in the current acid rain controversy. The International Joint Commission is such an institutional arrangement that has proven its worth many times over in the past seventy years.

The success of the IJC can be attributed to a number of factors:

- it has received strong support from the United States and Canada;
- it has been independent, neither being influenced by, or trying to influence government;
- it is a permanent, not an ad hoc agency, which has allowed it time to develop its technique;
- there is equal representation from each country;
- the countries are considered as equals despite the significant strength advantage of the United States in population, income, military strength, etc.;
- it uses the best informed specialists of each country for assembling its technical data;
- it is extremely pragmatic in its procedures;
- it has taken into account local and regional requirements where appropriate
- its has an element of luck going for it, in that it was established prior to water resource issues becoming a crucial issue; and

- it was established and is maintained by people of similar ideals and ambitions.

In consideration of the above factors and our past experience with the use of the IJC, the author suggests that the role of the IJC be expanded so that it might play a greater role in transboundary environmental issues such as the evolving Fundy tidal issue. The author is not alone in his advocating the expansion of the IJC's powers. Among others, Presidents Franklin Roosevelt and Lyndon Johnson, representatives of the U.S. Congress, and a study discussion group called the Canada-United States University Seminar have all recommended expansion of the commission's functions for various different reasons ranging from tariff questions to foreign policy issues.⁵ It is probably inappropriate at this time to suggest that the IJC take on all these issues. However, without substantially increasing the IJC's funds, personnel, and nature, the author suggests the following changes to further what he believes to be a proper role for an agency with the goal of protecting the transboundary environment.

The IJC should be expanded to allow it greater leeway in investigations and decisionmaking on pollution issues with potential transboundary impacts. This would mean two basic changes. First, the use of the reference process must be changed to allow initiation of investigation at the request of just one of the governments, as opposed to the current practice where both governments must jointly request a reference. Secondly, the IJC recommendations must become something more than just recommendations in order to be further removed from the politics of the Canadian and United States administrations. The IJC should be authorized to make preliminary assessments of proposals with potential transboundary implications prior to actual authorization and funding.

Furthermore, in keeping with the desired goal of prior notification and consultation, the IJC should increase the public participation process and the

availability of public information. In the Fundy situation, it might be appropriate to hold a series of meetings throughout New England and eastern Canada on the issue and the Commission's findings including alternatives. In this same context, participation by non-governmental people on some of the commission's investigative boards would be encouraged.

Lastly, the IJC must be allowed to utilize its never used arbitral function, either by having automatic jurisdiction over any questions or differences that either government refers to it, by permitting arbitration references without the consent of the United States Senate, or by negotiating a new treaty or amendments to the Boundary Waters Treaty to mandate some adjudication process. One possible way in which this might be accomplished is by incorporating a new tribunal of IJC personnel knowledgeable in Canadian, American, and international law.

Summary

Fundy tidal power is an interesting proposition. On one hand it could be a great boon to northeastern North America. On the other hand it might be opening a Pandora's box. One academician writing on transboundary damaging projects has noted that "scientific knowledge and associated technologies have vastly enlarged opportunities for enterprises that reshape natural environments to advance economic interests and political reputations. The costs of such projects are often inordinately large in relation to the number of persons actually benefited."⁶ Is Fundy tidal power worth reshaping the natural environment?

The problem of transboundary pollution is rooted in the reality of the natural world. As a physical proposition, there is no difference between international and internal pollution. The final realization must be that we all live on one planet and we share a common responsibility to protect it.

CHAPTER VI NOTES

1. Glenn Pincus, "The "NEPA-Abroad" Controversy: Unresolved by an Executive Order," Buffalo Law Review 30 (January 1981), p. 661.
2. Testimony of Alison Rieser before the Senate Committee on Environment and Public Works, July 25, 1983, Augusta, Maine in The Effects of the Proposed Hydroelectric Project in the Bay of Fundy. (Washington, D.C.,: Government Printing Office, 1983), p. 215.
3. Roland St. J. Macdonald, "Settling Our Canadian-United States Differences: A Canadian Respective," Canada-United States Law Journal (1978), p. 17.
4. *Ibid.*, discussion comments of Monroe Leigh, p. 26.
5. In the 1920s, Loring C. Christie suggested some method might be found to adapt the IJC 'to the business of regulating the rum-running problem . . . or even to the immigration problem.' In the thirties, President Roosevelt talked about referring the 'tariff matter' and 'a lot' of other things to the joint agency. In 1963, Judge Norris recommended that during the period of the proposed trusteeship for Canadian maritime transportation unions, 'the matter of the harassment of Canadian vessels in U.S. ports' be referred to the IJC for study and report. In the mid-sixties, the Merchant-Heeney Report, drafted at the request of President Lyndon Johnson and Prime Minister Lester B. Pearson, suggested that the two governments 'examine jointly the wisdom and feasibility of extending the Commission's functions;' while the 'Tupper Report,' prepared by ten Republican 'moderates' in the House of Representatives, recommended that the IJC be asked to add 'facilities for the joint study of technical aspects of foreign policy issues between the two countries' and be requested 'to make recommendations for a continental program of water sharing and hydroelectric power development.' The Canada-United States University Seminar has recommended the Commission's functions be expanded to encompass certain responsibilities relative to policy formulation, planning, and management to the water and associated land resources of the Great Lakes Basin.
6. Lynton K. Caldwell, "Garrison Diverson: Constraints on Conflict Resolution," Natural Resources Journal 24, (October 1984), p. 843.

SELECTED BIBLIOGRAPHY

- Allegra, Francis M. "Executive Order 12,114 - Environmental Effects Abroad: Does it Really Further the Purpose of NEPA?" Cleveland State Law Review 29 (1980): 109-139.
- American Bar Association/Canadian Bar Association. Settlement of International Disputes Between Canada and the United States - Resolutions adopted by the ABA and CBA 20 September 1979. American Bar Association, 1979. (Mimeographed).
- Arbuckle, J. Gordon; Frick, G. William; Hall, Ridgway M.; Miller, Marshall Lee; Sullivan, Thomas F.P.; and Vanderver, Timothy A. Environmental Law Handbook (Rockville, Maryland: Government Institutes, Inc., 1983).
- Baker, George C and Knecht, Robert W. "Fundy Tidal Power" in Coastal Zone and Continental Shelf Conflict Resolution: Improving Ocean Use and Resource Dispute Management (Cambridge, Massachusetts: Massachusetts Institute of Technology, 1984).
- Barros, James, and Johnston, Douglas M. The International Law of Pollution. New York: The Free Press, 1974.
- Beigie, Carl E. and Hero, Alfred O. (eds.) Natural Resources in U.S.-Canadian Relations. Boulder, Colorado: Westview Press, 1980.
- Bilder, Richard B. "The Role of Unilateral State Action in Preventing International Environmental Injury." Vanderbilt Journal of Transnational Law 14 (Winter 1981): 51-95.
- Boundary Waters Treaty of 1909, 11 January 1909, United States - Great Britain, 36 Statutes 2448; Treaty Series No. 548.
- Butterfield, Fox. "Nova Scotia Dam's Effect on Coast Ecology Feared." New York Times, August 6, 1984. A8.
- Caldwell, Lynton K. "Garrison Diversion: Constraints on Conflict Resolution." Natural Resources Journal 24 (October 1984): 839-863.
- Carter, Karen B. "Is one man's power another man's poison?" Journal of Water Pollution Control Federation 55, (August 1983): 1028-1033.
- Champ, Michael A. "Etymology and use of the term 'pollution'." Canadian Journal of Fisheries and Aquatic Sciences 40 (1983): 5-8.
- Constans, Jacques. Marine Sources of Energy. New York: Pergamon Press, 1979.
- Denaiux, Brigitte. "Tidal Power Generation in the French Bay of Mon Saint-Michel: Possibilities and Problems." Marine Affairs Journal 2. Kingston, Rhode Island: University of Rhode Island, 1974: 97-115.
- Ember, Lois R. "Government Study Admits Man-Made Pollution-Acid Rain Tie." Chemical and Engineering News 61, (June 20, 1983): 27-29.

Ember, Lois R. "U.S. Accused of Hindering Progress in Acid Rain Control." Chemical and Engineering News 61, (April 11, 1983): 20-22.

Emond, Paul D. Environmental Assessment Law. Toronto: Emond-Montgomery Ltd., 1978.

Fairbridge, Rhodes W., ed. Encyclopedia of Oceanography. New York: Van Nostrand Reinhold, 1966.

Federal Register 44 "Executive Order 12,114" 1979: 1957.

Franson, Robert T. and Lucas, Alastair R. "Revised Guide to the Federal Environmental Assessment and Review Process." Canadian Environmental Law 6 Statutes and Regulations. Toronto: Butterworths, 1979.

Gray, T.S. and Gashus, O. eds. Tidal Power. New York: Plenum Press, 1972.

Greenberg, David. "A numerical investigation of tidal phenomena in the Bay of Fundy." Geodesy 2(2) 1979: 161-187.

Gross, M. Co. Charles E. Merrill Publishing

Handl, De. "Transnational Environmental Law 74" Journal of International Law

Hilema. "Environmental Science

Hoffr. "International Law and International and Comparative Law

Inte. "Accomplishment (Ottawa, 1982).

Jol. "Law of the Sea. Berlin: Erich Schmidt

K. "Canada - United States Law

Larson, Peter F. "Preliminary Consequences of Fundy Tidal Power in the State of Maine." West Boothbay for Ocean Sciences, 1983. Technical

Anderson, P. "United States Regulatory Authority Over Canadian Tidal Power Proposed Legislation." Marine Law Working Paper.

Harber, B. "The International Law Commission Relating to the Environment!" Economic Quarterly 11 (1983): 189-214.

McCaffrey, Stephen. "The International Law Commission Relating to the Environment!" Economic Quarterly 11 (1983): 189-214.

BRUCE MARTIN LIBRARY
319 WASHBURN
URI

COLOR 8853 CLASS A
NO. OF SAME TITLE CODE NO.
(J) LETTERING
G W B
Hilma BIND COMPLETE
FRONT COVERS ON ONLY
Hoffr COVERS ON OFF
CONT. F B
Inte INDEX F B
Jol ADS. IN OUT
K CALL NBR.

Spine TITLE MAL
RUDOLPH, ROBERT W. 1985

Front: FUNDY TIDAL POWER

ROBERT W. RUDOLPH

COPIES #1 AND #2 TO BINDERY
COPIES #3 AND #4 TO LIBRARY

- Mingst, Karen A. "Evaluating Public and Private Approaches to International Solutions to Acid Rain Pollution." Natural Resources Journal 22 (January 1982): 5-20.
- OECD. Compensation for Pollution Damage. Paris: Organization for Economic Co-operation and Development, 1981.
- OECD. Transfrontier Pollution and the Role of States. Paris: Organization for Economic Co-operation and Development, 1981.
- OECD. Legal Aspects of Transfrontier Pollution. Paris: Organization for Economic Co-operation and Development, 1978.
- Pincus, Glenn. "The 'NEPA-Abroad' Controversy: Unresolved by an Executive Order." Buffalo Law Review 30 (1981): 611-661.
- Redfield, Alfred Clarence. The Tides of the Waters of New England and New York. Woods Hole, Massachusetts: Woods Hole Oceanographic Institution, 1980.
- Remz, Florence, ed. Annual Review of the United Nations Affairs 1971-1972. Dobbs Ferry, New York: Oceana Publications, 1973.
- Rudolph, Robert W. and Larsen, Peter F. "Transnational Legal Issues and Fundy Tidal Power." In Magoon, Orville T. (ed), Coastal Zone '83, vol. I. New York: American Society of Civil Engineers, 1983: 817-828.
- Sohn, Louis. "The Stockholm Declaration on the Human Environment." 14 Harvard International Law Journal (1973): 423-515.
- Taylor, Robert. "Liability for Transboundary Pollution and State Responsibility." Marine Law Institute: Portland, Maine (1983). Working paper.
- Tidal Power Corporation. Fundy Tidal Power Update '82. Halifax, Nova Scotia, 1982.
- United Nations. "Report of the United Nations Conference on the Human Environment, held at Stockholm, June 5-16, 1972, U.N. Doc. A/CONF.48/14 and Corr. 1, 11 International Legal Materials (1972): 1416.
- United States Department of Energy. Guide to Authorization Procedures for the International Export of Electricity and Electric Power Lines Crossing International Borders. Washington, D.C.: U.S. Department of Energy, 1980. (Mimeographed.)
- United States Department of State. Treaties in Force. Washington, D.C.: Government Printing Office, 1985.
- United States Senate, 98th Congress. The Effects of the Proposed Tidal Hydroelectric Project in the Bay of Fundy, hearing before the Committee on Environment and Public Works; July 25, 1983, Augusta, Maine. Washington, D.C.: Government Printing Office, 1983.
- Utton, Albert E. "International Environmental Law and Consultation Mechanisms." Columbia Journal of Transnational Law 56 (1973): 56-72.

von Glahn, Gerhard. Law Among Nations. New York: Macmillan Publishing Co., 1981.

Willoughby, William R. The Joint Organizations of Canada and the United States. Toronto: University of Toronto Press, 1979.

Wilson, George Grafton. The Hague Arbitration Cases. Boston: Ginn and Company, 1915.