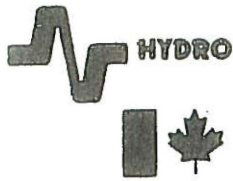


**Presentation to the Shareholders
of
Lower Churchill
Development Corporation Limited**

Project Recommendation

Executive Summary

JUNE 1980



LOWER CHURCHILL DEVELOPMENT CORPORATION LIMITED

June 25, 1980

Honourable Leo D. Barry, Q.C.
Minister of Mines and Energy,
Government of Newfoundland and Labrador.

Honourable Marc Lalonde,
Minister of Energy, Mines and Resources,
Government of Canada.


Dear Ministers,

The Board of Directors of The Lower Churchill Development Corporation Limited is pleased to submit a report outlining the immediate opportunities which exist for development of the substantial untapped hydro-electric potential of the Churchill River. The recommendation which is presented for your review has the unanimous support of all Members of the Board as well as Corporation's Management and reflect both considered judgement and the findings of an impressive series of technical, marketing, economic, financial and environmental analyses.

It is our view that the two hydro-electric sites at Gull Island and Muskrat Falls, which can together produce the energy equivalence of 27 million barrels of oil annually, should be exploited at the earliest possible opportunity. Your attention is directed to the consistency of our proposals for the development of these renewable energy sources with Canada's declared objective of energy self-sufficiency.

The nature of our findings suggest the need for careful, but expeditious, Shareholder consideration of the report. The Board and staff of LCDC are at your disposal to assist in your deliberations.

Respectfully Submitted



V.L. YOUNG
Chairman

A.D. HUNT
Vice Chairman

W.S. READ
President & Chief Executive Officer

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THE CHURCHILL RIVER RESOURCE

The importance of the vast renewable energy resource sites of the Churchill River has long been recognized. Indeed, as far back as 1928, the Financial Post carried headlines declaring "Labrador is a Land Abounding in Timber, Power and Minerals" and "Enormous Reserve of Power is Found in Labrador Rivers". Technological advancements and economic need have produced gradual but persistent development of the region and the renewable energy of the Churchill River has played an important role in such development.

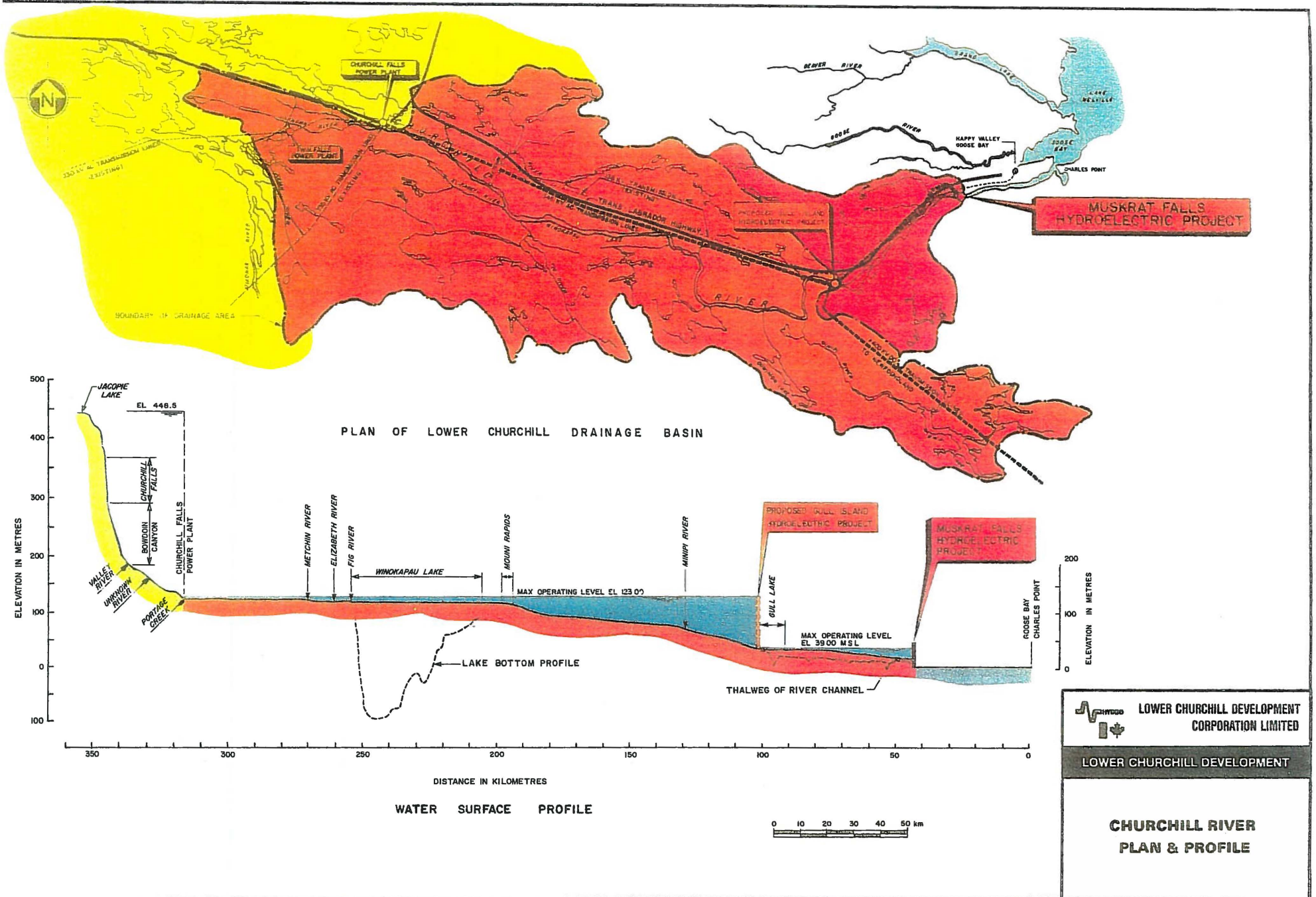
The Churchill River is located in the northeastern section of the North American land mass known as Labrador which lies entirely within the Province of Newfoundland. The River is unique in that its total hydro-electric potential, which is large even by international standards, may be exploited by developing only three sites (see illustration on page 2). One location near Churchill Falls has already been developed and it is the site of a 5,225 megawatt (MW) generating station. The remaining sites at Gull Island and Muskrat Falls remain unexploited and together represent 2,300 MW of additional hydro-electric potential. Together these undeveloped resources have an energy potential equivalent to 27 million barrels of oil per year, 75,000 barrels of oil per day - forever.

DEVELOPMENT CONSTRAINTS

Newfoundland and Labrador Hydro has been investigating the interconnection of its Island transmission grid with Eastern Canada since 1968. The Lower Churchill sites at Gull Island and Muskrat Falls are logical additions to an energy grid which would permit the interconnection of the Island's electrical system to that of Labrador and in particular to the Churchill Falls network. All of the analyses performed to date have proven the renewable energy resources of the Lower Churchill to be technically feasible and economically attractive in relation to alternative energy sources available to serve Newfoundland's requirements. Sharply escalating fossil fuel prices and growing concerns as to the security of international energy supplies make the development of these sites imperative.

Satisfaction of the growing energy requirements of the Province of Newfoundland presents a priority, but limited, marketing opportunity. Even with the curtailment of its existing oil-fired electrical energy generation, the immediate needs of the Province are modest in relation to the Lower Churchill's potential. The additional stimulus of major industrial expansion and/or external sales is clearly a prerequisite for the development of both sites.

Development efforts during the 1970's which were focused on the Gull Island site faced two major constraints; (i) access to suitable energy markets, and (ii) funding. In



order to realize the full potential of the renewable energy resources of the Lower Churchill, Newfoundland sought a strong visible partner who would;

- have an interest in pursuing development,
- support efforts in marketing the energy, and
- lend strength to the credit support available from the Province and its energy marketing agency, Newfoundland and Labrador Hydro.

Recognizing the national importance of the development opportunities involved, Canada became that willing partner and a unique co-operative venture, The Lower Churchill Development Corporation Limited (LCDC), was established to meet the challenge of Labrador power development.

LOWER CHURCHILL DEVELOPMENT CORPORATION

The Agreement to establish the Lower Churchill Development Corporation was signed by representatives of the Governments of Canada and Newfoundland and Labrador on November 24th, 1978. The Corporation has as its primary objective the establishment of a basis for the development of all or part of the hydro-electric potential of the Lower Churchill River. LCDC represents a milestone in the annals of co-operative Federal/Provincial energy resource development efforts; 51 % of its shares are owned by Newfoundland and Labrador Hydro (on behalf of the Province of Newfoundland) and 49 % of its shares are owned by Canada.

The initial mandate of the Corporation focused on;

- a complete review of the capital and operating costs and construction schedules for the hydro-electric sites at Gull Island and Muskrat Falls as well as associated transmission facilities,
- the establishment of a marketing plan for the sale of power and energy,
- completion of environmental studies and an assessment of the likely impact of a project on the area and its people, and
- the development of a financial plan for the funding of the selected project.

A thirty month option of the rights to the Gull Island and Muskrat Falls power developments was given to LCDC and a budget of \$14.9 million was approved to permit completion of the feasibility stage. The initial funding of \$5.0 million was provided by the Government of Canada while the Province provided the Option as its equity. The balance of \$9.9 million was shared by Canada and Newfoundland in proportion to the agreed shareholdings of 49 % and 51 % respectively.

PROJECT CONSIDERATIONS

Generation

LCDC engaged SNC-Lavalin, a consortium of two of Canada's largest consulting engineering firms, to carry out the technical studies leading to the definition of a project. They made use of previous study material but carried out extensive additional field work at Muskrat Falls and the Strait of Belle Isle. The results of the engineering studies are contained in a substantial volume of reports which are supported by LCDC's management and where appropriate, by consultative committees of internationally recognized experts.

The recommended plan for development of Gull Island includes the excavation of two large tunnels in rock on the north bank of the river as a means of diverting the river's flow around the main dam while it is being built. This rock filled dam with a central impervious core would be constructed on the dry river bed to a height of 90 meters. The dam would be 1,300 meters in length at the crest. An artist's concept of the Gull Island site development is provided on page 5.

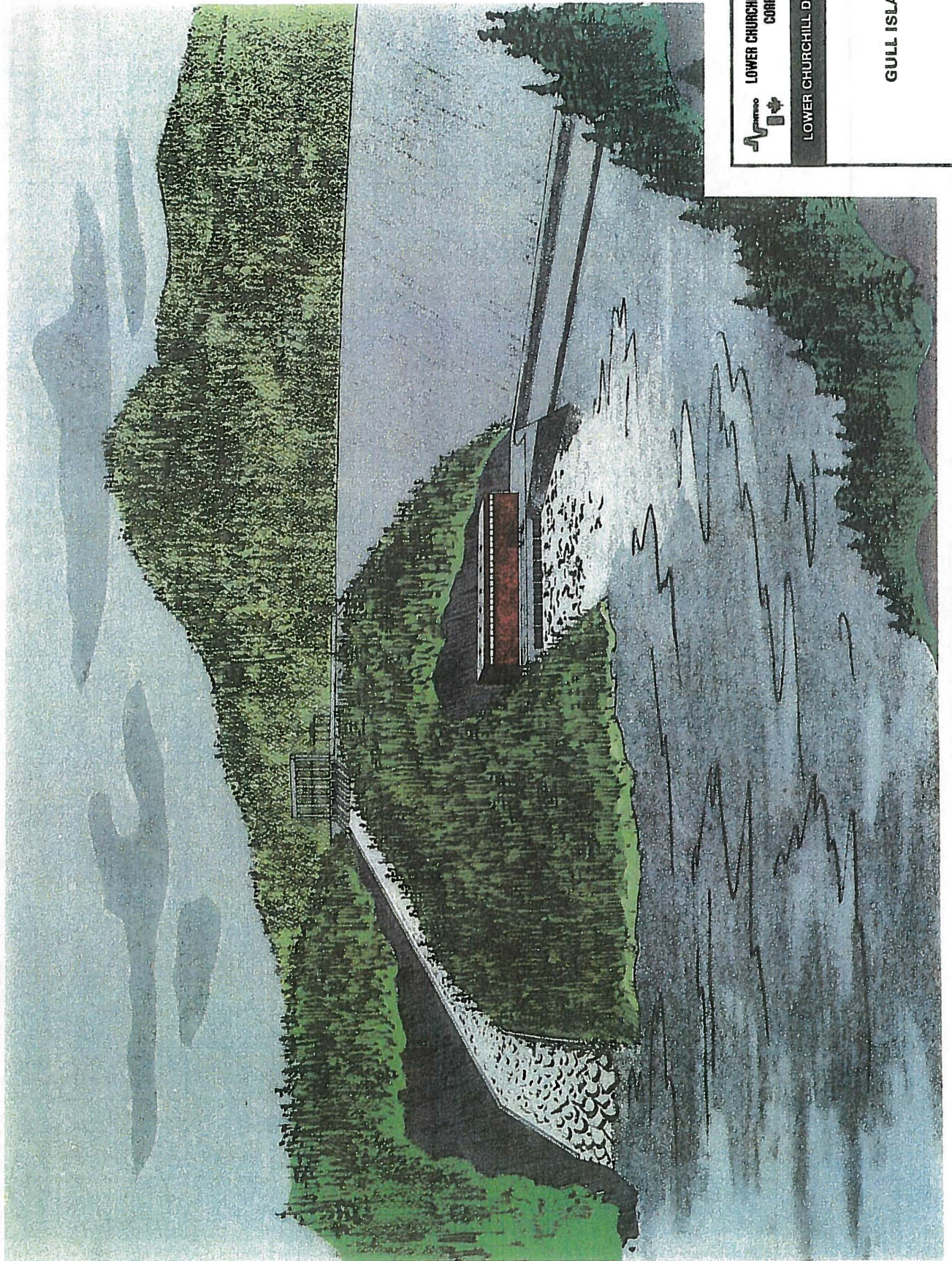
The water intake structures would be built on the south bank of the river. These structures would supply a surface powerhouse containing six turbine generators each rated at 283 MW. The 1,698 MW installation would be capable of generating 11.3 billion kilowatthours (kWh) in an average year. A spillway would be constructed on the south bank and designed to pass the maximum predicted flood of the river.

The powerhouse would be connected by a 735,000 volt transmission line to the existing generating station at Churchill Falls to facilitate energy interchanges between the two plants. The entire Gull Island installation would cost \$2.65 billion and power could be delivered as early as 1987.

At Muskrat Falls there is a natural dam which formed during geologic time and diverted the river south around a predominant rock knoll. The recommended plan of development involves driving two tunnels through the rock knoll on the north bank which would permit diversion of the river and construction of a dam and spillway on the rock shelf above the upper rapids. Simultaneously, a third tunnel and a surface powerhouse containing three 206 MW turbine generators would be built.

Following completion of the spillway and powerhouse, the three tunnels would serve as the water intake structures to supply the powerhouse. An artist's concept of the Muskrat Falls site development is provided on page 6. A stabilization program for the natural dam would be necessary to ensure the safety of the structure for the new hydraulic conditions that would be imposed by increasing the natural reservoir level.

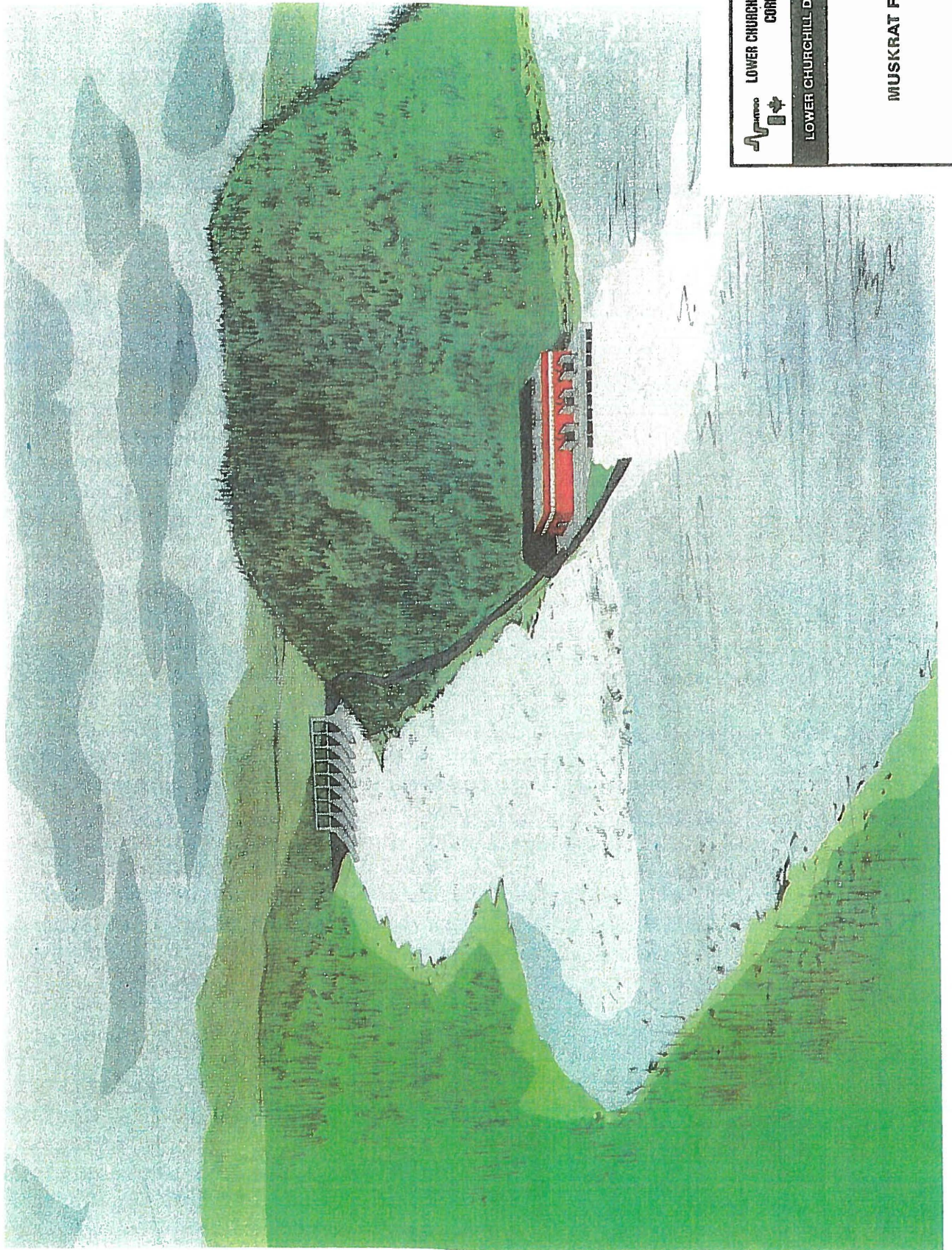
Two 345,000 volt transmission lines would connect the Muskrat Falls plant with power conversion facilities near Gull Island and its interconnection to Churchill Falls. This arrangement would ensure flexible operation with maximum efficiency through energy interchanges between plants. The 618 MW installation would cost \$1.60 billion



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GULL ISLAND



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MUSKRAT FALLS

and be capable of producing 4.7 billions kWh in an average water year. The project could be completed to produce power by 1986.

While no two hydro-electric developments are exactly alike, the Gull Island and Muskrat Falls power sites present no new technological challenges. Tried and proven designs are used and there exists ample successful construction experience in the climatic conditions that will prevail.

A summary of power site characteristics is shown in the following table:

Summary of Generating Site Characteristics

	<u>Gull Island</u>	<u>Muskrat Falls</u>
Installed capacity (MW)	1,698	618
Annual energy (billion kWh)	11.3	4.7
Capital cost (\$ billion)	2.65	1.60
Unit cost of capacity (\$ per kW)	1,560	2,590
Unit cost of energy (mills/kWh)	33	48

Transmission

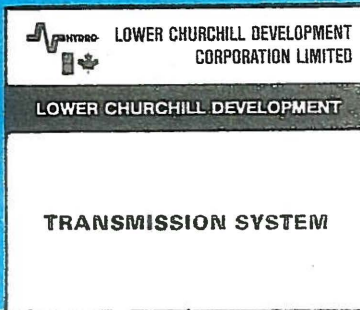
The engineering review of transmission requirements, in particular to supply the Island's load, confirmed that high voltage direct current (HVDC) is preferable to a standard alternating current system. Selection of an HVDC system reflected both technical and economic considerations. HVDC transmission is a well proven method of moving large blocks of energy long distances and there are many operative examples of this technology in North America, as well as throughout the world.

Power system analysis confirmed the $\pm 400,000$ voltage level and a bipole circuit rating of 800 MW as being the optimum transmission configuration. Initially, one circuit interconnecting the Island with Labrador is proposed.

The anticipated climatic conditions which will be encountered throughout the transmission route was a major consideration in designing the line. Heavy wind and icing loads are anticipated, particularly in the Long Range Mountains area of the Island and in certain sections of Southern Labrador. Engineering studies concentrated on developing heavier design parameters and selecting routes which minimize storm exposure, with the objective of providing a reliable electrical supply consistent with that expected of modern power systems. The recommended route is illustrated on page 8.

Completion of a single 800 MW transmission line has been scheduled to coincide with the on-power dates of the generation sources. The capital cost of one circuit, exclusive of the cable crossing at the Strait of Belle Isle, would be \$1.20 billion, which is equivalent to a unit energy cost of 30 mills/kWh.

The 18 kilometer (km) water crossing at the Strait of Belle Isle is an integral part of the proposed transmission system. Two alternative methods for crossing the Strait



have been studied; (1) cables located in a tunnel underneath the seabed, and (2) submarine cable laid in trenches on the sea bottom.

Cable Tunnel

It had been concluded in earlier studies that a cable tunnel should be located in the strong pre-Cambrian rock below the Strait for maximum security during construction and subsequent operation. This concept involves vertical shafts 500 meters deep and a horizontal tunnel beneath the Strait.

While the techniques for sinking the shafts, driving the tunnel and installing the cables are readily available, the tunnel scheme does present certain risks. These include the danger of fire and the impact on cost and schedule of unknown rock conditions. Also, the maintenance of such a facility is costly. The tunnel would take seven and one-quarter years to complete at a capital cost, inclusive of cables, of \$0.70 billion.

Submarine Cables

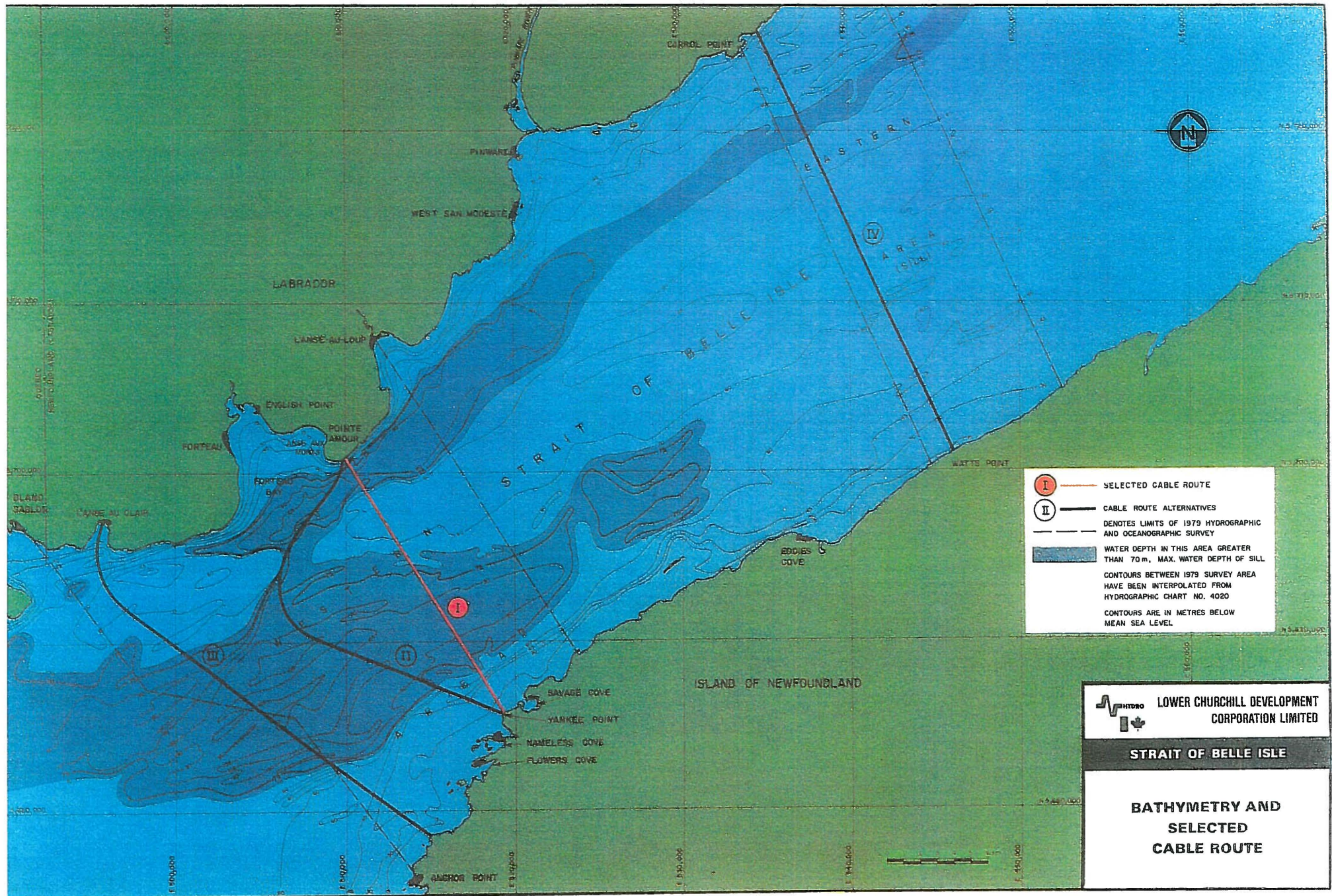
LCDC also investigated the feasibility of reliably crossing the Strait of Belle Isle with submarine cables. Page 10 illustrates the alternative crossing sites examined. A concentrated program of field investigations in the Strait of Belle Isle was undertaken during 1979. The analysis included;

- a definition of the sea bottom profile along the proposed routes,
- oceanographic studies on tides, currents and waves,
- gathering of meteorological and iceberg movement data, and
- a geological interpretation of the bedrock material.

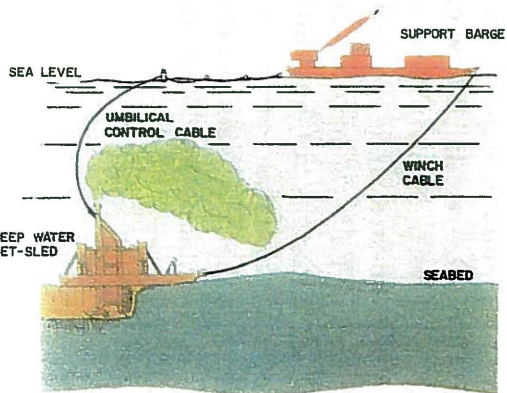
Concurrently, evaluations were conducted with contractors and suppliers to determine the reliability of existing cable laying and protection techniques. These evaluations and the field investigations were directed toward achieving the desired security for the cables and maintaining the reliability of this section of the transmission circuit.

The Strait crossing is subject to the usual hazards of ice, ships' anchors and fishing activity but has an added dimension from the presence of icebergs which scour the sea bottom. Protection can be afforded by placing the cables in rock trenches excavated in the sea bottom and reliability can be increased by installing spare cable capacity.

The technique of underwater cutting of trenches in rock has been proven. However, further development is required to maximize the effectiveness of the equipment to be used under conditions prevailing in the Strait of Belle Isle. Page 11 schematically illustrates the recommended cable trenching technique. The supply of suitably rated cables is within the capability of several cable manufacturers and the maximum use of trench capacity is proposed by installing two cables per trench. The recommended program of work in the Strait of Belle Isle can be completed in five years at a capital cost of \$0.38 billion which is equivalent to a unit energy cost of 10 mills/kWh.

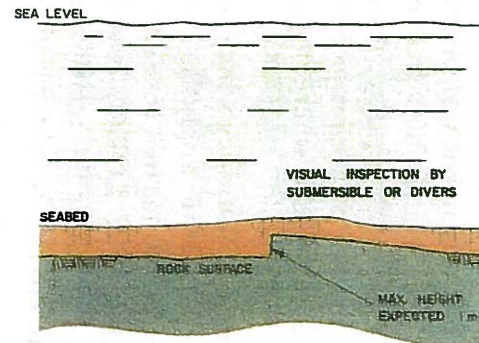


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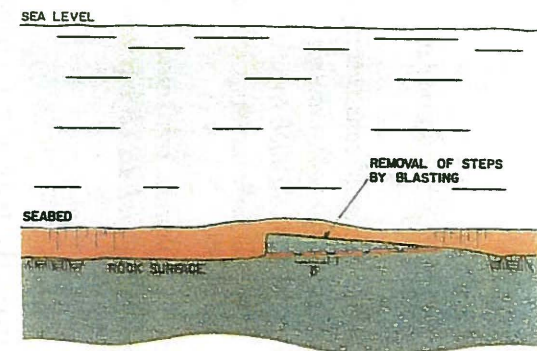
OVERBURDEN REMOVAL

2



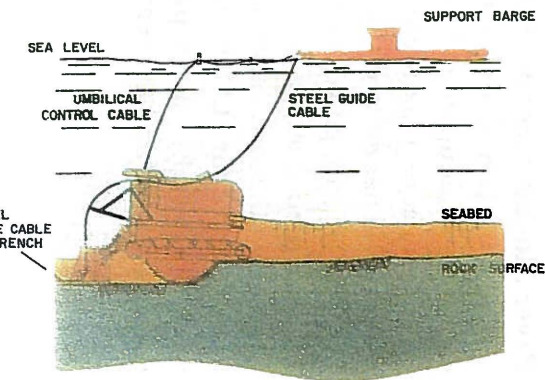
TERRAIN INSPECTION

3



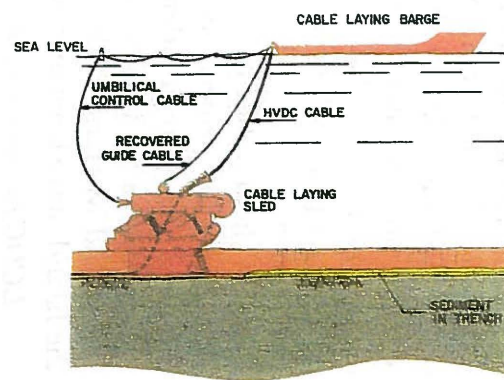
TERRAIN PREPARATION

4



TRENCHING

5



CABLE LAYING

Conclusion

The general conclusions arrived at with respect to the generation and transmission of power are favourable.

SNC-Lavalin have confirmed the technical feasibility of constructing either of the two power sites, the associated transmission lines and the power cable crossing of the Strait of Belle Isle by tunnel or by the laying of cables on the sea bottom in rock trenches. In the case of the Strait crossing, costs and schedule considerations support their recommendation that submarine cables, installed in rock trenches, be used.

SNC-Lavalin also attest to the capital cost estimates, construction schedules, energy production levels, and the reliability of the generating and delivery system presented in this report.

Environment

Environmental analysis proceeded concurrently with the engineering review. The environmental study program was co-ordinated by LCDC staff, with reliance upon appropriate consulting services in areas requiring specialized expertise.

LCDC development activity is subject to a process of environmental review which, by agreement of the Province and Canada, is conducted in accordance with procedures and guidelines laid down by a Federal Environmental Assessment and Review Panel.

Since 1973, when a preliminary overview of study needs was prepared, a series of in-depth field and office studies have been in progress. LCDC has continued this work and baseline data has been gathered on the physical, aquatic, terrestrial and human environments. The changes anticipated as a result of the project have been identified and, where practical, mitigative measures are proposed where impacts are expected to be negative.

LCDC held public hearings in the various communities which lie close to the areas affected by the project, as part of its socio-economic analysis. Public concerns were reviewed and strategies identified for addressing issues in a cost-effective manner.

Environmental impact statements, prepared by LCDC, covering both the Gull Island and Muskrat Falls generation sites, as well as the transmission line routing to the Island, have been prepared and submitted to the Panel for review.

LCDC has concluded that both of the power sites, and the proposed transmission lines from these sites to the adjoining power grids, could be constructed and operated with an acceptable minimum of environmental disturbance.

River Management Agreement

The Gull Island and Muskrat Falls generating stations would have little reservoir capacity to call upon and would depend heavily on the regulated flow out of Churchill Falls to ensure maximum energy production. The pattern of flow which exists at present and has existed since Churchill Falls came on-stream, is acceptable.

However, the power contract between Churchill Falls (Labrador) Corporation and Hydro Quebec surrenders control of reservoir discharges at Churchill Falls to Hydro Quebec, with some very wide limits of operation. While such extremes in operation are unlikely to occur, LCDC will need to be assured that variations in river flows which would materially affect production levels at its plants would be confined to circumstances beyond the reasonable control of all parties.

Land Acquisition

A plan for the acquisition of property required for the construction program has been completed. The majority of the land is Crown owned or controlled and under the Option Agreement, Newfoundland, upon the request of LCDC, would deliver a Water Lease and acquire such private lands or rights as may be reasonably required for the project.

Provision has been made in the cost estimates for the purchase of these properties and any known rights. However, the establishment of the basis for the settlement of any native claims is not within the purview of LCDC and hence no provision has been made for any costs which may be associated with this item. Any discussions on this issue will be held between the shareholders and the native groups concerned.

LCDC will require an assurance that it can occupy the property in question and proceed unencumbered with construction activities.

Newfoundland and Canada Preferences

Procurement policies have been developed for the project which will ensure that, where it is reasonable and economic to do so, Newfoundland goods and services as well as Newfoundland agents and contractors, will be given preference in contract awards. Where procurements are not made from Newfoundland sources, the preferential policy will apply to other Canadian contractors and suppliers.

It is not advisable or practical to commence collective bargaining until there is a commitment to proceed with the project. However, hiring practices, which reflect local employment preferences, will be an integral part of LCDC's philosophy during negotiations.

Legislative Requirements

Certain legislative requirements may be needed from both the Governments of Newfoundland and Labrador and Canada as a prerequisite to project release. They include commitments related to;

- equity funding by the shareholders,
- financing support by Canada, and
- labour, procurement and environmental policies required by the project.

These matters would require the involvement of both Governments before a determination can be made of the extent to which enabling legislation has to be introduced or existing legislation amended.

ENERGY MARKET

The major potential markets for the energy available from the Lower Churchill River are Labrador, the Island of Newfoundland — 1,000 kilometers east, and Eastern Canada and the Northeastern United States — 1,000 to 1,500 kilometers west.

Newfoundland and Labrador Market

Under the terms of the Lower Churchill Development Corporation Agreement, Newfoundland has the right of first refusal to all power developed by LCDC. The Corporation, therefore, has a primary obligation to supply its power for the electrical energy needs of both Labrador and the Island of Newfoundland. The existing electrical requirements of the major population centers within Labrador, namely, Labrador City-Wabush and Happy Valley-Goose Bay, are served by transmission interconnections with the Churchill Falls power plant. Newfoundland and Labrador Hydro has access to sufficient power from this plant to meet the anticipated needs of the interconnected Labrador system after 1986 without purchases from LCDC, barring any new major industrial expansion.

As a result of the projected energy load growth averaging 4.7% per year between 1980 and 2000, the Island's needs are expected to reach 8.2 billion kWh by 1986. The Island's requirements from a new energy source are predicted at 3.4 billion kWh in that year, in part due to Newfoundland and Labrador Hydro's intent to displace its oil-fired generation as soon as a Labrador infeed is achieved. Page 15 illustrates Newfoundland's energy requirements in relation to available recall power from the Churchill Falls plant and the Muskrat Falls project.

The Province of Newfoundland is intensively assessing the opportunity for the attraction of major industrial customers to the Island or Labrador that would require large blocks of firm energy. Such arrangements are unlikely to be firmed up in sufficient time to assist LCDC in the preparation of its project financing plan.

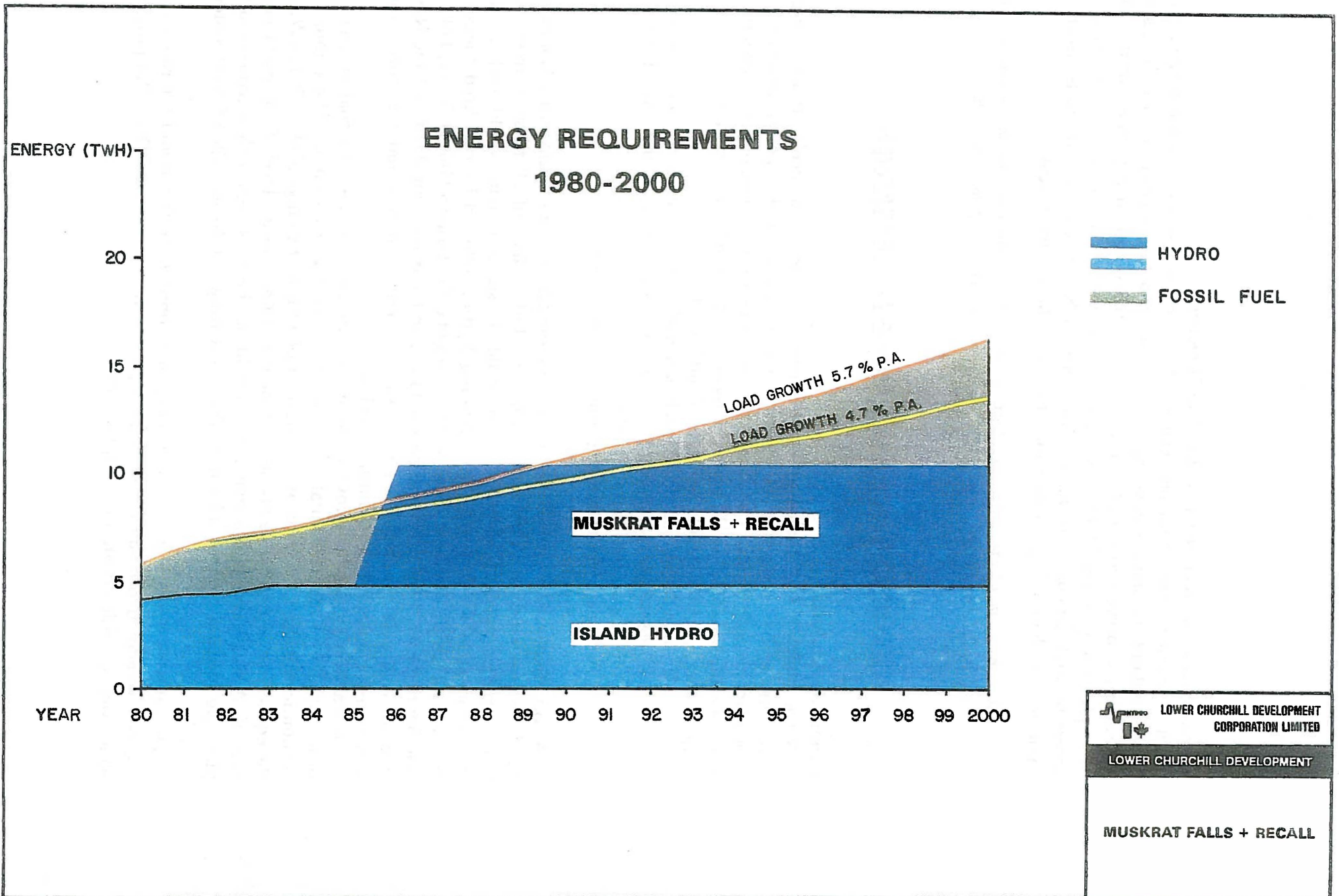
Eastern North American Markets

LCDC investigated sales opportunities in the Maritimes, Quebec, Ontario, and the Northeastern United States. The most economic and efficient way of reaching any of these areas is through the Churchill Falls system, making use of the existing spare capacity of its lines and the power system of Hydro Quebec.

The Maritime market is primarily based on the displacement of fossil fuel, which in 1985 is estimated to be equivalent to 25 million barrels of oil or 15 billion kWh of electrical energy. The economic market supply route would be via a strengthened HVDC interconnection between Quebec and New Brunswick.

Large surpluses of hydraulic energy are anticipated in the Quebec system up until 1988. Therefore sales to Quebec would depend upon its export markets. Ontario's fossil fuel consumption in 1985 is estimated to be mostly coal with an energy equivalent of 60 billion kWh. However, studies have indicated that Labrador energy transmitted to Ontario is not economically attractive when compared to its nuclear alternative, nor is it likely to compete with coal. Therefore, sales are unlikely.

The Northeastern United States will continue to have a high dependence on oil-fired generation through the year 2000. Fossil fuel consumption is estimated to be equivalent to 250 million barrels of oil or 150 billion kWh of electrical energy in 1985. Premium selling prices in relation to Canadian markets are anticipated and prices will escalate. However, significant sales in this market will be dependent upon strengthening of the transmission delivery system, both within Canada and the United States. Therefore, energy sales contracts will have to be long-term and require a co-



operative effort between Newfoundland and Quebec.

The current disagreement between the Province of Quebec and the Province of Newfoundland on matters affecting the existing and future power developments in Labrador has prevented the advancement of any meaningful negotiations for the sale of surplus energy from LCDC. Without a resolution of the problem associated with access through Quebec, the value of the Eastern North American markets becomes somewhat academic. Page 17 identifies the size of these market areas.

The conclusion of the marketing study is that LCDC can rely only on energy sales to Newfoundland and Labrador Hydro for the initial development of the Lower Churchill.

NEWFOUNDLAND'S ENERGY ALTERNATIVES

Economic Analysis

Newfoundland and Labrador Hydro can meet the Province's future energy requirements by continuing to operate Island and Labrador power systems independent of each other. The Island would depend on a series of local generation sources while Labrador would be served by access to Churchill Falls power.

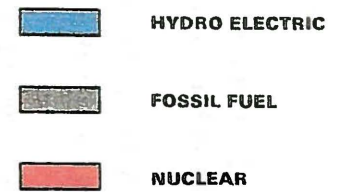
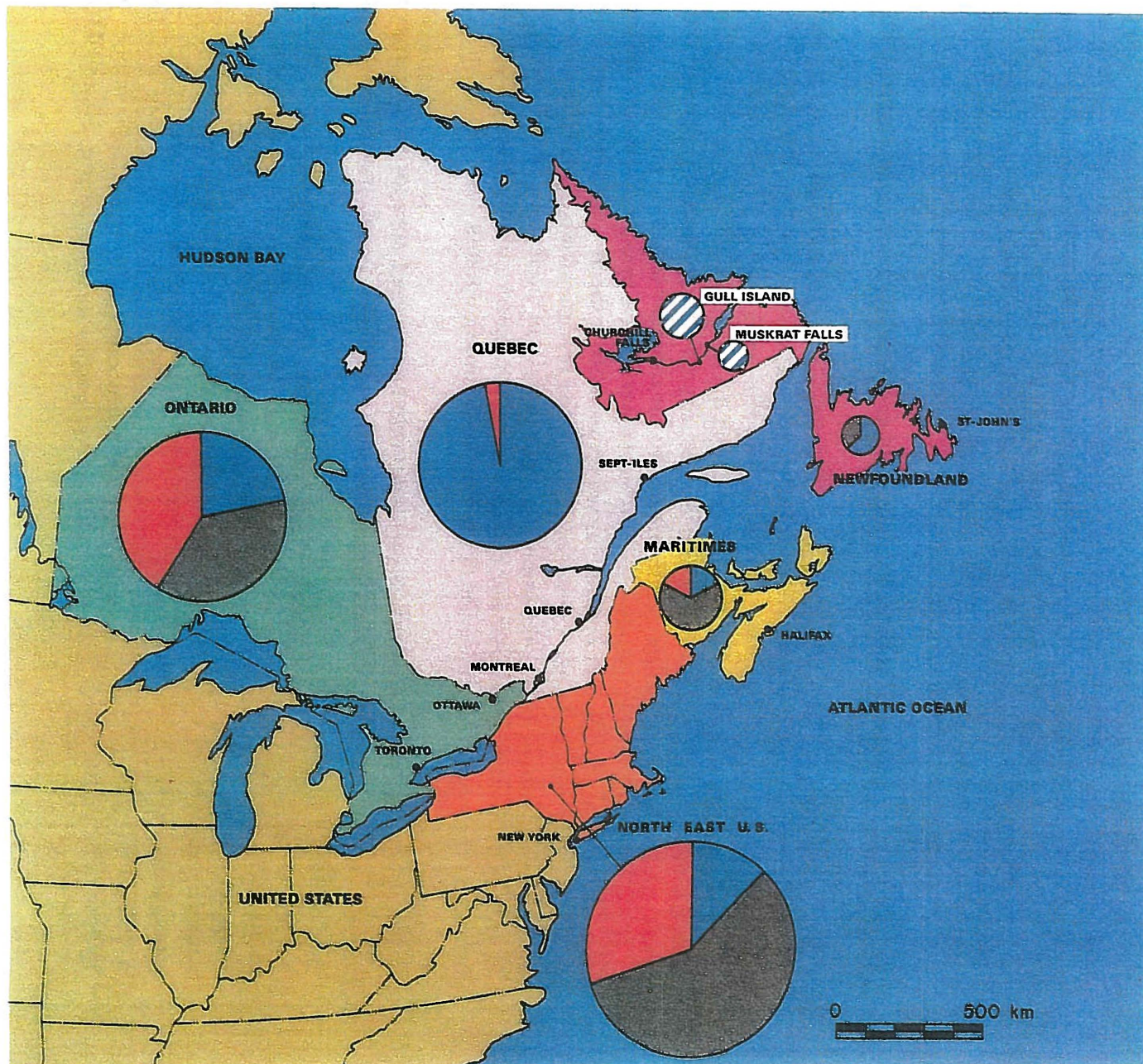
Local energy sources available to the Island include;

- a limited number of undeveloped hydro-electric sites, the only two considered economically and environmentally feasible at this time having a total capacity of only 154 MW,
- fossil fueled units burning either coal or oil, and nuclear units.

A cost effectiveness analysis undertaken by the Shawinigan Engineering Company for Newfoundland and Labrador Hydro concluded that, of all these sources, the optimum generation sequence for an isolated Island system would include the development of the 154 MW of remaining hydro, followed by coal-fired thermal. Sources identified for the coal are western Canada, the Eastern United States, Poland and South Africa. Newfoundland does not have an indigenous supply of coal and Nova Scotian coal was eliminated on the basis of anticipated cost and the uncertainty concerning the availability of future supplies.

Nuclear energy did not prove to be more cost effective than the coal alternative primarily due to higher capital cost and system reserve constraints. The minimum economic unit size for a conventional nuclear plant is in the range of 600 - 700 MW, or the equivalent of approximately 50% of the present generation level of the total Island system. A single unit of this magnitude would not be consistent with accepted utility planning criteria, which limits unit sizes to a range of 10 to 15% of total system capacity.

The other major option is to electrically interconnect the Island and Labrador and access Labrador hydro sources through a power contract with LCDC. The projects which were considered within this option were:



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LOWER CHURCHILL DEVELOPMENT

**ENERGY
GENERATION 1985**

- the development of Gull Island (1,698 MW) and its associated transmission facilities at a capital cost of \$4.3 billion and a construction schedule of six and one half years;
- the development of Muskrat Falls (618 MW) and its associated transmission facilities at a capital cost of \$3.2 billion and a construction schedule of five and one half years.

In each project the transmission facilities include an electrical inter-tie with Churchill Falls and one 800 MW transmission line to the Island utilizing submarine cables placed in rock trenches across the Strait of Belle Isle.

Cost effectiveness analysis was performed which compared the capital and operating costs of supplying the energy requirements of the Island, up to a load level equivalent to the full output of a Gull Island project, from three alternative sources:

- the optimum isolated Island generation sequence which involved a combination of 154 MW of hydro and 1950 MW of coal fired thermal units;
- Muskrat Falls including recall energy from Churchill Falls followed by 154 MW of Island hydro and 930 MW of coal fired thermal units;
- Gull Island.

The comparison was made to the year 2045, which represents the sixty year normal life of a hydro project.

The results of this analysis show that over the 65 year period the Gull Island project is preferred by a margin of 21 % over the isolated Island alternative. The Muskrat Falls project is preferred by a margin of 11 % during the same period. These preferential margins result from analysis which assumes a real discount rate of 6 %; a growth in the Island's energy requirements of 4.7 % per year; surplus energy receiving zero revenue credit; and common escalation occurring on all cost components.

Higher forecast energy requirements would increase the margin of preference for each of the Labrador project options, as would increasing the assumed escalation rate for coal and oil. Similarly, the receipt of even modest revenues from the surplus output of Gull Island would positively impact on the margin of preference of this project. Higher real discount rates disfavour capital intensive projects and thus have a negative impact on the margin of preference of the Labrador project options.

Financial Analysis

While cost effectiveness studies determined that both of the Labrador energy source options are preferred to isolated Island alternatives, this type of analysis does not address financial viability.

LCDC engaged McLeod Young Weir Limited of Toronto, Merrill Lynch White Weld Capital Markets Group of New York and the Toronto Dominion Bank, as financial advisors. With their support LCDC conducted financial analyses to determine the viability of the Lower Churchill sites using market information discussed previously, the construction cost estimates and schedules prepared by SNC-Lavalin and escalation indices provided by Informetrica Limited. Of particular note was the assumption of a 12% average interest rate on borrowings. This specifically implies a favourable credit rating perception by lenders resulting from strong Shareholder

support.

One analysis examined the financial implications of Newfoundland and Labrador Hydro paying for energy on the following basis:

- during each of the first five years recall energy from Churchill Falls (1.3 billion kWh) to be priced at a rate which would recover the cost of transmitting that energy; the balance of the energy taken to be priced at a rate equivalent to the estimated cost of energy from the Island's best alternative;
- during the second five years the rate to be paid would be sufficient to recover all the costs of the Muskrat Falls project including the deficits occurring in the first five years and the cost of servicing these deficits;
- in estimating the cost of alternate energy sources, it was assumed that existing federal oil subsidies would be eliminated entirely by 1986 and hence oil and coal would have to be purchased by Newfoundland and Labrador Hydro at the then prevailing world energy prices.

The blended rate resulting from these prices was applied to sales from both the Gull Island and the Muskrat Falls projects. On this basis, the mill rates paid by Newfoundland and Labrador Hydro, assuming five year pricing blocks, would be 80 mills for the first five years, 105 mills for the next five years and potentially reducing to 75 mills in the third five years and 65 mills thereafter.

A statement of the earnings and cash positions of the Corporation for the Gull Island project during the first seven years of operation, which is the time period required to utilize the full capacity of the initial transmission line, is shown below:

Earnings and Cash Position — Gull Island
1986 - 1992

<u>Year</u>	<u>Earnings</u>		<u>Cash Position</u>	
	<u>Annual</u>	<u>Cumulative</u>	<u>Annual</u>	<u>Cumulative</u>
1986	(311)	(311)	(213)	(213)
1987	(315)	(626)	(211)	(424)
1988	(318)	(944)	(214)	(638)
1989	(309)	(1253)	(207)	(845)
1990	(306)	(1559)	(202)	(1047)
1991	(182)	(1741)	(189)	(1236)
1992	(151)	(1892)	(159)	(1395)

The results illustrate that the Gull Island project would accumulate operating deficits in the first seven year period of \$1.9 billion and cash deficits of \$1.4 billion

The accumulated deficits for the Gull Island project are judged to be unacceptable and indicate that the projected Island load cannot alone support a financially viable Gull Island.

It is self-evident that the Gull Island project, which is capable of producing 11.3 billion kWh annually, cannot be reasonably financed when its customer's energy requirement for the first ten years will only half utilize the facility. However, it should be remembered that up to 5.0 billion kWh of the available surplus energy from Gull Island could be transmitted over the existing facilities of Churchill Falls to Hydro Quebec. If a sale for this surplus energy could have been arranged at a price in the order of 30 mills/kWh it would have permitted LCDC to generate sufficient revenue, in conjunction with its sales to Newfoundland and Labrador Hydro, to financially support the preferred Gull Island project.

A comparable statement of the earnings and cash position of the Corporation for the Muskrat Falls project during the same seven year period appears below:

Earnings and Cash Position — Muskrat Falls
1986 - 1992

<u>Year</u>	<u>Earnings</u>		<u>Cash Position</u>	
	<u>Annual</u>	<u>Cumulative</u>	<u>Annual</u>	<u>Cumulative</u>
1986	(169)	(169)	(99)	(99)
1987	(170)	(339)	(91)	(190)
1988	(144)	(483)	(65)	(255)
1989	(117)	(600)	(38)	(293)
1990	(88)	(688)	(93)	(386)
1991	56	(632)	50	(336)
1992	113	(519)	107	(229)

The Muskrat Falls project incurs a peak cumulative operating deficit of \$700 million and a peak cumulative cash deficit of \$400 million in the first seven year period. However, the project from an earnings and cash position breaks even on an annual basis in the sixth year and on a cumulative basis by the tenth year.

The losses projected in the early years of the operation of the Muskrat Falls project are judged to be acceptable to the financial community, provided adequate financial support from the Shareholders is arranged to cover these cash requirements. Given the marketing constraints for Gull Island, then Muskrat Falls should be proceeded with as the initial project.

LCDC's financial advisors have confirmed that based on current market information and the estimated capital, operating and financing costs, the project which is financeable is Muskrat Falls.

SHAREHOLDERS' SUPPORT

The development of either of the sites on the Lower Churchill River would require the provision of credit support arrangements which would allow the raising of the very significant volume of funds required. Both shareholders recognized from the inception of LCDC that Newfoundland does not have the financial strength to support either project. With the highest per capital debt and lowest credit rating of any of Canada's Provinces, Newfoundland simply is unable to undertake a further debt commitment which would approximately equal the current level of its outstanding debt. The need for Federal Government support was obvious even before the technical and financial analyses were undertaken.

The financial viability of the Muskrat Falls development is dependent on lenders being assured that the project will be completed, and that following commencement of operations, it will receive the cash needed to service the senior debt and pay all of its expenses. Such an assurance can only be provided by means of strong credit support from the Government of Canada.

Such support would take the form of a completion and cash deficiency agreement which would provide that,

- while the project is being constructed; in the event LCDC is unable to borrow all of the capital funds for the project on reasonable terms from conventional sources, Canada would advance to LCDC such amounts as may be required from time to time to make up the shortfall; and,
- following completion of the project; in the event that project revenues and all other funds available to LCDC are not sufficient to pay all the costs and expenses of the project, including principal and interest due on the senior debt, Canada would advance to LCDC such amounts as may be required to make up the shortfall.

Based on such credit support, LCDC can raise the required \$3 billion over a five year period commencing in 1980-81 through the sale of long-term debt securities in the private and public Canadian and United States capital markets. The terms and conditions under which such funds could be borrowed will depend on market conditions at the time of financing.

In addition, the Canadian banking system could provide, on a floating interest rate basis:

- the bridge financing required during the construction period;
- term loan financing sufficient to cover the cash flow deficiency during the period 1986-1990; and,
- additional term loans to make up any shortfall in the funds obtainable in the long-term market to finance the project's capital costs.

FINDINGS AND RECOMMENDATION

This report is an Executive Summary of the main report to Shareholders which is supported by an impressive series of technical, marketing, economic, financial and environmental analyses. The summary of findings leading to a project recommendation is supported by the formal opinions of the engineering and financial advisors shown in Appendices (i) and (ii).

Summary of Findings

- The development of the hydro-electric sites on the Lower Churchill River at Gull Island and Muskrat Falls, the construction of the 1100 km transmission line across Labrador and the Island of Newfoundland, and the 18 km crossing at the Strait of Belle Isle by submarine cables buried in rock trenches are all technically feasible, involve minimal negative environmental impact and will meet electric utility reliability standards.
- The cost of the Gull Island project, including transmission, is estimated at \$4.3 billion and its capability is 1698 MW and 11.3 billion kWh annually. It can be constructed over a period of six and one-half years.
- The cost of the Muskrat Falls project, including transmission, is estimated at 3.2 billion and its capability is 618 MW and 4.7 billion kWh annually. It can be constructed over a period of five and one-half years.
- The energy need of Newfoundland and Labrador Hydro is the only firm marketing opportunity available to LCDC. Aggressive marketing efforts to attract a large energy intensive industry and to develop significant short term energy sales have not yet produced a confident prediction of higher Provincial energy requirements than those used as the basis for analysis.
- Gull Island is the most economic alternative in the long term to serve the Province's load. The large quantities of Gull Island energy, surplus to Newfoundland's needs in the early years, emphasize the desirability of additional energy sales in order to take advantage of the favourable unit cost differential of this project in comparison with Muskrat Falls. Surplus energy sales at a price in the order of 30 mills/kWh would permit financing of the economically preferred Gull Island project.
- The Muskrat Falls project is a financially viable undertaking which more closely matches the initial requirements of Newfoundland and Labrador Hydro. It offers lower energy costs than the alternative energy sources available to Newfoundland and Labrador Hydro which involve building oil and/or coal fired generating plants.
- A firm power purchase agreement between LCDC and Newfoundland and Labrador Hydro, a river management agreement, and Government of Canada

financing support are key requirements for project financeability.

Recommendation

- The Board of Directors of the Lower Churchill Development Corporation recommends to the Shareholders that the Corporation proceed with a 618 MW hydro-electric development at Muskrat Falls on the Churchill River with the necessary transmission facilities to interconnect the Labrador and Island power networks with that source, including a submarine cable crossing of the Strait of Belle Isle.

Appendices

(i) Letter from Engineering Advisors

(ii) Letter from Financial Advisors

SNC-LAVALIN Newfoundland Ltd.

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Montreal, Quebec
May 30, 1980

LOWER CHURCHILL DEVELOPMENT CORPORATION LIMITED
6 Logy Bay Road
St. John's, Newfoundland
A1A 1J3

SUBJECT: LOWER CHURCHILL DEVELOPMENT

Gentlemen:

In May 1979, SNC-Lavalin Newfoundland Ltd., comprised of Surveyer, Nenniger & Chênevert Inc. (SNC) and LAVALIN Inc., entered into a contract with Lower Churchill Development Corporation Limited (LCDC), as Engineering Advisor to undertake engineering studies and investigations and to prepare cost estimates and schedules for the Lower Churchill Development.

As members of SNC-LAVALIN Newfoundland Ltd., both SNC and LAVALIN have provided personnel, engineering services and management services to the joint venture in the performance of the contract. Strong support was also provided by senior executives of both parent companies, participating directly in the management of the joint venture.

Sixteen reports have been prepared in the performance of this contract, covering all major elements and aspects judged necessary for the definition of likely viable projects in the development of the Lower Churchill. These projects include the two principal ones under consideration:

- a) The Muskrat Falls Power Development with an intertie to Churchill Falls and a \pm 400 kV DC single bipole transmission system across Labrador and Newfoundland to St. John's. This System includes a submarine cable crossing of the Strait of Belle Isle.
- b) The Gull Island Power Development with an intertie and transmission system, as identified above, for Muskrat Falls.

All reports have been reviewed by both parent companies of the joint venture, who together and separately confirm their agreement with the conclusions and recommendations expressed therein.

We also express that, in our opinion, the development of both sites including

transmission system and the submarine cable crossing are all technically viable.

SNC and LAVALIN are both prepared, with the full support of their companies, to undertake in joint venture the engineering, procurement, construction and project management necessary for the successful completion of your selected project for Lower Churchill Development. This would be done fulfilling all the essential recommendations and undertakings described in SNC-LAVALIN's reports.

Yours very truly,

SNC-LAVALIN NEWFOUNDLAND LTD.



Armand Couture, Eng. M.Sc.

ENDORSED BY:



C.A. Dagenais
Chairman and
Chief Executive Officer
SNC Inc.

B. Lamarre
President and
Chief Executive Officer
LAVALIN Inc.

June 6, 1980

Lower Churchill Development Corporation Limited,
St. John's, Newfoundland

Dear Sirs:

As your financial advisors, McLeod Young Weir Limited and Merrill Lynch White Weld Capital Markets Group, and your banking advisor, The Toronto-Dominion Bank, we confirm the advice contained in our report dated June 6, 1980 that the Muskrat Falls project (the "Project") is financeable, given reasonable conditions in the financial markets and the credit support arrangements and other assumptions discussed in our report.

The Project

We understand the proposed Muskrat Falls project comprises a 618 megawatt hydro-electric development on the Churchill River with the necessary transmission facilities to interconnect the Labrador and Island power networks with that source, including a submarine cable crossing of the Strait of Belle Isle. Project power would be sold on a firm basis to Newfoundland and Labrador Hydro.

The capital cost of the Project is estimated at \$3.2 billion, including provisions for contingencies, interest during construction and escalation.

Project Financing Risks

In order to arrange a successful project financing for LCDL, the financial and banking advisors believe that, in addition to Newfoundland's and Canada's equity investments and the long term sale of certain amounts of Project energy to Newfoundland and Labrador Hydro, lenders will require additional credit support to provide assurances with respect to the major project financing risks. These risks are cost overruns and non-completion during the Project's construction phase; and, in its operating phase, interruption of service because of technical problems and inadequacy of Project revenues to cover all costs in the initial years following completion.

Sources of Credit Support

Since the output of the Project will be entirely committed to Newfoundland and Labrador Hydro, no other potential buyer of energy on a firm basis will be available to provide credit support.

The magnitude of the Project debt and the amounts required annually to pay principal and interest on it are very large in relation to the resources of the Province of Newfoundland. The expected senior Project debt of approximately \$3 billion exceeds the total currently outstanding public sector debt of Newfoundland. It is the opinion of the financial and banking advisors that even a direct application of the credit of Newfoundland, or of Newfoundland and Labrador Hydro, to support Project debt in all circumstances, including non-completion and extended interruption of service, would not suffice to render Project debt marketable. Exposure of the credit of

Newfoundland to a risk of this magnitude could result in Newfoundland itself being unable to issue any further debt for its ongoing requirements.

In the circumstances of the Project, it has therefore been concluded that the necessary assurances against the major project risks must, in the last resort, be provided by means of a credit support agreement entered into by Canada.

Security Arrangements

One approach that would satisfy the requirements of prospective lenders would include a first mortgage on the Project facilities, an assignment of a long term power contract with Newfoundland and Labrador Hydro, substantial pre-commitment of funds from lenders and a completion and deficiency agreement with Canada.

The completion and deficiency agreement would provide:

- while the Project is being constructed, in the event LCDC is unable to finance all the capital costs of the Project on reasonable terms from conventional sources, Canada will advance to LCDC such amounts as may be required from time to time to make up the shortfall, and
- following completion of the Project, in the event Project revenues and all other funds available to LCDC are not sufficient to enable LCDC to pay all costs and expenses of the Project, to pay all principal and interest due on the senior debt and to maintain a minimum level of working capital, Canada will advance to LCDC such amounts as may be required to make up the shortfall.

Certain of Canada's obligations under its agreement would be reduced once the Project had complied with various financial tests. The tests would be designed to establish that the Project had become entirely self sufficient and could meet all of its future debt service and other cash requirements out of its anticipated revenues. Canada's obligation to cover cash deficiencies in the event of an extended service interruption would, however, continue until the Project debt had been retired.

The financial and banking advisors believe that the arrangement outlined above includes the minimum level of support from Canada required for the Project to be financeable. It is the opinion of the financial advisors that such an arrangement should result in an "A" rating for senior Project debt by the major U.S. rating agencies. The financial advisors consider that such a rating, or its equivalent in the view of lenders, will be necessary to assure completion of the financing at a reasonable cost.

Alternatively, if Canada's obligations under the agreement in respect of major Project risks were required to continue for the life of Project debt, the financial advisors are of the opinion that such an arrangement should result in LCDC's debt obligations being rated not less than "Aa". This would have several advantages for LCDC, including the ability to proceed with a minimum of pre-commitments for its senior debt, access to all major capital markets at virtually any time and reduced borrowing costs with a consequent reduction in estimated cash deficiencies during the early years of Project operation.

Our views with respect to the financeability of the Project and the rating of LCDC's

securities are based on the assumption that the agreement shall have been authorized by such actions of Parliament, including special legislation, as may be required to create a legal, valid and binding obligation of Canada to make the payments contemplated. In the event that the disbursement of funds by Canada pursuant to such an obligation were to require annual appropriations by Parliament, we consider the Project would be financeable, although the need for appropriations would affect the financing and result in higher interest rates being required by lenders in each case.

Conclusions

Based on the foregoing, LCDC's financial advisors have concluded that the project is financeable and LCDC could raise the required \$3 billion over a five year period commencing in 1980-81 through the sale of long term securities in the private and public Canadian and United States capital markets. The terms and conditions under which such funds could be raised will depend on market conditions at the time of the financing as well as the extent of the support to be provided by Canada.

LCDC's banking advisor has similarly concluded that the Canadian banking system could provide on a floating interest rate basis:

- the bridge financing required during the construction period,
- term loan financing sufficient to cover the cash flow deficiency estimated at approximately \$400 million during the period 1986-1990, and,
- additional term loans to make up any shortfall in the funds obtainable in the long term market to finance the Project's capital costs.

Yours very truly,

(Signed) A.G.E. Taylor

President,
McLeod Young Weir Limited

(Signed) W. Joseph Wilson

Managing Director,
Merrill Lynch White Weld
Capital Markets Group

(Signed) A.B. Hockin

Executive Vice President,
Investment Division
The Toronto-Dominion Bank

