CANADA

National Energy Board

Reasons for Decision

Hydro-Québec

EH-5-84

January 1985

National Energy Board

Reasons for Decision

In the Matter of

Hydro-Québec

An application Under the National Energy Board Act

EH-5-84

January 1985

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Cat. No. NE22-1/1985-1
ISBN 0-662-3500-6

Copies are available on request from:
Secretariat
National Energy Board
473 Albert Street
Ottawa, Ontario
K1A 0E5
(613) 992-3972

Printed in Canada

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Nº du cat. NE22-1/1985-1
ISBN 0-662-3500-6

Exemplaires disponibles auprès du:
Secrétariat
National Energy Board
473, rue Albert
Ottawa (Canada)
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Imprimé au Canada

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Abbreviations

Units of measurement

km	kilometre	(1 000 metres)
kV	kilovolt	(1 000 volts)
MW	megawatt	(1 000 kilowatts)
kW.h	kilowatt hour	
GW.h	gigawatt hour	(1 000 000 kW.h)
TW.h	terawatt hour	(1 000 GW.h)
A	ampere	
$	Canadian current dollar (unless otherwise indicated)	

Names

Act	*National Energy Board Act*
Applicant	Hydro-Québec
Board	National Energy Board
CFLCo	Churchill Falls (Labrador) Corporation Limited
Island	The Island of Newfoundland
NEB	National Energy Board
NEPOOL	New England Power Pool
NLH	Newfoundland and Labrador Hydro
PASNY	Power Authority of the State of New York
Vermont	State of Vermont
Vermont DPS	State of Vermont Department of Public Service

Recital and Appearances

IN THE MATTER OF the *National Energy Board Act* and the Regulations made thereunder; and

IN THE MATTER OF an application by Hydro-Québec for licences to export electric power and energy, pursuant to Part VI of the said Act, and for a certificate of public convenience and necessity, pursuant to Part III of the said Act, filed with the Board under file number 1923-4/Q2-11.

HEARD in Montréal, Québec on 1, 2 and 3 October 1984

BEFORE:

J.L. Trudel	Presiding Member
A.B. Gilmour	Member
W.G. Stewart	Member

APPEARANCES:

P.R. Fortin G. Marchand	Hydro-Québec
W.W. Davidson	The New Brunswick Electric Power Commission
M. Greene	Newfoundland and Labrador Hydro - Churchill Falls (Labrador) Corporation Limited
M. Hare	Ontario Hydro
N. Markettos J.M. Johnson	Minister of Energy for Ontario
J. Robitaille	Attorney General for Québec
L. Meagher D. Tremblay	National Energy Board

Chapter 1
Background

The Applicant, Hydro-Québec, is a public utility producing and distributing electricity throughout Québec. It was established in 1944 by an act of the legislature of the Province of Québec. It operates under the authority of the Hydro-Québec Act (R.S.Q. c. H-5).

Hydro-Québec owns and operates an electric power system which covers nearly all regions of Québec. Appendix I is a map illustrating the main facilities in the system as of 1984. The map also shows the interconnections with systems outside the Province. Appendix II is a summary of Hydro-Québec's main generating stations. At the end of 1983, the Applicant had 21 301 MW of generating capacity and a total supply capacity, including firm power purchases, of 26 526 MW.

The main Hydro-Québec system does not have synchronous interconnections with neighbouring electric systems in Canada with the exception of the 735 kV lines between the Québec network and the Churchill Falls generating station in Labrador. There are some 14 transmission lines between Ontario and Québec, but these lines are used to connect electrically isolated area or generating plant to the other province. Between Québec and New Brunswick there is a direct current asynchronous tie with a nominal capacity of 320 MW, and a 230 kV line which can supply radially 130 MW of New Brunswick's load. There is also a temporary alternating current line with a 75 MW capacity.

There are no synchronous interconnections between Hydro-Québec and any major United States system. There are a number of international power lines originating in Québec, but most of these are low-voltage distribution circuits serving small loads along the border.

The major asynchronous interconnections with neighbouring American states include a 120 kV double-circuit line having a capacity of 186 MW owned by the Cedars Rapids Transmission Company Limited (Cedars) and a 765 kV line to New York State having a capacity of 2500 MW. The Board has approved the construction of a ±450 kV direct current interconnection, 690 MW transfer capacity, with the New England States.[1]

The interconnections with the State of Vermont more specifically include: a 120 kV line, 100 MW transfer capacity, between the Stanstead substation and the Border substation for which the Board has issued Certificate of Public Convenience and Necessity No. EC-III-17 and three other lines, each of 25 kV, authorized by Certificates EC-7, XE-3-82 and XE-4-82 and having a total transfer capacity of 15 MW.

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1 **Reasons for Decision - Hydro-Québec/NEPOOL, NEB, August 1984.**

Total transfer capacity of Hydro-Québec's existing lines to the United States is approximately 2800 MW.

Chapter 2
Licences Held by Hydro-Québec

2.1 State of Vermont

Hydro-Québec holds two licences authorizing it to export a maximum of 525 GW.h annually to Citizens Utilities Company using the existing 120 kV line to the State of Vermont. Licence EL-132 covers exports of firm power and energy from April to October each year and expires in December 1985. Licence EL-133 covers exports of interruptible energy and expires in September 1985.

A third licence, EL-131, authorizes the export of 52 MW of interruptible power and 320 GW.h of interruptible energy each year to Vermont Public Service Board, and expires in September 1985. The power is wheeled via the 765 kV line of the Power Authority of the State of New York (PASNY) system to the Vermont Public Service Board.

2.2 State of New York

Hydro-Québec has seven licences for exports to New York State via its 765 kV line and the 120 kV Cedars double-circuit line. Two of these licences, EL-154 and EL-155, also authorize exports to New England. More details are presented in Section 2.3.

Licence EL-96, which expires on 23 June 1991, authorizes the export to PASNY of 800 MW of firm diversity power from April to October each year and a basic amount of energy up to 3000 GW.h per year. Before the basic amount of not more than 3000 GW.h is determined, the energy must be offered to Canadian electric utilities at the same price and on the same terms. Before exports can commence, the price and basic amount must be approved by the Board. At present the basic amount has been set at 3000 GW.h per year for 1985 and 1986.

Licence EL-151 authorizes the export of interruptible energy according to the energy contract between Hydro-Québec and PASNY. This licence expires at the earlier of: 31 August 2002 or the date on which the target quantity of contract energy, 111 TW.h, will have been offered and exported to, or rejected by, PASNY as provided by the contract.

Licences EL-152 and EL-153 authorize interruptible exports to Niagara Mohawk Power Corporation (NMPC) and PASNY respectively under interconnection agreements. The quantity of energy that may be exported during any consecutive 12-month period is 23 564 GW.h for the two licences combined less any amounts of energy exported pursuant to any other licences under which energy is transmitted over the international power lines mentioned above. These licences expire on 31 August 1995.

Licence EL-156 authorizes the export of firm power and energy as a carrier transfer with simultaneous return to the Hydro-Québec system in order to serve the Indian Reserve of St-Régis in the Province of Québec. The maximum quantities of power and energy that can be exported are 5 MW and 25 GW.h respectively. This licence expires on 31 August 2002.

2.3 State of New York and New England States

The exports of short-term firm power and energy to the New York and New England utilities authorized by Licences EL-154 and EL-155 can be made over any international power line between Québec and the New York and New England markets.

These licences, as amended, authorize exports of blocks of short-term firm power and energy, for periods from six months to five years. Licence EL-154 authorizes exports during the nine-month period from 1 March to 30 November of each year. The maximum export under EL-154 is 1700 MW less any block of firm power already committed under Licence EL-155. Licence EL-154 expires on 30 November 1992. The maximum export authorized under Licence EL-155 is the lesser of: 1500 MW, or 1700 MW less any block of firm power already committed under Licence EL-154. Licence EL-155 expires on 31 December 1988.

2.4 New England States

Hydro-Québec has three licences for exports to the New England market, more precisely to the New England Power Pool (NEPOOL), which will become effective on 1 September 1986. These exports will be made over the existing lines to the State of Vermont and the future ±450 kV interconnection with NEPOOL.

Licence EL-165 authorizes the export of stored energy to NEPOOL, up to 3000 GW.h per consecutive 12-month period, from 1 September 1986 to 1 November 2004.

Licence EL-166 authorizes the export of interruptible energy according to the energy contract between Hydro-Québec and NEPOOL. This licence expires at the earlier of: 31 August 2002 or the date on which the target quantity of contract energy, 33 TW.h, will have been offered and exported to, or rejected by, NEPOOL as provided by the contract.

Licence EL-167 authorizes interruptible exports to NEPOOL. The quantity of energy that may be exported during any consecutive 12-month period is 6920 GW.h, less any amounts of energy exported pursuant to any other licences authorizing exports over the international power lines described above. This licence expires on 31 August 1995.

Chapter 3
The Application

Hydro-Québec's application dated 30 March 1984 is divided into two parts: the first part is a request for two export licences, the second part is a request for a certificate of public convenience and necessity for an international power line.

3.1 Licences

(a) a licence to export firm power to the State of Vermont for a period of 10 years, commencing 1 September 1985 at the earliest and 1 March 1986 at the latest, under the terms of the firm power contract between Hydro-Québec and the State of Vermont Department of Public Service (Vermont DPS);

(b) a licence to export power and energy to the State of Vermont for a period of 10 years and 6 months, from 1 September 1985 to 28 February 1996, under the terms of the interconnection agreement between Hydro-Québec and Vermont DPS.

3.2 Licence Limits

The licence requested for exports pursuant to the firm power contract is for a total of 150 MW of firm power.

The licence requested for exports under the interconnection agreement is for up to 200 MW of interruptible power less the power exported under the firm power contract.

The following table shows the requested amounts of energy.

Table 3-1
Energy
Maximum Annual Quantities

(Gw.h)

Year	Firm Power Contract	Interconnection Agreement [1] (Interruptible)
1985	439.2	585.6
1986	1314.0	1752.0
1987	1314.0	1752.0
1988	1317.6	1756.8
1989	1314.0	1752.0
1990	1314.0	1752.0
1991	1314.0	1752.0
1992	1317.6	1756.8
1993	1314.0	1752.0
1994	1314.0	1752.0
1995	1314.0	1752.0
1996	212.4	283.2

(1) Less the energy exported under the firm power contract.

3.3 Certificate

The certificate requested by Hydro-Québec would authorize construction of a 120 kV international power line, 17.6 km in length, between the Bedford substation in the Province of Québec and a point located 450 metres east of marker 620A on the international boundary in the municipality of Saint-Armand-Ouest. The cost of the line is estimated at $ 4.5 million (1985) and the in-service date is scheduled for 1 September 1985.

Chapter 4
The Contracts

4.1 Firm Power Contract

The firm power contract between the State of Vermont Department of Public Service and Hydro-Québec, signed on 25 July 1984, includes in substance the conditions stipulated in the letter of intent signed on 8 March 1984, when the contract negotiations started between the two parties.

The contract period is divided into two parts. Part A begins on or after 1 September 1985, but no later than 1 March 1986, and ends five years later. Part B begins at the termination of Part A and ends five years later.

Vermont DPS has the option to terminate its obligation to take and pay for the power and energy at the termination date of Part A of the contract period provided that it notifies Hydro-Québec in writing of its decision on or before 30 April 1986.

Hydro-Québec will make available to Vermont DPS not less than 150 MW of capacity at up to 100 % annual load factor.

Vermont DPS will take the energy at a minimum of 80 % annual load factor for Part A of the contract period and at a minimum of 50 % annual load factor thereafter until the end of the contract period.

Appendix III of these Reasons for Decision gives additional information concerning the firm power contract, including price.

4.2 Interconnection Agreement

The interconnection agreement dated 25 July 1984 between Vermont DPS and Hydro-Québec provides for mutual assistance in the event of emergency and for operating economies by the exchange of surplus power and energy. The transactions provided for under this agreement are summarized in Appendix IV.

4.3 Operating Committee

The Operating Committee is authorized to ensure delivery of and payment for power and energy on behalf of both parties in accordance with the spirit and provisions of the firm power contract and the interconnection agreement. The Committee may, among other things, alter the hourly delivery schedule, and may set the price for supplemental or conservation energy and tertiary energy.

Chapter 5
The Evidence: Power and Energy Exports

5.1 Quebec Loads

At the end of 1983, the Applicant served 2 252 697 domestic and farm customers, 262 155 commercial customers and 12 953 industrial customers. The industrial category includes such primary industries as mining and pulp and paper as well as a large body of secondary industries in the manufacturing sector.

The peak load on the system in December 1983 was 19 788 MW, compared to a peak of 18 379 MW the year before, for an increase of 7.7 %. Total energy sales in 1983 were 107.7 TW.h, an increase of 3.9 % from the previous year.

5.2 Generating Capacity and Additions

According to the Hydro-Québec annual report, the total generating capacity of the Hydro-Québec system in 1983 was 21 301 MW. This amount included about 19 555 MW of hydraulic capacity, 1061 MW of thermal capacity and 685 MW of nuclear capacity (see Appendix II). Hydro-Québec also had access to most of the generation of Churchill Falls power station which has a nominal capacity of 5225 MW.

To supply the increased Québec demand as forecasted in previous years, the Applicant is constructing large hydroelectric facilities on the LaGrande River. The LG-4 station will be completed in 1985 with a total capacity of 2637 MW.

A witness for the Applicant stated that the forecast average annual growth rate for demand of 2.9 % for the period 1981-2001, as presented at previous hearings [1], is still valid and is the only scenario compatible with the current expansion plan. A planning witness indicated that, due to this 2.9 % annual growth rate, the installation of various equipment has been delayed during recent years. Only peaking generating stations will be added to the system and no new base load facilities designed to produce energy are scheduled. In response to a question from Board Counsel, the same witness stated that, in the case of a higher rate of load increase, Hydro-Québec would react by looking at the generating equipment program as a whole and, following that, there would be a complete revision of the expansion program. In contrast to the current situation, the in-service dates of certain facilities would probably have to be advanced.

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1 **Reasons for Decision - Hydro-Québec/PASNY, NEB, January 1984.**

Reasons for Decision - Hydro-Québec/NEPOOL, NEB, August 1984.

5.3 Load, Supply and Excess Power and Energy

The application includes two series of estimates of monthly power requirements and generating capacity for the Hydro-Québec system throughout the period to be covered by the requested licences. These estimates are based on a forecast average annual load growth scenario of 2.9 % for the period 1981 to 2001.

The first series, provided in accordance with section 6(2)v of the Board's Regulations, hereinafter referred to as "Tables 6(2)v", is identical to the monthly estimates presented during previous hearings [12] and was prepared by the System Operation Group. As indicated by the Applicant, the load estimates were prepared using so-called compound analytical methods, taking into account the separate categories of customers and the quality and quantity of the data available for each of these categories. In addition, the forecasting model used a set of demographic, economic and energy assumptions and an analysis of the demand elasticity resulting from both inter-fuel competition and the energy conservation and consumption incentive programs implemented by Hydro-Québec. Another model taking into account the results of the preceding model established the optimal production in order to maximize the operating profits during the period studied.

The second series, showing the monthly capacity balance, submitted by the Applicant in response to a request from the Board for additional information, was prepared by the Equipment Planning Group. An analysis of these monthly statements indicates that the Applicant expects there will be an excess of power for each month in the proposed export period, except for the month of January of the years 1994, 1995 and 1996 when there would be deficits lower than the margin of error generally acceptable in this type of calculation. Appendix V shows an estimate of the generating capacity for the month of January of each year as presented in this second series. The witness, the Executive Vice-President for Equipment Planning, explained why Hydro-Québec had revised its monthly capacity balance statements, stating that at the two most recent hearings the contracts submitted to the Board dealt with energy only, while the one presently submitted to the Board involves firm power and energy.

These new monthly capacity statements take into account the reliability criteria used by Hydro-Québec[3] and are in accordance with the Hydro-Québec equipment program. These statements show a somewhat different situation concerning the supply, demand and excess of power on the Hydro-Québec network when compared with Tables 6(2)v. First, looking at the supply side, the total capacity available at Churchill Falls has been taken into account, including 459 MW from the eleventh unit, for a total of 4715 MW in January 1985 decreasing to 4542 MW in January 1990, instead of the contractual amount of 4083 MW. The same witness said that he was convinced that he could count on the eleventh unit at Churchill Falls and therefore had included it in the capacity statement. Consequently, in taking account of this additional capacity from Churchill Falls, the required reserve

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1 **Reasons for Decision - Hydro-Québec/PASNY, NEB, January 1984.**

3 **For planning purposes, Hydro-Québec calculates a loss of load not exceeding one day in ten years.**

had to be increased accordingly. Two new components had been included to increase the surplus capacity at the peak time, namely: interruptible load shedding and aid from neighbouring systems.

Under cross-examination by the Board, the Applicant's witnesses explained that in difficult situations, such as at the time of the winter peak, Hydro-Québec can shed certain industrial loads which could be interrupted provided that a few hours' notice is given. The contracts with these clients stipulate that Hydro-Québec may interrupt the load up to twice a day for a total of 200 hours annually. The witnesses also stated they have taken account of purchases from neighbouring systems up to an estimated 500 MW during the whole term of the proposed licences. They explained that this is a potential figure which they believe would be available (out of a maximum of 1700 MW) from neighbouring Canadian or American systems.

Appendix VI gives estimates of annual energy capability, regular load and excess energy. It shows that from 1985 to 1996 Hydro-Québec will have a cumulative quantity of excess energy of about 400 000 GW.h that could be offered on the interruptible market.

The data on capacity and energy production indicate that the Applicant plans to operate its system to ensure the reliability of supply to its regular loads based on an average annual load growth scenario of 2.9 % for the period 1981 to 2001, and to utilize the excess in order to maximize its operating profits.

In addition to the quantities of excess power and energy that would be generated by Hydro-Québec, including contractual purchases, there could be additional amounts of power and energy available mainly from the Churchill Falls generating station. Since 1978, Hydro-Québec has purchased more power and energy annually than the contractual quantities given in the application. A witness said that Hydro-Québec intends to continue to buy all of the energy production available from the Churchill Falls station.

5.4 Export Market

Vermont DPS, a state-owned corporation, would redistribute the power and energy purchased from Hydro-Québec to 24 private or publicly-owned electric utilities which serve the entire State of Vermont. As these utilities are all members of the New England Power Pool, the power and energy could also be re-sold to other New England utilities, or to NEPOOL, at cost when in excess of requirements within the State.

In 1982 total electricity generation in the State of Vermont amounted to 5045 GW.h. Total consumption within the State was 3948 GW.h while 808 GW.h were sold outside Vermont. Losses and station service for the same period accounted for 289 GW.h. The 1982-83 winter peak load reached 871 MW. Throughout the term of the firm power contract, the average annual increase is anticipated to be 1% for both peak load and energy requirements. The tables below indicate that Vermont is counting on Canadian imports to meet its power and energy demands during this period.

Table 5-1
State of Vermont
Projected Energy Requirement by Sources
(Percent)

Sources	1985-86	1990-91	1995-96
Instate Renewables	16.7	17.7	16.9
PASNY	6.3	6.0	5.7
Nuclear	49.3	53.5	51.6
Canadian Imports	8.2	11.2	11.3
Coal	10.5	8.6	11.1
Oil	8.9	2.9	3.4
	99.9	**99.9**	**100.00**

Table 5-2
State of Vermont
Canadian Imports
(Megawatts)

	1985-86	1990-91	1995-96
Ontario Hydro	52	52	52
Hydro-Québec [1]	69	103	103
Total	**121**	**155**	**155**

1

1 **1 As members of NEPOOL the electrical utilities of the State of Vermont are entitled to purchase a portion of the energy which Hydro-Québec is authorized to**

5.5. Offers to Canadian Utilities

On 30 March 1984, the Applicant sent identical letters of offer to The New Brunswick Electric Power Commission, St. Lawrence Power Company (St-Lawrence) and Ontario Hydro. On 11 July 1984, a similar letter was sent to Churchill Falls (Labrador) Corporation Limited (CFLCo). These letters, accompanied by copies of the application filed with the Board, requested these companies to make their position known regarding the proposed exports within two months.

In a letter dated 31 May 1984, The New Brunswick Electric Power Commission indicated that it did not oppose the sale of firm power and energy to the State of Vermont. However, it reserved its right to formulate a final opinion after having examined the official contract. No reference was made to interruptible sales under the interconnection agreement.

In a letter dated 12 June 1984, St. Lawrence indicated that it had no objection to sales of power and energy to the State of Vermont since Hydro-Québec, in its letter of offer, stated that St. Lawrence may, at all times, inform Hydro-Québec of its requirement.

In a letter dated 31 May 1984, Ontario Hydro stated that it was not interested in purchasing any part or all of the firm power that Hydro-Québec proposes to export to Vermont DPS. As for the exports under the interconnection agreement, it added that, provided that the prices and conditions are virtually identical to those in the Hydro-Québec - NEPOOL agreement, the position of Ontario Hydro was the same as stated in its response dated 17 April 1984 in the matter of the exports to NEPOOL.

Churchill Falls (Labrador) Corporation did not directly respond to Hydro-Québec's letter of offer dated 11 July 1984. The only response, dated 17 September 1984, was sent to the Chairman of Hydro-Québec and a copy was filed as part of the Newfoundland Labrador Hydro (NLH) intervention which was submitted at the opening of the hearing. In this response, the Chairman and Chief Executive Officer of NLH reiterated his position as well as that of CFLCo, that they could not respond to the Hydro-Québec letter of offer until such time as they had had an opportunity to discuss the availability of Québec surpluses for use in Labrador and on the Island of Newfoundland. More details are given in Chapter 7.

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export to NEPOOL. These entitlements correspond to a maximum of 9.75 % of the transfer capacity of the ±450 kV interconnection between Québec and NEPOOL, scheduled to be in service in 1986.

5.6 Prices

5.6.1 Export Prices

Because the two parts of the application deal with exports under different contracts, the export prices are set by different formulae.

Table 5-3
Firm Power Contract
Part A of the Contract Period
Combined Price for Power and Energy
($ US/MW.h)

12-month Period	Gross Price	Rebate	Net Price
1 st	40	7	33
2 nd	40	7	33
3 rd	42	7	35
4 th	44	7	37
5 th	47	7	40

The rebate of $ 7 US/MW.h would be applied to the combined price of power and energy up to 31 August 1990 in consideration for building the direct current converter at Highgate Substation in Vermont.

Part B of the Contract Period

Price of energy = 80% of the weighted NEPOOL fossil energy cost.

Price of power = B x I $ US

where B is the annual price set during the previous contract year (for 1990, B = $ 10 million US) and

I is an inflation factor.

Additional information on the firm power contract is given in Appendix III.

The capital expenditures required for the proposed new interconnection and the converter station would be much higher on the American side than on the Canadian side. Hydro-Québec allowed a $ 7 US/MW.h rebate for a five-year period so that the cost of the facilities to be installed on each side of the border would be shared equally, taking into consideration that the project would give it access to a new market to sell energy surpluses that would otherwise remain unsold during the early years of the contract.

The rebate was negotiated and the agreement signed before the actual costs of the project in the State of Vermont were known. At the beginning of the negotiations the cost of the converter station was based on Hydro-Québec's estimates rather than on the costs that Vermont DPS would pay. An American manufacturer subsequently agreed to build the facilities at a price 50 % lower than the Applicant's estimates, which was unforeseeable at the time of the negotiations.

Interconnection Agreement

Appendix IV gives information about the prices of the various transactions provided for under the interconnection agreement.

5.6.2 Canadian Costs

According to the application, the proposed exports would require no new generating facilities, except the possible advancement of the in-service date of peaking generation to firm up the supply of the 150 MW of the firm power contract after 1992. The most economical and plausible available option that could help to supply that additional load during peak periods would be the advancement of 165 MW of gas turbines to 1993 from 1996 and 1997. The application stated that a final decision on this matter would not be required before 1986. The cost of advancing the in-service date of this equipment would amount to $ 15.8 million (1985) discounted at 14.5 %. This cost as well as the costs associated with the international power line would be recovered within the first year of the export period. These costs are presented in detail in Chapter 6.

For the firm exports, the Applicant estimated the total incremental cost of hydro generation, including losses, at $ 200 000 for the contract year 1985-86 increasing to $ 600 000 in 1994-95. Hydro-Québec did not foresee any significant increase in its average generation costs over the proposed export period. These annual costs would be recovered during the first month of each contract year.

In respect of thermal generation that could be required to supply 150 MW of additional load after 1990, the quantities and costs, as estimated by the Applicant, are given in the table below. If the exports should continue during Part B of the contract period, the total cost for the thermal production would be $ 6 208 600 and this amount would be recovered during the first year.

Table 5-4
HYDRO-QUÉBEC
Estimate of Quantities and Costs of Thermal Energy
Needed to Meet an Additional 150 MW of Load 1991 to 1995

		1991	1992	1993	1994	1995	Total
Tracy thermal plant							
Quantities	GW.h	2.5	3.1	3.8	3.8	3.8	17.0
Costs	$/MW.h	104.5	115.2	126.9	139.9	154.2	
	$ 000	261.3	357.1	482.2	531.6	586.0	2218.2
Gas turbines							
Quantities	GW.h	0.9	1.4	2.9	6.1	6.1	17.4
Costs	$/MW.h	172.6	190.2	209.6	230.9	254.5	
	$ 000	155.3	266.3	607.9	1408.5	1552.4	3990.4
Total							
Quantities	GW.h	3.4	4.5	6.7	9.9	9.9	34.4
Costs	$ 000	416.6	623.4	1090.1	1940.1	2138.4	6208.6

5.6.3 Cost for Equivalent Service to Canadians

Regarding exports under the firm power contract, the Applicant stated that it had offered to CFLCo, New Brunswick, Ontario Hydro and St. Lawrence Power Company a firm power and energy contract which contained essentially the same prices and conditions agreed upon with Vermont DPS. Accordingly, the export price for this service would not be less than the price to Canadians for equivalent service in related areas.

CFLCo did not respond directly to the letter of offer, while the other three utilities replied that they were not interested in accepting it.

These offers did not contain the $ 7 US/MW.h rebate given to Vermont DPS for the first five years of the contract period. When cross-examined by Board Counsel on this point, a witness for Hydro-Québec stated first that the $ 7 US/MW.h rebate had been conceded in order to open a new market at a time when Hydro-Québec would otherwise be spilling great amounts of water. The second reason was the equal sharing of the expected capital cost of facilities between Hydro-Québec and Vermont DPS. He added that Hydro-Québec would negotiate some rebate on the price for a Canadian

customer where a new interconnection would be built which would mean a new Opening into the Canadian market. It would not necessarily be a $ 7 rebate.

In dealing with exports under the interconnection agreement, Hydro-Québec noted that the term "equivalent service" is not defined in the *National Energy Board Act* and Regulations, and submitted its own definition, translated and restated as follows:

> "The expression "equivalent service" applied to fuel replacement energy in two adjoining systems implies that the energy replaced has the same value. In other words, to replace 1 MW.h produced from coal or oil at a cost of $ 20 is an equivalent service. But to replace 1 MW.h produced from coal at a cost of $ 20 or from oil at $ 50 is not an equivalent service since the value of the replaced energy is not the same."

This definition used by Hydro-Québec, means that two energy sales would only be equivalent services if the avoided or decremental cost (the cost of the energy which the buyer would not have to produce because of the purchase) would be the same.

Hydro-Québec stated that the price for energy sales, in its interconnection agreements with neighbouring systems, is generally a function of the cost of the displaced fuel. Consequently, according to this definition, the export prices provided for by the interconnection agreement with Vermont DPS would not be lower than the prices charged to Canadians for equivalent service in adjacent regions.

The evidence shows that the proposed exports of power and energy pursuant to the interconnection agreement could be interrupted at any time by any Canadian company with access to Hydro-Québec's system, in the same manner as currently provided for by condition 6 of Licences EL-152, EL-153 and EL-167. The Applicant stated that it wishes to maximize its revenue by making maximum use of its interconnections with neighbouring systems in both Canada and the United States. In the case of interruptible exports, the energy would be first offered to the most lucrative market; it is therefore difficult to tell which system would be served first, Vermont DPS, NEPOOL or PASNY. It would depend on the conditions that prevail at the time of the export transactions.

5.6.4 Alternative Cost in the United States Market Area

To show that the proposed export prices would not be materially less than those of other sources in the export market, the application put forward all the sources of production accessible to or available within the State of Vermont. Only three sources could be considered as possible alternatives to the 150 MW of firm power to be purchased under the contract with Hydro-Québec. Each alternative is subject to constraints which raise doubts about its viability.

Two of these sources would be the purchase of nuclear and oil-fired capacity from NEPOOL since all electrical utilities in Vermont are members of the pool.

1. The total cost of nuclear capacity is projected to range from 20 to 25 cents/kW.h in 1986 if used at 70 % capacity factor. Nuclear production already supplies approximately 50 % of the energy requirements in the State of Vermont. A higher proportion could mean

over-dependence on one single type of production and could therefore endanger the security of supply.

2. The current price for oil-fired generation is approximately 5 to 6 cents/kW.h for the energy plus a capacity charge which could vary from 1.5 to 4 cents/kW.h depending on the capacity factor. In addition, those prices were expected to escalate with the crude oil price on the world market. Vermont DPS did not consider this to be an economical long-term option. It would, instead, be more appropriately considered a short-term option for purchases of economy energy or to replace Vermont generation when certain units were out of service.

Purchases from Ontario Hydro via PASNY could be a third alternative. However, to gain access to 150 MW of firm power from Ontario Hydro, Vermont DAPS would first have to negotiate a wheeling agreement with PASNY to assure the transfer of energy through the State of New York to the State of Vermont throughout the proposed export period.

The application also mentions the possibility of installing new hydro or thermal generating units, but the cost would be high and the lead time required to install these facilities is too long to enable the near-term requirements in the State of Vermont to be met.

At the hearing the witness for Vermont DAPS, in response to questions asked by Board Counsel, virtually ruled out each alternative mentioned above, primarily because of time and transmission constraints as well as the danger of too high a dependence on nuclear plants. He maintained that, in fact, Vermont DAPS did not have any realistic alternative to the firm power contract with Hydro-Québec although in the last resort, Vermont DAPS could always count on NEPOOL. He also added that if the Applicant is not granted the requested licence and as a consequence the contract is not approved, Vermont DAPS would "have to try to muddle through" by negotiating a series of short-term transactions with utilities in the State of New York, in New Brunswick or with Ontario Hydro.

The same witness stated that Vermont DAPS has to replace a total of 270 MW due to the temporary shutdown of the Vermont Yankee nuclear station scheduled for September 1985. To date, no single source of firm generation has been found to replace this full amount.

5.6.5 Revenue

The firm power contract requires Vermont DAPS to take or pay for the energy at a minimum of 80 % annual load factor during the first five years of the contract, and at a minimum of 50 % during the last five years. Therefore, the Applicant is guaranteed about $ 200 million for Part A of the contractual period and would receive more than $ 300 million during Part B, if Vermont DAPS does not exercise its option to terminate the contract at the end of Part A of the contractual period (all in current Canadian dollars).

In addition, sales under the interconnection agreement could yield approximately 150 million current Canadian dollars during the 10-year period.

5.7 Environmental Effects

The production from the Tracy oil-fired generation plant and from gas turbines that would be required to supply the proposed firm export would equal less than 0.5 % of Hydro-Québec's total production for all purposes. Moreover, the Applicant operates its thermal stations in accordance with the "Règlement sur la qualité de l'atmosphère" adopted pursuant to the "Loi sur la Protection de l'environnement de la province de Québec".

As for the Gentilly 2 nuclear station, the application states that it will operate essentially as a base-load supply, and its operation would not be affected by the exports.

Chapter 6
The Evidence: International Power Line

6.1 General Route Selection

The evidence showed that during the planning stage, Hydro-Québec first examined three line configuration alternatives, namely : Cowansville-border, Saint-Sébastien-border and Bedford-border. Hydro-Québec determined that the Bedford-border configuration was the most satisfactory alternative based on technical considerations. Consequently, it selected this configuration for establishing the new interconnection.

After a study of the resistance to environmental damage of areas in the vicinity of the international boundary and negotiations with Vermont DAPS, Hydro-Québec determined that the interconnection point would be at a location near international marker 620A.

Hydro-Québec then defined a study zone, at a scale of 1:20 000, to cover:

Northern portion - the point of departure of the 120 kV line (Bedford substation) and a portion of the 120 kV network; and

Southern portion - a large enough portion of the Vermont border area to provide a good knowledge of possible routes in the Bedford - Vermont axis.

A comprehensive inventory of the human, visual and natural aspects of the surroundings was carried out in the zone of study [1].

It should be noted that a witness for the Applicant pointed out that, because of the small size of the study zone (15 km wide), Hydro-Québec omitted the intermediate step of establishing corridors, and proceeded directly to identify alternate routes.

The first phase of the route-selection process established three routes running from Bedford substation to the crossing point on the Vermont border. These routes are referred to as the West, Centre and East because of their geographical location (see Appendix VII).

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1 **The procedure normally followed by Hydro-Québec in an environmental impact study is firstly to define the zone of study, taking in all the area affected by the project. This zone is then subdivided into so-called environmental units which correspond to areas of land that, by their natural or human characteristics, possess some degree of homogeneity. The types of environmental units identified are characterized as agricultural lands, forested areas, important ecological areas, urban or vacation properties, areas of special interest such as parks and other areas devoted to other types of human endeavours related to mining, transportation and industry. Environmental units are then ranked in order of importance based on Hydro-Québec's perception of their sensitivity to the construction of an international power line.**

The results of these preliminary studies indicated that the northern part of the Centre route (running along the Bedford and Stanbridge municipal border) could be easily integrated into the environment, but it would be difficult to integrate the southern part. On the contrary, the West and the East routes present integration problems in the northern part, while there would be hardly any impacts in the southern part.

Two new routes were therefore established based on the Centre route: one is referred to as Centre-West and joins the West route where the latter runs through forested areas; the other one is named Centre-East and joins the East route where the latter runs through forested areas. Following a comparison of these new routes, Hydro-Québec, based on economic, technical and environmental considerations, selected the Centre-East route. A more detailed description of Hydro-Québec's route-selection process is given in Section 6.6.

Hydro-Québec conducted a communication program to inform the population in the affected area of the interconnection project and to obtain their general reaction. This was a two-stage program: a preliminary information stage and a second stage where the results of the study and the preferred route were announced.

Hydro-Québec indicated that no objection was raised at these information meetings. The Applicant also stated that four landowners requested that the route alignment be modified. A meeting with each of the landowners concerned has been held.

6.2 Preferred Route

According to Hydro-Québec, the Centre-East route selected for the installation of the Bedford-Vermont 120 kV line is the best choice from an environmental aspect and is technically the most practical. The total length of the route is 17.63 km, and the cost of the line is estimated at $ 4.5 million (1985).

This route skirts the eastern limit of the town of Bedford. The first portion runs along the municipal boundary between Bedford and Stanbridge, mainly through forested areas, up to the municipal boundary of Saint-Armand-Ouest and then runs through forests east of Guthrie and Pigeon-Hill. Finally, it bypasses the agricultural lands along Beaulac road to meet the crossing point on the international border located 450 meters east of the international boundary marker 620A, in the municipality of Saint-Armand-Ouest.

6.3 Technical Characteristics

6.3.1 International Power Line

The evidence showed that the thermal capacity of the line would be 270 MW in winter and 200 MW in summer. The facility would be able to transmit 200 MW in the final phase.

The 120 kV line would be supported on wood pole structures with an average height of 17.7 m and would have an average span length of 160 m. The width of the right-of-way would be 40 m. A more detailed listing of the technical characteristics of the line is given in Appendix VIII.

6.3.2 Modifications to Existing Substations

To be able to use the 200 MW thermal capacity of the new interconnection, Hydro-Québec must add new equipment and make changes to the following substations: Bedford, Saint-Sébastien, Saint-Césaire, Farnham, Sherbrooke and Stanstead.

In addition, the following electrical facilities must be installed earlier than planned:

- 120 kV line between Iberville and Saint-Sébastien;
- Additional transformer capacity at Saint-Césaire substation; and
- Reinforcement of the supply to Saint-Césaire.

6.3.3 Standards

Witnesses for Hydro-Québec maintained that the international power line would meet or exceed all the applicable Canadian standards.

6.4 Calculation of Capital Costs

The Applicant estimated the original cost of the interconnection project at 8.1 million current dollars divided as follows: 4.5 million for the 120 kV Bedford-Vermont line, 1.9 million for modifications at six substations and 1.7 million for associated facilities. A more detailed cost breakdown is given in Appendix IX.

Financing for this project would be provided under the Applicant's general capital expenditures program. Therefore, there would be no separate financing for the project. The Canadian content of the transmission line and related facilities would be more than 98 %.

6.5 Economic Justification

This new interconnection would enable Hydro-Québec to receive net revenue, during the 10-year term provided in the contract with Vermont DPS, amounting to $ 295.5 million discounted to September 1985, the expected in-service date.

Based on calculations described earlier, Hydro-Québec's evidence in support of the economic feasibility of the international power line stated that the net revenue would recover all costs associated with the line, $ 8.1 million, within the first three months of operation.

At the hearing, an equipment planning witness testified that the total cost of the project had been reduced to $ 7 million because some equipment already available on the system could be used for the new interconnection.

6.6 Environmental Impact

As part of its application, Hydro-Québec included documentation describing its route-selection process and its environmental assessment. This process and the environmental assessment are summarized in a document called the "Rapport sur les études d'avant-projet".

The environmental assessment[1] concentrates on the areas of visual impact and effects on land use. The assessment refers to a document called "Code de l'environnement", a handbook prepared by Hydro-Québec describing the measures and procedures available to minimize the environmental impact of its activities in the areas of exploration, construction of new facilities, and the operation and maintenance of its system. This handbook was filed at the May 1984 NEPOOL hearing.

6.6.1 Visual and Functional Impact

The evidence showed that the preferred route would run through wooded areas wherever possible. The permanent impacts caused by the installation of the line have been classified by Hydro-Québec as weak or very weak with the exception of one strong impact on agricultural lands and two strong impacts on forested areas.

In agricultural areas, special care would be given to the selection of the type of support (structure or single pole) to minimize adverse effects on agricultural activities.

6.6.2 Flora and Fauna

Since the process of defining the route took into account both the technical and environmental aspects of the project, the potential impacts on flora and fauna have been reduced to the absolute minimum.

Maintenance of the 120 kV line would normally require spraying of herbicides in forested areas once every three years. The evidence presented by Hydro-Québec showed, however, that they would consider the possibility of maintaining the right-of-way by manual methods rather than by spraying herbicides.

6.6.3 Corona

An expert witness for the Applicant testified that in general a 120 kV line will not exhibit corona effect during fair weather and that, with this voltage level, the effect would be minimal during rainy weather.

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1 **The procedure followed by Hydro-Québec in its environmental assessment was to classify the visual and functional impacts of the proposed routes according to their relative importance. Visual impacts were rated based on the effect on an observer's field of vision from a specified location; functional impacts were rated based on the effect on present, potential or possible use of land. The total number of visual and functional impacts, along with their ratings, were determined for each of the routes. The route having both the lowest rated and the lowest number of impacts was determined to be the Centre East route, which was selected as the preferred route.**

Chapter 7
Interventions

Six organizations submitted interventions regarding the application for licences. Short summaries of each submission and the arguments presented by the parties are given below.

7.1 Churchill Falls (Labrador) Corporation Limited

CFLCo owns and operates the Churchill Falls hydroelectric generating station which is interconnected with the Hydro-Québec system as well as the NLH system. Most of the station's energy output is sold to Hydro-Québec under a long-term contract. CFLCo was represented at the hearing but did not participate.

7.2 Newfoundland and Labrador Hydro

NLH, in its intervention, stated that the Province of Newfoundland has an immediate and long-term requirement for the type of power and energy that Hydro-Québec wants to export to Vermont DPS.

At the opening of the hearing, NLH stated that its position concerning the present Hydro-Québec application remains the same as the position adopted at the hearings held in October 1983 and May 1984 in the matter of the PASNY and NEPOOL applications respectively. Consequently, it introduced, by way of affidavit rather than viva voce, essentially the same evidence that it had presented at the NEPOOL hearing. The Board, in order to ensure a complete record, requested NLH to also refile the direct evidence presented at the PASNY hearing (which is slightly different from the direct evidence presented at the NEPOOL hearing), as well as the viva voce testimony of the NLH witnesses and the argument presented at both the PASNY and NEPOOL hearings.

NLH continued to deplore the lack of any meaningful attempt by Hydro-Québec to explore the possibilities and the means for its hydroelectric resources to be used to supply the Newfoundland requirements. This intervenor's evidence included forecasts of the loads of the Island of Newfoundland (the Island) and Labrador and of the purchases from Hydro-Québec needed to serve these loads throughout the requested licence period as shown in the following table. It also presented evidence to demonstrate the accessibility of the Island and Labrador to Hydro-Québec's system.

NEWFOUNDLAND AND LABRADOR HYDRO
Forecast Annual Purchases from Hydro-Québec
(GW.h)

1990	1991	1992	1993	1994	1995	1996	Total
1940	2296	6042	6396	6721	7115	7864	**38374**

The evidence showed that for the period from 1990 to 1996, purchases from Hydro-Québec could displace approximately 40 million barrels of heavy fuel oil required for thermal generation on the Island. Part of these purchases could displace oil-fired generation at the existing Holyrood Plant, and the rest could be used to displace energy from possible new oil-fired generation which could be required to meet future increases in Newfoundland's load. NLH indicated that, if a stable supply of electricity could be obtained, it could reasonably expect to attract new industries to Labrador, such as a new aluminum smelting industry. Moreover, one customer in Labrador could require up to 310 MW to displace heavy fuel oil used in the metal refining industry. NLH's evidence showed that most of its present load in Labrador was served from the Churchill Falls plant over one 138 kV and two 230 kV transmission lines. New transmission lines or improvements to the existing facilities could be required to serve new loads in Labrador.

The intervention stressed that the preferred alternative for supplying future electrical needs on the Island would be the construction of an interconnection with Labrador. This project could not be financed until such time as an assured power supply was available to NLH.

This intervenor also deplored the fact that Hydro-Québec had not offered NLH the power proposed for export to the State of Vermont prior to the submission of the application to the Board. It added that it remains apparent that, in making the offer to CFLCo, Hydro-Québec ignored the arguments related to the need for an electrical interconnection to the Island. Finally, NLH stated it considers that a period of less than two months given by Hydro-Québec is not sufficient to enter into extensive discussions with respect to the letter of offer.

NLH requested that the Board not grant Hydro-Québec any export licences which would in any way interfere with or impede the supply of energy to Newfoundland. NLH submitted that the Board must first be satisfied that the energy needs in Labrador and on the Island of Newfoundland have been thoroughly investigated by first be satisfied that the energy needs in Labrador and on the Island of Newfoundland have been thoroughly investigated by Hydro-Québec in the context of the Board's Act; and that a reasonable attempt has been made by Hydro-Québec to ensure that these Canadian energy needs are met as required in the Act.

NLH also indicated that the Board ought not to approve the export of energy by Hydro-Québec, to the extent this is made possible only through the import of energy from Newfoundland, unless and until an equitable sharing arrangement is in place with respect to the substantial export revenues.

7.3 Ontario Hydro

In its intervention, Ontario Hydro reserved the right to cross-examine the Applicant and to submit a brief if it was considered to be appropriate. It was represented at the hearing but did not participate.

7.4 Minister of Energy for Ontario

In his intervention, the Minister of Energy for Ontario reserved his right to cross-examine the Applicant and to submit a brief if he felt it to be appropriate. He was represented at the hearing but did not participate.

7.5 The New Brunswick Electric Power Commission

In its intervention, The New Brunswick Electric Power Commission reserved its right to cross-examine the Applicant and to submit a brief if it felt it to be appropriate. It was represented at the hearing but did not participate.

7.6 Attorney General of Quebec

In his intervention, the Attorney General of Québec stated that Québec intended to ensure that its socio-economic and other interests were respected and considered at the public hearing into Hydro-Québec's application. Moreover, Québec reserved its right to cross-examine the Applicant or the intervenors and to submit a brief if it felt it to be appropriate. The Attorney General of Québec was represented at the hearing and supported the Applicant.

Chapter 8
Disposition

The Board has given careful consideration to all the evidence and submissions presented.

Application for Export

Section 83 of the Act requires the Board, in examining an application for an export licence, to have regard to all considerations that appear to it to be relevant. Without limiting the generality of the foregoing, the Board is required to satisfy itself that the power to be exported is surplus to reasonably foreseeable Canadian requirements and that the price to be charged by the applicant is just and reasonable in relation to the public interest.

8.1 Surplus

8.1.1 Available Excess Power

The Board notes that the excess power figures submitted by Hydro-Québec, shown in Appendix V, have been modified from those submitted with the recent applications to export power and energy to PASNY and NEPOOL[1]. The Board is satisfied that these modified figures, used by Hydro-Québec in determining the requirement for additional generation, give a more accurate representation of the quantities of surplus power available at the time of the system peak over the proposed licence period than those previously presented to the Board.

The Board accepts Hydro-Québec's evidence regarding the inclusion of the eleventh unit at Churchill Falls, and the use by Hydro-Québec of its interruptible loads and aid from neighbouring systems in its surplus power calculations. Hydro-Québec testified that it expected to receive this aid under existing interconnection agreements but did not give any specific information regarding sources. To support this conclusion, the Board notes that Hydro-Québec can count on 800 MW from PASNY in emergencies according to the terms of their interconnection agreement.

The Board, therefore, accepts the new tables submitted by Hydro-Québec as an accurate representation of the amounts of surplus power available on the Hydro-Québec system at the time of peak load. The Board notes that there will be power surpluses in practically all months of the proposed licence period but that this surplus becomes a small deficit during January in the last three years and has considered this in its deliberations. The Board's decision regarding surplus is given in detail in Section 8.1.4, Exports Under the Firm Power Contract, and in Section 8.1.5, Interruptible Exports.

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1 **Hydro-QuébeC / PASNY - Reasons for Decision, January 1984 Hydro-Québec/ NEPOOL - Reasons for Decision, August 1984**

8.1.2 Available Excess Energy

The Board notes that the excess energy figures submitted by Hydro-Québec, shown in Appendix VI, are unchanged from those submitted for the two previous applications. These figures result from Hydro-Québec's current generation expansion plan under average hydraulic conditions, normal system operation and a 2.9 % average annual load growth rate. The Board accepted these figures in its deliberations on the earlier applications and sees no reason to change its opinion.

The Board notes also that the additional power sources listed in the revised power surplus tables are sources of peaking power and would thus be used only for short intervals, if at all. They would, therefore, only produce small quantities of energy which would not add significantly to the surplus energy figures.

Hydro-Québec has not prepared a new load forecast since the Board's hearing of its NEPOOL application in May of 1984. The Board sees no reason to revise its opinion that the load forecast methodology utilized by Hydro-Québec is satisfactory and that Hydro-Québec would be able to meet a load growth rate higher than 2.9 % by adjusting its generation expansion plan described in the "Plan de développement d'Hydro-Québec, 1984-86 - Horizon 1993". The Board is satisfied that the energy proposed to be exported is surplus.

8.1.3 Newfoundland and Labrador Hydro

In determining whether the power and energy proposed for export is surplus to reasonably foreseeable Canadian requirements, the Board has given careful consideration to the submission made by NLH.

The Board accepts that the loads in Labrador and the Island of Newfoundland could be supplied in part by Hydro-Québec. The preferred arrangement would be a firm supply of power and energy from Hydro-Québec. An alternative arrangement would be interruptible energy purchases from Hydro-Québec complemented by other sources, such as NLH's own generation, when sufficient interruptible energy is not available. This alternative is the premise put forward by NLH in testimony to explain its interventions in hearings for different types of exports.

In determining energy surpluses, the Board has made provision for the requirements of NLH even though these are based largely on new and uncertain loads such as a possible demand of 400 MW in Labrador and even though service of part of these loads by Hydro-Québec will require the construction of an HVDC interconnection between Labrador and the Island. It has not been demonstrated to the Board under what conditions this interconnection would be economically feasible.

Nevertheless, the Board continues to recognize that a portion of the NLH load might in time constitute a reasonably foreseeable Canadian requirement which could be supplied by Hydro-Québec and has included this load in its surplus determination. The Board notes that Hydro-Québec's surpluses of power and energy as presented in the application are diminishing. However, for the period covered by this application, they would be adequate to supply NLH's energy requirements in addition to the exports.

The Board considers that it would be unreasonable to expect Hydro-Québec to supply the NLH power requirement out of its surplus capacity especially during peak load periods. In fact, NLH did not indicate that it would expect Hydro-Québec to do so. The Board, therefore, did not include the NLH requirements in its examination of power surpluses.

The NLH objections to the proposed exports will be dealt with later, in Section 8.1.6, Offers to Canadian Utilities.

8.1.4 Exports Under the Firm Power Contract

Hydro-Québec has requested a licence to export not less than 150 MW of firm power at up to 100 % capacity factor over a period of 10 years commencing in 1985 under a firm power contract with Vermont DAPS. Appendix V shows Hydro-Québec's power surplus for the month of January in each year of the proposed licence period. January is the month in which the system peak normally occurs and is, thus, the most critical month as far as surplus power is concerned. Appendix V shows that Hydro-Québec has sufficient surplus power to make the proposed export. Starting in 1994, deficits of less than 100 MW do appear in the tables but these are so small in relation to Hydro-Québec's generation as to be within the margin of error of the calculation of the required reserve. Such deficits actually would mean only a slight reduction in Hydro-Québec's reserve at the time of peak load and would not significantly affect its ability to meet its load. In any case, Hydro-Québec has testified that, if the need develops, they will be able to install gas turbines for use as peak load generation in time to meet any such requirements. It has outlined a possibility involving the advancement of 165 MW of such capacity which would be more than adequate to supply the deficit shown in the tables. In all other months of the proposed 10-year licence, surplus power would be available for the proposed export.

Appendix VI shows the annual energy surplus on the Hydro-Québec system. Since the proposed export is for firm power at up to 100 % capacity factor at the buyer's discretion, Hydro-Québec must be able to supply the associated energy, amounting to approximately 1300 GW.h annually, in every year of the contract. This would present no problem since even in 1996, the critical year of the proposed export period when the surplus available for export will be at its lowest level, the quantity proposed for export as it amounts to less than 7 % of the forecast surplus.

The surplus energy remaining after subtracting the energy associated with the proposed firm export in each year would be adequate to supply the possible requirements of Newfoundland. In addition, Hydro-Québec would be able in most years to meet the target quantities of the PASNY and NEPOOL energy contracts as well as proposed exports to PASNY under Licence EL-96 as described in Section 2.2, State of New York.

The Board is satisfied that in every year up to 1994 Hydro-Québec would have sufficient excess energy to supply all these possible requirements. In 1995 and 1996, Hydro-Québec might not be able to offer the full target amounts of energy in accordance with the PASNY and NEPOOL energy contracts but any such shortfall can be made up in subsequent years when surpluses will still exist.

The Board is satisfied that the proposed export of power and energy to Vermont would be surplus to reasonably foreseeable Canadian needs.

8.1.5 Interruptible Exports

Hydro-Québec has also requested a licence for exports of interruptible power and energy under an interconnection agreement with Vermont DAPS, up to a maximum of 200 MW less any power exported under the firm power contract. This amount is equivalent to the nominal capacity of the proposed international power line. The requested licence would permit Hydro-Québec to make full use of its new line when surplus energy is available for interruptible export.

The annual maximum quantity of energy associated with the interruptible exports as requested by the Applicant is 1752 GW.h throughout the term of the licence, except for leap years where it would be 1756.8 GW.h, less any exports made under the firm power contract. The Board, for convenience in monitoring the exports, would disregard the higher value for leap years.

It is clear that during most years in the requested licence term there would be quantities of power and energy surplus to Hydro-Québec's needs including possible sales to Newfoundland and sales to PASNY and NEPOOL under the respective energy contracts.

In addition to interruptible energy, exports under the interconnection agreement could also include capacity power which would normally be exported in the case of emergencies or other difficulties on the purchaser's system. Although the interconnection agreement does not provide for the interruption of such exports upon demand by other Canadian utilities, any licence which would be issued would provide for such interruption. In this way, Canadian requirements would be protected.

The Board is satisfied that any energy exported under the requested interruptible licence would be surplus to Canadian requirements.

8.1.6 Offers to Canadian Utilities

As noted in Section 5.5, Offers to Canadian Utilities, Hydro-Québec has offered the proposed exports to all directly interconnected Canadian utilities including CFLCo which is interconnected with the Labrador portion of the NLH system. (NLH owns 65.8 % of CFLCo). None of the utilities, except for CFLCo, objected to the proposed exports provided licences were conditioned to give Canadian utilities priority over the export market. CFLCo did not respond directly to the offer. Its response was incorporated into the NLH intervention, described in Section 7.2, Newfoundland and Labrador Hydro, which objected to the exports for reasons set forth in that section of this report.

To ensure that Canadian utilities would have priority over the export market, the Board would condition any interruptible licences it issues so that exports could be interrupted to meet Canadian needs.

In response to the NLH objections, the Board notes that it has previously used offers to adjacent utilities as a mechanism to ensure that due allowance has been made for reasonably foreseeable Canadian requirements and to give such utilities the opportunity to purchase the power and energy which would otherwise be exported. The Board considers that this mechanism should not be used to force Hydro-Québec to bargain with NLH for a long-term sale of power and energy in the future. It would be unjust to deny to Hydro-Québec the potential income from the exports while a contract is

being negotiated with NLH and the necessary interconnection built. This is particularly true when it appears to the Board that Hydro-Québec would be able to make the proposed exports and supply the energy wanted by NLH as well and, in addition, when Hydro-Québec has already expressed its willingness to negotiate.

The Board considers that the period of two months. Hydro-Québec allowed for a reply was adequate as the offer was for a specific quantity of power and energy over a limited period and not a long-term arrangement as desired by NLH.

8.2 Export Price

The price for exports under the firm power contract involves a $ 7 US/MW.h rebate during the first five years of the contract period. This amount was established at an early stage of the negotiations leading to the firm power contract. This rebate was intended to reimburse Vermont DAPS for approximately one-half of the capital cost of the new facilities based on cost estimates available at the time. Actual costs turned out to be lower than estimated but the rebate was not reduced since Hydro-Québec considered this an acceptable price to pay for the additional revenue to be obtained by opening a new market in the State of Vermont at a time when it would otherwise be spilling water. The Board has accepted such cost-sharing arrangements in the past and considers them justified when one party must otherwise pay a major portion of the capital costs associated with the new interconnection. This rebate was not included in the offer of the proposed export to directly interconnected Canadian utilities.

In assessing the suitability of an export price, the Board has developed three guidelines: it should recover the applicable costs incurred in Canada, it should not be less than the price for equivalent service to Canadian customers, and it should not be materially less than the least cost alternative in the proposed market area.

8.2.1 Applicable Costs in Canada

The Board considers that, with the exception of the international power line, which will be dealt with later, and the possible advancement of gas turbines, applicable costs include only the incremental costs associated with the proposed exports since the evidence shows that all other facilities required to make the proposed export have been or are being built primarily to supply the Québec load. Since Hydro-Québec did put forward the possibility of advancing 165 MW of gas turbines for peak load generation during the later years of the contract period, the Board included the associated cost, estimated at $ 15.8 million (1985), as an applicable cost in its application of the first price guideline. The other applicable expenses are the incremental cost of producing the energy, the losses associated with its transmission, the construction, operation and maintenance costs of the line and its associated terminal facilities and the costs of strengthening the 120 kV system in the Saint-Césaire area.

The evidence shows that these costs would be significantly less than the expected revenues throughout the requested licence period. In addition, the evidence shows that a profit greater than the cost of advancing the gas turbines would be realized within the first year of the export period.

The Board is satisfied the export prices would recover all the applicable costs which might be incurred in Canada.

8.2.2 Price for Equivalent Service to Canadians

Exports Under the Firm Power Contract

Evidence showed that the power and energy destined for export under the firm power contract has been offered to all directly interconnected Canadian utilities, none of which showed any interest in accepting the offer or objected to the pricing conditions. The Board notes, however, that Hydro-Québec did not offer this power and energy at the net export price, which involves a $ 7 US/MW.h rebate during the first five years of the contract period.

Hydro-Québec considered that there was no justification for including the rebate given to Vermont DAPS in the offer of this power and energy to neighbouring Canadian utilities over existing interconnections. Hydro-Québec did state that it would consent to an appropriate rebate in the case where a Canadian customer would have to build a new interconnection and would present Hydro-Québec with a new opening into the Canadian market.

In addition to the revenue it would produce, the new interconnection would also provide benefits from co-ordinated operation of the two systems, such as aid in emergencies, which are not easily assigned dollar values. This is particularly important since Hydro-Québec is not presently interconnected with the Vermont system as a whole.

The Board accepts Hydro-Québec's reasons for allowing the $ 7 US/MW.h rebate to Vermont DAPS and agrees that the value of the benefits to be derived from this export, when considered together with the export price, justifies the ffers to Canadian utilities at a price that may not conform strictly to the Board's second price guideline. For these reasons and because of Hydro-Québec's stated willingness to negotiate a corresponding rebate to Canadian customers who would be able to give Hydro-Québec similar benefits, the Board is satisfied that prices for exports under the firm power contract are just and reasonable.

Interruptible Exports

Exports under the interruptible licence could be pre-empted at any time by any interconnected Canadian utility willing to accept similar pricing conditions. Possible differences in the cost of delivery on the Applicant's system would be taken into account.

Under its normal commercial practices, Hydro-Québec offers interruptible energy to utilities with which it has negotiated interconnection agreements at prices related to the decremental cost of the generation to be displaced. Such energy is offered to the available markets in a decreasing price priority system which ensures the maximum economic gain to Hydro-Québec. Under these practices, Hydro-Québec would displace higher cost generation in Canada before exporting energy at lower prices to displace lower cost generation in the export market. The Board recognizes that occasionally these practices can cause prices for certain Canadian utilities to be higher than export prices. However,

this would represent differences in the economic value of the service being provided and in every instance the purchasing Canadian utility would benefit from its purchases from Hydro-Québec.

The Board considers that in the circumstances of this case such price differences would not conflict with the second price guideline and, therefore, is satisfied that the price for the proposed interruptible exports is just and reasonable in relation to the public interest.

When Hydro-Québec has sufficient surplus to supply all the energy that both Canadian and export markets would take, the prices for Canadian sales would be independent of export prices, being determined through the usual mechanisms of inter-utility dealings, normally interconnection agreements. Export prices would apply to Canadian sales only when Hydro-Québec has insufficient surplus to supply all of the energy which the two markets, Canadian and export, are prepared to take. In that event Hydro-Québec would give priority to Canadian buyers but, if the export price would have been higher than the price determined by the applicable interconnection agreement, would charge that higher price (appropriately adjusted for differences in delivery costs) for any portion of the energy sold in Canada which would otherwise have been exported.

Since Hydro-Québec could soon be interconnected with several American markets and as a consequence could sell surplus energy on these markets at different prices, the Board, to protect Canadian interests, would ensure that a Canadian utility would pay the lowest export price in effect at the time it wishes to pre-empt an export sale. Accordingly, the Board would condition an interruptible licence so that, when a Canadian utility wishes to pre-empt exports, the applicable export price would be calculated as though existing exports under corresponding licences were pre-empted in order of increasing price up to the amount of energy required to meet the Canadian utility's requirements. This procedure is illustrated in Appendix X.

8.2.3 Purchaser's Least Cost Alternative

Exports Under the Firm Power Contract

In the application, Vermont DAPS gave a number of alternatives to its purchase of power and energy from Hydro-Québec. These included: purchase of additional nuclear capacity from NEPOOL planned units, purchase of oil-fired capacity from NEPOOL, purchases from Ontario Hydro and construction of new instate generating facilities. The replies given by the witness for Vermont DAPS to questions from the Board showed that, after more detailed examination, Vermont DAPS no longer considered them to be viable alternatives to the proposed export. If power and energy from Hydro-Québec were not available, the only feasible course open to Vermont DAPS would be a series of short-term purchases from the lowest-cost source available at the time.

The Board accepts the evidence of the Vermont DAPS witness and concludes that there is no realistic single alternative which would provide it with the same amount of power and energy for the same period. Because there is no comparable alternative, the Board considers that the third price guideline cannot be applied in this case.

As related considerations, the Board notes that the export price is consistent with current prices approved by the Board for exports to Citizens Utilities, a Vermont utility. Also, the take or pay

provision in the firm power contract would provide a significant guaranteed income for Hydro-Québec for a minimum of five years even if Vermont DAPS were to use its option to cancel purchases in the second half of the contract period.

The Board believes that these considerations, in addition to the other benefits described in Section 8.2.2, provide adequate reasons for accepting the export price.

Interruptible Exports

Vermont DPS's alternative to purchases of interruptible energy from Hydro-Québec would be to purchase the energy from other suppliers. Such purchases are normally made under terms and conditions similar to those in the interconnection agreement between Hydro-Québec and Vermont DAPS. The only transaction classification that is unique in that agreement is fuel replacement energy which is priced at 80 % of the purchaser's decremental cost. This would result in a higher price for Hydro-Québec than the split-savings formula normally used for interruptible sales. The Applicant stated that mainly coal would be displaced by the proposed interruptible export. Based on these considerations, the Board is satisfied that prices for interruptible energy would not be materially less than the least cost alternative in the market area.

8.2.4 Price Decisions by Operating Committee and Minimum Export Price

Because certain of the export prices are to be determined by the Operating Committee, any export licence would include a condition requiring the Applicant to file its proposed price levels with the Board when they are first set and whenever they are revised.

Because the interconnection agreement does not provide for a minimum price for exports of supplemental energy or conservation energy and tertiary energy, any export licence would include conditions specifying a minimum price below which exports could not be made and requiring Hydro-Québec to promptly report each use of these energy classifications to the Board by telex would also be included. For energy generated from thermal or nuclear sources, the minimum price would be 110 % of the incremental production cost and for hydraulic energy it would be the value given by the economy energy formula.

8.3 Environmental Impact

The evidence shows that almost all of the exports would come from the Applicant's hydraulic installations and purchases, which have been installed or contracted for to supply the Québec load. In the years 1991 to 1995 energy from thermal stations would be required to meet the firm export during peak load periods. This energy would amount to less than 1.0 % of the maximum annual export in any year. With this exception, energy from the Applicant's thermal stations would only be exported in the event of an emergency in the United States. In all cases, while generating energy for export, the thermal stations would be operated within the existing approved environmental constraints. The Board is, therefore, satisfied that no material environmental impact would result from the production of the energy involved in this application. The environmental impact of the international power line will be dealt with in Section 8.8.

8.4 The Board's Findings

The Board, having satisfied itself that the power and energy to be exported are surplus to reasonably foreseeable Canadian requirements, and that the prices to be charged are just and reasonable in relation to the public interest, and having had regard to all other considerations that appear to be relevant, is prepared to issue the following licences:

1. a licence authorizing the export of firm power and energy to Vermont DPS of not less than 150 MW at up to 100 % annual load factor for a period of 10 years from 1 September 1985 at the earliest or 1 March 1986 at the latest. Applicable terms and conditions are set out in Appendix XI.

2. A licence authorizing exports of interruptible power and energy to Vermont DPS of up to 1752 GW.h per consecutive 12-month period less any exports made under the firm power licence for a period of 10 years and six months from 1 September 1985 to 28 February 1996. Applicable terms and conditions are set out in Appendix XII.

Application for Certificate

Section 44 of the Act requires the Board, in considering an application for a certificate, to take into account all matters that appear to it to be relevant. In particular, the Act states that the Board may have regard to the availability of power to the line, the existence of markets, the financing and economic feasibility of the project and any public interest that may be affected by the granting or refusing of the application.

8.5 International Power Line

The availability of power and the existence of markets have been demonstrated in previous sections of this report. The financing of the line and the associated terminal equipment would be included in Hydro-Québec's general capital investment program and would represent a small addition to the Applicant's total annual capital investment. The evidence shows that the Canadian content of the line and the associated terminal equipment would be approximately 98 %, therefore the Board is satisfied that Canadians would have ample opportunity to participate in supplying and installing the equipment.

8.6 Economic Feasibility

The Board has examined the cost estimate for the proposed interconnection and finds it reasonable. The cost includes work at other Hydro-Québec stations required to maintain system voltage levels with the higher power flows associated with the export, and also the advancement of a 120 kV line between lberville and Saint-Sébastien which would complete a second 120 kV supply to Bedford. It is clear from the evidence that the cost related to the construction and operation of the Canadian portion of the proposed interconnection would be fully recovered by revenues from the take or pay portion of sales under the firm power contract within the first year of operation. This minimum take or pay revenue would be more than adequate to ensure the economic feasibility of the interconnection. Based on these considerations the Board is satisfied that the line would be economically viable.

8.7 Corridor and Route Selection

The Board notes that Hydro-Québec has conducted a comprehensive study to establish its preferred route based on economic, technical and environmental considerations. The Applicant testified that because of the small size of the study area, the identification of corridors as an intermediate step in developing the preferred route was impractical and was therefore omitted in the study procedure. The Board is only concerned with the certification of the general location of the proposed line at this stage of the proceedings. Although the Board used the preferred corridor in the NEPOOL application to set limits for the general route, the Board recognizes the special circumstances of this case and accepts that omission of the corridor stage of the study was more practical.

The Board considers it significant that this project has achieved general acceptance by the public in the area affected and that no intervenors appeared, at any stage in the Board's proceedings, who were opposed to the line routing.

The Board also considers it significant that the proposed project has been approved by the relevant provincial government agencies and Hydro-Québec has received the necessary provincial authorization to commence construction of the line in accordance with its preferred routing.

The Board has carefully examined Hydro-Québec's route-selection process and is satisfied that the Applicant's choice of the Centre-East route is cost effective and environmentally acceptable. For this reason and for the reasons noted above, the Board accepts Hydro-Québec's preferred route shown in Appendix VII of this report, and more specifically illustrated under Annexe I of the "Rapport sur les études d'avant-projet", as a general route for the international power line.

As a condition of any certificate the Board would grant, it would require that Hydro-Québec submit reports describing the effectiveness of procedures and policies it proposed for the protection of the environment and of the actions taken to mitigate any long-term damage to the environment due to construction of the project.

8.8 Environmental Impact

The evidence shows that the Applicant has thoroughly investigated the potential environmental effects of the proposed interconnection and has demonstrated that there would be no unacceptable environmental effects from the construction and operation of the line. Any damage which might be caused by the construction would be minimized by following the general procedures and policies described in the Application and the Applicant's "Code de l'environnement" which it applies to all its construction projects.

Because the proposed line operates at 120 kV, a comparatively low transmission voltage, most of the considerations relating to corona and other effects of electromagnetic fields of power lines of higher voltage do not apply.

For all these reasons, the Board is satisfied that the interconnection can be installed and operated with an acceptable level of environmental impact.

8.9 The Board's Findings

In view of the foregoing, the Board, having satisfied itself that the proposed international power line is and will be required for the present and future public convenience and necessity, is prepared to issue a certificate of public convenience and necessity authorizing the construction and operation of the Canadian portion of the proposed transmission line. The line is to be located generally on the route identified as the Centre-East route in Appendix VII. Applicable terms and conditions are set out in Appendix XIII.

The foregoing constitutes our Reasons for Decision and Decision in the matter on the application of Hydro-Québec pursuant to Part III and Part VI of the *National Energy Board Act*.

J.L. Trudel
Presiding Member

A.B. Gilmour
Member

W.G. Stewart
Member

Ottawa, Canada
January 1985

Appendix I
Map - System's Main features in 1984

Figure a1
Map - System's Main features in 1984

Image not supplied
by author
or
Image not available

Appendix II
Generating Stations in Service as of 31 December 1983

Table a2-1
Hydro-Québec
Generating Stations in Service as of 31 December 1983

	Hydro-electric Stations	MW
1.	LG-2	5328
2.	LG-3	1920
3.	Beauharnois	1613
4.	Manic 5	1292
5.	Manic 3	1183
6.	Manic 2	1015
7.	Bersimis 1	912
8.	Outardes 3	756
9.	Bersimis 2	655
10.	Carillon	654
11.	Outardes	4632
	Others (less than 500 MW)	3595
	Total hydro-electric	**19555 MW**
	Thermal Stations	
1.	Gentilly 2 (nuclear)	685
2.	Tracy (oil)	600
3.	La Citière (gas)	201
4.	Cadillac (gas)	162
5.	Internal Combustion	97
	Total thermal	**1746 MW**
	Total of Generating Stations in Service as of 31 December 1983	**21301 MW**

Appendix III
Summary of the Firm Power Contract

A - Contract Period

Term

The contract period, 10 years, will begin on September 1, 1985 and end on August 31, 1995. In the case of delay in commissioning the interconnection facilities, it could begin at the latest on March 1, 1986 and end on February 29, 1996.

"Part A of the contract period" shall be the period beginning on the first day of the contract period, not later than March 1, 1986, and ending five years later. However if only Vermont DPS is late in commissioning its interconnection facilities, not later than October 31, 1990, and if only Hydro-Québec is late in commissioning its interconnection facilities, not later than February 28, 1991.

"Part B of the contract period" shall be the period beginning at the termination of Part A of the contract period and ending five years later. However if only Vermont DPS is late in commissioning its interconnection facilities, Part B of the contract period will end not later than October 31, 1995, and if only Hydro-Québec is late in commissioning its interconnection facilities, not later than February 29, 1996.

Option of Vermont

Vermont DPS will have the option to terminate its obligation to take and pay for the power and energy at the termination date of Part A of the contract period provided that on or before April 30, 1986 Vermont DPS notifies Hydro-Québec in writing of its decision.

Delay in commissioning less than six months

If there is a delay in commissioning of the interconnection facilities, the contract period shall begin on the date Hydro-Québec is capable of delivering power and energy or on the date Vermont DPS is capable of receiving it but not later than March 1, 1986.

If the delay is attributable to Hydro-Québec, the contract period will terminate:

a) five years after the beginning of the said contract period if Vermont DPS exercises its option to terminate it, or

b) ten years after the beginning of the said period.

If the delay is attributable to Vermont DPS, the contract period will terminate:

c) five years after the beginning of the said contract period but no later than October 31, 1990 if Vermont DPS exercises its option to terminate it, or

d) ten years after the beginning of the said period but no later than October 31, 1995.

If however, Vermont DPS terminates its obligation and the contract period ends after five years or on October 31, 1990 at the latest, the energy not received by Vermont DPS during the said contract

period because of the delay in commissioning the facilities, shall be made available by Hydro-Québec from April 1, 1991 to November 30, 1991 at a price established as per Article 7.2 (Part B of the contract period).

B - Quantity and Delivery

Hydro-Québec will make available to Vermont DPS a total capacity of not less than 150 MW at up to 100 % annual load factor.

Vermont DPS will take the energy at a minimum of 80 % annual load factor until the earlier of the following dates: the end of the first five years of the contract period or October 31, 1990. Thereafter, Vermont DPS will take the energy at a minimum of 50 % annual load factor until the end of the contract period.

At least 125 MW of this amount shall be made available at the border south of Bedford, and the remaining amount shall be made available at the border south of Stanstead.

C - Prices

The prices for power and energy are established until the end of the contract period, according to Article VII of the contract.

Part A of the Contract Period

Table a3-1
Combined Price for Power and Energy
($ US/MW.h)

12 month Period	Gross Price	Rebate	Net Price
1st	40	7	33
2nd	40	7	33
3rd	42	7	35
4th	44	7	37
5th	47	7	40

Part B of the Contract Period

Price of energy = 80% of the weighted NEPOOL fossil energy cost.

Price of power = B x 1 $ US

B is the annual price for the availability of 150 MW during the previous contract year; for the contract year beginning September 1, 1990, the reference price of power for 150 MW is 10 million US dollars regardless of delays in commissioning of the interconnection facilities.

1 is an inflation factor obtained by dividing the average price index for the previous contract year by the average price index for the twelve-month period preceding the said previous contract year.

"The average price index for a given year" shall mean the average of the four consecutive quarterly indexes ending on March 31, of the "National Income Product Accounts - Implicit Price Deflator For Gross Private Domestic Fixed Non Residential Investment" in the Survey of Current Business published by the Bureau of Economic Analysis of the United States Department of Commerce.

D - Derivation of Weighted NEPOOL Fossil Energy Cost

The weighed NEPOOL fossil energy cost is established each month based on the actual experience of the NEPOOL participants during the twelve-month period ending the last day of the second previous month and shall be equal to $\frac{A}{B}$.

A = The cost of the fossil fuel burned by each NEPOOL participants shall be determined each month and summed to yield the total for NEEPOL totals shall be summed for the applicable twelve-month period.

B = The net electrical energy generated from fossil fuel by each NEPOOL participant shall be determined each month and summed to yield the total for NEPOOL for the month. The monthly NEPOOL totals shall be summed for the applicable twelve-month period.

Appendix IV
Summary of the Interconnection Agreement

Definitions

Incremental cost is defined as the cost incurred by the party supplying the energy which would not have been incurred had the transaction not taken place. Decremental cost is the net sum of all the avoided costs to the party to whom energy is supplied.

Economy energy is defined as energy from non-renewable resources which is delivered in order to effect a saving when the receiving party has adequate generating capability available to carry its own load.

Fuel replacement energy is defined as energy from renewable resources and delivered to replace energy from non-renewable resources in order to effect savings and economize non-renewable resources.

Capacity or emergency power is defined as power and associated energy which is supplied as day-to-day assistance in case of a temporary capacity deficiency resulting from forced outages of facilities or unusual or abnormal operating condition affecting the capacity of the receiving party's own generating capability.

Supplemental or conservation energy is defined as energy provided to supplement energy storage (water or fuel) or conserve fuel supplies of the receiving party, the need of which result from water or fuel unavailability, government actions or widespread disasters.

The terms, including the rates and charges, are subject to review at least every two years, or more frequently at the request of either party.

Table a4-1
Transactions

Class	Description	Demand Charge	Energy Charge
Economy Energy	from non-renewable energy sources	-	1/2 (incremental cost + decremental cost)

Fuel Replacement Energy	from renewable energy sources	-	the lesser of: a) 80% of decremental cost, less delivery cost, or b) a price consisting of one half of a basic energy cost agreed upon from time to time by the Operating Committee, plus one half of the decremental cost of the energy thus replaced, less the cost of delivery, such said price not to be less than a value specified by the Operating Committee
Tertiary Energy	any energy not included in another class	-	as agreed by Operating Committee
Inadvertent Transfer		-	no charge. To be balanced in subsequent deliveries
Capacity or Emergency Power	power by the day	120 US $/MW/day	higher of 110% of incremental cost, or as agreed by Operating Committee
Supplemental or Conservation Energy	provided off-peak to supplement storage	-	as agreed by Operating Committee
Operating Reserve	to supplement production capacity	-	as agreed by Operating Committee

Table a5
Hydro-Québec
Capacity, Demand and Excess of Power
for the Month of January*

(MW)

	1985	1986	1987	1988	1989	1990	1991	1992	1993
1. Internal capacity HQ									
hydro	21655	22269	22312	22353	22385	22418	22451	22466	17926
thermal (oil)**	1191	1191	1191	1191	1191	1191	1191	1191	1191
nuclear	637	637	637	637	637	637	637	637	7 3
pumped storage	0	0	0	0	0	0	0	0	4
total	**23483**	**24097**	**24140**	**24181**	**24213**	**24246**	**24279**	**24294**	**19748**
2. Power purchases	5034	4977	4919	4861	4861	4861	4861	4861	1684
3. Total capacity (1+2)	**28517**	**29074**	**29042**	**29042**	**29074**	**29107**	**29140**	**29155**	**[illegible]**
4. Regular loads***	22257	23267	24087	24897	24566	25406	26286	27006	[illegible]
5. Gross excess (3-4)	6260	5807	4955	4145	4508	3701	2854	2149	[illegible]
6. Required reserve	**3061**	**3061**	**3016**	**2971**	**2987**	**3032**	**3070**	**3100**	[illegible]
7. Net excess (5-6)	3199	2746	1939	1174	1521	669	-216	-951	[illegible]
8. Emergency Aid****									
interruptible loads	720	780	800	830	850	880	900	930	[illegible]
neighbouring systems	500	500	500	500	500	500	500	500	[illegible]
total	**1220**	**1208**	**1300**	**1330**	**1350**	**1380**	**1400**	**1430**	[illegible]
9. Total excess (7+8)	**4419**	**4026**	**3239**	**2504**	**2871**	**2049**	**1184**	**479**	[illegible]

* January is the critical month, i.e., the month of least excess power in most years.

** Oil-fired and gas turbine.

*** Includes domestic load plus all other firm commitments.

**** Loads that could be interrupted or available power at the peak period (see section 5.3 for details).

Appendix VI

Table a6-1
Hydro-Québec
Capability, Load and Excess of Energy

(GW.h)

	1985	**1986**	**1987**	**1988**	**1989**	**1990**
1. Total capability*	142400	150282	159764	165515	167086	166835
2. Regular load**	111119	115694	117842	121243	124090	127790
3. Excess	**31281**	**34588**	**41922**	**44272**	**42996**	**39045**

	1991	**1992**	**1993**	**1994**	**1995**	**1996**
1. Total capability*	167116	167407	168895	171516	167834	171712
2. Regular load**	131590	135494	139192	143191	147493	151891
3. Excess	**35526**	**31913**	**29703**	**28325**	**20341**	**19821**

* Total capability required to meet the regular load and take advantage of the available export market, taking into account:

a) average streamflow conditions and normal system operation,
b) nuclear based load generation at 70% annual capacity factor, and
c) thermal generation for isolated areas only.

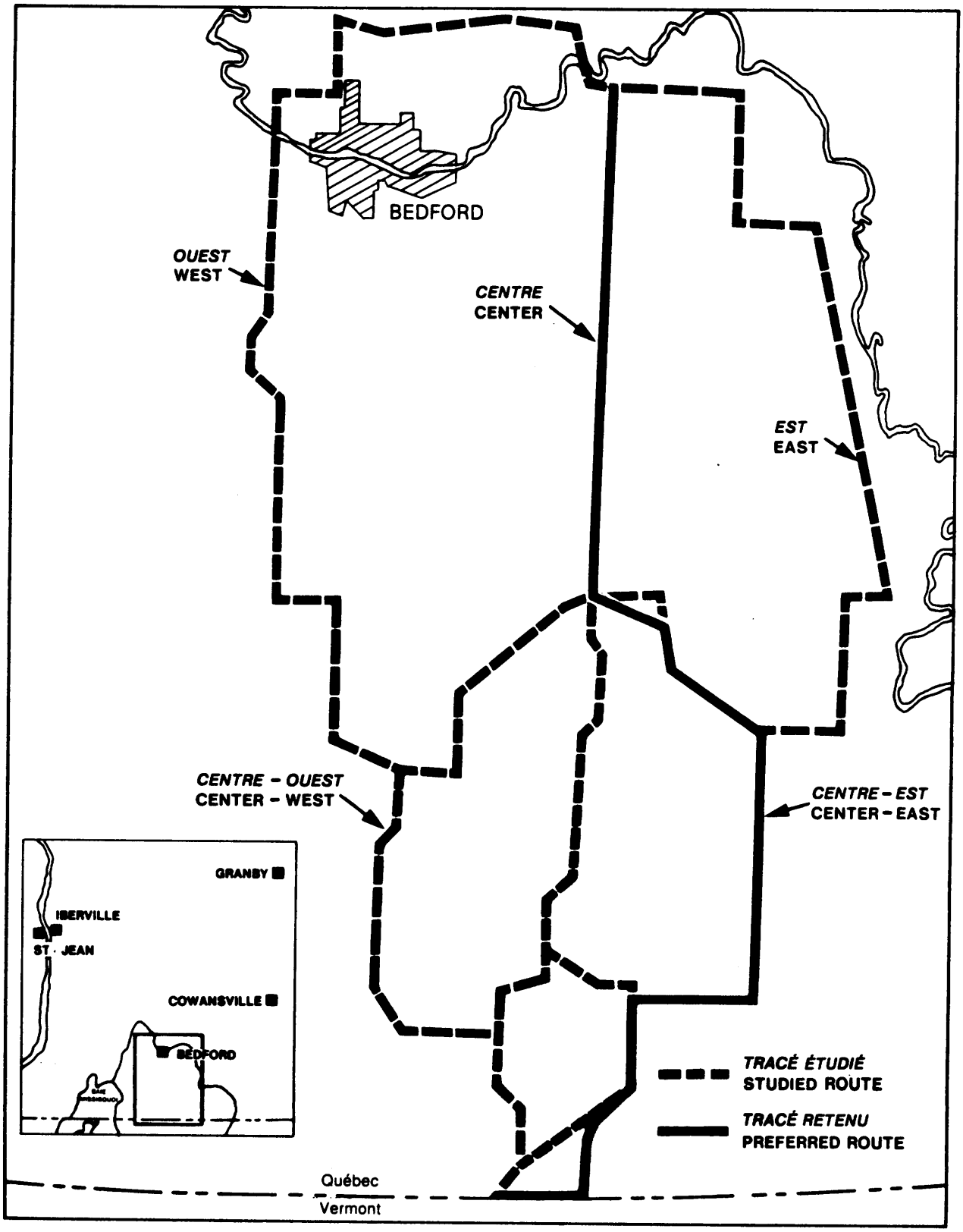
** Includes Québec domestic load which is based on a 2.9% average annual growth rate scenario plus all other firm commitments.

Appendix VII
International Power Line Proposed Routes

Figure a7-1
International Power Line Proposed Routes

LIGNE INTERNATIONALE DE TRANSPORT D'ÉLECTRICITÉ
TRACÉS PROPOSÉS

INTERNATIONAL POWER LINE
PROPOSED ROUTES



Appendix VIII
International Power Line: Technical Characteristics

Table a8-1
International Power Line
Technical Characteristics

General Characteristics:	
Line Description	120 kV single circuit line 17.7 km length
Type of support	Wood "H" frame
Average height	17.7 m
Average span	160 m
Right-of-Way	40 m
Electrical Characteristics:	
Nominal Voltage	120 kV
Number of circuits	1
Conductors	
number per phase	1
size and type	795 MCM-ACSR 54/7
minimum spacing between phase at any time, all along the line	1.6 m metal-metal
Carrying capacity	
summer	1050 A/cond.
winter	1275 A/cond.

Shield wire	
size and type	0.95 cm (galvanized steel)
number per support	1 or 2
max. protection angle	35^0
Insulation	
number of insulators per chain	7 elements 14.6 cm
chain	x 25.4 cm
minimum spacing between parts under tension and	
a) ground	0,92 m with a 35^0 angle
b) the earth	CSA C22.3 no 1 - 1970 at 200^0 F (95^0 C max.)
Grounding of supports	Continuous conterpoise or ground rod at each support.

Appendix IX
International Power Line: Assessment of Capital Costs

Table a9-1
International Power Line
Assessment of Capital Costs

A -	120 kV International Power Line Bedford/Highgate	
	Environment	150,000
	Engineering	980,000
	Acquisition	350,000
	Construction	2,430,000
	Administration and interest	590,000
		4,500,000
B -	Bedford Substation	
	120 kV terminal equipment, capacitor banks and circuit breakers	1,935,000
C -	Other Facilities	
	Modifications and additions to various substations: capacitor banks, modification of the relay protection and addition of one 120 kV circuit breaker	1,225,000
	Cost of advancement of the Iberville / Saint-Sébastien line	500,000
		1,725,000
	GRAND TOTAL A + B + C	**$8,160,000**

Appendix X
Pre-Emption of Export

Figure a10-1
Pre-emption of Export

PRÉEMPTION DES EXPORTATIONS

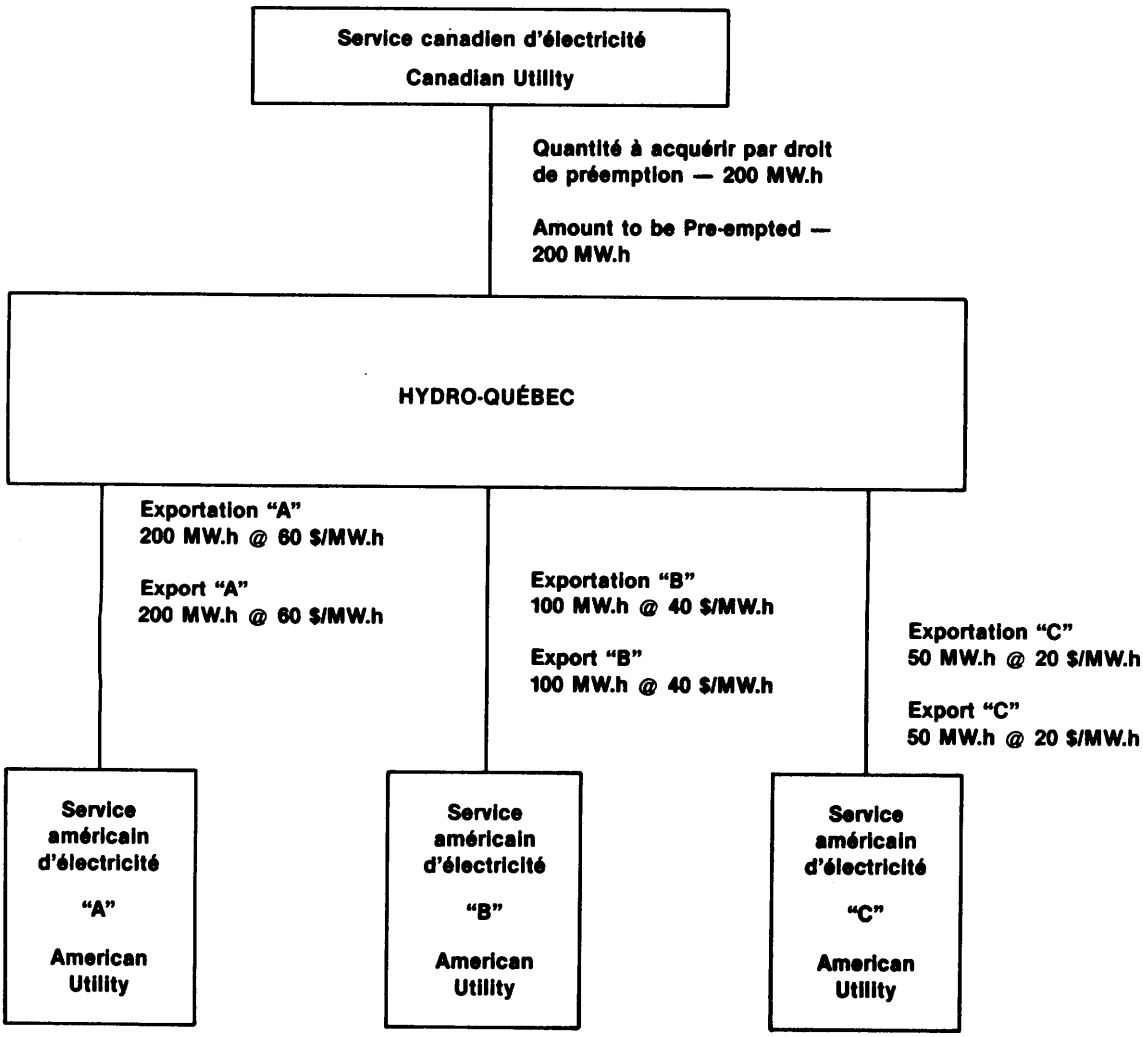
Procédure à suivre lorsqu'un service canadien d'électricité exercera son droit de préemption et devra payer le prix d'exportation comme prévu à la modalité 7 de l'Annexe XII (licence EL-169).

Hypothèse: Hydro-Québec ne disposerait pas suffisamment d'énergie excédentaire pour fournir le marché canadien et le marché d'exportation.

PRE-EMPTION OF EXPORT

Procedure to follow when a Canadian utility will pre-empt an export and have to pay the export price as defined in Condition 7 of Appendix XII (Licence EL-169).

Assumption: Hydro-Québec has insufficient surplus to supply the Canadian and the export markets



Prix exigé du service canadien (total 200 MW.h)

1e tranche 50 MW.h @ 20 $/MW.h
2e tranche 100 MW.h @ 40 $/MW.h
3e tranche 50 MW.h @ 60 $/MW.h

Price to Canadian Utility (total 200 MW.h)

1st block 50 MW.h @ 20 $/MW.h
2nd block 100 MW.h @ 40 $/MW.h
3rd block 50 MW.h @ 60 $/MW.h

Appendix XI
Terms and Conditions of Export Licence EL-168. Firm Power and Energy - Vermont DPS

Terms and Conditions of Export Licence EL-168
Firm Power and Energy - Vermont DAPS

1. The term of this licence

   (a) shall commence on the later of

      (i) 1 September 1985, or

      (ii) the in-service date of the 120 kV international power line to be authorized pursuant to Certificate of Public Convenience and Necessity No. EC-III-22 to be issued by the Board, and

   (b) shall end on the earlier of

      (i) 29 February 1986, or

      (ii) 10 years from the date on which exports commence under this licence, or

      (iii) the termination date of the Power Contract referred to in Condition 3 hereafter.

2. The class of inter-utility export transfer authorized hereunder is sale transfers of firm power and energy.

3. The power and energy to be exported shall be that described in the Firm Power Contract between the Licensee and the State of Vermont Department of Public Service dated 25 July 1984, hereinafter referred to as the "Power Contract".

4. In relation to the power and energy to be exported hereunder, the Licensee shall not, without the prior approval of the Board, amend, terminate, or enter into any agreement in substitution for or in addition to the Power Contract.

5. The power and energy to be exported hereunder shall be transmitted over the international power line for which the Board has issued Certificate of Public Convenience and Necessity No. EC-III-17 and the 120 kV international power line to be authorized pursuant to Certificate of Public Convenience and Necessity No. EC-III-22 to be issued by the Board

6. The quantity of power that may be exported hereunder shall not at any time exceed 150 MW.

7. The quantity of energy that may be offered for export hereunder in any contract year, 1 September to 31 August, shall not exceed 1314 GW.h, except for the contract years 1987-1988 and 1881-1992 where it should not exceed 1317.6 GW.h.

8. The price to be charged by the Licensee for exports made hereunder shall not be less than the prices defined in Sections 7.1 and 7.2 of the Power Contract.

9. The Licensee shall interrupt or curtail the delivery of power and energy hereunder whenever extent such power and energy is required to supply any firm load in Québec.

10. The Licensee shall, within 15 days after the end of each month during the term of this licence, file with the Board a report, in such form and detail as the Board may specify, pertaining to transactions under the licence in that month.

Appendix XII
Terms and Conditions of Export Licence EL-169
Interruptible Power and Energy - Vermont DPS

1. The term of this licence shall commence 1 September 1985, and shall end on 29 February 1996.

2. The classes of inter-utility export transfer authorized hereunder are sale, equichange and adjustment transfers of interruptible power and energy.

3. The power and energy to be exported hereunder shall be transmitted over the international power lines for which the Board has issued Certificate of Public Convenience and Necessity Nos. EC-III-17 and the 120 kV international power line to be authorized pursuant to Certificate of Public Convenience and Necessity No. EC-III-22 to be issued by the Board.

4. The quantity of power that may be exported hereunder shall not exceed 200 MW less any amount of power exported pursuant to the licence EL-168 to be issued by the Board.

5. The quantity of energy that may be exported hereunder shall not exceed 1 752 GW.h in any consecutive 12-month period throughout the term of the licence less any amount of energy exported during the same 12-month period pursuant to the licence EL-168 to be issued by the Board.

6. The Licensee shall not export power or energy hereunder whenever and to whatever extent such power or energy is required to supply

   (a) the Licensee's firm load requirements

   (b) any firm load of a Canadian electrical utility directly interconnected with the Licensee's system which lacks generating capacity to meet such firm load, and

   (c) any Canadian electrical utility directly interconnected with the Licensee's system willing to buy part or all of the power or energy on similar terms and conditions and at the higher of

      (i) the price under the relevant interconnection agreement between the Licensee and the said Canadian utility, or

(ii) the export price as defined in Condition 7 hereafter,

adjustments having been made corresponding to any differences in the cost on the Licensee's system of delivering the power or energy to the said Canadian electrical utility instead of to the export customer.

7. The export price referred to in Condition 6(c)(ii), that could be charged to a Canadian electrical utility directly interconnected with the Licensee willing to buy part or all of the power or energy to be or being exported hereunder, shall be the lowest price obtained by the Licensee for an equal amount of interruptible energy exported under an interconnection agreement with any American utility at the time the said Canadian utility would be pre-empting. To derive this price, exports shall be pre-empted in order of increasing price until Canadian requirements are met.

8. The price to be charged by the Licensee for exports made hereunder as sale transfers shall be not less than the price calculated according to the method set forth for the applicable classification of transaction in the Interconnection Agreement dated 25 July 1984 between the Licensee and the State of Vermont Department of Public Service hereinafter referred to as the "Interconnection Agreement".

9. Exports of power and energy made hereunder shall be in accordance with the Interconnection Agreement and the Licensee shall not, without the prior approval of the Board, amend, terminate, or enter into any agreement in substitution for or in addition to the Interconnection Agreement.

10. When electric energy exported hereunder is generated by the burning of fuel oil, the fuel price to be included in the incremental cost used in the formula for deriving the price of the energy exported shall be

(a) for imported fuel oil, or fuel oil made from imported crude, the price paid by the Licensee, plus the amount by which that price was reduced by any subsidy or compensation payment from any level of government in Canada, and

(b) for fuel oil made from Canadian crude, the export price of such Canadian fuel oil, including any export charge.

11. The Licensee shall forthwith file with the Board a report of each decision on the pricing of power or energy to be exported hereunder which is made subsequent to the date of the existing decisions by the Operating Committee described in Article VIII of the Interconnection Agreement.

12. The price to be charged by the Licensee for sale of supplemental or conservation energy and tertiary energy made under the Interconnection Agreement, shall not be less than

    (a) in the case of thermal or nuclear generated energy 110 percent of the incremental production cost as defined in Supplement II of the Interconnection Agreement

    (b) in the case of hydro-electric energy the price determined from the split savings formula, (C+V)/2, where C is equivalent to the Licensee's incremental production cost for hydro-electric energy and V is equivalent to the buyer's decremental production cost as defined in Supplement II of the Interconnection Agreement.

13. The Licensee shall forthwith report to the Board, by telex or by the most expeditious means available at the time the sale is made, the full details of each sale of supplemental or conservation energy and tertiary energy made under the Interconnection Agreement.

14. The Licensee, within 15 days after the end of each month during the term of this licence, shall file with the Board a report, in such form and detail as the Board may specify, setting forth for that month information pertaining to transactions under the licence.

Appendix XIII
Terms and conditions for Certificate of Public Convenience and Necessity No EC-III-22
120 kV International Power Line

1. The international power line to be constructed pursuant to this certificate shall be owned and operated by Hydro-Québec.

2. The international power line shall consist of one three-phase circuit with one 795 MCM ACSR conductor per phase insulated for 120 kV, operating at 60 hertz supported on wood-pole structures.

3. The international power line shall extend from the Bedford substation a distance of approximately 17.6 km to a point on the international boundary line located 450 m east of international marker 620A in the municipality of Saint-Armand-Ouest in the Province of Québec and should generally follow the preferred route described by Hydro-Québec in the Application.

4. The international power line shall be constructed in accordance with Canadian Standards Association standard C22.3, "Overhead Systems and Underground Systems"

5. Hydro-Québec shall, unless otherwise authorized or ordered by the Board, implement or cause to be implemented all of the policies, practices, recommendations and procedures for the protection of farmlands and the environment included in the Application, the environmental reports filed as part of the Application, the "Code de l'environnement - 1981" or as otherwise adduced in evidence before the Board or approved pursuant to these Terms and Conditions, and shall not cause or permit any change to the said policies, practices, recommendations and procedures without the prior approval of the Board.

6. Hydro-Québec shall submit to the Board for approval prior to commencement of construction, a description of the mitigation procedures to minimize environmental impacts associated with installation of the international power line. This may be in the same form required by the Commission de Protection du Territoire Agricole du Québec.

7. Hydro-Québec shall file with the Board, not later than one year after the commencement of operation of the facilities or at a date to be set by the Board, a report satisfactory to the Board describing the implementation of the policies, practices, recommendations and

procedures referred to in Condition 5 including an assessment of the effectiveness of the said policies, practices, recommendations and procedures.

8. Hydro-Québec shall, both during and after the construction of the facilities authorized hereunder, monitor the effects of the construction on farmlands and the environment and shall,

   (a) within one year after the commencement of operation of the facilities, and

   (b) prior to 31 December of the year of the second complete agricultural growing season after the commencement of operation of the facilities, or at a later date to be set by the Board,

   submit reports satisfactory to the Board describing the effects observed and the actions taken or to be taken to mitigate any long-term damage caused by the construction.

9. Hydro-Québec shall file a description and diagram of the metering facilities proposed in association with the international power line for approval of the Board, which approval shall be obtained before the metering facilities are installed.

10. Hydro-Québec shall not make any change in the international power line as defined in Condition 2 or in the associated metering facilities without the prior approval of the Board.

11. If the international power line has not been placed in operation by 1 September 1986, the certificate shall expire on that date or upon such later date as may, upon an application, be fixed by the Board.