



Environmental Performance  
Report 1998



Our **Commitment**  
for **Today**  
*and* **Tomorrow**



*This policy sets out Hydro-Québec's commitment toward the environment. Hydro-Québec emphasizes the judicious use of resources from a sustainable development perspective. This policy presents Hydro-Québec's orientations regarding the environment, as well as public health and safety.*

# Our *Environment*

## General Principles

Hydro-Québec is a leader in the field of environment. Thanks to hydropower, the company produces clean, renewable and safe energy, thus protecting our environmental heritage for future generations. It develops profitable, environmentally acceptable projects that are well received by communities. It practises rigorous environmental management that complies with ISO 14001, with a view to continuous improvement. Thus:

### *Sustainable Development*

To contribute to sustainable development and to the protection of the global environment, Hydro-Québec undertakes to:

- give preference to hydropower, other sources of renewable energy and energy efficiency to meet the needs of its customers;
- use resources as efficiently as possible and practise reduction at source, reuse and recycling.

### *Continuous Improvement of Environmental Performance*

To improve its environmental performance, Hydro-Québec undertakes to:

- include environmental concerns in its decision-making processes and at all stages in the life-cycle of its products, services and facilities, in such a way as to meet recognized environmental standards, prevent pollution, manage impacts at source, mitigate negative impacts and maximize positive impacts;
- adopt a transparent approach by encouraging the participation of local communities in the environmental assessment of its proposed projects and activities;
- make its business partners and suppliers aware of the need for responsible environmental management of their activities, products and services.

### *Public Health and Safety*

To ensure public health and safety, Hydro-Québec undertakes to:

- design, manage and maintain its facilities and conduct operations in such a way as to control the risk of bodily injury;
- inform the public on how to use its products and services safely;
- put in place and maintain emergency measures and plans that are coordinated with those of local responders and the relevant authorities, and make them public.

### *Research*

To improve its performance in terms of the environment, sustainable development and public health, Hydro-Québec undertakes to:

- carry out or support research and development on the environmental and health effects of its operations, as well as on environmental or energy-efficient technologies.

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## Units of Measure

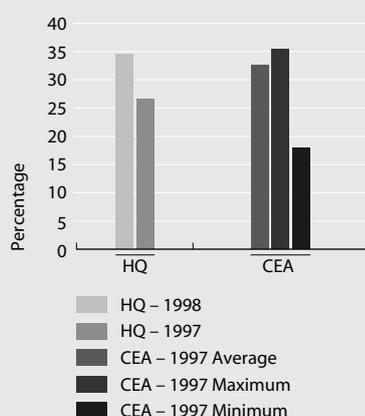
\$M:	millions of dollars
ppm:	parts per million
mSv:	millisievert
kV:	kilovolt
TJ:	terajoule
kW:	kilowatt
MW:	megawatt (one million watts)
GW:	gigawatt (one million kilowatts)
GWh:	gigawatthour (one million kilowatthours)
TWh:	terawatthour (one billion kilowatthours)

# Hydro-Québec's Performance Compared With th

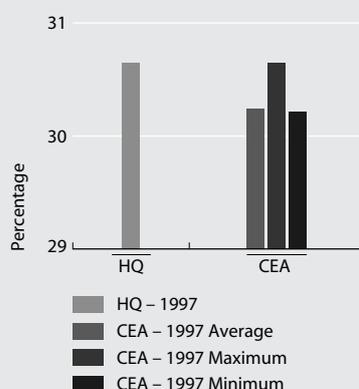
## Energy Conversion Efficiency

Energy conversion efficiency is the total net energy output divided by the total energy input needed to generate the electricity (net energy output/energy input). These results show that hydroelectric facilities are, on average, three times more efficient than thermal or nuclear facilities.

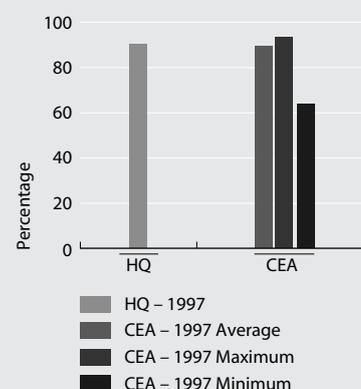
a) Energy conversion efficiency of thermal generating facilities



b) Energy conversion efficiency of nuclear generating facilities



c) Energy conversion efficiency of hydroelectric generating facilities



N.B.: This indicator was no longer used in 1998. However, the efficiency data available for 1997 are presented for purposes of comparison with the CEA.

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In 1997, an inventory was made of PCB quantities held by CEA member utilities. This inventory showed that Hydro-Québec has only 4% of this inventory.

## PCB in Storage and Use

Type of PCB	CEA member utilities as a whole – 1997	Hydro-Québec	
		1997	1998
High level in service	3,666 tonnes	0.5 tonne	0.5 tonne
High level in storage	4,392 tonnes	3 tonnes	2.7 tonnes
Low level in service	7,208 tonnes	450 tonnes	400 tonnes
Low level in storage	1,933 tonnes	190 tonnes	9.7 tonnes
<b>Total</b>	<b>17,199 tonnes</b>	<b>643.5 tonnes</b>	<b>412.9 tonnes</b>

N.B.: Low-level equipment contains between 50 and 10,000 ppm of PCB. The reduction in quantities of low-level PCB in storage from 1997 to 1998 stems from the disposal plan begun in 1996.

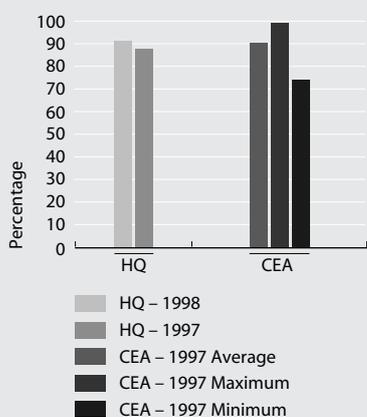
\* Industry data from CEA Annual Report 1997.

# The Canadian Electric Industry\*

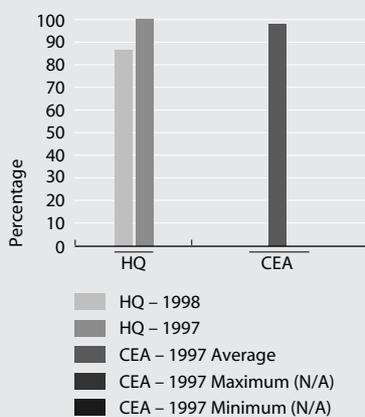
## Internal Energy Efficiency

Internal energy efficiency for generating facilities is the total quantity of electricity sold divided by the total electricity generated and purchased (imports). This indicator illustrates internal electric energy use and line losses on transmission and distribution systems.

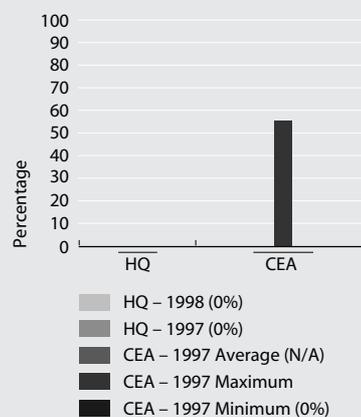
### Internal Energy Efficiency



### Reuse, Recycling and Energy Recovery of Electrical Insulating Oil



### Utilization of Solid Combustion By-products



*N.B.: In 1998, Hydro-Québec disposed of, by incineration, 174,295 litres of PCB-contaminated insulating oil, leading to a reduction in the percentage of reuse of this oil. This operation was carried out under the company's PCB elimination plan.*

*N.B.: Hydro-Québec's thermal power plants are used mainly in peak periods. The small quantities of ash and residue which they produce are accumulated until their volume is sufficient to allow sale to third parties, with a view to reuse or recycling. In 1997 and 1998, Hydro-Québec did not sell any solid combustion by-products.*

## Number of Spills

Environment contaminated	CEA member utilities as a whole – 1997		Hydro-Québec	
	1997	1998	1998 (excluding ice storm)	1998 (ice storm only)
Atmosphere	48	1	2	–
Water	50	5	15	–
Soil	905	185	245	3,028
<b>Total</b>	<b>1,003</b>	<b>191</b>	<b>262</b>	<b>3,028*</b>

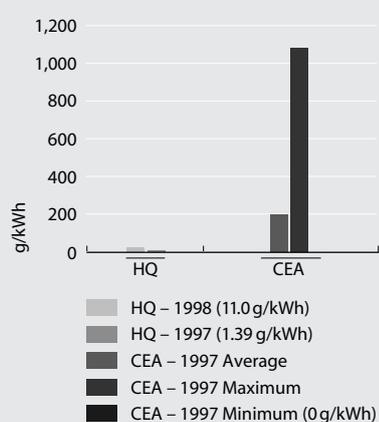
\* During January's ice storm, a large number of spills occurred as a result of breaks in numerous electrical devices.

## Atmospheric Emissions

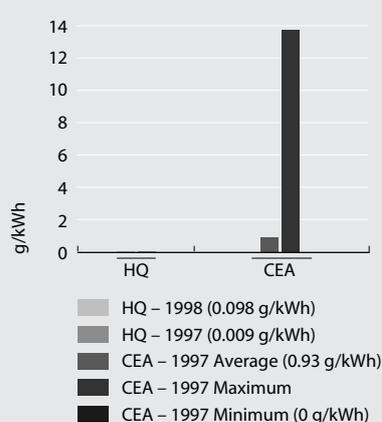
The following points apply to the three indicators concerning atmospheric emissions.

- Companies whose emission level is null (0 g/kWh) do not generate any electricity.
- For Hydro-Québec, intensive use of Tracy thermal generating station in 1998 brought about a substantial increase in levels of atmospheric emissions. They are, however, considerably lower than the average for Canadian electric utilities.

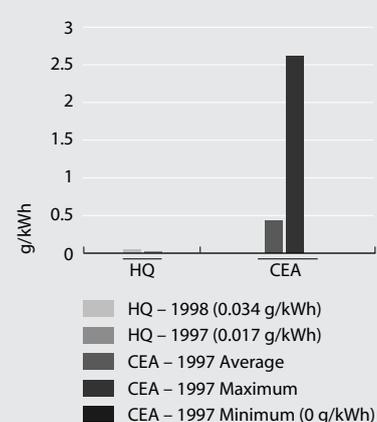
### a) CO<sub>2</sub> Emissions



### b) SO<sub>2</sub> Emissions



### c) NO<sub>x</sub> Emissions



## Public Reporting of Environmental Performance

Question	CEA 1997	Hydro-Québec 1997-1998
Proportion of utilities producing a publicly available report on their environmental performance	60%	Yes
Proportion of utilities whose report includes environmental or sustainable development indicators	50%	Yes
Proportion of utilities whose report includes environmental or sustainable development objectives and targets	30%	Yes

## Evidence of an Effective Employee Awareness and Training Program

Question	CEA 1997	Hydro-Québec 1997	Hydro-Québec 1998
Proportion of electric utility employees that have received environmental training	15 to 20%	4.17%	5.7%

N.B.: The percentage shown for Hydro-Québec does not include the number of employees who attended technical training sessions incorporating environmental segments. The company's apparently poor result is further explained by the fact that it has far more employees than most CEA member utilities.

# A Word from the President and Chief Executive Officer and from the Chairman of the Board

*In 1998, Hydro-Québec met some major environmental challenges. The ice storm that struck Québec called for extraordinary efforts to restore power transmission and distribution lines extending over thousands of kilometres. A large part of the grid in the Montréal and Montérégie regions was rebuilt in record time and in compliance with the company's very strict environmental criteria.*

*The introduction of environmental management systems (EMS) based on the ISO 14001 model increases our managers' accountability. Indeed, a number of our administrative units are gradually integrating the environment into their decision-making processes and their day-to-day business.*

*In this regard, the efforts to institute ISO 14001 are progressing smoothly. The activity timetables, declarations of environmental principles, identification of environmental aspects along with their objectives, targets and action plans, as well as the deployment of EMS implementation teams across Hydro-Québec's territory, clearly illustrate its determination to establish this system throughout the company by the year 2002.*

*For Hydro-Québec's Board of Directors, 1998 also meant the opportunity to adopt a new environment policy emphasizing sustainable development, continuous improvement of our environmental performance, public safety, research and accountability.*

*Hydro-Québec is continuing to promote hydroelectricity as a way to reduce CO<sub>2</sub> emissions and control greenhouse gas emissions. It remains convinced that hydropower is the most acceptable energy source from both the environmental and social perspectives.*

*On the local level, Hydro-Québec continued to play a partnership role in environmental enhancement, regional development and with Aboriginal communities. The implementation of numerous local environmental enhancement projects has enabled Hydro-Québec to contribute to economic growth in Québec's various regions and to help support thousands of jobs.*



*On the international scene, Hydro-Québec played an environmental role through its involvement in a number of projects. Our environmental expertise and know-how were put to good use in South America, India and the Middle East. We should also point out the contribution of the Environment and Corporate Social Responsibility Committee, whose mandate is to make recommendations to the Board of Directors concerning the company's environmental management and social responsibility, public health and safety, and our relations with Aboriginal communities.*

*These many activities designed to contribute to a better environment attest to Hydro-Québec's genuine desire to protect and enhance the environment. In accordance with its Strategic Plan, Hydro-Québec is resolutely committed to achieving growth, but with due respect for the environment and local communities.*

L. Jacques Ménard  
Chairman of the Board

André Caillé  
President and Chief Executive Officer



# Introduction and Context

Hydro-Québec is pleased to present its fourth Environmental Performance Report. This report contains the most significant results and activities of the company's business and support units.

The highlights of 1998 included:

- ISO 14001 implementation efforts, which are making satisfactory progress and which we review in each of the sections devoted to the business and support units;
- adoption of a new environment policy, which is reproduced in full on the inside front cover of this report;
- participation by Hydro-Québec in the founding of the Canadian Hydropower Association, to promote the advantages of hydroelectricity to governments and target publics (see page 15);
- institution of a series of measures for optimizing certain generating facilities (see page 24);
- implementation of a program for evaluating the environmental compliance of all transmission substations (see page 31);
- publication of a guide to ornamental trees and shrubs as part of the campaign *Le bon arbre au bon endroit* (the right tree in the right place) (see page 37);
- start of work to reinforce the transmission system (see page 43);
- recovery, reuse, recycling or energy recovery of large quantities of materials during the ice storm and the ensuing cleanup operation, with expertise developed since the introduction of the 3RE program (see page 47).



*Reservoir in the La Grande complex*

## *Hydro-Québec at a Glance*

	1998	1997	1996	1995	1994
Total installed capacity (MW) <sup>1</sup>	31,472	31,397	31,413	31,125	30,400
Hydroelectric generating stations (MW)	29,203	29,203	29,220	28,932	28,207
Nuclear generating stations (MW)	675	675	675	675	675
Conventional thermal generating stations (MW)	1,594	1,518	1,518	1,518	1,518
Total sales (TWh)	161	163	163	166	158
Exports (TWh)	19	15	19	24	19
Transmission system (km)	32,144	32,036	30,557	30,831	30,478
Distribution system (km)	105,705	104,640	104,078	102,785	101,285
Number of customer accounts	3,481,030	3,456,768	3,427,260	3,398,944	3,345,616
Number of employees	20,847	20,416	23,320	24,852	25,406
Total revenue from sales (\$M)	8,812	8,423	7,754	7,680	7,335

*1. Hydro-Québec also has access to most of the output of Churchill Falls power plant, which has a nominal capacity of 5,428 MW.*

# The Environment at Hydro-Québec

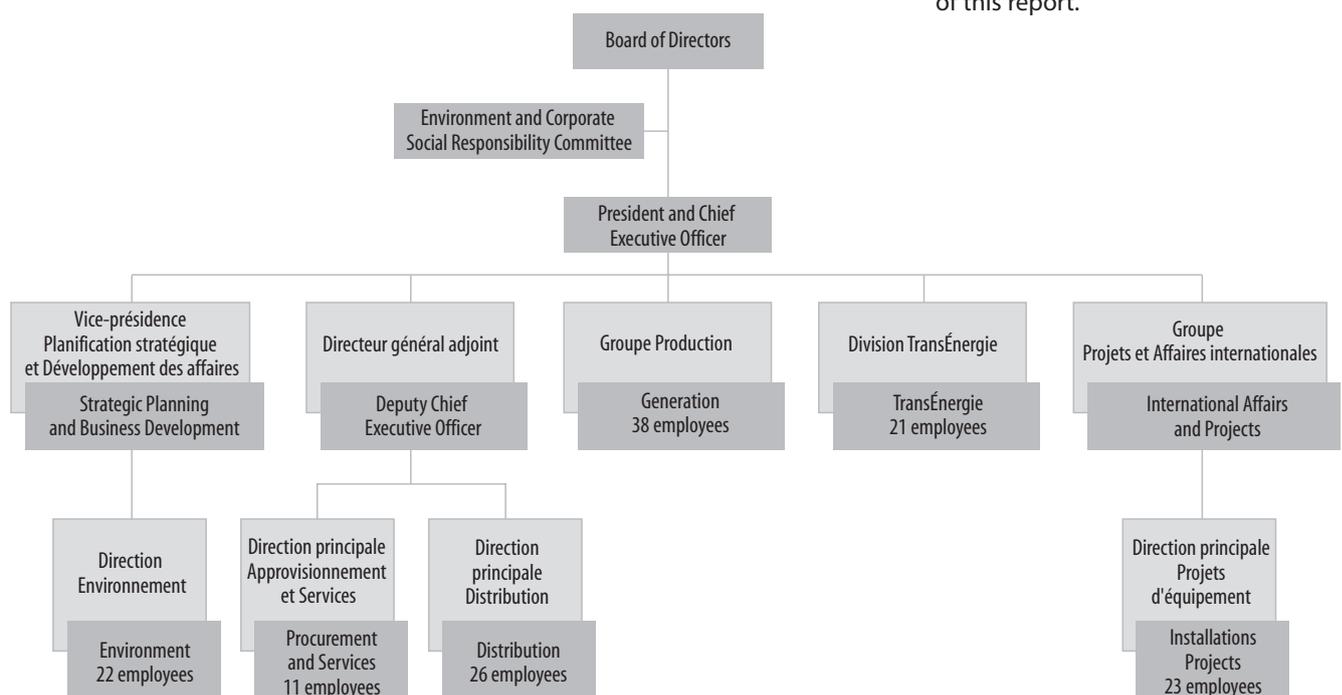
## Organizational Structure

### Environment Personnel

At Hydro-Québec, the environment is of concern to everyone. Managers are responsible for managing the environmental impacts of their activities. To assist them, 141 employees specialized in environment are distributed throughout the company's various administrative units. At the operations level, the employees' role entails providing managers with support and expertise specific to their field of specialization. In addition, the role of Hydro-Québec's Environment department is to monitor strategic environmental issues, propose corporate orientations and assure Hydro-Québec's senior management of control over its management system and environmental performance.

### An Exceptional Event

From January 5 to 9, 1998, southwestern Québec was struck by an ice storm of exceptional intensity and duration. Up to 100 mm of freezing rain fell on some areas. The storm had significant consequences for Hydro-Québec's system: more than 115 transmission lines and 3,400 km of distribution lines were damaged to varying degrees. In addition to the environmental impacts on the facilities, vegetation and landscape, a series of spills occurred. Approximately 40% of the defective equipment – mostly distribution transformers removed from the system during the crisis – lost over half of the oil they contained. Altogether, more than 3,000 separate spills occurred in the region as a whole, for a total of about 110,000 litres of oil, with little or no PCB contamination. The repercussions of this event on the activities of each of the business and support units are discussed in their respective sections of this report.



## Environmental Management

### Environmental Commitment and Responsibility (ECR) Program

In connection with its participation in the ECR program of the Canadian Electricity Association (CEA), Hydro-Québec produces an account of its performance every year. This report is based on performance indicators that are common to all electric utilities that belong to the CEA. Last February, the CEA published its first annual report presenting the overall results of the member utilities. It can be consulted on the CEA Web site ([www.canelect.ca](http://www.canelect.ca)).

For most of the indicators, Hydro-Québec compares favorably with Canadian electric utilities as a whole. The result of these indicators and Hydro-Québec's performance for 1997 and 1998 are presented at the beginning of this report.

### The Environmental Management System as per ISO 14001

In general, implementation efforts are proceeding well and should allow us to meet or even exceed the timetable outlined by the CEA program; this timetable calls for implementation of the environmental management system (EMS) by the end of 2002.

### Committees and Chairs

#### Advisory Committee on the Environment and Community Affairs

In 1985, Hydro-Québec created the Environmental Advisory Committee, with a mandate to advise the company on its strategic environmental orientations and to provide recommendations on various environmental matters. In 1996, it became the Advisory Committee on the Environment and Community Affairs (ACECA) with new responsibilities for analyzing matters related to the company's relations with various communities.

In 1998, the ACECA held its 61st and 62nd meetings. During the year, the composition of the Committee was modified and it was assigned a new mandate. It will now play more of a decision-making assistance role rather than an advisory role. The members must express opinions on matters for which decisions have not yet been made. The subjects tackled in 1998 mainly concern the new environment guidelines and the environmental performance assurance program.

### 1998 Advisory Committee on the Environment and Community Affairs

#### Chair

**Louise Roy**  
President  
L.R. Services-conseil

#### Members

**André Bouchard**  
Professor  
Institut de recherche en biologie végétale

**Aurélien Gill**  
President, Gestion GAMAC  
Commissioner, Commission nationale des revendications territoriales autochtones

**Michel Gariépy**  
Dean, Faculty of Design  
Université de Montréal

**Lorne Giroux**  
Professor, Faculty of Law  
Université Laval

**Roger Lanoue**  
General Manager  
Strategic Planning and Environment  
Hydro-Québec

**Claude-Hillaire Marcel**  
Professor, Environmental Research Chair  
Université du Québec à Montréal

**Marie-France Raynault**  
Physician, Department  
of Preventive Medicine  
Hôpital Saint-Luc

**Ed Villeneuve**  
Vice-President, Environmental Projects  
and Audits and Industrial Hygiene  
Noranda Inc.

	Business unit in which an EMS must be established					
	Generation	TransÉnergie	Distribution	Procurement and Services	Installations Projects	Corporate Level
Scheduled implementation date	2000	2002	2000	1999-2002	2000	1999
Timetable approved by senior management to comply with scheduled implementation date	Yes	Yes	Yes	Yes	Yes	Yes
Financial resources provided to ensure compliance with timetable	Yes	Yes	Yes	Yes	Yes	Yes
Gap analysis completed by the end of 1998	Yes	Yes	Yes	Yes	Yes	Not applicable

## **Chairs**

Hydro-Québec funds three university research chairs in the environment field.

### **1. Hydro-Québec–NSERC–UQÀM Environmental Research Chair**

In partnership with the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Université du Québec à Montréal (UQÀM), Hydro-Québec continued its commitment to this chair. This is the final year of a second five-year term. In 1998, Hydro-Québec allocated \$577,000 to this chair, for a total investment of approximately \$2.5 million by the end of this term. The chair comprises two separate sections: mercury and greenhouse gases (GHGs).

#### *Mercury*

In connection with this chair, experimental fishing was carried out in natural lakes, in cooperation with the Nemaska Crees. These tests were intended to verify the effectiveness of intensive fishing as a method for reducing mercury levels in fish. The results will allow an assessment of the feasibility of applying this measure in recently created reservoirs.

#### *Greenhouse Gases*

Continuing sectoral studies begun in 1997 and new studies conducted in 1998 on GHGs focused mainly on the following areas of interest:

- the spatial and temporal representativeness of CO<sub>2</sub> and CH<sub>4</sub> emissions measured since 1993 in the La Grande 2, Laforge 1 and Cabonga reservoirs;
- carbon cycle in reservoirs;
- carbon cycle throughout drainage basins (preliminary study);
- decomposition of organic matter in flooded soils;
- modeling of GHG emissions;
- development of a GHG database and measurement methods;
- use of stable carbon isotopes to evaluate GHG flows (preparatory study).

The study findings should provide important additional details on the actual role of hydroelectric reservoirs in the GHG balance on the local and provincial levels. They will permit a clearer definition of R&D to be carried out between 1999 and 2003 in order to close this file.

### **2. École polytechnique de Montréal NSERC Industrial Chair in Site Bioremediation**

In addition to Hydro-Québec, this chair has 10 other industrial partners. The chair's first term began in June 1994 and was scheduled to end in May 1999. The company's minimum financial contribution is \$60,000 a year. Hydro-Québec also finances specific studies related to decontamination work carried out as part of the chair's activities. In 1998, this meant an allocation of \$40,000. The research focused mainly on reducing the costs of current technologies and developing innovative, inexpensive and environmentally viable approaches. By the end of this term, some 30 master's and Ph.D. students received training in the restoration of contaminated sites.

### Revision of Guidelines

As part of the comprehensive review of all its policies, directives and supplementary guidelines begun in 1997, Hydro-Québec adopted its new policy, *Our Environment*, in September 1998. This policy aims to comply with ISO 14001, which emphasizes the wise use of resources from a perspective of sustainable development. The policy presents Hydro-Québec's orientations with respect to the environment as well as public health and safety. The text is reproduced on the inside front cover of this report. It has been distributed to all the company's personnel, and can be consulted at Hydro-Québec's Web site ([www.hydroquebec.com](http://www.hydroquebec.com)). Those interested may obtain a copy by calling 1 800 363-7443.

### 3. Université de Montréal Environmental Design Chair

Hydro-Québec, along with other partners (Transports Québec and Société d'affichage Omni), has supported the Université de Montréal Environmental Design Chair since 1996. The company is investing an annual amount of \$150,000 over a five-year period.

Landscape is an issue of prime importance for Hydro-Québec. The nature, scale and location of its structures and facilities require it to consider this essential element of spatial organization, which expresses deep-seated cultural and social values held by Quebecers.

In 1998, the chair's research focused on:

- development of a visual landscape monitoring system and formulation of a methodological guide for characterizing and managing landscapes of heritage interest in the Laurentians;
- landscape issues related to the various electrical generation options;
- ways of integrating distribution facilities into their sites, and economic analysis of subdivision constraints in new residential construction projects;
- the color of pedestal-supported equipment and the graphic rules to be applied;
- the development aspect of the environmental enhancement program, specifically landscape quality.

### Relations with Interested Parties

#### Complaint Management

Members of the public with complaints, questions or comments about Hydro-Québec's environmental performance should call 1 800 363-7443 or the Customer Service number on their electricity bill. Questions and comments are passed on to the responsible environment personnel in Hydro-Québec's various districts or to Environment department personnel. Complaints are dealt with by Hydro-Québec's complaint handling system.

Nature of complaint or claim	1996	1997	1998
Poorly executed work	421	467	236
Pruning	121	127	115
Contamination caused by a spill or fire	59	116	116
Maintenance of site	26	28	27
Visual impact	—	32	26
Noise	20	17	16
Interference	—	16	6
Erosion	—	5	2
Other	47	—	—
<b>Total environment-related complaints and claims</b>	<b>694</b>	<b>808</b>	<b>544</b>
Total number of written complaints and claims	8,140	6,578	6,637
Environment-related percentage out of total	8.5%	12.3%	8.2%
Average handling time	22 days	19 days	29 days*

\* The increase in average complaint-handling times in 1998 is due to events that occurred during January's ice storm.



### Training and Awareness

Environmental training and awareness are key elements of an effective environmental management system. Under its EMS, Hydro-Québec is developing methods and procedures for accurately defining training needs and setting up appropriate sessions. In 1998, the company's training program focused on the areas most likely to improve its environmental performance. In addition to environment segments incorporated into the program on operating methods, specific environmental sessions were organized. Some 1,187 people attended these sessions. Of this total, 407 took part in workshops dealing with management of residual hazardous materials and spills.

Training area	1996	1997	1998
Specific environmental training	1,121	766	809
EMS – ISO 14001 training or awareness	—	86	378
<b>Total number of participants</b>	<b>1,121</b>	<b>852</b>	<b>1,187</b>

Since the start of the ISO 14001 implementation program in 1997, 464 employees have taken part in EMS training or awareness sessions.

### Environment Month

*Apart from its training programs, Hydro-Québec continues to contribute to Environment Month, an event held in May every year in Québec. In 1998, based on the theme L'arbre et l'environnement, the company organized a number of activities pertaining to trees and the environment for its employees and the public, including:*

- *distribution of 2,000 copies of L'arbre, une matière précieuse, une richesse aménageable et un élément vital, a brochure explaining the vital natural resource that trees represent;*
- *sponsorship of Opération reboisement 1998, a reforestation program organized by the Fondation québécoise en environnement, in which 350,000 seedlings were distributed free of charge to the public;*
- *distribution – through Provigo supermarkets and the Fondation québécoise de la faune – of 500,000 copies of Faites la cour aux oiseaux. This brochure suggests species of trees that are compatible with distribution systems and that attract birds.*

### Environmental Interns

In 1998, Hydro-Québec continued its program of university internships in environment. Under this initiative, 14 students worked as interns during the summer or fall of 1998 in eight of the company's administrative units. The work carried out during these internships was beneficial: it allowed the company not only to meet specific environmental workforce needs, but also to take advantage of the students' knowledge of new technologies in this field. The interns, for their part, were able to acquire practical experience that will facilitate their integration into the job market.

The internships lasted an average of 15 weeks and covered such subjects as EMS implementation, impact assessment of hydroelectric developments, vegetation control and environmental issues.

### Reference Centre

It is the responsibility of the Strategic Planning and Environment division to see that all information of an environmental nature is made available. Environment employees can thus count on a team of specialists who are well acquainted with the sources of information and their value.

During the year, the team designed a new intranet research tool providing access to a collection of printed and electronic documents, including all reports produced by Hydro-Québec since the beginning of the 1970s. The public may obtain information on these reference documents at the following address: [info.strategique@hydro.qc.ca](mailto:info.strategique@hydro.qc.ca).

## Environmental Compliance

### Infraction Notices

The particular risks related to compliance problems and, more specifically, legal proceedings under way, infraction notices pending and inquiries are all contained in a report submitted to the Board of Directors every six months. In 1998, Québec's Ministère de l'Environnement issued four new infraction notices. These notices mainly concerned:

- the lack of an authorization certificate for excavation work;
- irregularities regarding application of the *Regulation respecting hazardous materials* and, in particular, storage standards for residual hazardous materials;
- an in-trench disposal site;
- an aviation-fuel spill.

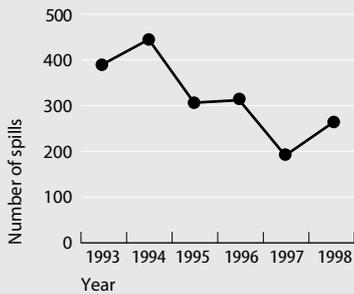
Detailed information on the handling of these infraction notices can be found in the sections on the various business and support units.



### Number of Infraction Notices

Corporate unit	1996	1997	1998
TransÉnergie	4	—	—
Generation	1	—	1
Distribution	—	1	1
International Affairs and Projects	2	1	—
Procurement and Services	4	1	2
<b>Total</b>	<b>11</b>	<b>3</b>	<b>4</b>

**Number of Spills  
(excluding 1998 ice storm)**



Source: Hydro-Québec.

### Legal Proceedings

Two legal proceedings were the focus of attention in 1998.

- The first was launched by the Coalition des citoyens et citoyennes du Val-Saint-François and by 10 private citizens, against four defendants, including Hydro-Québec. The plaintiffs sought to have the work on the Hertel – Des Cantons line project stopped and asked that the Québec government comply with the normal processes prescribed by various laws of public order, especially those respecting environment and land use.
- The second resulted in the company's being convicted following two spills of PCB-contaminated mineral oil in the Saint-Maurice River, in January 1990 and June 1995. Hydro-Québec had to pay \$85,000 to the federal government, which will pass it on to a local environmental organization. The amount was determined on the basis of factors identified in the case, such as modifications and improvements made to Shawinigan-3 generating station between the time of the incident and the date of the judgment. These modifications, which will make it possible to avoid any recurrence of such incidents, along with those to be added between now and the end of 1999, will complete the additional refurbishing work deemed to be a "total environmental gain" and estimated at a minimum of \$1,731,000.

### Spills

During the ice storm of January 1998, a large number of spills occurred as a result of breaks in numerous electrical devices. Fortunately, the majority of these pieces of equipment contained less than 55 litres of insulating oil. Furthermore, the analyses carried out showed that this oil had little or no PCB contamination. More than 3,000 incidents occurred, mainly in the Montérégie region, and more than two-thirds of them required site cleanup and recovery work. In each of the districts concerned, we reached agreements with the regional offices of Québec's Ministère de l'Environnement regarding the information to be supplied to them and the modes of intervention. Most of the cleanup operations began in January and were completed by July 1998.

Owing to the exceptional nature of the ice storm, we did not take into account spills that occurred during this event, for comparison purposes with other years.

While a number of other spills occurred, at nearly every type of facility, none was major. These various spills were not the subject of infraction notices, with the exception of an aviation-fuel spill at the La Grande-3 airport, for which recovery and decontamination operations proceeded normally, in agreement with the Ministère de l'Environnement. In addition, in most cases the spills were quickly contained or were followed by appropriate remedial measures.

## Issues

The issues presented in this section are of great importance to Hydro-Québec on account of their scope and their impact on the development of hydroelectric projects. They arise out of Canadian and international concerns. In the medium and long term, they could even influence the company's strategic and business positioning.

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### **Recognition of the Value of Hydropower**

Major dam projects have local impacts on ecosystems, biodiversity and communities, which may give rise to challenges all over the world and create difficulties for new hydroelectric projects.

Hydro-Québec continues to promote the comparative advantages of hydropower with respect to sustainable development and renewable energy, in order to control greenhouse gases and better define acceptable hydroelectric projects from the environmental and social standpoints. To that end, the company is involved in various activities on a number of levels.

#### **World Commission on Dams**

Hydro-Québec provides financial support and expertise for this independent commission formed by the World Bank and the International Union for the Conservation of Nature. The Commission's role is to evaluate the efficiency of large dams as development projects and propose recommendations to improve decision making in future projects. Hydro-Québec thus ensures that its 25 years of experience in environmental management contributes to the Commission's awareness of the intrinsic advantages of hydropower and the solutions developed and applied to minimize the impacts of large-scale hydroelectric projects.



*Daniel-Johnson dam*

#### **Canadian Hydropower Association**

In 1998, Hydro-Québec proposed the creation of the Canadian Hydropower Association in order to promote the advantages of hydropower to the public and governments and to ensure equitable treatment of this energy source by the authorities.

#### **International Energy Agency – Appendix III – Hydropower and the Environment**

Within this agency, Hydro-Québec is responsible for summarizing the International Energy Agency's research on the environmental impacts of hydroelectricity. The summary includes international recommendations concerning practices for ensuring the environmental and social acceptability of hydroelectric projects.



#### **Working Group of the International Hydropower Association**

The International Hydropower Association (IHA) is a multidisciplinary, non-profit, public organization. It was founded in 1995 to establish a forum for the exchange of views and knowledge on all aspects of hydroelectricity. By forming different technical working committees and organizing workshops, the association wishes to make decision makers aware of the role that hydroelectricity can play in terms of sustainable development. Hydro-Québec has been a member of the group since 1998 and takes an active part in the operations of the IHA's environment committee, especially the working groups on social impacts, atmospheric emissions and impact assessments.

#### **Hydro Strategy Team Committee of the Canadian Electricity Association**

This committee has developed a strategy intended to promote, to the Canadian government, the importance of hydropower's contribution to the supply of energy, and the need to remove certain obstacles to its development.

#### **E7 Network of Expertise for the Global Environment**

As a founding member, Hydro-Québec plays an active part in the operations of this network. The most recent activities include:

- project for implementing solar-energy technologies in remote villages in Indonesia;
- project for promoting the advantages of hydropower in Lithuania;
- coordination of the efforts of the Southern African Power Pool, an organization established in 1995 and comprising 12 electric utilities in countries of southern Africa.

#### **International Association for Impact Assessment**

Hydro-Québec is a member of the Board of Directors of this association.

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## **Salmon**

The Atlantic salmon populations have been falling for several years. Changes in environmental conditions in marine habitats, as well as offshore commercial fishing, have been singled out as the principal factors responsible for the decline in stocks. Salmon is therefore an issue of major importance for developers and managers of hydroelectric facilities.

Some of Hydro-Québec's hydroelectric facilities are on salmon rivers. They include Mitis-1 and Mitis-2 generating stations on the Mitis River, along with Bersimis-1 and Bersimis-2 generating stations on the Betsiamites River. For Hydro-Québec, any new projects and operating activities must have direct positive effects on the local environment. For example, to ensure the protection of the salmon, the company has made the following commitments:

- continue to invest in research programs;
- develop, test and carry out projects to help maintain this resource and fishing activities;
- plan projects and adopt technologies and equipment that are the most efficient possible, not only to avoid any decrease in salmon populations, but also to increase them substantially;
- ensure that the groups and organizations concerned by the preservation of this resource are involved in the various stages of project design and operation, so that they can take part in defining the mitigative measures and monitoring the results.

In the fall of 1998, as part of the diversion projects designed to develop the hydroelectric potential of the Betsiamites River, Hydro-Québec held several meetings with Montagnais representatives in order to propose different management and development plans to preserve the salmon in the river.

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## **Management of Greenhouse Gas Emissions**

Since the adoption of the Kyoto protocol, the Canadian government has wanted to formulate a national strategy for GHG management. It has consequently established 14 information and discussion panels. Hydro-Québec is involved in the activities of the four panels that are most likely to affect its operations in connection with the adoption of this strategy. The mandates of these panels cover:

- definition of a system that would grant credits for voluntary GHG reduction initiatives;
- proposal of ways of reducing emissions for the electricity sector;
- evaluation of means of setting up a tradable permit system for GHG emissions;
- proposal of ways of implementing flexible international mechanisms.

In these discussions, Hydro-Québec stresses the advantages of developing hydropower as one of the indispensable means for allowing Canada to reach the GHG emission reduction target set in Kyoto.



mission

The groupe Production (Generation group) is responsible for generating electricity at the lowest possible cost, according to the expected quality requirements. It must also use competitive means of generation in order to meet electricity demand while ensuring an optimum service life for, and development of, existing facilities. The Generation group manages its activities and installations rigorously, with due respect for the environment.

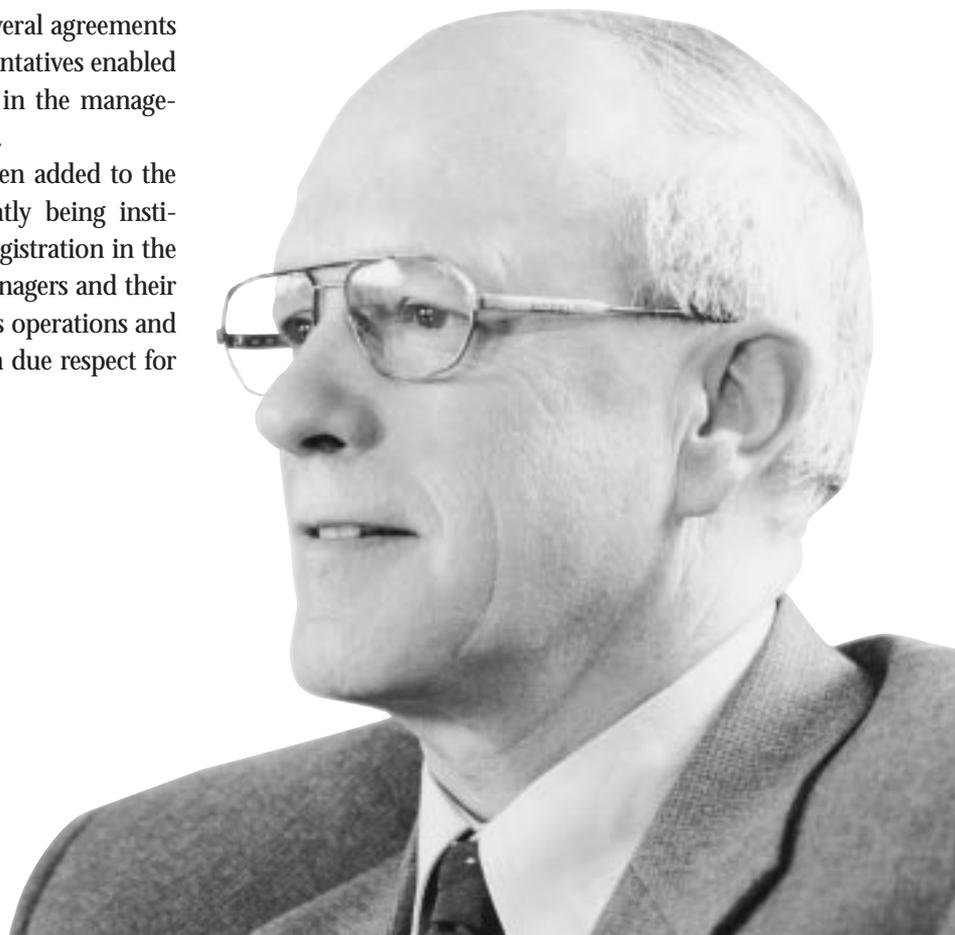
# Electricity Generation

Preventing pollution at source and improving our environmental performance are an integral part of our operating objectives for the 52 hydroelectric and thermal generating stations and the nuclear power plant under our responsibility.

In 1998, these principles were reflected in our ongoing efforts to incorporate the environment into our activities and projects from the planning stage on. The optimization of our generating facilities and the start-up of various projects and research programs also helped limit the environmental impacts of our installations. In addition, several agreements and our close cooperation with local representatives enabled us to better consider stakeholder concerns in the management of our present and future installations.

Since 1997, all these activities have been added to the environmental management system currently being instituted and scheduled to receive ISO 14001 registration in the year 2000. With this proactive approach, managers and their employees are able to manage the company's operations and facilities on a daily basis rigorously and with due respect for the environment.

**Ghislain Ouellet**  
Executive Vice President Generation



## Commitment of the Business Unit

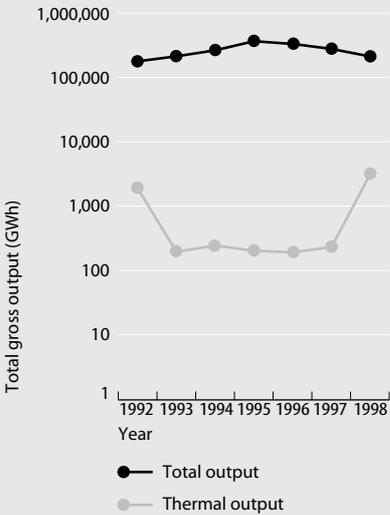
By adopting a declaration of environmental principles, the Generation group is committed to managing its electricity generation activities and its facilities in a spirit of sustainable development and in harmony with the environment. It recognizes the need to exercise strict management of environmental matters, to disseminate accurate, honest information and to act in cooperation with the interested parties. Prevention of pollution and continuous improvement of our environmental performance are part of its day-to-day concerns.

The Generation group also wishes to make its employees, partners and suppliers more accountable regarding the importance of preserving the environment.

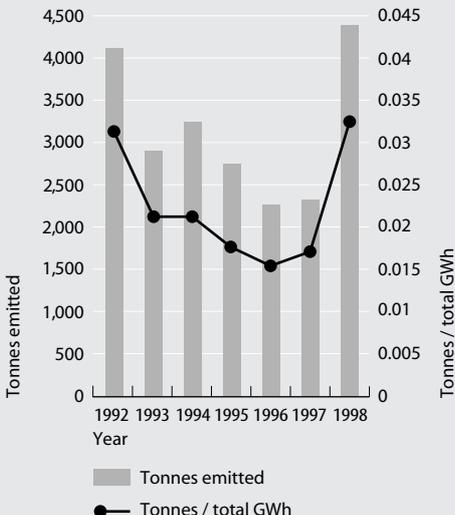
## Impacts of the Ice Storm

During the ice storm crisis, no generating equipment was damaged. However, since the transmission lines connecting certain hydroelectric generating stations to the distribution system were out of service, some thermal generating stations had to run for longer than usual. For example, to meet demand, Tracy generating station operated on an emergency basis for about a month, with four generating units running. In addition, La Citière power plant generated 47,620 MWh in 1998 compared with 1,100 MWh in 1997. The impacts of the ice storm on the Generation group consequently resulted in an increase in CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>x</sub> emission levels.

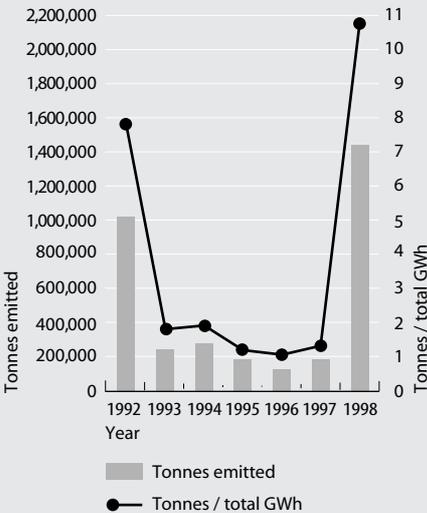
Estimated Atmospheric Emissions of Hydro-Québec's Thermal Generating Stations



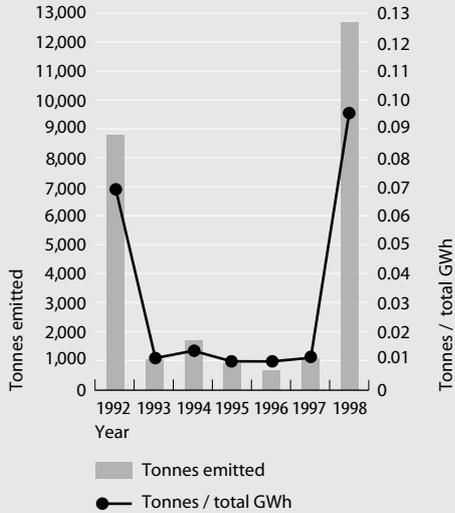
NO<sub>x</sub> Emissions



CO<sub>2</sub> Emissions



SO<sub>2</sub> Emissions



## **Environmental Management**

### **Progress of the Environmental Management System**

The Generation group's declaration of environmental principles was approved in 1998. The environmental aspects have now been identified for all our hydroelectric and thermal generating stations and our nuclear power plant. The legal stipulations and other requirements specific to these facilities are currently being listed. At the same time, environmental objectives, targets and action plans have been integrated into the 1999 business plan. Finally, all managers have been trained in ISO 14001 requirements.

EMS

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### **Significant Environmental Aspects**

The inventory of significant environmental aspects of the Generation group's generating stations allowed us to define the environmental issues associated with its operations, products and services. The principal areas for which we have identified significant environmental aspects are:

- management of residual hazardous materials and environmental discharge, including:
  - balance for quantities of oil and grease used and recovered;
  - equipment producing greenhouse gases and containing ozone-depleting substances;
  - drinking, waste and industrial water;
  - thermal discharge;
  - atmospheric emissions, according to type of fuel;
  - underground tanks.
- management of bodies of water and properties:
  - management of water flows and levels;
  - maintenance of access roads and generating facilities;
  - multipurpose use of properties.
- management of the environment:
  - integration of the environment into operations planning;
  - contingency plans in case of spills.

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### **Objectives, Targets and Action Plans**

In 1998, the Generation group set the objective of gradually implementing an EMS in compliance with ISO 14001 by the year 2000. This objective is part of the business plans of its various departments. The goal of the action plan is to continue the introduction and application of the EMS. More than 85% of the activities included in the 1998 plan have been carried out, with respect to manager training, management review and environmental inventories. The only activity that is somewhat behind schedule is the listing of legal stipulations; this objective will be reached in 1999.

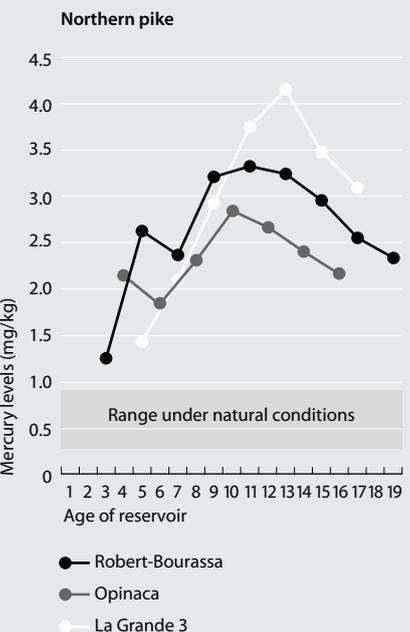
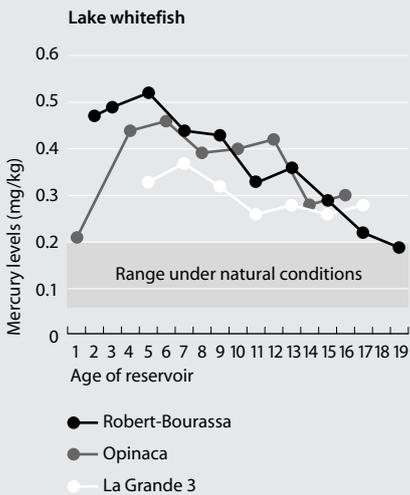
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### **Environmental Research and Monitoring**

The Generation group continued its applied environmental research and monitored the environmental effects of its reservoirs.

Research and monitoring	Context	Activity	Principal result or environmental benefit
Harlequin duck	Since 1990, the population in Eastern North America has been classified as an endangered species.	<ul style="list-style-type: none"> <li>Monitoring of migration of males.</li> <li>DNA analysis.</li> </ul>	<ul style="list-style-type: none"> <li>Findings confirm that the population frequenting Northern Québec is distinct from that on the east coast of the United States.</li> <li>The status of the species frequenting Northern Québec will likely be revised starting in the year 2000.</li> </ul>
American eel	Species in decline for about 15 years in Lake Champlain and Lake Ontario. Dams and generating stations may form obstacles to its migration.	<ul style="list-style-type: none"> <li>Monitoring of fishway built in 1997 at Chambly dam and installation of an electronic eel counter.</li> </ul>	<ul style="list-style-type: none"> <li>The fishway is very effective.</li> <li>Out of an estimated population of 17,209 eels, 57.4% apparently passed through the fishway.</li> <li>The margin of error associated with use of the electronic counter proved to be less than 2%.</li> </ul>
Lake sturgeon	Monitoring of spawning grounds downstream from Rivière-des-Prairies generating station.	<ul style="list-style-type: none"> <li>Second year of reproduction monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>Population estimated at 6,500 breeders, which produced 130 million eggs in mid-May 1998.</li> <li>Confirmation of suitable design of spawning grounds.</li> </ul>
Mercury	Management of risks to the environment and human health.	<ul style="list-style-type: none"> <li>Monitoring of fish mercury levels in Robert-Bourassa, La Grande 1 and La Grande 3 reservoirs.</li> <li>Fish consumption guide for people using the Robertson reservoir.</li> <li>Evaluation of health risks for anglers using the La Grande complex.</li> </ul>	<ul style="list-style-type: none"> <li>Confirmation of 1985 forecasts (see figures on page 22).</li> <li>The guide sparked great interest by users and explains how they may benefit from the nutritional value of fish while eliminating health risks.</li> <li>The health risks for anglers are low.</li> <li>Traditional methods of evaluating consumption overestimate levels of mercury exposure.</li> </ul>
Estuary environment	Measures for protecting banks in estuarine and marine environments.  Method for comparing northern estuaries.	<ul style="list-style-type: none"> <li>Proposal for implementing new methods of protecting banks with riprap.</li> <li>Standardization of methods.</li> <li>Analytic model with user's guide.</li> </ul>	<ul style="list-style-type: none"> <li>The Manicouagan regional county municipality and Hydro-Québec will be partners in setting up test facilities at sites on the Manicouagan peninsula.</li> <li>Quality control tool for collecting and processing physical data in estuarine environments.</li> </ul>
Integrated management according to drainage basin	The many different uses of bodies of water in a drainage basin may be a source of conflict related to hydroelectric generation.	<ul style="list-style-type: none"> <li>National and international survey.</li> <li>Case studies (Taureau and Gouin reservoirs).</li> <li>Calculation of fixed charges.</li> <li>Cartographic tools.</li> </ul>	<ul style="list-style-type: none"> <li>Eventual formulation of a reservoir management plan to harmonize the different uses.</li> </ul>
La Grande complex	Monitoring of reduced-flow rivers downstream from diversion structures.  Improvement of brook trout habitats in the Nécopastic and Achazi rivers, in connection with the La Grande-1 project.	<ul style="list-style-type: none"> <li>Monitoring of water and fish quality in the Eastmain and Opinaca rivers.</li> <li>Review of intermittent environmental monitoring for the past 20 years in the Caniapiscou and Koksoak rivers.</li> <li>Monitoring of effectiveness of remedial measures.</li> <li>Monitoring of brook trout population.</li> </ul>	<ul style="list-style-type: none"> <li>Fishing yields are higher than before diversion.</li> <li>Over all, the actual impacts observed are less than expected.</li> <li>The weirs are still in place.</li> <li>However, breeding grounds and shelters have deteriorated owing to flooding and ice action.</li> <li>The species makes little use of this environment.</li> </ul>
Gentilly-2 generating station	Environmental monitoring.  Radiological monitoring.	<ul style="list-style-type: none"> <li>Study of causes of fish mortality in the area of the tailrace canal during spring shutdowns in 1997 and 1998.</li> <li>Monitoring of radionuclides and <sup>14</sup>C.</li> <li>Monitoring of atmospheric tritium in surface and seepage water.</li> <li>Monitoring of critical group.</li> </ul>	<ul style="list-style-type: none"> <li>Search for a solution in cooperation with the Ministère de l'Environnement du Québec.</li> <li>The level of liquid and atmospheric waste is so low that an indirect method had to be used to evaluate doses in members of the critical group.</li> <li>Annual dose of 5.9 mSv, or 0.12% of the allowable dose, which is 5,000 mSv, and 0.3% of the annual dose of background noise.</li> </ul>

*Changes in mercury levels in the flesh of fish in reservoirs in the western sector of the La Grande complex*



## Environmental Activities

### Measures in Natural and Human Environments

#### Memorandum of Agreement on the Suroît Region

In June 1998, Hydro-Québec signed the memorandum of agreement on the Suroît region with the Beauharnois-Salaberry regional county municipality (MRC) and four municipalities along the St. Lawrence River which are part of the Vaudreuil-Soulanges MRC (Pointe-des-Cascades, Les Cèdres, Coteau-du-Lac and Les Coteaux). This agreement, to run for 20 years, covers the implementation of measures and improvements that will help enhance Hydro-Québec's installations and properties in the Suroît region, in particular:

- accessibility and management of bodies of water (construction of a spawning ground at Beauharnois and earlier flooding of Pointe-des-Cascades basin for boating and fishing);
- use and enhancement of certain Hydro-Québec properties (e.g., bicycle paths on Hydro-Québec properties and along the Beauharnois canal).

Most of the measures will be implemented between now and 2002 (bicycle paths, cleanup of a rock deposit at Melocheville, raising of the dike in the town of Les Cèdres), while others will be spread throughout the agreement (cleanup of aquatic plants at Les Cèdres, maintenance of water quality at Saint-Timothée, etc.).

This agreement also provides for a management contract between Hydro-Québec and the Beauharnois-Salaberry MRC. Under this contract, to run for 20 years, the MRC now manages some of the company's properties in its territory. The revenues are shared by Hydro-Québec and the MRC, to help the latter finance its regional park. Monitoring mechanisms acceptable to both parties have been instituted.

## Environmental Compliance

### Monitoring and Measuring

During 1998, the Generation group established various systems for monitoring and measurement activities. The results will be known only in 1999.

Following the recommissioning of two generating units in continuous mode at Tracy power plant, Hydro-Québec will resume operating its atmospheric emission sampling station. The measurement station is already operational. As for the meteorological data station, it is being set up and will be used for data analysis.

At the Manicouagan complex, we began drawing up waste-sampling protocols for each type of water-oil separator. These protocols will be completed in 1999 and applied in the year 2000.

### Environmental Compliance Evaluations

In the Manicouagan region, the Ministère de l'Environnement du Québec conducted an environmental compliance evaluation of 10 generating stations. Altogether, 42 anomalies were noted. The action plans established allowed 27 of them to be corrected in 1998, in less than eight months. These measures were designed mainly to improve the drinking water supply systems, treatment of waste and oily water, and management of residual hazardous materials. This exercise also enabled employees and managers to become aware of the potential impacts of generation operations on the environment.

In the region of the La Grande Rivière, five new compliance evaluations at the La Grande complex were completed, along with three in the Abitibi-Témiscamingue area. The program, which began in 1996 and called for a total of 13 evaluations, was thus concluded. The main findings concern the management of spills, residual hazardous materials, and drinking and waste water. The action plans were followed for all of these findings, resulting in a decrease in instances of environmental non-compliance.

### Infraction Notices

In April 1998, the Ministère de l'Environnement du Québec issued an infraction notice as a result of the execution, without prior authorization, of riverbed excavation with a backhoe. Once the representatives of the Ministère were on site, they ordered the work stopped and notified the responsible authorities. The Ministère requires that employees likely to perform this type of work be made aware of the measures to be taken to minimize its impacts. No significant environmental impact was noted. Training was therefore provided, according to the requirements stipulated in the infraction notice.



La Grande-3 generating station



Tracy generating station

### **Optimization of Generating Facilities**

Every year, Hydro-Québec devotes considerable efforts to integrating the environment into the maintenance and operation of its generating facilities.

Some examples are listed hereafter.

Site	Activity	Environmental result or benefit
Tracy thermal generating station	<ul style="list-style-type: none"> <li>• Modification of piping in fuel oil heaters in two units and installation of new heaters in another unit.</li> </ul>	<ul style="list-style-type: none"> <li>• Elimination of risk of oil spills in the St. Lawrence River.</li> </ul>
Chute-Bell generating station (refurbishing)	<ul style="list-style-type: none"> <li>• Construction of a boat ramp.</li> <li>• Installation of fences for public safety.</li> <li>• Recovery of equipment with heritage value and preservation of building architecture.</li> <li>• Maintenance of ecological flow of 3 m<sup>3</sup>/s from April to November.</li> </ul>	<ul style="list-style-type: none"> <li>• Improved access to facilities and multipurpose use of Hydro-Québec properties.</li> <li>• Preservation of architecture and appearance of local environment.</li> <li>• Protection of aquatic environment downstream from the facility.</li> </ul>
Reservoirs in Haute-Mauricie region	<ul style="list-style-type: none"> <li>• Application of a new reservoir management method designed to minimize impacts on lake trout reproduction.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring of effectiveness by consulting users; monitoring of breeding activities and scientific fishing yields.</li> </ul>
Armagh dam in Lower St. Lawrence region	<ul style="list-style-type: none"> <li>• Study of various scenarios for making the structure safe (reinforcement or demolition).</li> <li>• Chemical analysis of sediment in upstream reservoir.</li> </ul>	<ul style="list-style-type: none"> <li>• Choice of best scenario limiting impacts on the environment.</li> </ul>
La Grande-1 generating station	<ul style="list-style-type: none"> <li>• Location and monitoring of areas where floating peat bogs originate.</li> </ul>	<ul style="list-style-type: none"> <li>• Proposal of measures for keeping the remaining peat bogs in their original channels (100 ha).</li> <li>• Removal of peat bogs that have accumulated at the intake, and spreading out on a granular-deposit site provided near the generating station.</li> </ul>
La Grande-3 generating station	<ul style="list-style-type: none"> <li>• Removal of halon fire protection system.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction in use of ozone-depleting substances in generating facilities.</li> </ul>
La Grande-4 generating station	<ul style="list-style-type: none"> <li>• Reduction in lubrication frequency, to 10 injections twice a week, and interruption when generating units are shut down.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction of waste released into the environment.</li> <li>• Reduction of purchases and costs.</li> </ul>
La Grande-3 and La Grande-4 generating stations	<ul style="list-style-type: none"> <li>• Study to improve the efficiency of water-oil separators.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction of waste released into the environment.</li> </ul>
Dikes and dams at the La Grande and Manicouagan complexes	<ul style="list-style-type: none"> <li>• Testing of five new formulations to control vegetation.</li> </ul>	<ul style="list-style-type: none"> <li>• Search for more effective products that are less damaging to the environment.</li> <li>• Monitoring of effectiveness.</li> </ul>
Manic-5, Outardes-3 and Outardes-4 generating stations	<ul style="list-style-type: none"> <li>• Installation of systems for treating domestic sewage.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduction of waste released into the environment.</li> </ul>
Manic-2 generating station	<ul style="list-style-type: none"> <li>• Installation of a skimmer in the water-oil separator.</li> </ul>	<ul style="list-style-type: none"> <li>• Elimination of waste released into the environment.</li> </ul>
Témiscouata dam	<ul style="list-style-type: none"> <li>• Repair of fishway concrete.</li> </ul>	<ul style="list-style-type: none"> <li>• Fishway improvements carried out at a suitable time to ensure that fish continue to migrate upstream toward their spawning grounds.</li> </ul>

## New Projects

The Generation group is studying several major installations projects. The specialists are participating in joint studies with their colleagues in the Installations Projects division. These studies mainly concern Sainte-Marguerite-3 and Grand-Mère generating stations. The teams are also looking into optimization of the hydropower potential of the La Grande and Churchill Falls complexes; these studies are now in the preliminary phase. The table shown opposite lists the projects and indicates their progress.

Project	Progress
1. Generating station project on the Toulnostouc River	Project notice and feasibility study phase; studies suspended.
2. Project for optimizing the Betsiamites River basin: diversion of the Boucher, Manouane, Portneuf and Sault aux Cochons rivers	Project notice and feasibility study phase; studies suspended.
3. Generating station (micro-turbines) project on the Olomane River	Feasibility study.
4. Mégiscane project	Feasibility study; studies discontinued.
5. Tabaret project	Project phase; studies discontinued.

### 1. Generating station project on the Toulnostouc River

The Toulnostouc River empties into the Manicouagan River. Lac Sainte-Anne, a reservoir with an area of 213 km<sup>2</sup>, is located behind the dam, approximately 80 km from the confluence of the Toulnostouc and Manicouagan rivers. The project involves enlarging this reservoir by about 20 km<sup>2</sup> with a view to building a generating station. The technical and environmental studies have been suspended.\*

### 2. Project for optimizing the Betsiamites River basin

The project for optimizing the Betsiamites River basin covers the partial diversion of four rivers. The Portneuf and Sault aux Cochons rivers empty into the St. Lawrence River. The waters from their upper basins would be diverted to the Pipmuacan reservoir in the Bersimis complex. The Manouane River flows into the Péribonka, a tributary of Lac Saint-Jean. Part of its waters would be diverted to the Pipmuacan reservoir. Finally, the Boucher River, which empties downstream from Bersimis-2 generating station, would be diverted to the Outardes-3 reservoir. The technical and environmental studies have been suspended.\*

### 3. Generating station (micro-turbines) project on the Olomane River

The Olomane River is on the Lower North Shore. The proposed hydroelectric generating station would replace the output of La Romaine diesel generating station.

### 4. Mégiscane Project

The Mégiscane River is a tributary of the Bell River, itself a tributary of the Nottaway River, which empties into the southern part of James Bay. The project entails partially diverting the inflows of the upper portion of the Mégiscane into the Saint-Maurice drainage basin. The technical and environmental studies have been discontinued.\*

### 5. Tabaret project

Tabaret generating station would be located about 40 kilometres northwest of the town of Témiscaming, between the two outlets of Lac Kipawa; this reservoir has an area of 284 km<sup>2</sup> at its maximum level. The technical and environmental studies have been discontinued.\*

\* These projects have been either discontinued or suspended pending agreements between Hydro-Québec and the populations concerned.

mission

The mission of the TransÉnergie division is to transmit electricity and market the transmission capacity in accordance with the requisite quality standards and in compliance with current regulations. TransÉnergie must also ensure the durability and optimum growth of our assets, from a perspective of sustainable development. It is also responsible for marketing our products and services in areas related to energy transmission. As well, it controls energy movements on the transmission system under its responsibility, at the best possible cost, while complying with reliability and security requirements in effect.

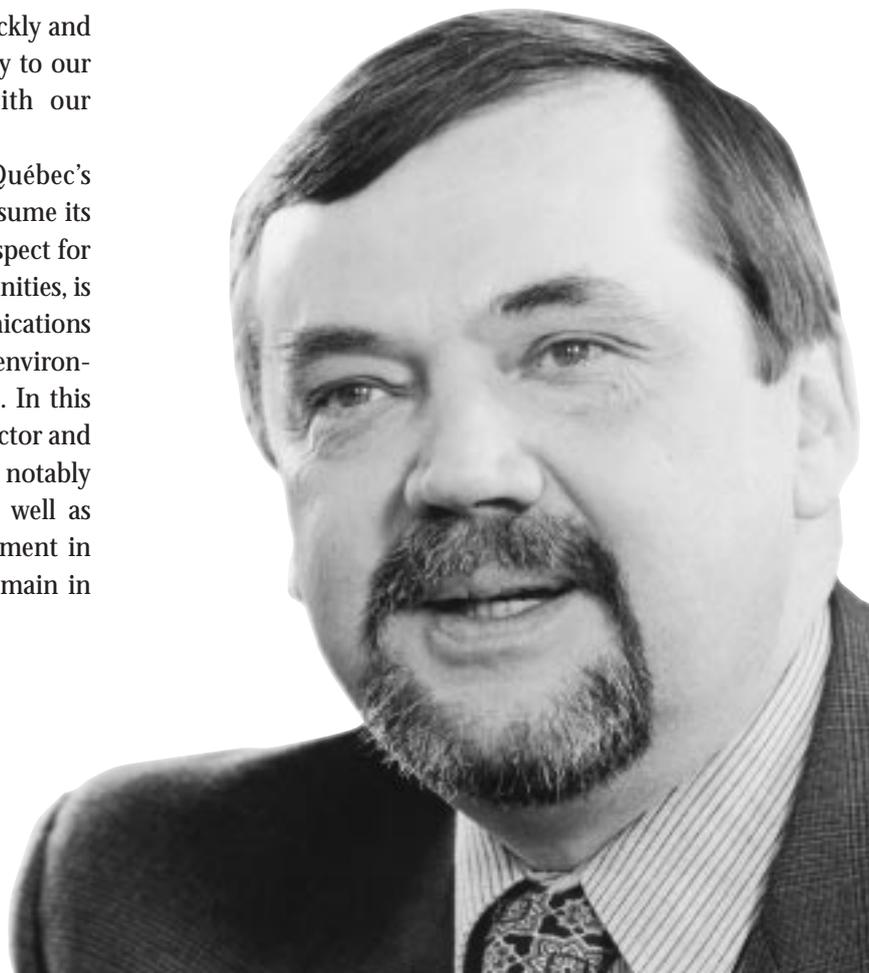
# Electricity Transmission

To carry out our mission, we conducted a variety of environment-related activities in the areas of installations planning, operations and maintenance.

The year 1998 was marked by an exceptional event that had a major impact on our business plan. The ice storm we experienced at the beginning of January compelled us to meet a great many unexpected challenges, in particular that of rebuilding the damaged portion of our transmission system. Our personnel mobilized quickly and found innovative solutions to restore power supply to our customers, taking constant care to comply with our environmental concerns.

TransÉnergie's contribution to Hydro-Québec's strategic orientations will allow the company to resume its growth and achieve a satisfactory performance. Respect for the environment, in cooperation with local communities, is the basic principle underlying our new communications strategy intended to increase awareness of the environmental qualities of Hydro-Québec's power system. In this regard, we took part in discussions with the farm sector and informed the public about our research projects, notably those concerning electric and magnetic fields as well as herbicide use. We consider this strategy an investment in the future, which will enable Hydro-Québec to remain in the forefront of the environment field.

**Jacques Régis**  
President of TransÉnergie



## Commitment of the Business Unit

TransÉnergie's 1998 actions and commitments are in line with the strategic orientations adopted by Hydro-Québec. For example, the division took part in research and development projects with a view to acquiring new environmental expertise.

In the implementation of its communications strategy, TransÉnergie's activities focused on the following points:

- participation in discussions with the farm sector, through Hydro-Québec's liaison committee and the Union des producteurs agricoles (UPA);
- information provided to target publics on transmission R&D projects related to the environment and, more specifically, electric and magnetic fields;
- publication of brochures on herbicide use;
- implementation of an action plan for establishing an environmental management system in compliance with ISO 14001.

In addition, TransÉnergie made official its objective of having its environmental management system registered as ISO 14001-compliant by the year 2002.

## Impacts of the Ice Storm

The ice storm of January 1998 caused considerable, but local, damage to transmission system infrastructures. The environmental impacts of this natural disaster are essentially linked to the major failures that affected the transmission system and required line repairs or reconstruction. Moreover, since the outages chiefly affected transmission system circuits serving substations south of Montréal, it was rural agricultural areas that were the hardest hit. The fact that the work was carried out in winter, on frozen ground, lessened the environmental impacts considerably, however.

From the outset of these operations, TransÉnergie stated its desire to take the company's environmental obligations into account. To that end, it compiled all the information deemed necessary for site restoration: property damage, equipment and materials left on the sites, ditches filled in to allow the operation of equipment, possibly compacted soils, as well as poles left on the ground on farmland and woodlands. More than 500 people were involved in recovering materials from damaged lines.

In light of the lessons learned from this storm, we plan to keep up and improve our data collection program in order to have even more complete information. The primary objective of this exercise is the integration of environmental concerns and measures that are essential to Hydro-Québec's emergency plan.

## Environmental Management

### Progress of the Environmental Management System

EMS

In view of the importance of the environmental issues surrounding the installation and maintenance of transmission facilities, TransÉnergie continued the implementation of its environmental management system which it began in 1997. During 1998, two manuals were written, one on the EMS itself and the other on system procedures. The environmental aspects concerning line and substation maintenance were identified. In addition, the work of the various implementation teams got under way.

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### **Significant Environmental Aspects**

TransÉnergie undertook an inventory of substation and overhead and underground line maintenance activities in 1998. Less than 12% of these activities present significant environmental aspects and impacts. The main areas are:

#### **Major significant aspects**

- Management of hazardous materials and discharge into the environment
- Management of contaminated soil
- Management of equipment noise
- Modification of land – soil, hydrography and topography
- Presence of equipment
- Use of pesticides

#### **Major significant impacts**

- Water contamination
- Soil contamination
- Sound nuisance
- Deterioration or loss of wildlife habitats
- Disruption of normal activities in the right-of-way
- Contamination of wildlife and vegetation
- Slope erosion and instability
- Conflicting uses



*Substation with sound barrier*

### **1998 Objectives, Targets and Action Plans**

With a view to sustainable development, TransÉnergie has adopted an action plan to implement an EMS that will gradually meet ISO 14001 requirements. Continued implementation of the EMS was therefore one of TransÉnergie's objectives. Deployment of this system began in 1997 and should be completed by 2002. In 1998, TransÉnergie conducted a specialized evaluation of nine substations in its territory and completed its self-evaluation program for the compliance of all its transmission substations.

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### **Environmental Research and Monitoring**

In the environmental area, TransÉnergie's Transmission Expertise and Technical Support department is responsible for the consistency of the division's environmental activities and the management of expertise and monitoring. The main research programs that took up TransÉnergie's attention in 1998 concern the following environmental aspects.

#### **Noise Management**

Electrical substations are the main source of sound nuisance, owing to their number and their location in inhabited areas. To limit their effects on the quality of the environment, TransÉnergie applies noise standards to its installations. For example, the levels of noise produced by new substations in residential neighborhoods must not exceed 40 dBA at night, and 45 dBA during the day.

Furthermore, TransÉnergie is developing and evaluating noise measurement and forecasting tools. In 1998, it finished its survey of noise-calculation software programs and acquired a new sound-simulation tool complying with the latest ISO standards. TransÉnergie is also instituting appropriate noise-reduction measures to control acoustic impacts. It favors noise reduction at source through the purchase of appropriate equipment, construction of sound barriers and installation of sound-absorbing walls in many substations.

For all substation projects in inhabited areas, TransÉnergie conducts an acoustic impact study and monitors the projects to ensure that its noise regulations are followed.

It emphasizes proactive noise management. In 1997 and 1998, it proposed a noise-evaluation program for 66 substations in and around urban areas. This program had two main objectives:

- establish acoustic protection perimeters around the facilities;
- convey this information to the MRCs so that they can integrate TransÉnergie's concerns into their local development plans and avoid problems resulting from the construction of homes on land where sound levels are too high.

To find new ways to reduce noise, TransÉnergie is working with the Université de Sherbrooke's acoustic research group on a project for actively controlling transformer noise. This \$200,000, two-year project will conclude in 1999. The research findings could lead to the development of a new, innovative technique for active noise control.

## Electric and Magnetic Fields

Exposure to electric and magnetic fields (EMFs) is an environmental issue linked to the construction of new power lines, refurbishing of existing lines and system operation in energy transfer mode. Public consultations on the installation of new high-voltage lines for the downtown Montréal, Montérégie and Outaouais loops brought out the importance that interested parties attach to potential EMF impacts. The company's specialists took an active part in these consultations. They presented current knowledge in the field and the specific exposure profiles for each high-voltage line, and answered questions raised by the participants.

The adoption of the company's action plan, in June 1986, gave rise to research intended to better characterize EMF impacts on the environment and on the health of the local population and Hydro-Québec employees. A multidisciplinary team made up of engineering, medical and environmental experts is responsible for constantly monitoring developments in this area.

### **State of EMF Research**

*In 1998, Hydro-Québec's research institute (IREQ) developed a cartographic software program on exposure to magnetic fields in residential neighborhoods. This innovation was presented at the conferences of the Canadian section of the Institute of Electrical and Electronics Engineers (IEEE). EMF-related issues have impacts on an international scale. The main organizations that examined this issue during the year are:*

- *the International Conference on Large High Voltage Electric Systems and the International Commission for Non-Ionizing Radiation Protection, on the subject of exposure limits;*
- *the National Institute of Environmental Health Sciences (NIEHS), regarding impacts on public health;*
- *the World Health Organization, with respect to research orientations for reducing scientific uncertainty.*

*The company's specialists are in contact with representatives of these organizations in order to keep up to date on developments concerning this social issue.*

*International research has reached a pivotal stage today. Following the adoption of the Energy Act Policy by the U.S. government in 1992, the EMF research program ended in December 1998. With a total investment of US\$50 million, this program intensified the scientific effort to improve current knowledge. The relevance of whether to pursue the research will be evaluated in light of the U.S. Department of Energy and NIEHS reports.*



Herbicide application

## Herbicides and Vegetation Control

### *Integrated Vegetation Control*

To ensure the reliability of its system, TransÉnergie must control vegetation that is incompatible with the operation of its transmission lines and transformer substations. Rights-of-way alone cover more than 135,000 hectares of land. Like other Canadian and American electric utilities, TransÉnergie favors three approaches:

- mechanical intervention;
- selective application of herbicides;
- management practices.

TransÉnergie applies various approaches to control vegetation. Its choices are based on criteria pertaining to the environment, effectiveness, safety, health and economics. One constant emerges: it always takes into account the surrounding environment and the use of the right-of-way. In short, TransÉnergie favors the right approach, in the right place and at the right time.

An environmental appraisal of these approaches demonstrates that herbicides can be used without jeopardizing public health and safety, while also protecting the environment. Selective herbicide use leads, in the long term, to a reduction in the density of incompatible vegetation (trees) in rights-of-way.

The medium-term objective of our programs for vegetation control in rights-of-way is to establish and maintain low-growing plant species that are compatible with system operation. This integrated vegetation control concept has found widespread favor with Canadian and American companies that manage such corridors (oil and gas pipelines, electrical power lines, railways, etc.).

### *Herbicide Use in Power Line Rights-of-Way*

Area	1997		1998	
	Mechanical cutting (ha)	Selective application of herbicides (ha)	Mechanical cutting (ha)	Selective application of herbicides (ha)
North	2,569	1,612	3,129	2,785
South	2,086	—	2,727	—
East	2,307	2,961	2,192	2,637
West	709	2,290	649	1,831
<b>Total per type of treatment</b>	<b>7,671</b>	<b>6,863</b>	<b>8,697</b>	<b>7,253</b>
Proportion	53%	47%	55%	45%
<b>Total area treated</b>	<b>14,534</b>		<b>15,950</b>	

Source: Hydro-Québec

An environmental impact assessment is made prior to all vegetation control operations in order to identify sensitive features of the local environment (streams, wildlife habitats, etc.). TransÉnergie assigns to each a protective perimeter, or zone within which special measures are applied.

Lastly, for several years TransÉnergie has been working closely with Québec's Ministère de l'Environnement to develop tools for improving practices related to herbicide use (guide to sound practices, herbicide management code, working committees, etc.).

#### **Research and Development**

In the field of integrated vegetation control, R&D in 1998 dealt mainly with the following aspects:

- technical and environmental comparison of the different herbicides usable in rights-of-way and around substations;
- validation of various approaches that minimize herbicide use;
- changes in vegetation in rights-of-way under different approaches;
- environmental role of waterside protective strips;
- further development of Myco-Tech brand biological herbicide.

#### **Environmental Activities**

##### **Measures in Natural and Human Environments**

In 1998, TransÉnergie carried out the first phase of studies concerning vegetation screens and biodiversity in power line rights-of-way in northern environments. The purpose of these studies is to evaluate biodiversity in rights-of-way as a function of the surrounding environment.

#### **Environmental Compliance**

##### **Environmental Compliance Evaluation**

###### **Self-evaluations of substations 100% complete**

TransÉnergie completed the environmental compliance evaluation of all its substations in 1998. The facility manager is personally responsible for conducting this evaluation. It involves measuring the degree of TransÉnergie facilities' compliance with the laws and regulations in effect in Québec, as well as with Hydro-Québec's requirements concerning management of contaminants, noise, wildlife and vegetation, among other elements.

###### **Nine substations subjected to specialized evaluation**

In 1998, TransÉnergie carried out a specialized evaluation of nine of its substations. A team of internal auditors conducts these evaluations, which examine the facility's environmental aspects as part of the program of technical audits. In the course of this exercise, various environmental aspects, including management of records, hazardous materials and spills, were identified as calling for improvement.

Each of the specialized evaluations was completed by an action plan specific to the facility in question. This plan contains the problems noted, the recommended improvement measures, the name of the person in charge and a timetable.



*Du Tremblay substation, Longueuil*

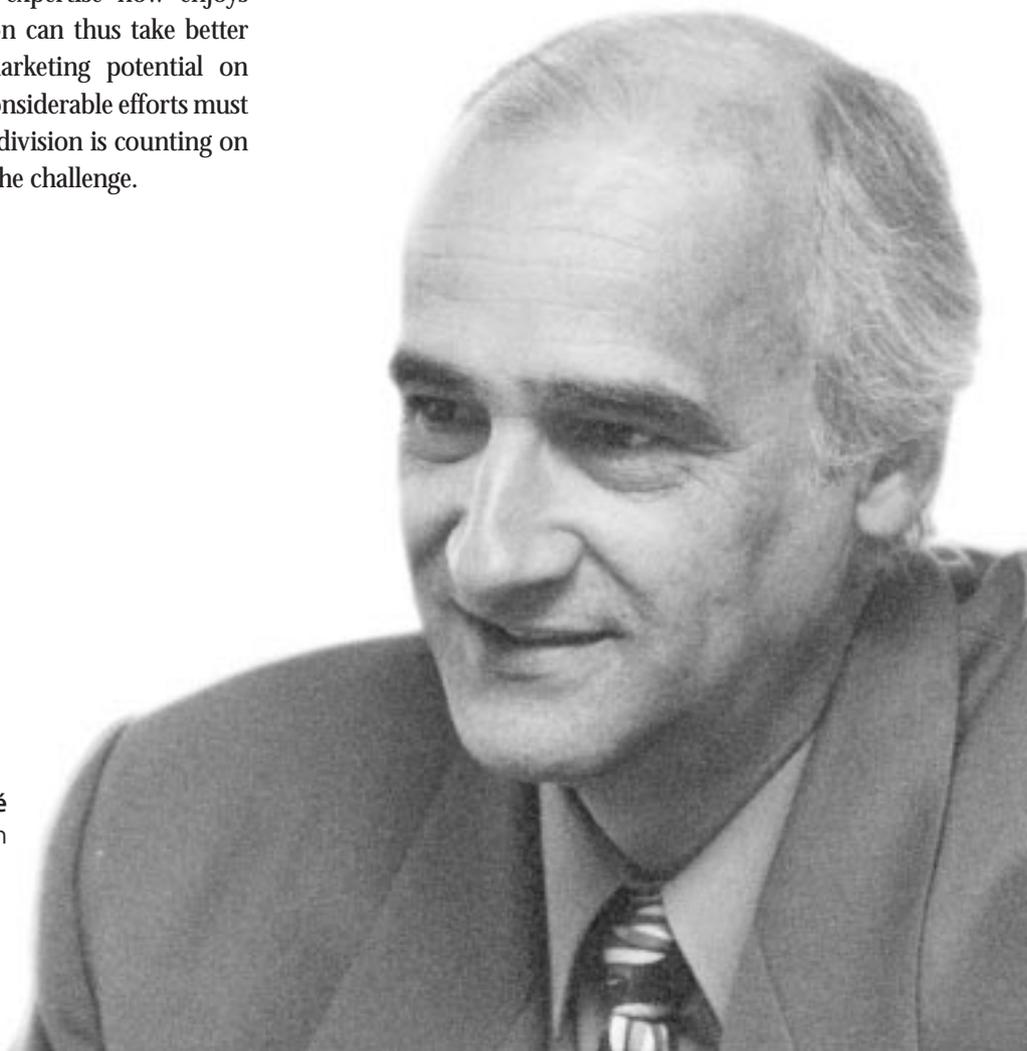
mission

Hydro-Québec's direction principale Distribution (Distribution division) is responsible for carrying out investment projects and maintenance plans with a view to optimizing the distribution system and improving service quality at the lowest possible cost and with due respect for the environment. The division is in charge of customer power supply projects and requests from third parties. The distribution system supplies more than 3.4 million residential, agricultural, general, institutional and industrial customers in 1,497 cities and towns in Québec. The system covers more than 105,700 km, nearly 9% of it underground, for assets totaling more than \$8 billion. Distribution is also responsible for operating the 24 off-grid thermal generating stations and Lac-Robertson hydroelectric generating station.

# Electricity Distribution

The Distribution division has made a commitment to institute an environmental management system (EMS) that complies with the ISO 14001 model. This approach increases managers' environmental accountability and obliges them to integrate this aspect into day-to-day management. As a result of this initiative, its environmental expertise now enjoys international recognition. The division can thus take better advantage of distribution-related marketing potential on national and international markets. Considerable efforts must be made to achieve this goal, and the division is counting on all its employees to successfully meet the challenge.

**Roger Bérubé**  
General Manager Distribution



## Commitment of the Business Unit

### Declaration of Principles

The Distribution division put its commitment into concrete form by adopting a declaration of environmental principles in June 1998. The declaration sets out its environmental values and the measures it plans to implement so as to improve its performance in the following areas:

- sustainable development;
- strict management and continuous improvement of its environmental performance;
- environmental research;
- communications with its employees and the public;
- relations with its partners and customers.

## Impacts of the Ice Storm

At the height of the ice storm in January 1998, nearly 1.4 million customers – 40% of all customers of the Distribution division – were without electricity in 733 cities and towns in Québec. More than 3,400 km of distribution lines were damaged. To restore power, 7,700 km of medium-voltage conductors, 1,500 km of low-voltage conductors, 16,250 poles and 4,767 transformers had to be replaced. The system was completely restored by October 1998.

The chief environmental consequences of this event were spills of insulating oil resulting from breaks in a large number of distribution transformers, the impact on vegetation, which caused many interruptions in service, the recovery of materials left in the field and, finally, the restoration of sites after the storm.



The Distribution division took advantage of this exceptional opportunity for analysis to undertake studies on monitoring the behavior of vegetation after an ice storm and on emergency measures.

## Environmental Management

### Progress of the Environmental Management System

In 1998, the Distribution division set up implementation teams in all its regions. This mobilization of personnel enabled it to define its declaration of environmental principles and to set objectives and improvement targets for environmental performance. The various regions also defined the significant environmental impacts related to their activities, products and services, and established means of operational control. To that end, they drew up action plans that will be implemented during 1999. The adoption of a communications strategy will help ensure effective dissemination of the elements of the EMS to personnel, notably through newsletters circulated by the division's operations units.

### **Management of Significant Environmental Impacts**

The main environmental issues related to Distribution and emanating from the lists of significant aspects concern:

- environmental integration of the distribution system;
- management of contaminants;
- recovery, reuse and discarding of system components;
- environmental management of vegetation;
- impacts of work on customers' property.

In the case of thermal generating stations in off-grid systems, the issues relate to:

- assessment of environmental risks associated with facilities;
- protection of the environment in the event of contaminant spills in remote areas;
- restoration of contaminated sites;
- dismantling of certain facilities;
- management of residual materials.

### **Environmental Objectives**

To improve its environmental performance, the Distribution division incorporated the following environmental objectives into its 1998 business plan:

- implement an environmental management system in compliance with ISO 14001 by the year 2000;
- reduce property damage and the number of claims;
- recover and reuse treated wood poles;
- increase the proportion of projects undergoing an internal environmental assessment (IEA) and evaluate the satisfaction of customers affected by these projects.

### **Management by Objectives and Performance Indicators**

In 1998, some of these issues were expressed as performance targets and objectives.

Issue	Action plan	Indicator	1998 target	1998 result
Comprehensive management of the environment	• Implementation of an environmental management system in compliance with ISO 14001.	• Percentage of EMS compliance with ISO 14001 benchmark.	Not applicable	42%
Environmental integration of distribution system	• Conducting of environmental assessments for the projects. • Satisfaction of customers affected.	• Percentage of projects undergoing an IEA.	90%	84% <sup>1</sup>
		• Rate of customer satisfaction.	80%	86%
Recovery, reuse and discarding of system components	• Recovery and reuse of treated wood poles.	• Percentage of poles returned to storage yards compared with number of poles removed from the system.	90%	46% <sup>2</sup>
		• Percentage of poles reused compared with number of poles returned to storage yards.	10%	11.5%
Impacts of operations on customers' property	• Reduction in property damage. • Reduction in claims.	• Instances of property damage.	860	480
		• Number of claims.	135	202 <sup>1</sup>

1. This performance below the target set is explained by the current restructuring, which delayed the progress of certain matters, especially those related to the action plans.  
2. This new activity was in the implementation phase in 1998. Since data collection and activity monitoring were being developed, it was impossible to achieve the target in the first year of implementation of this action plan.

## Management of Research Programs

Other issues were the focus of research programs.

Issue	Focus of Research	Principal Activities
Restoration of contaminated sites	<ul style="list-style-type: none"> <li>Contaminated sites and soils</li> </ul>	<ul style="list-style-type: none"> <li>Application of the Québec Ministère de l'Environnement policy on soil protection and rehabilitation of contaminated sites.</li> <li>Evaluation and classification of sites.</li> <li>Procedure for evaluating dangers and risks.</li> <li>Evaluation of characterization and treatment technologies.</li> </ul>
Management of contaminants	<ul style="list-style-type: none"> <li>Wood preservatives</li> </ul>	<ul style="list-style-type: none"> <li>Pole location criteria.</li> <li>Evaluation of dangers and risks.</li> <li>Evaluation of mitigative measures to reduce leaching and contamination.</li> <li>Dismantling of lines, recovery, reuse and recycling of used poles.</li> </ul>
Environmental integration of distribution system	<ul style="list-style-type: none"> <li>Landscaping and land use planning</li> </ul>	<ul style="list-style-type: none"> <li>Integration of system into heritage areas.</li> <li>Visual simulation.</li> <li>Land use planning and subdivision.</li> <li>Study of facilities design and new distribution techniques.</li> </ul>
Environmental management of vegetation	<ul style="list-style-type: none"> <li>Management of vegetation</li> </ul>	<ul style="list-style-type: none"> <li>Research on more environmentally friendly approaches to vegetation control.</li> <li>Structuring of plant growth.</li> <li>Restoration of plant cover.</li> <li>Management of clearing and pruning waste.</li> </ul>

## Risk Analysis

Risk assessment techniques facilitated decision making in environmental matters, especially for restoration of contaminated sites, environmental assessment and development of mitigative measures. Risk assessment provides a systematic operations framework based on scientific principles that allow a better understanding and management of various risks related to health and the environment.

To accurately assess the risks associated with its activities, Hydro-Québec conducted two studies in 1998, one on the ecotoxicological risk of a storage yard for treated poles and the other on contaminated sites.



*Soil characterization in a storage yard for PCP-treated poles*

## **Environmental Monitoring**

In 1998, the Distribution division continued its environmental monitoring activities for the following projects.

<b>Project</b>	<b>Environmental monitoring activities</b>
Lac-Robertson hydroelectric generating station	<ul style="list-style-type: none"><li>• Changes in water quality, fish populations and mercury concentrations.</li><li>• Potential for survival by Salmonidae in the outlet channel in winter 1997-1998.</li><li>• Inventory of waterfowl population in 1997-1998.</li></ul>
Île aux Coudres underwater crossing	<ul style="list-style-type: none"><li>• Restoration of site of buried underwater cable.</li></ul>
Restoration of site of former gas power plant on Verdun Street, in Québec City <sup>1</sup>	<ul style="list-style-type: none"><li>• Monitoring of groundwater quality.</li></ul>
Former Îles-de-la-Madeleine power plant <sup>1</sup>	<ul style="list-style-type: none"><li>• Air quality measurement system: measurement of suspended particles in the air from May 1997 to April 1998.</li><li>• Restoration of groundwater table: review after 95 months of operation.</li></ul>
Regional operating activities	<ul style="list-style-type: none"><li>• Energy recovery of pruning chips.</li><li>• Monitoring of herbicide application and vegetation maintenance activities.</li></ul>
Distribution system projects (IEA)	<ul style="list-style-type: none"><li>• Monitoring of mitigative measures recommended as part of the IEAs of 60 projects.</li></ul>

1. See also the section on site restoration, on page 40.

## **Monitoring of Contamination of Underground Structures**

*The issue of monitoring cases of contamination of underground structures is of particular concern to the urban region of the Island of Montréal, where the underground system comprises some 20,000 structures. We have therefore developed certain tools for listing and monitoring structures that have already been contaminated.*

*A database containing information on the steps taken by firms specializing in cleanup enables us to reconstruct the contamination history of a structure, record the operations and the actions taken to determine the source and ensure that the problem has been solved. In 1998, 35 new cases of infiltration of contaminants were recorded on the Island of Montréal. The monitoring of these events depends on the type of product found, the quantities and the information gathered in subsequent inspections. Since 1990, about 1,100 cases of contamination have occurred in more than 830 structures. Cleanup costs totaled \$1.5 million. The search for the source of contamination requires the cooperation of various authorities in the municipalities and government departments concerned.*

*In addition, some parts of the island, where industrial concerns have been established for decades, present serious histories of soil contamination. Operation of an underground system in these conditions therefore requires special attention. For example, in the area of the refineries in the east end of Montréal, buried cables and connections have to be made of materials that are resistant to petroleum products. The Environment team has therefore drawn up a detailed map of this area, in order to make a host of useful data available to workers and planners.*

## Environmental Activities

### Measures in the Natural Environment Vegetation

As part of the extensive public awareness campaign on trees, *Le bon arbre au bon endroit*, which Hydro-Québec launched in 1986, the Environment unit published a guide to ornamental trees and shrubs in 1998. This publication, titled *Répertoire des arbres et arbustes ornementaux*, presents an inventory of more than 1,200 species and varieties found in Québec and is intended for all the company's customers.

Numerous specialized studies were also carried out in 1998. The subjects covered concern management of clearing waste resulting from distribution-line maintenance, evaluation of measures taken in rights-of-way, and approaches to apply to vegetation in case of emergency repairs.

Following the ice storm, a number of public awareness campaigns were conducted to inform the public of Hydro-Québec's approaches to management of vegetation, as well as ways of avoiding incompatibility between vegetation and public utility infrastructures.



### The Lessons of the Ice Storm

*The ice storm of January 1998 allowed us to verify the relevance of the mitigative measures proposed in a study conducted in 1997. This study examines methods used for trees in connection with emergency repairs, in particular after freezing rain.*

*The principal measures recommended concern the behavior of overhanging branches, which are the main cause of service interruptions on distribution lines. The findings and analyses concerned the relationship between power outages and trees, suitable tree maintenance measures and management considerations.*

*Forecasts of freezing rain are the first line of defence recommended by the study. It also suggests a number of other measures likely to reduce risks, such as the elimination of species highly sensitive to freezing rain and a review of the treatment of branches overhanging primary conductors.*

*On the basis of the study findings, it seems possible to considerably strengthen the distribution system's resistance to the impacts of extreme climatic phenomena.*



Avenue du Colisée, Québec City – looking north

## Measures in the Human Environment

### *ORIEL Program*

In 1998, Hydro-Québec made its catalogue of ORIEL products available to the various municipalities in order to continue to offer them a selection of distribution system components that are better integrated into the environment. A few projects were carried out in certain Québec municipalities, such as Québec City and Boucherville, which installed steel poles that are more visually pleasing than traditional wood poles.

### **Subdivision Guide**

*In cooperation with the Union des municipalités du Québec and Bell Canada, Hydro-Québec put together a guide titled Lotissements et réseaux de distribution : guide des bonnes pratiques. The guide suggests practices fostering more harmonious integration of distribution systems in new residential subdivisions. It is intended for Bell Canada and Hydro-Québec personnel in charge of distribution system design, for municipal managers and for firms responsible for drawing up subdivision development plans. Presented in the form of thematic data sheets, the guide discusses the potential obstacles encountered by new subdivisions and proposes simple, original procedures to facilitate better integration of distribution systems into the environment. Application of these practices will lead to a decrease in the number of poles and devices needed for power supply and telecommunications service.*

**Internal Environmental Assessments**

During 1998, the IEA process was standardized to adapt it to the ISO 9001 quality system being implemented by the Distribution Projects department.

The division also began applying a new quality indicator focusing on customer satisfaction with distribution projects. This indicator will be combined with the performance indicator used to determine the number of projects that have undergone an IEA.

The purpose of the IEA is to systematically incorporate environmental concerns into planning, construction, modernization and maintenance operations on Hydro-Québec's distribution system.

**Customer Satisfaction Indicator**

Some 711 respondents completed a questionnaire on customer satisfaction with Distribution projects. The results are presented in the figure shown to the right.

**Management of Contaminants**

**Management of Residual Hazardous Materials**

To comply with the new regulations published by Québec's Ministère de l'Environnement on the management of hazardous materials, 39 residual hazardous material recovery sites were set up in 1998, intended for line workers, splicers and other distribution employees. Personnel will be trained, so that these sites can be used properly and effectively.

**Energy Recovery of Used Oil from Thermal Generating Stations**

The energy recovery of used motor oil from Kuujjuarapik thermal generating station continued in 1998. Some 2,920 litres of used oil was recovered. The goal of this initiative is to reclaim used motor oil from the generating station to meet the heating needs of an adjacent warehouse.

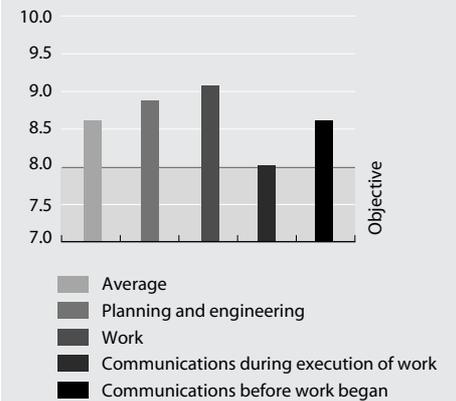
**Soil Decontamination**

**Research Findings**

In 1998, research on soil decontamination led to the development of two highly promising products.

- One study gave rise to the development of a method for rapid, reliable characterization of soils contaminated by insulating oil. Applicable both in the field and to diesel-contaminated soils, it will permit a reduction in the time required to obtain laboratory test results.
- A pilot project conducted at Îles-de-la-Madeleine thermal generating station allowed us to verify the effectiveness of a treatment concept developed in 1997 by the École polytechnique de Montréal's Industrial Chair in Site Bioremediation. A small quantity (< 1 m<sup>3</sup>) of diesel-contaminated soil is placed in special container and treated with hot air released by the power plant. The results are conclusive and indicate that the process could be applied to our thermal generating stations.

**Overall customer satisfaction indicator: Quality of work and environmental integration of projects**



**Indicator: Distribution projects that have undergone an IEA**



### Site Restoration Work

- **Gas plant on Verdun Street**

In 1998, Hydro-Québec completed its monitoring program for groundwater quality at this site. This commitment was part of the provisions of the authorization certificate for the restoration of the site, issued by Québec's Ministère de l'Environnement. The work is now finished. Hydro-Québec will discuss the future use of the site with the city of Québec and the Ministère.

- **Thermal generating stations**

Restoration work continued at Îles-de-la-Madeleine and L'Île-d'Entrée thermal generating stations, on the Îles-de-la-Madeleine, as well as at Port-Menier, on the Île d'Anticosti.

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### Environmental Compliance

#### Monitoring and Measurement

Monitoring activities in 1998 mainly concerned the archaeological aspects of projects involving construction of underground systems in Québec City. In Montréal, the joint study committee, in which the Commission des services électriques de la ville de Montréal, the city of Montréal and Hydro-Québec participate, examined 27 projects, five of which were the subject of archaeological measures. These consisted of studies of the projects' potential and construction monitoring.

### Decontamination Projects under Way at the End of 1998

Site and type of intervention	Volume to be treated	Volume removed and treated in 1998	Volume removed and treated to date	% of total volume to be treated	Cost to date (\$M)	Scheduled end
L'Île-d'Entrée Soil decontamination	9,900 m <sup>3</sup>	R: 1,100 m <sup>3</sup> T: 1,500 m <sup>3</sup>	R: 9,900 m <sup>3</sup> T: 7,500 m <sup>3</sup>	100 % 76 %	3.5	1999
Îles-de-la-Madeleine (Cap-aux-Meules) Soil decontamination	56,500 m <sup>3</sup>	R: 13,000 m <sup>3</sup> T: 16,000 m <sup>3</sup>	R: 56,500 m <sup>3</sup> T: 48,000 m <sup>3</sup>	100 % 85 %	10.8	1999
Îles-de-la-Madeleine (Cap-aux-Meules) Groundwater restoration	20,000 L of oil to be recovered	100 L recovered	10,800 L recovered to date	54 %	5.6	Ongoing
Île d'Anticosti (Port-Menier)	8,700 m <sup>3</sup>	R: 1,600 m <sup>3</sup> T: 1,600 m <sup>3</sup>	R: 6,300 m <sup>3</sup> T: 4,100 m <sup>3</sup>	72 % 47 %	1.3	2001

R = removed    T = treated

### Restoration of Plant Cover

Under various regulations, Hydro-Québec is required to develop plant cover restoration techniques that are adapted to the different environments and can ensure adequate regrowth of vegetation. By way of example, a recent regulation stipulates that it is now mandatory to restore certain areas with commercial species and ensure their growth for a period of eight years after completion of construction.

Certain regulations oblige Hydro-Québec to set restoration objectives that are difficult to achieve with the usual techniques, since the sites affected by its activities are generally not very favorable to the growth of species termed commercial.

The company is therefore working to develop restoration techniques that foster commercial species. A number of experiments under way throughout the company's territory focus mainly on the use of poplar, pine and spruce in combination with various silvicultural treatments. The preliminary results point to adequate regrowth and sufficient maintenance of seedlings to comply with the regulations.

### Infraction Notices

Following a visit to the electrical equipment shop in Saint-Hyacinthe, the Ministère de l'Environnement du Québec issued an infraction notice on September 23, 1998. The representative of the Ministère had noted irregularities relating to application of the *Regulation respecting hazardous materials*. The notice concerned a tank containing used mineral oil. By the end of October 1998, corrective action had been taken.



Alder and spruce

mission

The mission of the direction principale Projets d'équipement (Installations Projects division) is to supply its customers with project management services for new or refurbished installations. It is also responsible for providing them with project management guidelines from a perspective of competitiveness and sustainable development.

# Installations Projects

The exceptional events of 1998 enabled the division's employees to meet new challenges. Very quickly, we developed new procedures for carrying out activities including high-voltage line projects designed to increase the security of Québec's power supply.

In addition to the environmental studies stemming from the ice storm, Installations Projects ensured that all environmental aspects of its projects and operations were evaluated and managed at all phases of implementation. It also began establishing work processes that facilitate the effective hand-over of environmental commitments, from the draft design phase to construction.

Lastly, the division was involved in implementing the ISO 14001 environmental management system.

**Michel Clair**  
Executive Vice President  
International Affairs and Projects



## Environmental Management

### Progress of the Environmental Management System

As of the end of 1998, Installations Projects had completed the first version of the record of its activities covering environmental aspects and impacts, along with an inventory of environment-related legal cases. It also put together a newsletter for its employees, three issues of which were published and circulated during the year. The division is further in charge of ensuring that the EMS is implemented in line with the ISO 9001 standard.

## Projects under Way

### Reinforcement of the Transmission System

The ice storm that struck Québec at the beginning of January 1998 caused power failures on an unprecedented scale. Nearly half of Hydro-Québec's customers, mainly in the Montérégie, Outaouais and Montréal regions, were without electricity.

To avoid a recurrence of this situation, Hydro-Québec has adopted a targeted approach of system reinforcement, after studying several options. The company consequently carried out the following projects:

- loop of the Montérégie high-voltage system;
- loop of the Outaouais high-voltage system and construction of an interconnection with the Ontario grid;
- loop of the downtown Montréal high-voltage system.



Aqueduc – Atwater line

To ensure that these projects are implemented with due respect for the environment and local communities, Hydro-Québec conducted environmental impact studies in 1998. These studies allowed it choose line routes and substation locations with a view to optimum integration of technical and economic criteria while also respecting the environment. To that end, the company worked with the principal stakeholders concerned by these projects, in particular the Union des producteurs agricoles, the various regional county municipalities, the municipalities, the Ministère de l'Environnement du Québec, the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec, the Commission de protection du territoire agricole du Québec and groups representing local interests. At the conclusion of these studies, Hydro-Québec applies standard mitigative measures to minimize the impacts of its projects and proposes specific measures on the basis of project characteristics. In addition, the company conducts environmental monitoring of the work to ensure compliance with these measures.

Hydro-Québec also periodically publishes newsletters reporting on the progress of the work, construction methods used and environmental protection measures adopted, as well as the restoration of properties affected. This information is also accessible at Hydro-Québec's Web site ([www.hydroquebec.com](http://www.hydroquebec.com)). Finally, the *Info-projet* hot line was also started up to field requests for studies or complaints from interested parties.

### **The Montérégie Loop**

This loop project calls for the construction of the 735-kV Des Cantons – Saint-Césaire – Hertel line, covering 145 km, and of Montérégie substation. In 1998, Hydro-Québec began building the Des Cantons – Saint-Césaire section, which was to be completed in February 1999. After the Québec Superior Court issued an injunction, however, the company halted the work and postponed commissioning of the line.

Hydro-Québec applied a number of mitigative measures, including the acquisition of a woodlot between the right-of-way and a residential neighborhood, in order to create a permanent visual screen. Measures were taken in the woodlot, heavily damaged by January's ice storm, to preserve the viability of the trees.

The design of Montérégie substation takes environmental considerations into account in order to manage, at source, the impact of night-time lighting, noise and spills. The commissioning, scheduled for 2001, would conclude work on the Montérégie loop.

### **The Outaouais Loop**

This project involves construction of a 315-kV line covering 130 km between Grand-Brûlé substation, near Saint-Jovite, and Vignan substation, near Gatineau. Hydro-Québec is also negotiating with Ontario Hydro to build a 1,000-MW interconnection between the two systems to reinforce its own grid in the Outaouais region and to diversify Québec's power supply. The year 1998 marked the start of construction of the line linking the Québec and Ontario grids and construction of Outaouais substation. The substation is located on farm land and will be surrounded by a visual screen formed by a tree-covered slope, to lessen the visual impact on

nearby homes. The same environmental considerations as at Montérégie substation were taken into account, so as to manage, at source, the impacts of night-time lighting, noise and spills.

The commissioning of the Outaouais permanent substation and looping of the line to this substation, in 2001, will mark the end of work on this loop project.

### **The Downtown Montréal Loop**

This project involves replacing the current 120-kV transmission lines on steel towers, between Aqueduc substation and Atwater substation, with a 7-km, 315-kV line on tubular steel poles. Begun in 1998, this work will be finished during 1999. The entire loop project should be completed in the year 2000 with the construction of a 120-kV underground line running 3.6 km between Hadley and Atwater substations, and the 315-kV connection of the existing Atwater – Viger line.

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### **Duvernay – Anjou Line**

In 1998, Hydro-Québec completed construction of this 315-kV line, which includes a crossing of the Rivière des Prairies. Measuring 9 km in length, it was built entirely with tubular poles. In addition, the right-of-way was combined with that of the Ministère des Transports du Québec, planned for the extension of highway 25 — an advantage as far as urban planning is concerned.

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### **Grand-Mère Hydroelectric Generating Station**

Hydro-Québec submitted its draft-design report to the Ministère de l'Environnement du Québec in October 1998. Improvements, some of them of an environmental nature, have been added. They include the addition of public access to the river and a canoe portage site. Similarly, the management of 500,000 m<sup>3</sup> of excess excavated rock led to an agreement with the local authorities.

A further environmental issue involves assigning a new use to the present generating station building, which has recognized heritage value. A committee of local representatives will be formed to study various options. As well, a study of the project's cumulative effects was conducted, in order to meet Canadian government requirements.



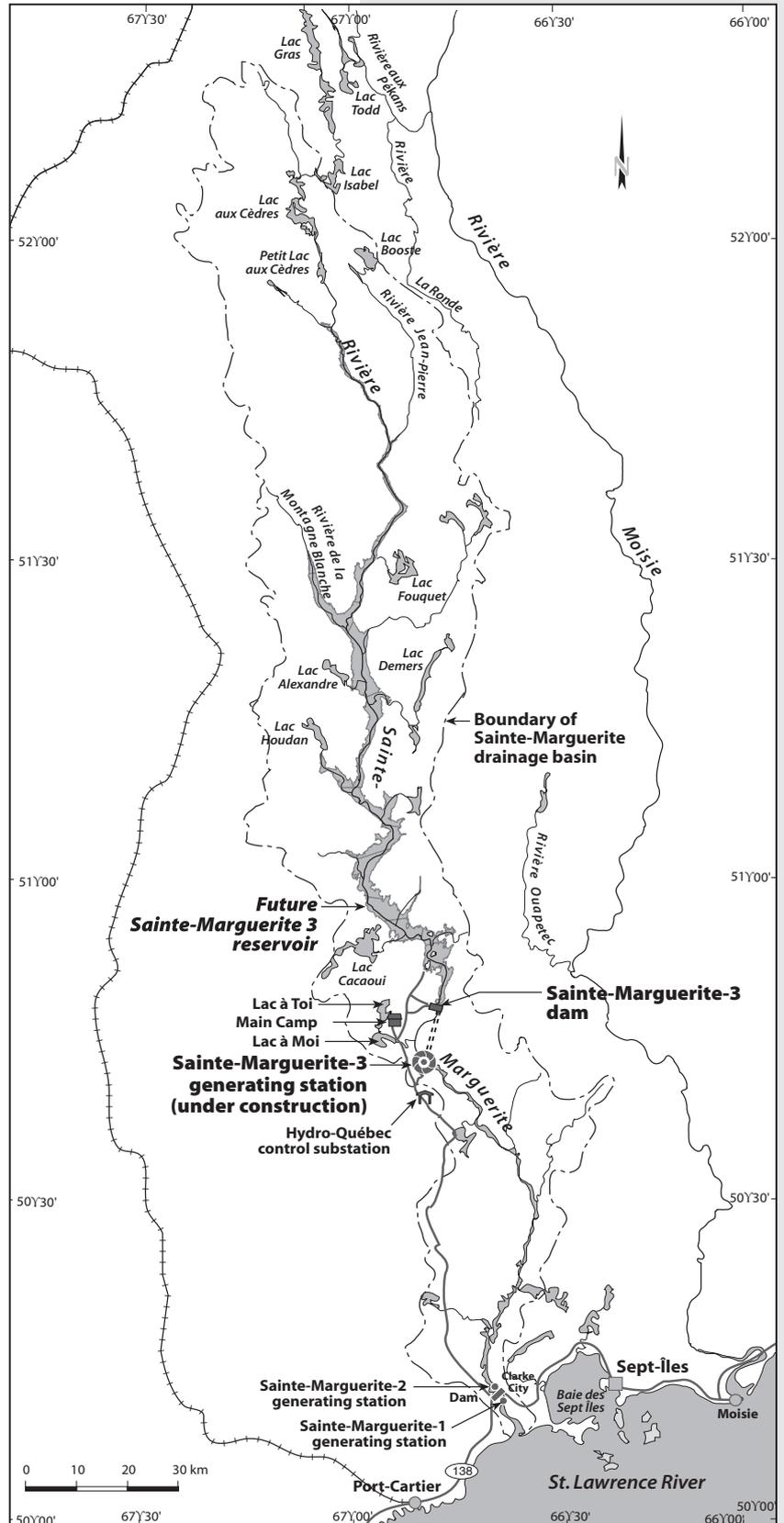
*Grand-Mère generating station*

### Sainte-Marguerite-3 Hydroelectric Generating Station

Filling of the reservoir began in 1998. By the end of the year, two-thirds of the work at the site was completed, including the dam. No infraction notices were issued during the year, as the work proceeded in compliance with the laws and regulations in force. A number of mitigative measures were implemented, including:

- reforestation and restoration of affected sites along the access road;
- stocking of lakes à Toi and à Moi with fish to increase the brook trout population;
- archaeological inventory campaign;
- construction of the Maison de transmission de la culture montagnaise.

Furthermore, Hydro-Québec financed six environmental enhancement projects and two regional development support projects, for a total investment of \$4.4 million. The company also carried on its program for monitoring the salmon population in the Moisie River. According to the original plans, the hydroelectric development of Sainte-Marguerite-3 generating station called for partial diversion of the waters of two tributaries of the Moisie River, namely the Carheil and aux Pékans rivers. As that would have meant a reduction in the flow of the Moisie River, Hydro-Québec studied the possible impacts on the salmon, its habitat and fishing. The studies found that 98% of the fish swimming up the Moisie River are salmon. The continuation of salmon studies in this river will depend on the governments' decision regarding the diversion of the tributaries.



mission  
The direction principale Approvisionnement et Services (Procurement and Services division) is responsible for supplying Hydro-Québec's business units with the goods and services they need, while demonstrating the utmost respect for the environment.

# Procurement and Services

For more than four years, Procurement and Services has made sure that the management of surplus and residual materials complies with the 3RE principle: recovery, reuse, recycling and energy recovery. This management practice contributes to achieving the company's sustainable development objectives and customers' targets, while also reducing costs. In 1998, the division continued all major 3RE programs, such as reclamation of insulating mineral oils, reuse of distribution transformers, and recycling and energy recovery of wood poles. These activities are generally carried out in partnership.

The ice storm episode allowed us to consolidate our 3RE practices. With the cooperation of the TransÉnergie and Distribution business units, we were able to recover millions of tonnes of metal, and refurbish and reuse tens of thousands of recovered line accessories.

As regards optimization of hazardous materials management, a new recovery centre started up in Québec City. In addition, more than 70 sites allowing our workers to recover hazardous materials generated by our operations were set up in the various regions.

Finally, the division wishes to consolidate its commitment to the environment by implementing its ISO 14001 environmental management system. Begun in two administrative units in 1998, this undertaking will continue until 2002 to obtain registration for all units.

**Antonio Pinho**  
General Manager  
Procurement and Services



## Commitment of the Support Unit

### Declaration of Principles

At the end of 1998, the final version of the text of the declaration of environmental principles was in the consultation stage. It was signed by the General Manager on March 15, 1999. Under the terms of the declaration, the division undertakes to comply with legal stipulations, to continually improve its environmental performance and to prevent any negative impacts of its activities. In view of its mission and the products it offers, Procurement and Services emphasizes sustainable development at all stages of the goods and services management cycle, especially by encouraging recovery, reuse, recycling and energy recovery.

### Impacts of the Ice Storm

The new procedures for recovery, reuse, recycling and energy recovery, along with the infrastructures established for these activities, served the company very well not only during the ice storm, but also during site cleanup operations in the spring of 1998. This expertise took concrete shape in the following activities:

- installation of recovery and sorting centres for materials removed from the system, with a view to their reuse for repairs;
- recovery, for reuse, of 250,000 litres of insulating mineral oil;
- recovery of distribution transformers: 25% for reuse, and the rest for recycling of metal components;
- recovery of 15,000 treated wood poles: 30% for recycling into lumber, and the rest for energy recovery;
- recovery of thousands of kilometres of transmission and distribution conductors, nearly 4 million tonnes of steel from dismantled towers, and 130,000 insulators sold to partner organizations for recycling purposes;
- repair and reuse of more than 80,000 different parts used for distribution lines;
- donations of materials (poles, personal computers, sound barriers, steel from towers and materials used in housing personnel);
- characterization, decontamination and restoration of 40 temporary storage sites for new, damaged or scrap materials.

## Environmental Management

### Progress of the Environmental Management System

As of December 31, 1998, the progress of the Procurement and Services EMS could be summed up as follows:

- A preliminary version of the declaration of principles, along with system procedures for the planning section of the ISO 14001 standard, had been submitted for consultation.
- Procurement and Services in the Centre-South district had completed its identification of significant environmental aspects, and determined its objectives and management program.
- Procurement and Services for the Island of Montréal had begun identifying its own specific significant environmental aspects.

### **Significant Environmental Aspects**

The significant environmental aspects affecting Procurement and Services activities in the various units where implementation has begun are the following:

- **Atmospheric emissions:** greenhouse gases, volatile organic compounds and ozone-depleting substances.
- **Production of waste:** used oil, discarded poles, contaminated soil and materials.
- **Discharge** into sanitary and storm drainage systems.
- **Protection of the environment** in case of spills, oil leaks from equipment and leaching from poles.
- **Use of natural resources:** water use, energy efficiency and packing materials.
- **Management of odors and noise.**

For each of the areas, the methods, materials and subcontractors' operating criteria are also considered significant environmental aspects. Action plans designed to control or improve activities related to these environmental aspects were defined and will be implemented starting in 1999.

### **Environmental Research and Monitoring**

Various studies on different issues related to significant environmental aspects were either begun or completed. The following cases are especially noteworthy.

<b>Issue concerned</b>	<b>Activity carried out</b>
Contaminated soils in storage areas	<ul style="list-style-type: none"> <li>• Methodology for prioritizing contaminated sites.</li> <li>• Relationship between pentachlorophenol (PCP) and dioxins-furans, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons and benzene hexachloride in the soil of storage areas for PCP-treated poles.</li> </ul>
Storage of treated wood poles	<ul style="list-style-type: none"> <li>• Monitoring of treated-wood storage facilities in Rimouski.</li> <li>• Environmental assessment of pole storage yard at Bout-de-l'Île site.</li> </ul>
Sludge from septic tanks	<ul style="list-style-type: none"> <li>• Disposal of sludge from septic tanks.</li> </ul>
Management of oil-immersed scrap equipment	<ul style="list-style-type: none"> <li>• Evaluation of performance of field analysis kits for measuring PCBs in insulating oils.</li> </ul>

### **1998 Environmental Objectives**

The 1998 objectives selected to comply with the orientations of the *Business Plan* in the spheres of the environment and hazardous materials management cover:

- compliance with the new regulations on hazardous materials through the adoption of new guidelines, training of personnel in residual hazardous materials recovery methods, and establishment of hazardous materials recovery sites and centres;
- continued implementation of an environmental management system in compliance with ISO 14001;
- completion of the PCB elimination plan.

### **Environmental Activities**

#### **Management of Residual Hazardous Materials**

Over the years, Procurement and Services has organized its activities in this area around four main approaches: consolidation of the hazardous materials management infrastructure, implementation of a PCB elimination plan, elimination of residual hazardous materials in order to maximize recovery, and application of the 3RE principle.



Bout-de-l'île hazardous-materials recovery centre

### Review of Action Plans at the End of 1998

#### 1. Consolidation of management infrastructure

Consolidation of the management infrastructure involved the following activities:

- establishment of more than 70 recovery sites in the working areas of 65% of Procurement and Services buildings;
- rationalization of transfer sites, following a 25% reduction in the number of these installations;
- start-up of operations at two hazardous-materials recovery centres and construction of two new centres in 1999;
- start-up of operations at a new in-trench disposal site in a remote area, and feasibility study for a future site.

#### 2. PCB elimination plan

Established in 1996, this elimination plan required investments of about \$24.3 million. It has made possible the recycling or elimination of 7,150 tonnes of contaminated materials, namely:

- recycling of 3,455 tonnes of metal parts;
- incineration of 3,310 tonnes of residual materials.
- burial of 385 tonnes of slightly contaminated soil in secure sites.

In 1998, Hydro-Québec carried on its PCB elimination plan and achieved the following results:

Type of PCB	Remaining Quantity	
	1997	1998
High level in service	0.5 tonne	0.5 tonne
High level in storage	3 tonnes	2.7 tonnes
Low level in service	450 tonnes	400 tonnes
Low level in storage	190 tonnes	9.7 tonnes

N.B.: Equipment is considered low level if it contains between 50 and 10,000 ppm of PCBs.

#### 3. Elimination of residual hazardous materials in order to maximize recovery

In 1998, under its residual hazardous materials elimination plan, the division recovered and eliminated the following products:

Material	Quantity (tonnes)
Liquids: Acids, antifreeze, lubricants, fixatives, halogenated solvents, etc.	390.1
Solids: Absorbent substances, sludge, rags, filters, grease, contaminated porous materials, paint, dry cells, silica, fuller's earth, nickel-cadmium batteries, etc.	282.1

#### 4. 3RE program

The division carried on its 3RE program in 1998. This sustainable development initiative has led to the recovery of the following products, which otherwise would have been treated as waste.

Product <sup>1</sup>	Quantity reused	Quantity recycled	Quantity used for energy recovery
Wood poles <sup>2</sup>	208 t	5,534 t	1,384 t
Insulating mineral oils	3,062,883 L		300,204 L
Distribution transformers	4,010 units		
Metal		20,850 t	
Electrical equipment		2,508 t	
Binders	7,000 units		
Paper and cardboard		97 t	
Various containers		6 t	
Food waste		25 t	
Lead batteries		116 t	
Light fuel			25,745 L
Used oils			252,412 L
Antifreeze	3,600 L		
Non-halogenated solvents			21,875 L
Vehicle filters		19 t	
Mercury and sodium lamps		1 t	
Contaminated containers	40 t		
Fluorescent tubes		23 t	
Contaminated (oily) water <sup>3</sup>			145,255 L

1. A printer-cartridge recycling program is also in effect, but the results were not available at the time of writing this report.
2. In 1998, the proportion of recycled quantities is estimated at 80%. Only the first phase of chipping was carried out with a view to energy recovery.
3. Contaminated water is treated, and reclaimed oils are used for energy recovery.

#### Energy Efficiency in Building Management

Under the provincial program for energy efficiency in administrative buildings, we recorded a reduction of 21.4% (more than 70,000 MWh) in net energy consumption in 1998 compared with 1991, the reference year. Altogether, 102 administrative buildings, spread throughout Hydro-Québec's territory and representing a total area of 721,000 m<sup>2</sup>, were monitored to evaluate this performance.



Head office

## **Environmental Compliance**

### **Soil Decontamination**

As part of our regular operations, characterization or restoration measures were applied at 10 sites. In all, this represents volumes of about 22,000 m<sup>3</sup> of soil.

During the ice storm, 50 storage areas, located at 40 different sites — 60% of which were properties belonging to third parties — were used and subsequently characterized, decontaminated and, in some cases, restored. About 1,600 m<sup>3</sup> of soil was excavated, treated or buried.

### **Petroleum Product Tanks**

Application of the regulations respecting petroleum products and hazardous materials requires removing or replacing certain underground tanks. In 1998, 31 of them were the subject of activities to comply with the regulations.

### **Waste Water and Drinking Water**

A number of facilities managed by Procurement and Services are equipped with autonomous drinking water supply or waste water treatment systems. The division supplied technical expertise concerning drinking water quality in certain wells, and for septic facilities in current operation. Studies on three new drinking water wells at La Grande-4 were conducted with a view to authorizing their use.

## **Infraction Notices**

### ***La Vérendrye substation – in-trench disposal site***

On November 12, 1998, the Ministère de l'Environnement du Québec issued an infraction notice regarding the in-trench disposal site at this substation. On January 13, 1999, the Ministère accepted, in writing, the remedial measures submitted on December 15 by the company. The work is to be completed by June 30, 1999.

### ***La Grande-3 airport – 20,000-litre fuel spill***

On April 15, 1998, Hydro-Québec received an infraction notice concerning an aviation-fuel spill at the La Grande-3 airport, located within the territory of the municipality of James Bay.

The company conveyed to the Ministère de l'Environnement du Québec a document summarizing the stages of the cleanup effort along with certain test results. The monitoring of the contamination of groundwater currently under way will enable us to ensure that the measures required will be applied to the authorities' satisfaction as promptly as possible.

This case is not yet closed, since the final report has not been submitted and the treatment of the contaminated soil must be covered by an agreement.

# Hydro-Québec at the Heart of the Québec Com

## **Environmental Enhancement**

In 1998, Hydro-Québec continued its environmental enhancement program, which also covers support for regional development and Aboriginal communities. The funding applies at the time of construction of new generating or energy transmission facilities.

### *Summary of Environmental Enhancement Initiatives and Funding*

Type of initiative	Number of initiatives	Hydro-Québec funding (thousands of \$)	Additional funding (thousands of \$)	Total cost (thousands of \$)
Accessibility to natural sites	1	45	0	45
Improvement of drinking water quality	1	1,500	3,546	5,046
Park landscaping	6	432.6	179.1	611.7
Creation of green spaces	3	340	12.9	352.9
Environmental knowledge and awareness	2	80	0	80
Landscaping of public buildings and infrastructures	4	165.8	40	205.8
Recovery and recycling of resources used	2	759.5	2,322.3	3,081.8
Restoration of a natural resource	2	147	0	147
Heritage restoration and enhancement	9	1,711.4	396.3	2,107.7
Stabilization of banks	2	185.3	3.2	188.5
Regional development	4	2,399.2	5	2,404.2
Community facilities	1	200	0	200
Linear recreational facilities	2	626.4	25	651.4
<b>Total in 1998</b>	<b>39</b>	<b>8,592.2</b>	<b>6,529.8</b>	<b>15,122</b>
<b>Total since 1985</b>	<b>745</b>	<b>62,857.4</b>	<b>43,166.7</b>	<b>106,024.1</b>

Source: Hydro-Québec.

N.B.: These totals do not include amounts devoted to Aboriginal communities.

munity



*On the occasion of the construction of Bécancour gas-turbine generating station, the Abenaki community of Wôlinak received enhancement funding of \$300,000. With part of this funding, it developed a site as well as a culture interpretation centre.*

*Overview of Hydro-Québec's Regional Activities in 1998*

Administrative region of Québec	Average workforce in the region	Expenditure (\$M)	Number of jobs supported (person-years)	Examples of partnership and social commitment
(01) Bas-Saint-Laurent	470	26.0	65	<ul style="list-style-type: none"> <li>• Université du Québec à Rimouski</li> <li>• Atlantic salmon interpretation centre</li> <li>• Théâtre de Trois-Pistoles</li> </ul>
(02) Saguenay – Lac-Saint-Jean	890	33.4	131	<ul style="list-style-type: none"> <li>• Université du Québec à Chicoutimi</li> <li>• Saint-Félicien zoological society</li> <li>• Institut de recherche et d'études sur les populations</li> </ul>
(03) Québec	1,341	168.6	853	<ul style="list-style-type: none"> <li>• Opéra de Québec</li> <li>• Place de la Gare – Québec City</li> <li>• Université Laval</li> <li>• Québec winter carnival</li> </ul>
(04) Mauricie	1,117	158.0	952	<ul style="list-style-type: none"> <li>• Institut national de la recherche scientifique – Culture et Société</li> <li>• Art vocal de Trois-Rivières</li> <li>• Orchestre symphonique de Trois-Rivières</li> <li>• Classique internationale de canots de la Mauricie</li> </ul>
(05) Estrie	113	17.0	77	<ul style="list-style-type: none"> <li>• Les événements populaires de l'Estrie</li> <li>• Légendes fantastiques</li> <li>• Orford Arts Centre</li> </ul>
(06) Montréal	7,894	1,969.8	3,319	<ul style="list-style-type: none"> <li>• Six university chairs</li> <li>• Three universities</li> <li>• Four hospitals</li> <li>• L'Opéra de Montréal</li> <li>• Centre d'entreprise et d'innovation de Montréal</li> <li>• Orchestre symphonique de Montréal and Orchestre métropolitain</li> </ul>
(07) Outaouais	518	10.4	40	<ul style="list-style-type: none"> <li>• Chambre de commerce et de l'industrie de l'Outaouais</li> <li>• Bicentennial of the city of Hull</li> </ul>
(08) Abitibi-Témiscamingue	608	21.0	130	<ul style="list-style-type: none"> <li>• Conseil de la culture Abitibi-Témiscamingue</li> <li>• Festival du cinéma international de l'Abitibi-Témiscamingue</li> <li>• Université du Québec en Abitibi-Témiscamingue</li> </ul>
(09) Côte-Nord	1,114	49.1	326	<ul style="list-style-type: none"> <li>• Vieux quai en fête de Sept-Îles</li> <li>• Tadoussac song festival</li> <li>• Salon plein air et commercial de Forestville</li> </ul>
(10) Nord-du-Québec	472	42.4	26	<ul style="list-style-type: none"> <li>• Chisasibi Skating Club Ice Show</li> <li>• Radisson scout movement</li> </ul>
(11) Gaspésie – Îles-de-la-Madeleine	214	4.9	27	<ul style="list-style-type: none"> <li>• Les productions du Festival de la Parenté</li> </ul>
(12) Chaudière-Appalaches	444	87.6	478	<ul style="list-style-type: none"> <li>• Beauce Grand Prix of cycling</li> <li>• Chaudière-Appalaches tourist association</li> </ul>
(13) Laval	341	99.5	501	<ul style="list-style-type: none"> <li>• Institut Armand-Frappier</li> <li>• Centre de bénévolat de Laval</li> <li>• Laval chamber of commerce</li> </ul>
(14) Lanaudière	243	28.8	109	<ul style="list-style-type: none"> <li>• Centre culturel de Joliette</li> <li>• Corporation de développement économique de Berthierville</li> </ul>
(15) Laurentides	983	50.3	193	<ul style="list-style-type: none"> <li>• Mont-Tremblant music festival</li> <li>• Parc de la rivière des Mille Îles</li> </ul>
(16) Montérégie	2,894	249.8	1,123	<ul style="list-style-type: none"> <li>• Fondation des Jeunesses musicales du Canada</li> <li>• Celebrations for 250th anniversary of Saint-Hyacinthe</li> <li>• Conseil de la culture et des communications de la Montérégie</li> </ul>
(17) Centre-du-Québec	921	57.5	285	<ul style="list-style-type: none"> <li>• Théâtre Parminou</li> <li>• Bois-Francs chamber of commerce</li> </ul>
Workforce not attached to any particular region	339			
<b>Total</b>	<b>20,916</b>	<b>3,074.1</b>	<b>8,635</b>	

Source: Hydro-Québec, Profil régional des activités d'Hydro-Québec 1998, 2nd quarter 1999.

## Local Agreements and Partnerships

### Social Commitment

In addition to the spin-offs arising from new construction, Hydro-Québec plays a part in regional development in many other ways. For example, it acts as a partner in local social and cultural initiatives and it obtains various goods and services from local suppliers. In 1998, Hydro-Québec spent over \$3 billion in this way and consequently supported more than 8,600 jobs at supplier and partner organizations.

In its construction and operation activities, Hydro-Québec favors partnership agreements with the populations concerned in order to reduce environmental impacts and define the most appropriate mitigative or compensation measures. It reached the following agreements in 1998.

#### Manicouagan

- Renewable agreement, negotiated in 1998 with the Association des propriétaires de chalets du camp 5, for the maintenance of a fishway for land-locked salmon on the Loup-Marin River, a tributary of the Outardes-2 reservoir.
- Five-year agreement with the Corporation de gestion de la pêche sportive de la rivière Mitis, covering the installation, during the downstream migration of smolts, of catch systems in the headrace canals of Mitis-1 and Mitis-2 generating stations along with a detour system in the headrace canal of Mitis-1 generating station.

#### Beauharnois-Gatineau

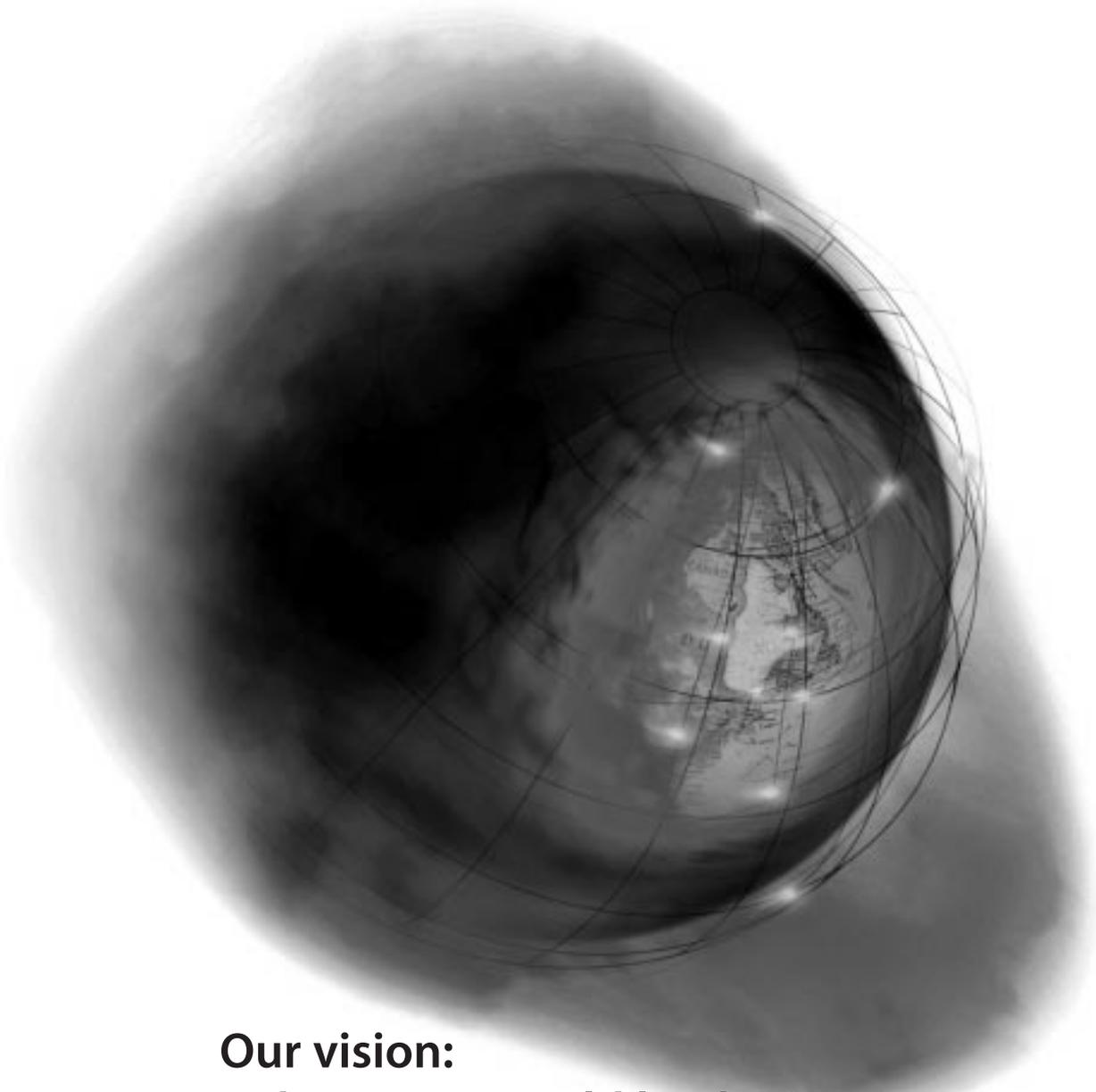
- In connection with the refurbishing of Chute-Bell generating station, an agreement with the association of waterside landowners on the Rouge River for the implementation of mitigative measures (for example, maintenance of a minimum daily and seasonal flow to preserve the falls), a waterside park and a boat ramp.

#### La Grande

- Agreement with the municipality of James Bay and James Bay Tourism to finance a survey of visitors using the territory, as part of the program to monitor access to northern regions. This agreement allows a better understanding of the nature of impacts arising from access, improvement of forecasting and mitigative methods, and optimization of costs and measures taken regarding operating activities.
- Creation of the Hydro-Québec – Community of Chisasibi working group with a mandate to solve certain problems related to operation of facilities in the La Grande complex. For example, the evaluation of the concrete structure and replacement of pumps at the filtration plant helped solve problems at the community's drinking water intake. An emergency evacuation plan was also drawn up in case of failure of the hydroelectric facilities. Finally, an agreement provides for the construction of two boat-landing sites.

#### Des Cascades

- Second agreement, to run for two years, with the Ministère de la Faune et des Parcs du Québec in connection with the action plan for the protection of lake trout in reservoirs in the Haute-Mauricie region. This agreement concerns monitoring of the effectiveness of proposed measures, and studies and tests on walleye spawning downstream from the Kempt and Manouane dams.



**Our vision:**  
**to become a world leader in energy**  
by developing its expertise for the benefit of its customers,  
employees and shareholder, and by working with partners  
in business ventures.

**Our values:**

Customer Satisfaction

A "Business First" Approach

Respect for Employees

Quality Improvement

Respect for the Environment in  
Cooperation with Local Communities

Safeguarding the Future

# Hydro-Québec on the International Scene

## ***International Projects***

In 1998, Hydro-Québec's specialized environment personnel put their technical expertise to use by taking part in a number of international projects in close cooperation with Hydro-Québec International (HQI).

### **Argentina (Mendoza)**

Environmental audit of Energía de Mendoza Sociedad del Estado and privatization of the electricity distribution company Empresa Distribuidora de Electricidad de Mendoza (EDEMESA), with a view to acquiring EDEMESA.

### **Argentina and Bolivia (Bermejo and Grande Tarija Rivers)**

Expertise on environmental impacts (review of sites and specialized studies) of the development of three hydroelectric sites on the Bermejo and Grande Tarija rivers.

### **Colombia (Barranquilla)**

Environmental audit of the Corporación Eléctrica de la Costa Atlántica (CORELCA), carried out for a project for acquiring CORELCA's thermal generating facilities.

### **Panama**

Environmental audit of four hydroelectric generating stations and one thermal generating station belonging to the Instituto de Recursos Hidráulicos y Electrificación, for the purpose of acquiring these facilities.

### **India (State of Gujarat)**

Formulation of a plan for developing electricity generation and transmission in this state of 40 million inhabitants. Continuing until 2012, this plan is to propose suitable generating methods and the most appropriate sites for the facilities.

### **Consortia for Ilisu**

In November 1997, the Consortia for Ilisu, of which HQI is a member, was authorized to conduct an impact study for the Ilisu hydroelectric project in Turkey. This 1,200-MW project involves developing the Tigris River about 60 km upstream from the border with Iraq and Syria. The reservoir area would be approximately 300 km<sup>2</sup>.

The Hydro-Québec team carried out project aspects dealing with archaeology and heritage, populations, health, regional development and population relocation, biodiversity, landscape and preservation.

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### ***Other Projects of the E7 Network of Environmental Expertise***

- Start of a project providing support for the Latin American Energy Organization (OLADE) in South America, where a team will draw up a guide on ways to make thermal generating stations comply with modern environmental standards and sound energy-efficiency practices.
- Seminar on environmental assessments for line projects held at Mexico's Comisión Federal de Electricidad.
- Technical support on refurbishing thermal and diesel power plants, for authorities in Yemen.
- Preparation of a guide to sound demand-side management practices, eventually to be circulated in a number of countries.

## ***Our Expertise beyond Our Borders***

### **International Commission on Large Dams**

Hydro-Québec has been a member of the Commission since 1968, and participates in the activities of the technical committees (more than 25) intended to improve technical, scientific and environmental aspects at all stages of design and operation of dams and related structures.

### **Senghor University, Alexandria, Egypt**

In 1998, Hydro-Québec organized an environmental management training seminar bringing together representatives of 11 French-speaking countries of Africa. This seminar examined environmental assessments for generating stations, follow-up and monitoring, preventive and remedial environmental measures, and partnership agreements between public and private organizations.



# Conclusion

*As we have noted often in this report, a key event of 1998 was the exceptionally severe ice storm that struck Québec this past January. In view of the increasingly frequent and violent blows of nature, Hydro-Québec has decided to consolidate its transmission and distribution system.*

*The restoration of its system, along with the numerous environmental and social impacts of this event, have prompted the company to review its emergency plans as well as many of its quality standards. In addition, Hydro-Québec has met with resistance and protests from various groups throughout implementation of the program for reinforcing its transmission system.*

*In its strategic planning, Hydro-Québec plans for completing the development of Québec's hydropower potential. While the construction of large dams entails environmental and social impacts, it nonetheless remains that these impacts are local in scope, unlike those associated with electricity generation using fossil-fuel-fired plants, which involve the production of greenhouse gases and global warming. From this perspective, Hydro-Québec is convinced that hydropower is the most reliable and sustainable energy source for helping achieve the greenhouse gas reduction targets that Canada promised to meet as part of the Kyoto protocol. In carrying out its new hydroelectric projects, the company has undertaken to ensure that they are acceptable from an environmental standpoint and are favorably received by the local communities.*



*Out of a concern for complying with regulations, improving its environmental performance and preventing pollution, Hydro-Québec has been committed, since 1997, to a process of establishing an environmental management system in compliance with ISO 14001. The implementation efforts are progressing at a highly satisfactory rate. As of fall 1999, one of the company's administrative units should be undergoing the certification audit. Hydro-Québec is convinced that implementation of this management system and increasing its managers' accountability will allow it to achieve the level of compliance and excellence which it has targeted. This is an objective which any organization in the forefront of technology and environment and with an international vision must certainly attain.*

## **Roger Lanoue**

General Manager  
Strategic Planning and Environment

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# Acronyms, Abbreviations and Symbols

<b>3REs</b>	recovery, reuse, recycling and energy recovery
<b>ACECA</b>	Hydro-Québec's Advisory Committee on the Environment and Community Affairs
<b>CEA</b>	Canadian Electricity Association
<b>CH<sub>4</sub></b>	methane
<b>CO<sub>2</sub></b>	carbon dioxide
<b>ECR</b>	CEA's Environmental Commitment and Responsibility Program
<b>EMF</b>	electric and magnetic fields
<b>EMS</b>	environmental management system
<b>GHG</b>	greenhouse gas
<b>IEA</b>	internal environmental assessment
<b>IHA</b>	International Hydropower Association
<b>IREQ</b>	Hydro-Québec's research institute
<b>ISO</b>	International Organization for Standardization
<b>MRC</b>	regional county municipality
<b>NO<sub>x</sub></b>	nitric oxide
<b>NSERC</b>	Natural Sciences and Engineering Research Council of Canada
<b>ORIEL</b>	Local Environment-Oriented Network Options
<b>PAH</b>	polycyclic aromatic hydrocarbon
<b>PCB</b>	polychlorinated biphenyl
<b>PCP</b>	pentachlorophenol
<b>R&amp;D</b>	research and development
<b>SF<sub>6</sub></b>	sulphur hexafluoride
<b>SO<sub>2</sub></b>	sulphur dioxide
<b>UQÀM</b>	Université du Québec à Montréal

# Definitions

<b>atmospheric tritium</b>	Water vapor containing tritium (H <sup>3</sup> ), a stable isotope of hydrogen.
<b>Canadian Electricity Association (CEA)</b>	Canadian association made up of 28 electric utilities (or 95% of installed capacity in Canada), 25 major manufacturers of electrical equipment and several hundred other companies and stakeholders involved directly or indirectly in the sphere of electricity.
<b>energy conversion efficiency</b>	Energy efficiency of the different types of electricity generation equipment, calculated on the basis of the energy source used as input (e.g., gas, coal, biomass, nuclear energy).
<b>environmental management system (EMS)</b>	A component of a company's overall management system which includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, setting up, carrying out, reviewing and maintaining the environment policy.
<b>herbicide</b>	<p>A chemical agent that destroys plants.</p> <p>A selective herbicide is designed to destroy certain plants in order to encourage others to grow.</p>
<b>in-trench disposal site</b>	Disposal site in the form of a trench excavated in wooded surroundings and meant to hold household waste.
<b>infraction notice</b>	Notice issued by a government department (federal or provincial) following observation of non-compliance with a law or regulation.
<b>internal environmental assessment (IEA)</b>	<p>Assessment designed to determine whether a project is likely to alter the quality of the environment and, consequently, to prescribe appropriate mitigative measures.</p> <p>This assessment is carried out even if the project in question is not the subject of a request for authorization under the <i>Environment Quality Act</i>.</p>
<b>isotope</b>	One of two or more forms of a chemical element with the same atomic number, but with different atomic masses.
<b>mercury</b>	<p>A heavy metal occurring naturally in the environment which, in soils and oceans, is found mainly in inorganic form, invisible to the naked eye and not readily assimilable by organisms.</p> <p>Following the flooding of land caused by reservoir construction, a portion of the mercury in organic soils and vegetation becomes subject to methylation. This is consequently not a new source of mercury added by the reservoir itself, but rather a transformation of inorganic mercury already present in the land environment that is flooded.</p>
<b>methylation</b>	Microbial activity that transforms mercury into methylmercury, a toxic compound that accumulates throughout the food chain.
<b>off-grid power system</b>	Regional electricity generation, transmission and distribution system in northeastern Québec which is not connected to Hydro-Québec's province-wide system.
<b>polychlorinated biphenyl (PCB)</b>	<p>Askarel in the family of chlorinated hydrocarbons contained in certain electric insulators and comprising more than 200 compounds.</p> <p>A property of askarels is that they do not release any combustible or explosive gases when an electric arc passes through them.</p>
<b>radionuclide</b>	An isotope whose forms are radioactive.
<b>residual hazardous material</b>	<p>Any residual material that is solid, semi-liquid at 20°C, liquid or gaseous, held in a transportable container, and that is combustible, corrosive, leachable, radioactive, reactive or toxic.</p> <p>The categories of waste listed in Schedule 1 of Québec's <i>Regulation respecting hazardous materials</i> are also considered residual hazardous materials.</p>
<b>stable isotope</b>	An isotope whose forms are stable.

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# Evaluation Questionnaire

To better meet your expectations and improve the quality of our annual Environmental Performance Report, we need your feedback. Please help us by completing this brief questionnaire and returning it to us as soon as possible. Your comments will be read with great interest.

**1. Is the report clear and easy to understand?**

- Very
- Fairly
- Not very
- Not at all

**2. Do you find the information in the report relevant?**

- Very
- Fairly
- Not very
- Not at all

**3. Have you read the following sections of the report?**

	Yes	No
The Environment at Hydro-Québec	<input type="checkbox"/>	<input type="checkbox"/>
Electricity Generation	<input type="checkbox"/>	<input type="checkbox"/>
Energy Transmission	<input type="checkbox"/>	<input type="checkbox"/>
Electricity Distribution	<input type="checkbox"/>	<input type="checkbox"/>
Installations Projects	<input type="checkbox"/>	<input type="checkbox"/>
Procurement and Services	<input type="checkbox"/>	<input type="checkbox"/>
Hydro-Québec at the Heart of the Québec Community	<input type="checkbox"/>	<input type="checkbox"/>
Hydro-Québec on the International Scene	<input type="checkbox"/>	<input type="checkbox"/>
Conclusion	<input type="checkbox"/>	<input type="checkbox"/>
Publications, Conference Papers and Posters	<input type="checkbox"/>	<input type="checkbox"/>
Acronyms, Abbreviations and Symbols	<input type="checkbox"/>	<input type="checkbox"/>
Definitions	<input type="checkbox"/>	<input type="checkbox"/>

**4. Do you use this report in your work?**  Yes  No

**5. Were you able to find the information you needed in the report?**  Yes  No

**What other information would you have liked the report to provide?**  Yes  No

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**6. Please rate the quantity of information in the following sections:**

	Too much	Enough	Not enough
The Environment at Hydro-Québec	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electricity Generation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Energy Transmission	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electricity Distribution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Installations Projects	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Procurement and Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydro-Québec at the Heart of the Québec Community	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hydro-Québec on the International Scene	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conclusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Publications, Conference Papers and Posters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Acronyms, Abbreviations and Symbols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Definitions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**7. Do you find that the report contains too much, enough or not enough of the following types of information:**

Text	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tables	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Charts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**8. Please indicate your place of residence:**

- Québec
- Other province of Canada
- United States
- Europe
- Asia
- Other

**9. Please indicate your area of activity:**

- Finance
- Government
- Economic or community interest group
- Association
- Energy
- Private company in other sector
- Student or teacher
- Environmental advocacy group

**10. How would you rate the report over all?**

- Excellent
- Very good
- Average
- Poor

**11. Comments or suggestions**

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*Thank you for your cooperation.*

*Please return to:*

**Hydro-Québec**

*Denis Sirois*

*Environmental Performance Advisor*

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***We need your feedback ...***



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