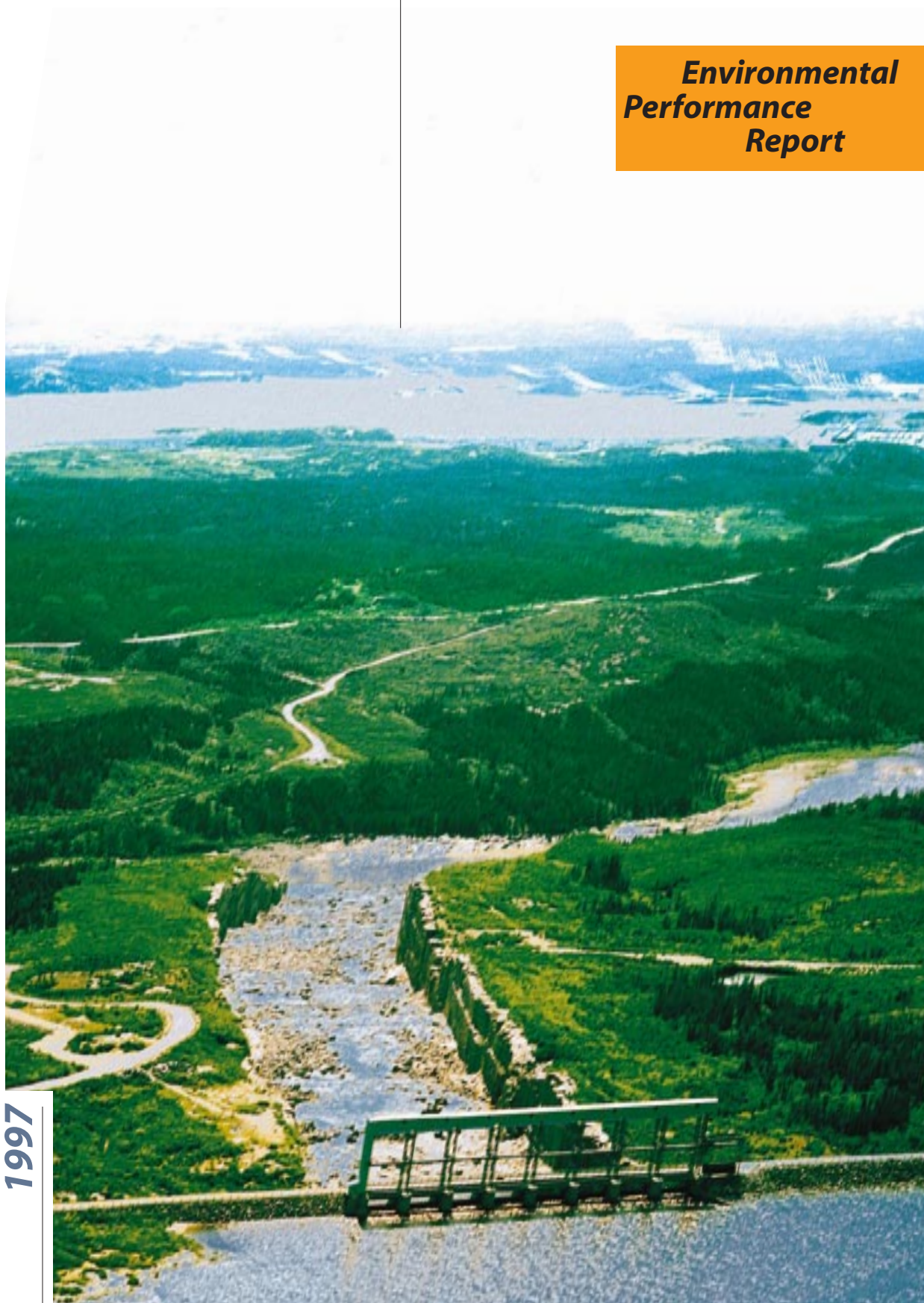
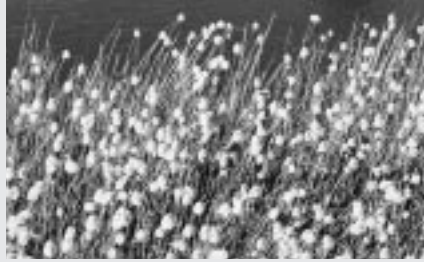


***Environmental
Performance
Report***

1997





1996 Environment Policy Main Policy Statement

Hydro-Québec wants to be recognized as a utility in the forefront of the environmental and sustainable development field. To achieve this goal, it assumes full responsibility for environmental issues inherent in all of its activities, and exercises strict environmental management to this end.

Principle 1 - Sustainable Development

For the benefit of present and future generations, Hydro-Québec gives priority to energy efficiency and renewable energy sources as means of meeting its customers' needs. It plans, designs and carries out its activities so as to contribute to maintaining quality of life, resources and environments.

Principle 2 - Strict, Responsible Environmental Management

Hydro-Québec incorporates the environment into the utility's day-to-day management, in order to continually improve its environmental performance.

Principle 3 - Environmental Research

Hydro-Québec conducts or supports research on the environmental effects of its activities.

Principle 4 - Enhancement of Activities and Facilities

Hydro-Québec enhances its activities and facilities so that they play a part in community development and in promoting the quality of the environment.

Principle 5 - Information, Consultation and Dialogue

Hydro-Québec ensures that the individuals, groups and organizations concerned are involved in the planning, design and implementation of its activities.

Principle 6 - Environmental Responsibility of Hydro-Québec Personnel, Subsidiaries and Business Partners

Hydro-Québec provides its personnel with the means to fully assume their responsibilities, requires that its subsidiaries take on their environmental responsibilities, and makes its business partners and customers aware of sound environmental practices.

Environmental Commitment and Responsibility (ECR) Program of the Canadian Electricity Association (CEA) Declaration of Principles

We, the electric utility members of the Canadian Electricity Association (CEA), endorse the concept of sustainable development, and recognize that a strong economy cannot be sustained without a healthy environment. We are committed to achieving environmental regulatory compliance and, further, to continual improvement by implementing the following principles:

1. To be more efficient in our use of resources.

We will seek opportunities to be more efficient in our use of resources by:

- reducing the amount of natural resources consumed during the generation, transmission and distribution of electricity;
- working with consumers of electricity to promote its efficient use; and
- promoting research, development and application of renewable energy technologies and new energy efficient technologies.

2. To reduce the adverse environmental impact of our business.

We will conduct our business in a manner that protects the environment and ecological relationships. Environmental impact avoidance will be considered as the first option; where impacts are unavoidable, they will be mitigated or compensated. Opportunities to enhance the environment affected by our activities will be pursued where feasible.

3. To be accountable to our constituents.

We will conduct our activities with increased transparency, and will consider and respond to inquiries from constituents.

4. To ensure that our employees understand the environmental implications of their actions and have the knowledge and skills to make the right decisions.

We will provide our employees with the skills and knowledge necessary to conduct their work in an environmentally responsible manner in all circumstances.



We need your feedback ...

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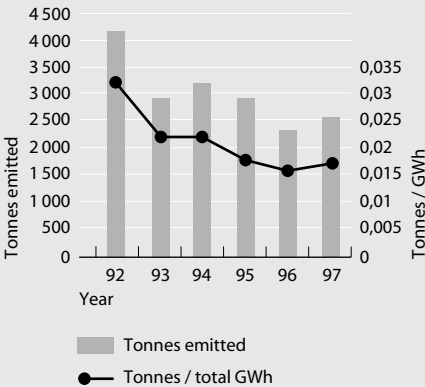
Units of mesure

\$M:	millions of dollars
FBM:	foot board measure
ppm:	parts per million
mSv:	millisievert
μT:	microtesla
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)

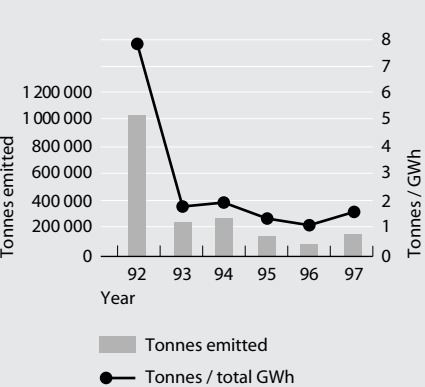
Some Indicators of Hydro-Québec's Environme

Estimated Atmospheric Emissions from Hydro-Québec's Thermal Generating Plants

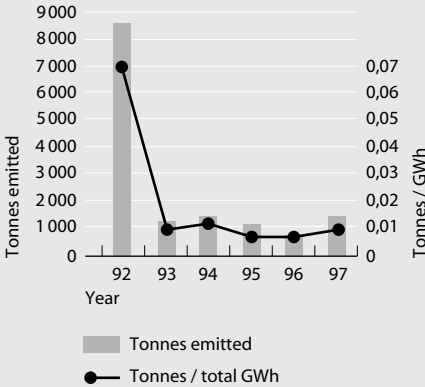
NO_x Emissions (see page 17)



CO₂ Emissions (see page 17)

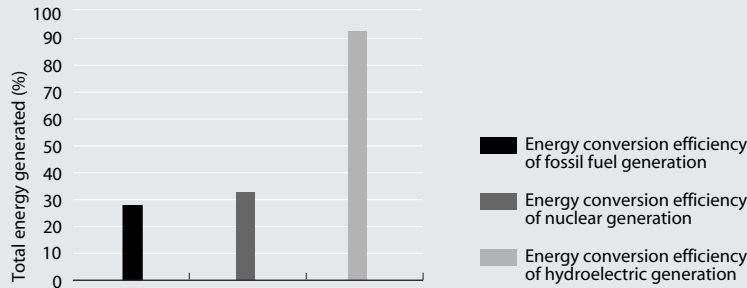


SO₂ Emissions (see page 17)

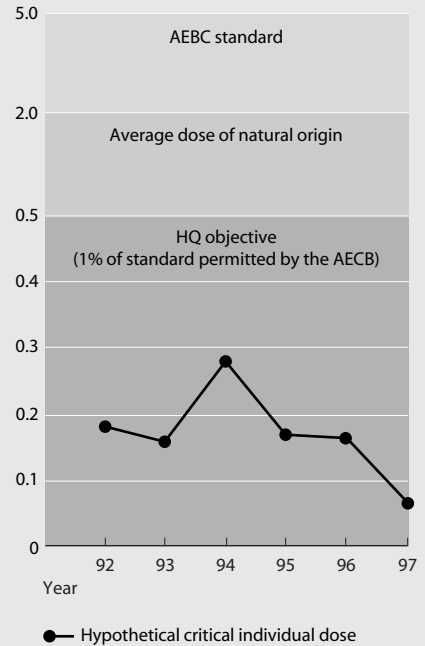


Note: Only emissions from thermal generating plants were considered in the calculation of CO₂ emissions. As mentioned on page 15, studies are in progress to evaluate rates of GHG emission from hydroelectric reservoirs.

Energy conversion efficiency (see page 16)

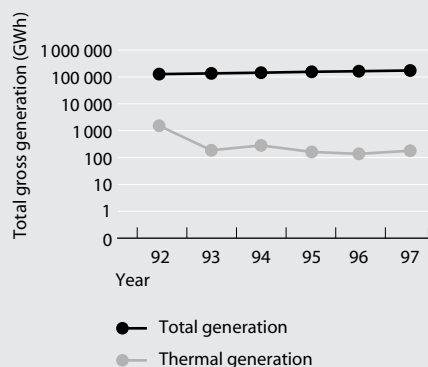


Estimated exposure doses related to discharges of liquids and gases from Gentilly-2 power plant (see page 21)

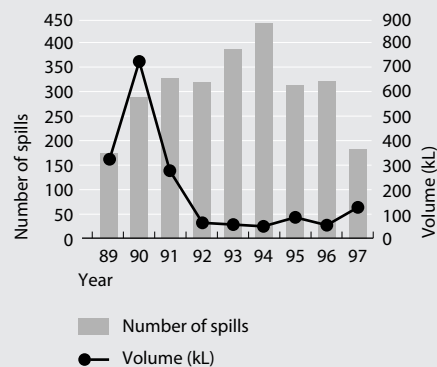


ntal Performance

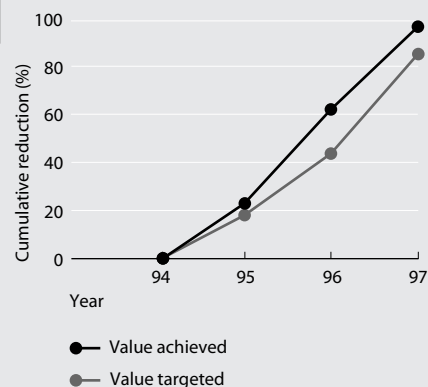
Energy generated by type of equipment
(see page 16)



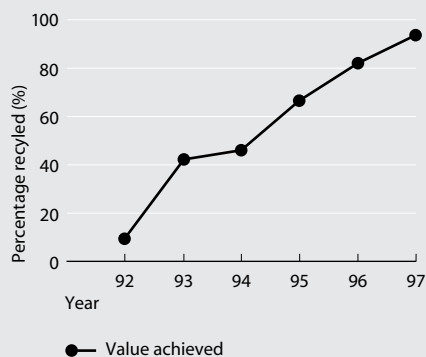
Number of spills
Volumes spilled (see page 13)



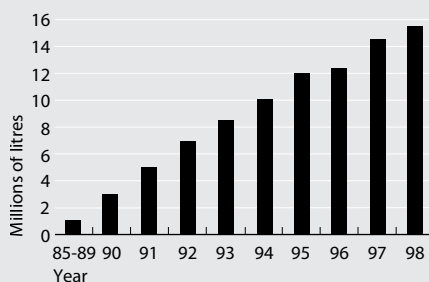
Cumulative reduction in PCB-contaminated material (< 50 ppm)
(see page 34)



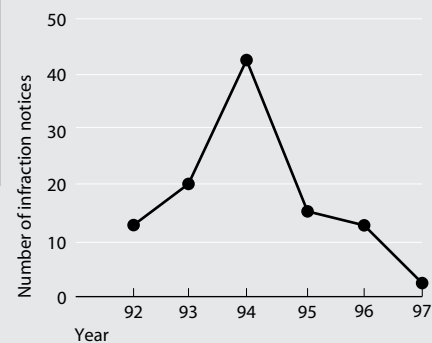
Percentage of insulating oils recycled by Hydro-Québec (see page 33)



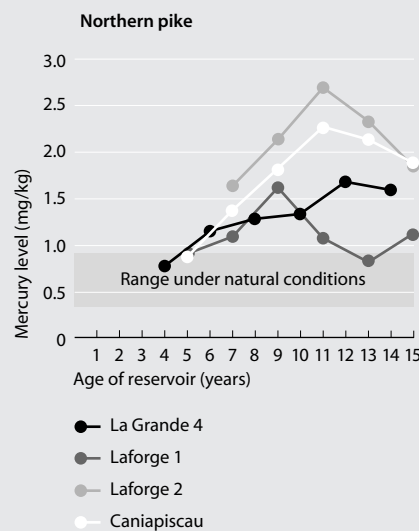
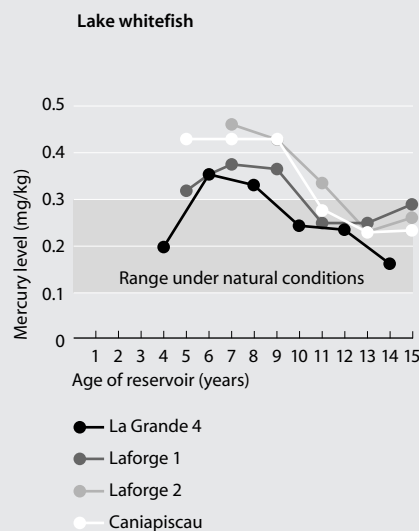
Cumulative volume of insulating mineral oils decontaminated (see page 34)



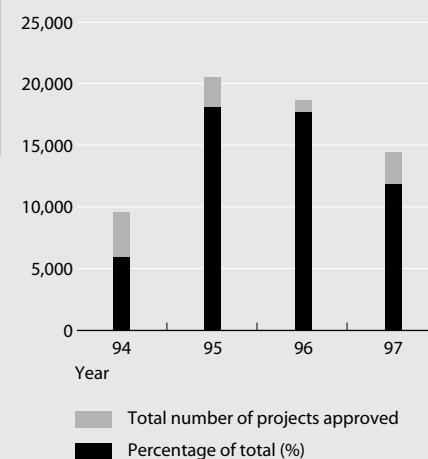
Infraction notices issued by the MEFQ to Hydro-Québec (see page 8)



Evolution of mercury levels in the flesh of fish in reservoirs in the eastern sector of the La Grande complex (see page 20)



Distribution projects subjected to an internal environmental assessment
(see page 29)



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

In 1997, Hydro-Québec passed some milestones that underscored its desire to carry out its activities in a spirit of respect for the environment.

In reorganizing the utility around business or support units accountable for their respective operations, Hydro-Québec increased its managers' responsibility for managing the environmental impacts of their activities. To be able to efficiently perform the tasks arising from this considerable responsibility, these managers added specialized personnel with environmental expertise to their organizations.

At the same time, Hydro-Québec officially joined the Environmental Commitment and Responsibility (ECR) Program of the Canadian Electricity Association (CEA). It also instituted measures aimed at implementing, by the year 2000, an environmental management system in compliance with ISO 14001. Joining the ECR program further commits Hydro-Québec to endorsing the concept of sustainable development and providing annual reports of its environmental performance to the CEA. This undertaking demonstrates Hydro-Québec's firm intention to improve its performance and manage the environmental impacts of its activities according to the highest standards of excellence.

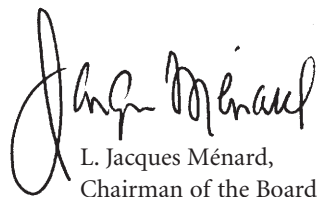
In addition, Hydro-Québec's Board of Directors heightened its commitment to the utility's environmental management in 1997. The main task of the newly formed Environment and Corporate Citizenship Committee is to make recommendations to the Board on environmental management, corporate citizenship and Hydro-Québec's image, as well as on public health and safety and relations with Aboriginal communities. Made up of six members, the Committee is informed of any environment-related reports or infraction notices.



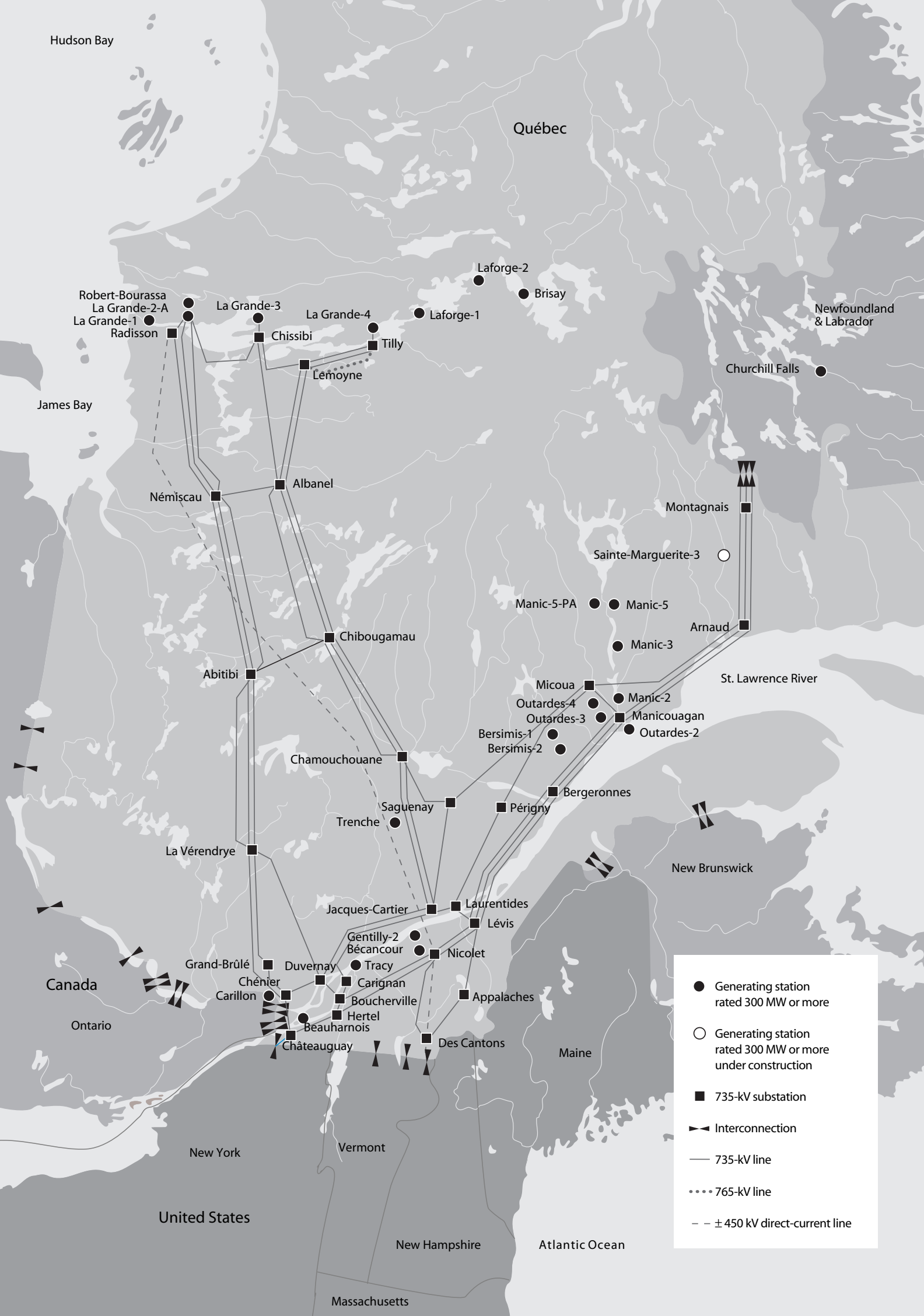
We also play an active part in International Energy Agency (IEA) activities connected with hydroelectricity and the environment. The purpose of these operations is to highlight the renewable nature of hydroelectric energy and the relatively few negative impacts that it entails for future generations, particularly in the area of greenhouse gas emission control.

Moreover, we will maintain our growth objectives stated in our Strategic Plan 1998-2002. Fulfilling these objectives involves, among other activities, the implementation of projects for completing Québec's hydroelectric potential. In this regard, only those projects that are favorably received by the local communities and acceptable in economic and environmental terms will be carried out.

We are confident that these efforts will allow Hydro-Québec to remain on the leading edge in the environmental field.


L. Jacques Ménard,
Chairman of the Board


André Caillé,
President and Chief Executive Officer



Introduction

Hydro-Québec is pleased to present its third environmental performance report.

The utility's new structure, based on its main areas of business, was established during 1997. We have decided to present the results of our environmental performance according to these same areas in order to comply with the principle of environmental accountability by our managers and, at the same time, to facilitate the appropriation, by our employees working in these business areas, of the environmental impacts of their activities.

In 1997, the Environment function at Hydro-Québec was affected by the following events:

- decentralization of environmental expertise to the business units;
- start of implementation of an environmental management system (EMS) in compliance with ISO 14001 throughout the utility;
- official joining of the Environmental Commitment and Responsibility (ECR) Program of the Canadian Electricity Association (CEA) on its launch in November 1997;
- formation of the Environment and Corporate Citizenship Committee reporting directly to the Board of Directors;
- participation by Hydro-Québec in International Energy Agency (IEA) activities relating to hydroelectricity and the environment;
- launch of preliminary projects for the partial diversion of certain rivers, including some in the Betsiamites basin;
- inauguration of the first two hazardous-material recovery centres which help in establishing an integrated structure for the management of hazardous waste and promote compliance with the principle of the 3 REs (recovery, reuse, recycling and energy recovery);
- organization, in collaboration with Bell Canada, of the "Partners Along Environmental Lines" seminar on the topic of internal environmental assessments;
- introduction, by the TransÉnergie division, of a new operating method which entails conducting environmental and technical audits simultaneously.



Reservoir in the La Grande complex

Hydro-Québec at a Glance

	1993	1994	1995	1996	1997
Total installed capacity (MW)	29,099	30,400	31,125	31,413	31,397
Hydraulic (MW)	26,896	28,207	28,932	29,220	29,203
Nuclear (MW)	675	675	675	675	675
Thermal (MW)	1,528	1,518	1,518	1,518	1,518
Total sales (TWh)	152	158	166	163	163
Transmission system (km)	29,869	30,478	30,831	30,557	32,090
Distribution system (km)	100,908	101,285	102,785	104,078	104,640
Number of customer accounts	3,307,686	3,345,616	3,398,944	3,427,260	3,456,768
Number of employees	26,781	25,406	24,852	23,320	20,416
Total revenue (\$M)	7,029	7,289	7,604	7,680	8,287

Environmental Management System

Environment and Corporate Citizenship Committee

The principal task of this committee, which was formed in 1997, is to submit recommendations to the Board of Directors on environmental management, corporate citizenship and the utility's image, as well as public health and safety and relations with Aboriginal communities. Made up of six members of the Board of Directors, the Committee is informed of any environment-related reports or infraction notices.

In 1997, the Committee reiterated its concern for the environment and defined its objectives in this regard. It further emphasized the need to establish and maintain a plan for communications with local and Aboriginal communities and to develop productive partnerships with these groups.

Participation in the ECR program of the CEA

Hydro-Québec officially joined the ECR program of the CEA on its launch in Ottawa on November 24, 1997.

Under this program, participating utilities undertake to:

- implement an ISO 14001-consistent EMS;
- give an annual account of their performance in a report to the CEA;
- comply with the four principles stated in the declaration on the inside front cover of this report.

Update of the Environment Policy

As part of the overall review of its policies, directives and guidelines, Hydro-Québec will publish a new Environment Policy in 1998. This revised policy, which meets the utility's new orientations, will also contain points dealing with public health and safety.

At the same time, Hydro-Québec will renew its environmental commitment so that it complies with ISO 14001. According to the principles of this standard, the Environment Policy constitutes the cornerstone of the utility's environmental management system (EMS).

EMS Implementation as at December 31, 1997

The decision to implement ISO 14001 provides essential support for the utility's growth on Québec, North American and world markets. This decision is the subject of a commitment in Hydro-Québec's Strategic Plan 1998-2002.

Make personnel in business and support units accountable

At the beginning of 1997, following a major restructuring, Hydro-Québec established business and support units that are accountable for their environmental performance, among other responsibilities.

As part of this restructuring, positions were created for EMS advisers. These advisers report to administrative units that are responsible for implementing and maintaining their respective EMS. At the same time, the environmental management unit (the corporate environment unit) set up a team of specialists in charge of guiding the implementation and startup of the EMS, as well as providing high-level expertise, in cooperation with consultants specializing in this field. This structure has been instrumental in building an environmental management network at Hydro-Québec.

Implementation under way since May 1997

The implementation project got under way in May 1997 in the following four business or support units: Generation, TransÉnergie, Distribution and Customer Services, and Procurement and Services. Progress as at December 31, 1997 can be summarized as follows:

- The participating units' managers are committed to implementing and maintaining an EMS in compliance with ISO 14001.
- They have adopted implementation plans, set up the organization required and put together the human and financial resources needed to make their implementation plans operational.
- The employees and managers engaged in the implementation project must receive training in ISO 14001 and in the operation of an EMS. Hydro-Québec designed three training modules for this purpose in 1997; by December 31, a number of employees had already been trained. At the present time, the project involves some 225 of the utility's managers and specialists.

stem

- The participating units' managers have carried out the following activities:
 - a first environmental review and a gap analysis;
 - initial identification procedures for significant environmental aspects, and initiation of those procedures;
 - assessments in a number of facilities.
- As well as:
 - producing preliminary guides to help identify statutory and other requirements;
 - raising awareness and distributing general information through the utility's publications;
 - establishing a work group on the EMS and the documentation for the system;
 - setting up a training work group;
 - setting up a communications work group.

General timetable: from 2000 to 2002

Under current planning by participating units, the timetable will run from 2000 to 2002. In addition, there are plans to integrate the International Affairs and Projects business unit at the beginning of 1998, as well as corporate activities.

Other units should begin to take part in the project in late 1998 or early 1999.

Environmental Audits

Since the environmental audit program was instituted in 1994, Hydro-Québec has conducted 69 audits on the following types of installations:

- hazardous-waste storage sites (8 audits);
- administrative and service centres (14 audits);
- thermal generating plants (4 audits);
- hydroelectric generating stations (11 audits);
- 735-kV substations (7 audits);
- 315-kV substations (9 audits, all conducted in 1997);
- 120-kV substations (16 audits, of which 10 were conducted in 1997).

The TransÉnergie division already instituted its compliance assessment program in 1997, covering 45% of its facilities. This activity, which comes under the territorial units, involves measuring the facilities' degree of compliance with laws and regulations in force in Québec, as well as with Hydro-Québec's requirements in such areas as management of contaminants, noise, and impacts on fauna and flora.



Du Tremblay substation, Longueuil

The shortcomings noted are brought to the attention of the facility manager. In the majority of cases, simple corrective action is taken promptly. By way of example, the table opposite illustrates some of the improvement needs revealed by audits conducted in 1997.

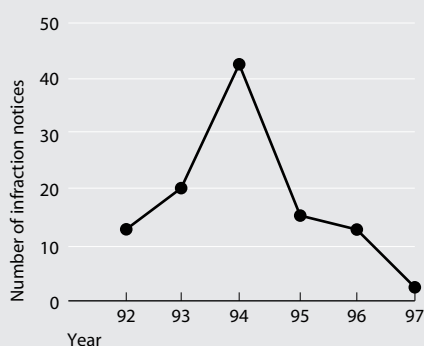
Hydro-Québec has many different installations throughout Québec. Starting in 1998, self-evaluation by the units responsible for certain installations will be added to the audit program. This procedure is part of the implementation of the EMS and will offer managers full control of their activities that have environmental impacts.

Improvement Needs Revealed by 1997 Audits

120 and 315-kV substations

- **Storage of hazardous materials**
 - Non-compliant labeling and storage
- **Management of spills**
 - Update of alarm procedures following the reorganization
- **Information on wastewater quality**
 - Analysis of waste from water-oil separators
- **Management of solid waste**
 - Presence of prohibited material in solid waste

Infraction notices issued by the MEFQ to Hydro-Québec



Complaint Management

Since 1993, we have specifically identified complaints of an environmental nature in our complaint handling system. Most of these complaints are related to distribution activities, mainly property damage and excessive or poorly executed pruning work.

The number of claims for property damage shrank considerably in 1997, chiefly as a result of Hydro-Québec's proactive attitude in this regard. If an employee damages a customer's property in the course of executing the work, and informs the customer of this, a claims officer communicates directly with this customer and settles the matter without the customer's having to file a claim. This approach helps improve the utility's image, as it allows the customer to negotiate an agreement amicably, without having to resort to a claim process.

Infraction Notices

Infraction notices issued by the ministère de l'Environnement et de la Faune du Québec (MEFQ) are contained in a four-monthly follow-up report intended for Hydro-Québec's Board of Directors. This report notes any deficiencies observed by MEFQ representatives, the response given by Hydro-Québec and the date each of the cases was resolved.

Between 1992 and 1997, the MEFQ formulated 105 infraction notices for all of Hydro-Québec's activities and facilities, including only three in 1997. As at December 31, 1997, 10 of these infraction notices were pending, five of which were the subject of an inquiry by the authorities. The latter cases involved a difference of interpretation between Hydro-Québec and the MEFQ on the need to obtain an authorization certificate before undertaking certain work.

Of the other five cases pending, three involve differences of interpretation regarding provisions of the law, while the other two concern:

- failure to notify the MEFQ promptly of a spill in the Manicouagan area;
- the emission of contaminants into the environment and the execution of in-water work without having first obtained an authorization certificate. This infraction concerns the Generation business unit.

Environment-Related Complaints

Year	Total number of written complaints and claims	Written environment-related complaints and claims		Average complaint handling time
		Number	Percentage of total complaints	
1993	6,611	504	7.6%	20 days
1994	8,143	588	7.2%	18 days
1995	7,148	667	9.4%	16 days
1996	8,140	694	8.5%	19 days
1997	5,555	544	9.8%	19 days

Source: Hydro-Québec, *Plaintes et réclamations (annual report 1997), 1st quarter 1998.*

Environmental Training and Awareness Activities

Topic	Number of participants
Implementation of an EMS in compliance with ISO 14001	65
Introduction to EMS and ISO 14001	21
SUBTOTAL: ISO 14001 training	86
Environmental awareness	405
Awareness of Aboriginal reality	130
Spills of contaminants	118
Recovery of hazardous waste	80
Outages caused by animals in substations	12
Information on internal environmental assessment grids	12
Hydro-Québec's technological heritage	5
Chemical maintenance of power line rights-of-way	4
TOTAL	852

Environmental Training and Awareness

Environmental training and awareness are key elements of ISO 14001. Hydro-Québec's strategic planning branch therefore established a work group to draft the environmental training and awareness procedure. This group will also work on establishing the necessary tools to:

- allow managers to measure the gap between training already received by their employees and subcontractors, and that which they should receive;
- ensure that the training programs help reduce this gap;
- make this training accessible, disseminate its content and conduct follow-up.

In 1997, Hydro-Québec also carried on its efforts to offer training and awareness activities to management personnel, Environment personnel and any other employees whose work may have an effect on the environment. During the year, 852 employees took part in these activities.

A total of 86 participants - employees and managers who are members of implementation committees, and EMS implementation team leaders and members - attended ISO 14001 training sessions. These activities will continue in 1998.

Some 6,500 employees and their superiors are to receive training on the recovery of hazardous waste. To this end, 30 environmental specialists will be accredited in 1998 to lead sessions on this particular issue, in order to enable Hydro-Québec to reach the entire target population within a reasonable length of time.

Apart from the above training on specific topics, Hydro-Québec organized various Environment Month activities, as it does every year. These activities are designed to raise awareness of a specific aspect of the environment by the utility's employees, as well as the general public. In May 1997, based on the slogan *Agir aujourd'hui pour l'environnement de demain* (Act Today for Tomorrow's Environment), employees were invited to share their good ideas about the environment in the areas of:

- integrating Hydro-Québec facilities into their environment;
- protecting and enhancing Hydro-Québec's architectural and technological heritage;
- the 3 REs;
- wildlife and Hydro-Québec facilities.



Wind power test facility, Saint-Ulric

Contribution of advisory committees, partners and research

Advisory Committee on the Environment and Community Affairs and Its Subcommittees

In 1985, Hydro-Québec formed the Advisory Committee on the Environment. It gave this committee the mandate to advise the utility on strategic environmental orientations and supply opinions on matters connected with research, studies, projects and activities of an environmental nature. Since 1996, the Committee has also been involved in analyzing cases pertaining to the utility's relations with the various Québec communities. It consequently became the Advisory Committee on the Environment and Community Affairs (ACECA).

Since it was created in 1985, the Committee has held 57 meetings and examined nearly 250 cases. Two subcommittees — one formed in 1989, and the other in 1994 — are responsible, respectively, for making recommendations to the utility on matters related to environmental enhancement and support for regional development.

1997 Advisory Committee on the Environment and Community Affairs

Chair

Louise Roy

President

L.R. Services-conseil

Secretary

Joanne Lalumière

Senior Director,

Communication and Environment

Hydro-Québec

Members

Roger Bilodeau

Director, Generation Expertise

and Technical Support

Generation

Hydro-Québec

André Bouchard

Professor

Institut de recherche en biologie

végétale (IRBV)

Aurélien Gill

President, Gestion GAMAC

Commissioner, Commission nationale

des revendications territoriales

autochtones

Lorne Giroux

Attorney

Claude-Hillaire Marcel

Professor, Environmental Research Chair

Université du Québec à Montréal

Philippe Poullaouec-Gonidec

Professor, Environmental Design Chair

Université de Montréal

Marie-France Raynault

Physician, Department

of Preventive Medicine

Hôpital Saint-Luc

Jean-Marc Tremblay

Director, Projects

Distribution and Customer Services

Hydro-Québec

Ed Villeneuve

Vice-President, Environmental Projects

and Audits and Industrial Hygiene

Noranda inc.

Environmental Research Partners

Hydro-Québec supports three university research chairs in the environment field:

- Hydro-Québec - NSERC - UQAM Environmental Research Chair;
- École polytechnique de Montréal NSERC Industrial Chair in Site Bioremediation;
- Université de Montréal Environmental Design Chair.

Hydro-Québec is also involved in a number of programs and studies in collaboration with public and private partners:

- various Québec and Canadian government departments, including the ministère de l'Environnement et de la Faune du Québec (MEFQ), the ministère des Richesses naturelles du Québec, Environment Canada and Fisheries and Oceans Canada;
- industrial and private enterprises such as Bell, Ontario Hydro, Électricité de France, Électrabel (Belgium) and Vattenfall (Sweden);
- environmental organizations such as the Fédération québécoise de la faune and the Fédération québécoise pour le saumon atlantique;
- universities, including Université du Québec, McGill University, Université de Sherbrooke, Université de Montréal and University of British Columbia;
- international organizations such as the Union internationale des producteurs et distributeurs d'énergie électrique (UNIPED), International Hydropower Association (IHA), International Energy Agency (IEA) and International Association for Impact Assessment (IAIA);
- environmental consulting firms and specialists.

Dissemination of Findings

The research results are disseminated in various ways: at events of a scientific nature (seminars, conferences, etc.), in research monographs or as part of

environmental assessment reports. The most important findings are published in the international scientific press.

Examples of publications and papers

MANDEVILLE, R., E. FRANCO, S. SIDRAC-GHALI, L. PARIS-NADON, N. ROCHELEAU, G. MERCIER, M. DÉSY and L. GABOURY, "Evaluation of the Potential Carcinogenicity of 60 Hz Linear Sinusoidal Continuous-Wave Magnetic Fields in Fischer F344 Rats," *FASEB Journal* 11:1127-1136, 1997.

MARUVADA, P.S., A. TURGEON, D.L. GOULET and C.U. CARDINAL, *A Statistical Model to Evaluate the Influence of Proximity to Transmission Lines on Residential Magnetic Fields*, Institute of Electrical and Electronics Engineers, PE-136-PWRD-0-11-1997.

MARUVADA, P.S., A. TURGEON, D.L. GOULET and C.U. CARDINAL, *An Experimental Study of Residential Magnetic Fields in the Vicinity of Transmission Lines*, Institute of Electrical and Electronics Engineers, PE-138-PWRD-0-11-1997.

BOISVERT, André, «Montréal et la conurbation de Hollande : Deux expériences métropolitaines d'aménagement», *Routes et Transports*, Vol. 26, No. 4, pp. 16-26.

TREMBLAY, A. and M. LUCOTTE, "Accumulation of Total Mercury and Methylmercury in Insect Larvae of Hydroelectric Reservoirs," *Canadian Journal of Fisheries and Aquatic Sciences* 54: 832-841.

GAGNON, Luc, "Hydropower: a major tool to reduce greenhouse gas emissions," *The International Journal on Hydropower & Dams*, Volume 4, Issue 4, 1997.

BEAULIEU, Gilbert, «La gestion du bois traité à Hydro-Québec», *Colloque annuel du chapitre Saint-Laurent de la Société de toxicologie et de chimie de l'environnement*, May 30, 1997.

Environmental Research

Every year, Hydro-Québec spends several million dollars on environmental research. We strive to acquire knowledge of resources, environments and communities that may be affected by the environmental impacts of the utility's activities and to implement solutions that limit the environmental impacts of such activities.

In the area of research on overall environmental issues, the programs carried out in 1997 are listed in the table below.

Field of research	Research result expected	Scheduled end	Total cost (in thousands of dollars)
Study of mechanisms and rates of greenhouse gas emissions from hydroelectric reservoirs	• Reports and models	2001	4,640
Instrument for remote reading of greenhouse gases (infrared laser)	• Optimized prototype	Dec. 2000	750
Atmospheric effects of SF ₆	• Scientific reports by IREQ	Dec. 1999	580
Instrument for remote reading of atmospheric pollutants	• Optimized measurement prototype	Dec. 1999	530
Study of life cycle of products purchased by Hydro-Québec	• Final report for each study	1999	N/A
Analysis of pairing of wind and hydropower Evaluation of ecological risks	• Scientific reports and articles • Framework and mathematical models for evaluating ecological risks to aquatic and land environments, in partnership with government and private organizations	1998 Dec. 1999	30 400
Evaluation of the consequences of technological accidents	• Scenarios of technological accidents for different types of installations • Equations of risk calculations adapted to Hydro-Québec cases • Emergency measures plans that take risks of accident into account	Dec. 1999	120

Specific Issues Related to Contaminants

Reduction and Elimination of Toxic Products

The ARET program (Accelerated Reduction/Elimination of Toxics) is a federal program which companies join on a voluntary basis. It aims to achieve significant reductions in the discharge of 117 toxic substances. Its specific objectives are:

- an end to discharges of 30 toxic, persistent, bioaccumulative substances by the year 2000; expected reductions are 90% in comparison with the 1993 level;
- a reduction in discharges of 87 other toxic substances to levels at which they cannot cause damage, by the year 2000; expected reductions are 50% from the 1993 level.

Along with 143 other companies, Hydro-Québec has taken part in this program since its inception in 1994.

However, Hydro-Québec discharges very few substances covered by the ARET program. This favorable situation is mainly due to the fact that the utility generates 97% of its energy hydroelectrically and has withdrawn nearly all of its electrical apparatus insulated with polychlorinated biphenyls (PCBs).

Total reduction in discharges of substances covered by the ARET program between 1993 and 1997 is 61%.



Site of former generating plant on the Îles de la Madeleine

Soil Decontamination

In 1997, Hydro-Québec continued its participation in the research conducted by the École polytechnique de Montréal's Industrial Chair in Site Bioremediation, which concerned:

- development of technologies for treating soil contaminated by pentachlorophenol;
- development of a treatment concept applicable to small areas of soil contaminated by diesel fuel in remote locations.

These innovative solutions will better equip us to deal with the issue of contaminated soil at Hydro-Québec.

Yet another study enabled us to identify a fast, reliable method for characterizing diesel-contaminated soil. This method, which is used in characterizing the sites of certain thermal generating plants, reduces the waiting time involved in obtaining analysis results.

Restoration projects under way focused on contaminated land at the Île d'Entrée and Cap-aux-Meules thermal generating plants located on the Îles de la Madeleine, and the Port-Menier plant on Île d'Anticosti.

Decontamination Projects in Progress at the End of 1997

Site and type of intervention	Volume to be decontaminated	Volume removed and treated in 1997	Volume removed and treated to date	Cost to date (\$M)	Scheduled end
Île-d'Entrée (Îles de la Madeleine) Soil decontamination	10,500 m ³	Removed: 1,400 m ³ Treated: 1,300 m ³	Removed: 8,800 m ³ Treated: 6,000 m ³	3.2	1999
Cap-aux-Meules (Îles de la Madeleine) Soil decontamination	50,000 m ³	Removed: 11,000 m ³ Treated: 9,900 m ³	Removed: 43,000 m ³ Treated: 32,000 m ³	9.4	1999
Cap-aux-Meules (Îles de la Madeleine) Groundwater decontamination	20,000 L		10,687 L recovered	5.4	—
Port-Menier (Île d'Anticosti) Soil decontamination	8,700 m ³	Removed: 2,100 m ³ Treated: 1,900 m ³	Removed: 4,700 m ³ Treated: 2,500 m ³	1.0	2000



Decontamination of the site of the former gas plant on Rue Verdun in Québec City is now complete. We also rehabilitated the land and continued the groundwater quality monitoring program laid out in the MEFQ authorization certificate. Meetings are to be held with Québec City authorities and the MEFQ in 1998 to discuss the future use of this site.

Other decontamination projects were also carried out during 1997. They include the characterization of the soil of 11 former hazardous-waste storage sites, as well as the characterization and restoration of the soil of three former service centres at Saint-Georges-de-Beauce, Alma and Sainte-Thérèse. In the last case, monitoring and characterization of contaminated groundwater will continue in 1998. Other former storage sites will also be the subject of characterization and restoration efforts in the coming year.

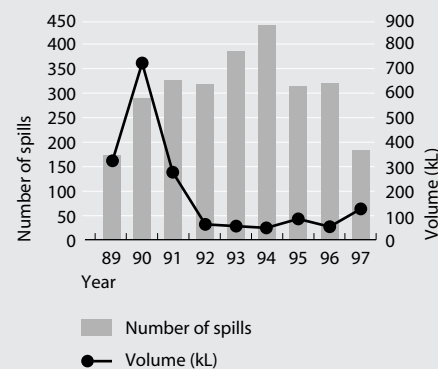


Spill after an ice storm

Spills

The data acquired to date show a decrease in the number of spills since 1995, along with a marked reduction in volumes spilled since 1991. These reductions are mainly the product of changes in transformers used on the distribution system in order to counter the effects of lightning (modification of surge arresters). The number of spills and the volumes spilled may fluctuate from year to year; however, a substantial increase in volumes may stem from unforeseeable events such as weather-related phenomena. At the beginning of 1997, for example, an ice storm affected the Trois-Rivières area, leading to an increase in volumes spilled. Furthermore, a very significant increase in the number of spills in 1998 may already be anticipated, as a result of the unprecedented ice storm that struck southern Québec in January.

Number of spills Volumes spilled



Electricity generation is the cornerstone of Hydro-Québec's operations. Indeed, 97% of the energy generated by Hydro-Québec is produced hydroelectrically. Hydropower is a renewable, sustainable resource, and supplies clean, ecological energy.

Electricity Generation



Sport fishing, Gouin reservoir

Hydroelectricity: After Kyoto

Selecting the most effective ways to control the greenhouse effect and comply with the principles of sustainable development is a major issue in the Kyoto protocol. In this regard, hydroelectricity seems to be the means of choice: it is renewable, and its use can incorporate environmental and social acceptability criteria, with few negative impacts on future generations.

Hydroelectricity, a Renewable Energy Source

The characteristics of hydroelectricity make it an energy source that is not only renewable, but also efficient and reliable:

- Hydroelectric energy is fundamentally an indirect, inexhaustible form of solar energy that is continually renewed. Hydroelectric generation does not diminish global energy reserves.
- A hydroelectric facility works by harnessing the diffuse kinetic energy of rivers and turning it very efficiently into electricity. In contrast, when a fossil fuel is converted into electricity, a large part of the energy is lost in the form of heat (see Energy Conversion Efficiency, p. 16).
- When it includes a reservoir, a hydroelectric facility can also store energy. This energy can be converted into electricity at any time, practically without loss. In addition, a reservoir can serve many different purposes, such as flood control, provision of drinking water, commercial fishing, and recreation and tourist activities.



Environmental and Social Acceptability of Projects

Projects like creating a reservoir, building and operating a hydroelectric facility and partially diverting rivers inevitably bring about local and regional environmental impacts, and may raise significant social issues. When a facility is first planned, i.e., before the necessary government authorizations are requested, the project must be favorably received by the local communities. It is therefore important to agree with them on ways to successfully integrate the project into their environment and maximize positive impacts. That is why Hydro-Québec organizes consultation and discussion forums with the local communities, and also offers them a system of economic partnership.

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Versatility of Hydroelectric Installations

Numerous outfitting operations, where recreation, tourist and traditional activities are practiced, have been established bordering Hydro-Québec’s reservoirs. Around some generating stations, Hydro-Québec has developed infrastructures such as parks, bicycle paths, and nature and heritage interpretation trails. A number of facilities also offer a program of guided tours for the public. In 1997, more than 126,700 people visited Hydro-Québec generating stations.

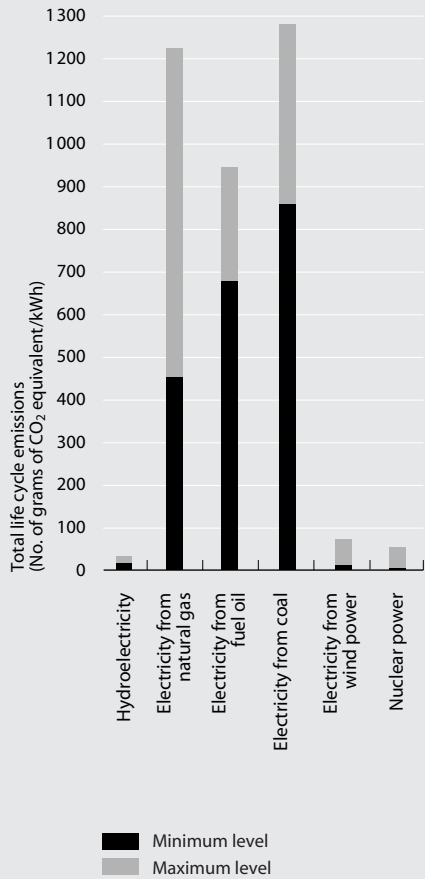
Greenhouse Gases

Studies of greenhouse gas (GHG) emissions from reservoirs are being conducted under a research program initiated five years ago. This program is carried out in collaboration with the Hydro-Québec — NSERC — UQAM Environmental Research Chair.

According to the latest research, rates of emission from hydroelectric reservoirs are at least 15 times lower than those stemming from energy generated by natural gas, and at least 29 times lower than those produced by coal. These data are calculated using life-cycle analyses based on a useful life of 100 years for dams.

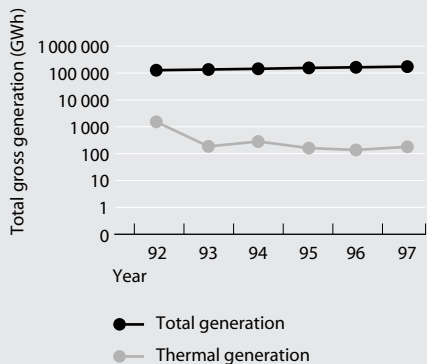
- In addition, Hydro-Québec plays an active part in current efforts in this area by the following international organizations:
- IEA — Hydro-Québec is responsible for research into mitigative measures as well as activities synthesizing the Agency’s research on the environmental effects of hydroelectric facilities;
 - IHA — Hydro-Québec is responsible for guiding the efforts of work groups on social impacts, atmospheric emissions and ichthyofauna, under the auspices of the IHA’s standing committee on the environment.

Greenhouse gas emissions according to energy system

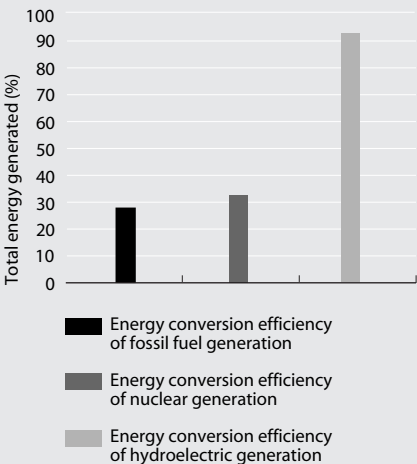


Source: Van de Vate, J.F., Energy Policy, International Atomic Energy Agency (IAEA), January 1997.

Energy generated by type of equipment



Energy conversion efficiency



Tracy thermal generating plant

Electricity Exports and Atmospheric Pollutants

Since 1980, our sales outside Québec have also yielded benefits in terms of the overall environment, since they allow our neighbors to avoid generating polluting emissions. In this regard, the deregulation of energy markets and Hydro-Québec’s desire to considerably increase its market share outside Québec should help prevent further deterioration of the environment.

Energy Conversion Efficiency

The energy conversion efficiency indicators shown opposite provide points of comparison among CEA member electric utilities. They also form an integral part of the report which Hydro-Québec produces annually for the CEA under the ECR program. These indicators allow a comparison of the energy efficiency of different types of generation, based on the energy input used.



Refurbishing of Beauharnois generating station

Thermal Generation

The 29 thermal generating plants operated by Hydro-Québec are used to meet special needs (low runoff, daily and seasonal peaks, synchronous compensation, etc.) and to supply off-grid power systems. The emissions produced by these plants fluctuate from one year to the next, as a result of their irregular use, but are generally very low. The most significant fluctuations result chiefly from the occasional use of Tracy generating plant (950.3 GWh in 1992 compared with 0.3 in 1996 and 48.3 in 1997) at peak periods or when alternative sources of supply to meet Hydro-Québec’s customer demand are not cost-effective.

Optimizing Our Generating Facilities

Existing Generating Facilities

Hydro-Québec devotes considerable efforts in every region to incorporate the environment into the maintenance and operation of its generating facilities. The table opposite lists some of the most important improvements.



generating station

Generating Station Refurbishing Projects

Beauharnois generating station

At the end of 1990, Hydro-Québec began draft-design studies on carrying out major refurbishing, reconstruction, modernization and automation of the installations at Beauharnois generating station on the St. Lawrence River, just outside Montréal. The purpose of this work is to extend the useful life of civil engineering structures by 50 years, and of electrical and mechanical equipment by 25 to 40 years.

Once the draft-design stage was completed in August 1994, Hydro-Québec gave its approval, in September, to the initial series of work, scheduled to run from 1994 to 2001.

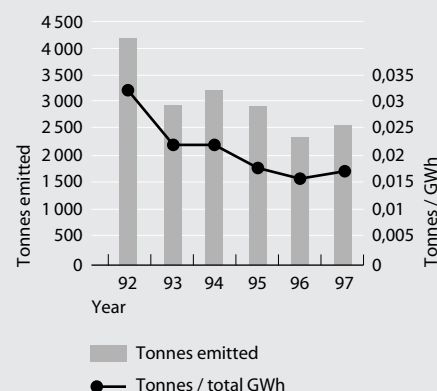
In conjunction with the environmental assessment and monitoring of this work, environmental enhancement and management measures were instituted, including:

- adoption of an emergency plan in case of a contaminant spill during the execution of work on the site;
- an inventory of heritage facilities, and a management method for facilities of special interest;
- a historical monitoring of the generating station's construction and refurbishing sites;
- establishment of a management program for contaminated waste, soil and sediments.

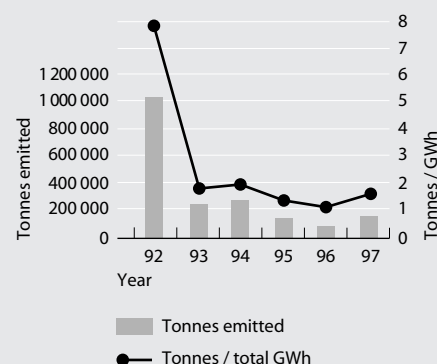
Site	Activity	Environmental benefit
Gatineau river generating stations	• Replacement of speed regulators	<ul style="list-style-type: none"> • Elimination of oil leaks • Reduction in volumes of hazardous waste to be managed
Tracy thermal generating plant	• Construction of a unit for neutralizing wastewater from the facility's treatment plant	<ul style="list-style-type: none"> • Improvement in wastewater quality
Outardes, Manicouagan, Bersimis and La Grande complexes	• Optimization of vegetation control strategies on dikes and dams during mechanical and chemical maintenance	<ul style="list-style-type: none"> • Protection of sensitive zones and elements in the area, based on reliability of infrastructure. • Integrated vegetation control approach.

Estimated Atmospheric Emissions from Hydro-Québec's Thermal Generating Plants

NO_x Emissions

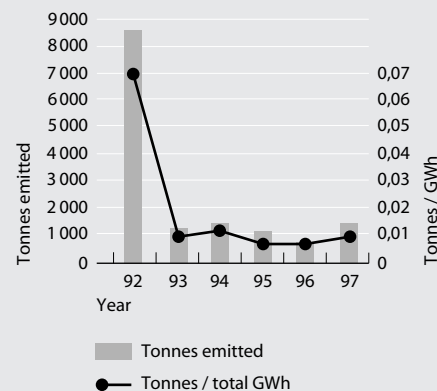


CO₂ Emissions



Note: Only emissions from thermal generating plants were considered in the calculation of CO₂ emissions. As mentioned on page 15, studies are in progress to evaluate rates of GHG emission from hydroelectric reservoirs.

SO₂ Emissions



La Tuque, La Gabelle and Shawinigan generating stations

La Tuque and La Gabelle generating stations, as well as those in the Shawinigan complex, were built between 1901 and 1949 in the Saint-Maurice river basin. These facilities contain numerous architectural and technological elements of heritage value, whose protection or enhancement was part of the draft-design studies.

The refurbishing of these three generating stations is intended to modernize the facilities and make them more efficient in terms of hydroelectric generation, safety and environment. The work was scheduled as follows:

- Shawinigan complex generating stations, August 1993 to November 2000;
- La Gabelle generating station, August 1994 to April 1999;
- La Tuque generating station (phase I), September 1996 to December 1998.

Accordingly, investments of several hundred thousand dollars have been devoted to establishing structures for controlling, defining and recapturing any spills of contaminants that may occur.

New Projects

Sainte-Marguerite-3 hydroelectric generating station

Construction of this facility began in 1994. A great many activities were carried out in 1997 on the site and in the communities affected by this project.

Economically usable merchantable timber in the zone of the future reservoir — which covers an area of 8,390 hectares — was recovered. The net cumulative volume is 550,000 m³. Waste wood from the recovery operation was burned to reduce the volume of floating wood debris during reservoir filling.

In the summer of 1997, Hydro-Québec began implementing its reforestation and restoration campaign on the affected sites along the permanent road leading to the jobsite. Some 136,000 conifers and 48,000 green alder were planted. By the end of the 1998 campaign, more than 87 hectares of public forest lands will have been restored.

In accordance with the development objectives of Matimek ZEC (controlled-used zone), where the Sainte-Marguerite-3 jobsite is located, measures were taken to develop brook trout production in the area. These include building spawning grounds at Lac Hall, stocking lakes À Toi and À Moi and conducting a diagnosis of wildlife and vegetation in Lac Hélène. Hydro-Québec also covered some of the ZEC's administrative expenses for mitigative measures.

The remedial works corporation (SOTRAC) for the Sainte-Marguerite-3 project — managed jointly by the Uashat-Maliotenam Montagnais band and Hydro-Québec — administers a fund for the implementation of measures that meet the Montagnais' needs. In 1997, the focus was on the following projects: construction of a community cultural centre and preparation of an archeological exhibition, study of a fishway project, development of a snowmobile trail, trapping of beaver in the flood zone and stocking of lake trout in the vicinity of the future reservoir.

In addition to these mitigative measures, Hydro-Québec carried out its commitments in terms of monitoring elements in the natural and human environments as a whole, as well as its surveillance activities. Only one infraction notice was issued in 1997, concerning a sedimentation problem that was resolved by waterproofing the sedimentation basin and building a filter.



La Tuque generating station

The Betsiamites project: partial diversion of the Portneuf, Sault aux Cochons, Manouane and Boucher rivers

These projects are designed to maximize the generating output of the existing facilities and yield net energy gains of approximately 0.9 TWh. The effect of the partial diversion of the Portneuf, Sault aux Cochons and Manouane rivers will be to increase inflow into the Pipmuacan reservoir, while the diversion of the Boucher will supply the Outardes-3 reservoir.

Draft-design studies in the field got under way in 1997. The environmental issues associated with the diversion of the four rivers in the Betsiamites project are closely related to the effects which changing flows and water level will have on wildlife and aquatic habitats, as well as on the harvesting of fish resources, recreation, tourist and vacation activities, and use of the land by Aboriginal communities.

Potential economic spinoffs also undergo assessment. Hydro-Québec has consequently proposed that the local communities participate in project investment and implementation. The object is to promote dialogue and the convergence of the long-term economic interests of the host communities and Hydro-Québec.

International Projects

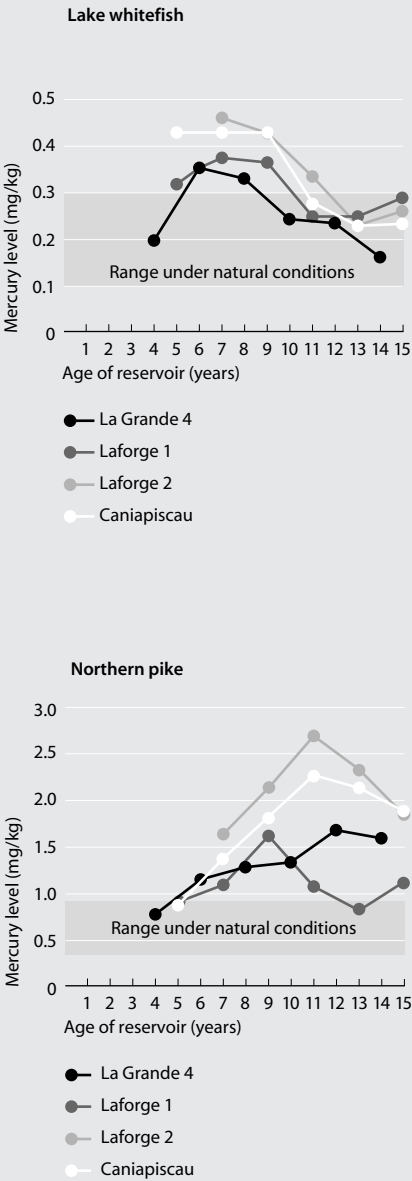
Hydro-Québec makes the most of its environmental expertise by working with a number of countries on the development of various energy projects. Some of the most important ones are:

- development of an environment unit in Morocco's national drinking water board (ONEP);
- definition of an overall development plan for the power system (choice of means of generation, fuels and sites, and impact assessment) for the State of Gujarat, India. This project is scheduled to end in 2012;
- a synthesis of what has been learned about forecasting the impacts and effectiveness of mitigative measures in the use of hydroelectric energy, as part of a study conducted by the IEA;
- identification of impacts and proposal of mitigative measures in connection with a project for building a 1,200-MW hydroelectric generating station in the Tigris River, in Turkey. This project includes the creation of a 313-km² reservoir in southeastern Anatolia on a very rich, very old (from the Paleolithic age to the present day) archeological site;
- conclusion of technical cooperation and technology transfer agreements in the nuclear field with South Korea, Argentina, Romania and China.

Hydro-Québec also continued its active participation in the E7 Network of Expertise. The object of this network, formed by the eight largest electric utilities in the G7, is to pool the members' experience and expertise in order to enable it to play a leading role in global environment protection and to promote energy efficiency and the appropriate use of electricity. Active projects in which Hydro-Québec is involved include:

- the Indonesia project to establish renewable energies in remote villages;
- the South Africa project, which enabled managers from the Southern African Power Pool (SAPP) to attend an environmental-management awareness seminar;
- a series of seminars on environmental assessments, presented in Malaysia and Tunisia;
- the Thailand project, in which a series of courses and workshops were offered to the government so as to build up its departments' environmental capabilities.

Evolution of mercury levels in the flesh of fish in reservoirs in the eastern sector of the La Grande complex



Ecosystem Management

In order to reduce the impact of the operation of its generating facilities, Hydro-Québec invests substantial amounts every year in the environmental monitoring of its installations, research into the mitigation of impacts and the implementation of remedial measures.

Environmental Monitoring

The purpose of environmental monitoring is to validate the relevance and effectiveness of mitigative measures specified for a project. Among other results, it helps document changes in the environment and compare them with those forecast.

The principal results achieved in 1997 under the environmental monitoring programs are listed in the table below.

Monitoring program	Activity
Lac-Robertson generating station	Environmental monitoring of the area following reservoir impoundment, focusing on: <ul style="list-style-type: none">• waterfowl• fish• water quality• the freshwater plume under ice cover• the economic spinoffs of construction of the Gros Mécatina road to the generating station
La Grande complex	<ul style="list-style-type: none">• Monitoring of use and effectiveness of remedial measures• Monitoring of fish mercury levels (eastern sector)• Monitoring of fish and water quality (La Grande-4, Laforge-1, Laforge-2 and Brisay)• Monitoring of erosion of banks downstream from La Grande-2A and La Grande-1
Gentilly-2 nuclear power plant	<ul style="list-style-type: none">• Monitoring of radioactivity in the environment• Monitoring of the concentration of discharges of copper in the St. Lawrence River

1. A recent report, produced jointly by Fisheries and Oceans Canada and North-South Consultants, compiles the results of the monitoring of fish mercury levels in reservoirs in the Churchill-Nelson complex in Manitoba. These results confirm the duration of the phenomenon as forecast by Hydro-Québec, namely a return to natural levels between 10 and 30 years after flooding. This conclusion is especially significant since, 10 years ago, following laboratory experiments, the Fisheries and Oceans Canada researchers forecast, on the contrary, that the phenomenon of mercury contamination would last at least 100 to 150 years.
2. The hypothetical critical individual dose represents the exposure dose that would be received by a "hypothetical" individual who lives within a radius of 1 km from the power plant, regularly consumes fish from the plant's discharge channel and drinks water drawn from the St. Lawrence River near the plant.

Electricity Generation



Gentilly-2 nuclear power plant

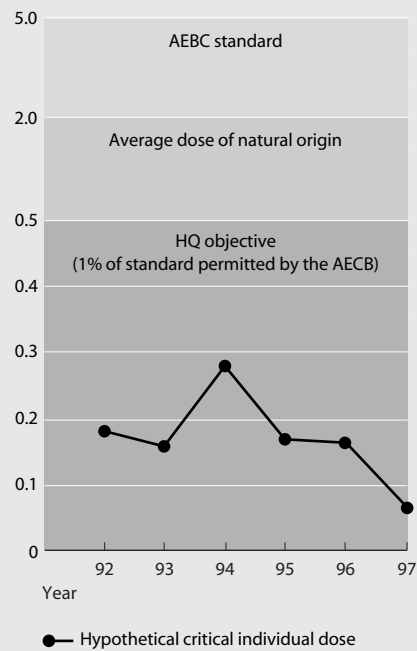
Principal result or environmental benefit

- The small bodies of water around the reservoir attract large numbers of waterfowl in the spring, when broods are raised right in the reservoir.
 - Increase in the biomass and number of fish in the reservoir, particularly rainbow smelt.
 - Significant increase in mercury levels for all species in the reservoir.
 - Marked increase in total phosphorus during the summer, and in chlorophyll and pheopigment concentrations.
 - Enlargement and thinning of the plume attributable to meteorological conditions in the winter of 1996-1997.
 - Regional spinoffs of \$1.5 million, or 42% of the total budget, in salaries, goods and services.
-
- The tributaries of the Laforge 2 and Caniapiscau reservoirs are used for spawning by fish.
 - Deforestation of the mouth of these tributaries does not constitute a relevant measure.
 - Return to natural levels in the region after 10 to 20 years of flooding for non-piscivorous species (e.g., lake whitefish), and after 20 to 30 years for piscivorous species (e.g., northern pike).¹ (See chart: Evolution of mercury levels in the flesh of fish in reservoirs in the eastern sector of the La Grande complex.)
 - Water quality comparable to natural variations.
 - Slight increase in fishing yields, as in the control environment.
 - Slight increase in erosion of banks.
 - Doses are less than 1% of the AECB standard (5 mSv).² (See chart: Estimated exposure doses related to discharges of liquids and gases from Gentilly-2 power plant.)
 - The discharges are 1,000 times less than Bécancour's municipal standard (5 ppm).



Fishing to monitor fish mercury levels at the La Grande complex

Estimated exposure doses related to discharges of liquids and gases from Gentilly-2 power plant





Monitoring harlequin duck migration

Research

In addition to monitoring the reservoirs' effects on the environment, the Generation unit conducts basic environmental research on wildlife and habitats, among other subjects.

Research program	Activity	Principal result or environmental benefit
Reduction in fish mercury levels	<ul style="list-style-type: none"> • Application of controlled intensive fishing 	<ul style="list-style-type: none"> • This project, in collaboration with the Némaska Crees, sets out to transpose to Northern Québec a method used successfully in small Scandinavian lakes.
Health risks and benefits of fish consumption	<ul style="list-style-type: none"> • Development of a model for forecasting mercury levels in reservoir fish • Development of a method for evaluating consumers' exposure levels 	<ul style="list-style-type: none"> • Strategy in keeping with Santé Québec principles, in terms of the nutritional qualities of fish.
Validation of techniques for inducing reproduction in lake trout	<ul style="list-style-type: none"> • Verification of the possibility of concentrating egg-laying in artificial sites, near natural spawning grounds that have been covered with canvas 	<ul style="list-style-type: none"> • Artificial spawning grounds are considerably deeper than natural ones and offer an ideal, permeable substrate. • Artificial spawning grounds are the most visited, and contain the largest quantities of eggs observed (44.8 eggs per m² compared with 11.4 on natural sites).
Wildlife measures for lake trout in the Manic-3 reservoir	<ul style="list-style-type: none"> • Catching of spawners in Lac Tétépisca, and sampling and fertilization of eggs • Installation of incubators in an artificial spawning ground, and observations on hatching 	<ul style="list-style-type: none"> • Compensation for loss or disturbance of habitats following repairs to riprap. • Restoration of lake trout population in a single, favorable site (Manic-3 reservoir), where 6,500 eggs were placed. • Contribution to establishing a natural population of this species which is in a precarious position in Québec.
Experimental fishway for eels at Chambly dam	<ul style="list-style-type: none"> • Design and installation of a fishway at Chambly dam 	<ul style="list-style-type: none"> • 15,622 eels captured in the fishway. • Restoration of the population of American eel, a species that has been on the decline for 15 years or so, particularly in Lake Champlain and the Richelieu River.
Caribou	<ul style="list-style-type: none"> • Using Argos and GPS (global positioning system) satellite telemetry, monitoring of caribou movements and use of the habitat by the two largest herds, taking environmental degradation into account 	<ul style="list-style-type: none"> • The movements are very difficult to anticipate • The presence of large hydroelectric reservoirs does not affect caribou migration.
Harlequin duck	<ul style="list-style-type: none"> • Use of Argos satellite transmitters to monitor the migration of males using rivers on the east coast of Hudson Bay in the region of the Rivière Nastapoca 	<ul style="list-style-type: none"> • The harlequin duck, which breeds in the region studied, migrates to southern Greenland, unlike species that winter along the coast of Maine in the United States. • The results may make it possible to re-evaluate the status of this species that nests in Northern Québec.

Measures in the Natural and Human Environment

Hydro-Québec attempts to reduce its facilities’ impact on the local environment by implementing remedial measures. The following measures provide some examples.



Borrow pit before and after planting, Robert-Bourassa development

Remedial measure	Activity carried out	Principal result or environmental benefit
Management of flows at generating stations and control structures	<ul style="list-style-type: none">• Seven generating stations or control structures are subject to environmental flow-management prescriptions	<ul style="list-style-type: none">• Effective mitigative measure for ensuring the protection of an aquatic ecosystem downstream from the structures.• The minimum flows also encourage the use of developed streams and bodies of water for recreation, tourism, navigation, and drinking water supply.
Development of Mitis falls for salmon	<ul style="list-style-type: none">• Reconfiguration of falls• Review of operations management plan to optimize the measures implemented	<ul style="list-style-type: none">• The new configuration of the falls makes them less hazardous for smolts and kelts migrating downstream.

Restoration of Ground Cover

Using specially adapted techniques, Hydro-Québec has planted more than 20 million shoots of various plant species since 1975 to restore all of the areas disturbed by its projects. For example, 16 million of these seedlings were used to reforest 7,100 hectares of land in the region of the La Grande complex. As well, research in this field and monitoring of restored areas is continuing, to evaluate the success of the methods used and develop commercial species.

The expertise established by Hydro-Québec in plant-cover restoration is acknowledged by numerous environmental specialists and has been cited as a model countless times.

Environmental Enhancement

Hydro-Québec participates in regional development in partnership with local organizations. In making use of its installations in 1997, for instance, it collaborated on activities including:

- financial support for tours of Mitis-2 generating station, the site of the Atlantic salmon interpretation centre;
- promotional partnership with Pointe-aux-Outardes nature park;
- official inauguration of the Cité de l’énergie in Shawinigan, on June 21, 1997. Since it opened, 105,000 people have visited this educational facility. The observation tower, one of the site’s main points of interest, was erected using the structure of a transmission tower recovered during the dismantling of the St. Lawrence River crossing at Lotbinière;
- agreement with the Drummond regional municipal county (MRC) under which Hydro-Québec entrusted the MRC with managing Drummond forest, a site belonging to the utility;
- participation in the activities of the steering committee in charge of optimizing environmental monitoring at the Bécancour industrial park and port facilities, as well as in those of the Corporation Environnement Bécancour.



Cité de l’énergie observation tower

Hydro-Québec created the TransÉnergie division in 1997. This decision is in line with the utility's recent reorganization and enables it to meet the requirements of the Federal Energy Regulatory Commission (FERC) in the United States. TransÉnergie's mission is to plan, build and operate Hydro-Québec's energy transmission system and to ensure non-discriminatory access to its transmission facilities by all accredited power producers.

Managing the Environmental Impacts of Transmission

Electric and Magnetic Fields

Hydro-Québec's action plan on electric and magnetic fields was adopted in 1986. In 1997, we received the findings of a research program that is part of this plan. The effort to resolve the scientific uncertainties related to electric and magnetic fields (EMF) yielded the following observation: prolonged exposure (two years) to magnetic fields higher than those generated by Hydro-Québec's electric installations does not cause cancer. These findings, which stem from experiments on laboratory animals, were published in a specialized, internationally recognized journal (see Dissemination of Findings, p. 11).

A scientific committee of the U.S. National Research Council (NRC) has concluded that there is no clear, convincing proof supporting the statement that exposure to EMF in residential settings constitutes a public health risk. After reviewing more than 500 studies conducted over a 17-year period, the committee of researchers asserts that there is no scientific evidence allowing them to conclude that exposure to EMF contributes to the development of cancer, nor that it causes any problems related to reproduction, development, learning abilities or behavior.

Measurement apparatus have determined that average magnetic fields emitted by high-voltage lines (120 to 735 kV) range between 6.0 and 15.0 microteslas (μT) when the measurement is taken directly under the centre of the line (in places where there are no homes), and between 0.2 and 2.7 μT when measured 40 metres from the same place. In comparison, common household appliances may emit magnetic fields ranging between 0.8 (an iron) and 60 μT (a can-opener) measured 15 cm from the source. Even an electric shaver is likely to emit 800 μT . Further information on this subject may be obtained from the brochure *Electric and Magnetic Fields and Human Health* published by Hydro-Québec.

To better characterize exposure of the general public to EMF, Hydro-Québec's research institute (IREQ) has also developed a software program able to quantify the contribution of high-voltage lines to the ambient fields found throughout Québec. This mathematical model, validated by a measurement campaign carried out in the field, was published during the year.

Energy Transmissi



Integrated Vegetation Control

To ensure the reliability of its power system, Hydro-Québec must control vegetation that is harmful to the operation of its energy transmission lines. This work is carried out in power line rights-of-way and around substations. The rights-of-way alone represent more than 135,000 hectares. Like other Canadian and American electric utilities, Hydro-Québec follows three approaches:

- mechanical intervention (selective cutting);
- selective application of herbicides;
- management practices.

on



Application of selective herbicides in a power line right-of-way

The trend is thus toward a balance between the proportion of areas treated with herbicides and those treated exclusively with mechanical cutting. Increasingly, the strategies employed combine cutting and selective application of herbicides. The precision of the techniques used is leading to a long-term decrease in the density of vegetation present in the rights-of-way.

Herbicide Use in Power Line Rights-of-Way

Area	1996		1997	
	Mechanical cutting (ha)	Selective application of herbicides (ha)	Mechanical cutting (ha)	Selective application of herbicides (ha)
North	5,572	779	2,569	1,612
South	2,338	—	2,086	—
East	4,943	1,711	2,307	2,961
West	1,618	1,561	709	2,290
Total per type of treatment	14,471	4,051	7,671	6,863
Proportion	78%	32%	53%	47%
Total area treated	18,522		14,534	

However, Hydro-Québec’s goal is not to gradually eliminate herbicide use. Rather, it advocates an approach that consists of selecting the most efficient type of intervention on the basis of the following criteria:

- efficiency of treatment;
- health and safety of workers and the general public;
- compliance with laws, regulations and standards in effect;
- environmental protection;
- optimum cost-effectiveness.

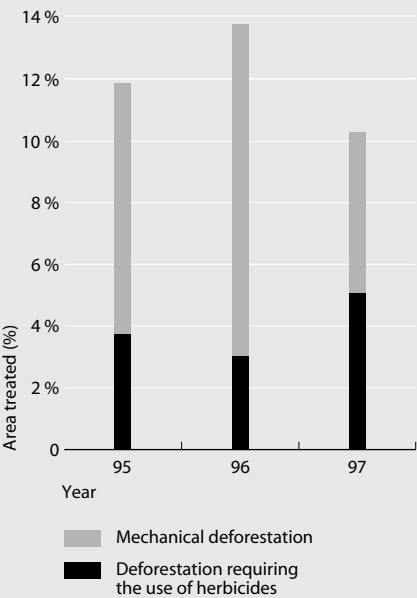
Noise Management

Electric substations are the principal sources of noise-related nuisance, due to their number and their location in residential zones. To limit the effects of this contaminant on the quality of the environment, Hydro-Québec has produced several guidelines dealing with noise pollution. To help ensure compliance with these guidelines, it develops, evaluates and uses noise measurement and simulation tools. It also establishes appropriate mitigative measures, such as the construction of sound barriers and the installation of soundproof enclosures in many substations.

To find new ways of reducing noise, Hydro-Québec is working together with the acoustic studies group at Université de Sherbrooke. Exploratory studies in the area of active control of noise and of voltage fluctuations in transformers were conducted in recent years. A \$200,000, two-year research and development project was launched in 1997 to finalize research and development on a brand-new concept that is highly promising.

In addition, the utility is very active in the field of noise management. Since 1996, it has devoted \$1.4 million a year to carrying out a variety of projects.

Comparative table - deforestation
Percentage of areas treated
by type of deforestation*



* Evolution of the proportion of rights-of-way that are treated by mechanical deforestation and by the use of herbicides. The percentages were based on the total area of rights-of-way to be maintained, namely 135,000 hectares.

More and more, Hydro-Québec advocates techniques offering a high degree of safety and selectivity. This method of intervention allows incompatible species to be cut and stumps to be treated with a herbicide that prevents sprouts from appearing.

The medium-term goal of the vegetation control programs in rights-of-way is to encourage the establishment and maintenance of low-growing plant species compatible with system operation. This concept of “integrated vegetation control” developed by Hydro-Québec has also found favor with Canadian public utilities as a whole.

Indeed, Hydro-Québec’s competence in this regard is now an accomplished fact. In 1997, a number of American electric utilities had the opportunity to observe the effectiveness of the strategies developed by Hydro-Québec. The utility therefore intends to market this expertise which combines efficiency, cost reduction and environmental protection.

Finally, Hydro-Québec was closely involved in writing the guide entitled *Phytocides en milieu industriel: bon sens, bonnes pratiques*, produced in collaboration with the MEFQ. Published by Publications du Québec, the work covers herbicide use.



Langelier substation, Montréal

Ecosystem Management

Research

The following research and development programs related to the environmental impacts of transmission were begun or continued in 1997.

Field of research	Research result expected	Scheduled end
Effects of electric fields on human cutaneous tissue	<ul style="list-style-type: none"> • Annual progress reports • Study report on interaction mechanisms (1999) 	Dec. 1999
Study on the effects of melatonin on populations exposed to EMF from power lines	<ul style="list-style-type: none"> • Annual progress reports • Study report on the measurement of melatonin (1999) 	Dec. 1999
Effects of EMF on the production and health of dairy cows (phase 2)	<ul style="list-style-type: none"> • Annual progress reports • Study report on the effects of certain parameters of milk production by dairy cows (1999) 	Dec. 1999
Individual factors involved in the psychophysiological perception of electric fields by humans	<ul style="list-style-type: none"> • Annual progress reports • Study report on predictive data for perception (1999) 	Dec. 1999
Active control of noise from transformers and reactors	<ul style="list-style-type: none"> • Annual progress reports • Study report on the development of autonomous noise-control units (1999) 	Dec. 1999
Biological vegetation control	<ul style="list-style-type: none"> • Comparison of technical and environmental effectiveness of different vegetation control strategies • Report on the role of strips of plants located alongside streams • Report on the pathway and persistence of herbicides applied in rights-of-way • Study report on the use of herbicides (2000) 	Dec. 2000

Measures in Natural Environments

Remedial measure	Activity	Environmental benefit
Wintering areas for white-tailed deer	<ul style="list-style-type: none"> • Publication of the report entitled <i>Emprises de lignes et ravages de cerfs de Virginie — Synthèse et bilan des études</i> • From 1987 to 1995, implementation of a research program on the issue of power line rights-of-way located in wintering areas for white-tailed deer • Studies conducted in various types of rights-of-way located in the 10 deer yards extending from the Laurentians to the Lower St. Lawrence, through the deer's area of distribution in Québec 	<ul style="list-style-type: none"> • The results of studies and observations in the field indicate potential for developing rights-of-way that are favorable to deer, if these areas are considered habitat units for winter feeding. • The knowledge acquired permits better integration of transmission facilities into the natural environment.

The electricity distribution system extends over more than 105,000 km of lines, of which 9,103 km are buried underground. A system this size requires a great many wood poles and involves considerable environmental and visual impacts, which Hydro-Québec is committed to managing according to the highest standards.

Electricity Distribution

"Partners Along Environmental Lines" seminar

In collaboration with Bell Canada, Hydro-Québec organized a one-day seminar on the environment and integration of public utility systems. This event brought together 50 representatives of different public utilities and outside organizations, including the ministère des Transports du Québec, Union des municipalités du Québec (UMQ), various telephone companies, the Association des redistributeurs d'électricité du Québec (AREQ), and cable television companies.

The main topic of the seminar was how to improve the environmental integration of electricity distribution and telecommunications systems. This approach fits in with the IEA review process currently under way at Bell Canada and Hydro-Québec to improve existing tools. Workshops were held on the following four topics:

- partnership with local stakeholders;
- IEA review (guidelines, training, etc.);
- management and monitoring indicators;
- ORIEL (Local Environment-Oriented Network Options) program.

The participants exchanged views on current practices and means to be applied to improve the integration of these systems into the environment. Specific measures will be defined on the basis of the principal orientations on which there was a consensus.

Management of Distribution-Related Environmental Impacts

Internal Environmental Assessments

The goal of internal environmental assessments (IEA) is to systematically incorporate environmental concerns into planning, construction, modernization and maintenance activities related to Hydro-Québec's distribution systems.

Environmental assessment indicators

The decrease in the number of projects subjected to an IEA in 1997 stems from the fact that this indicator was revised to better target projects with a real impact on the environment.

In addition, pilot projects aimed at developing a new quality indicator, in the form of a telephone survey, were completed. This new indicator will allow an assessment of customer satisfaction regarding distribution projects carried out near their homes. Customers were asked to state their satisfaction with the following points:

- communications with Hydro-Québec representatives during project planning and construction;
- integration of the facilities into the environment;
- quality of the work.



The results show that customer perception is generally positive, as the overall satisfaction rate is 8.5 out of 10.

This new indicator will be established in all Distribution unit territories in 1998.

Environmental monitoring of projects

The Distribution unit has instituted an environmental monitoring program for projects subjected to an IEA in order to evaluate the application of the recommended mitigative measures. In 1997, during inspections in the field, we noted that the environment had been taken into account in developing engineering plans and facility design in connection with 102 projects. The gradual incorporation of environmental practices into the planning process is a positive point.

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Integration of the System

ORIEL program

Launched in January 1996, the ORIEL (Local Environment-Oriented Network Options) program is the logical extension of IEAs of distribution system projects. The objective is to meet customers' expectations by means of a series of options that help preserve the appearance of the local environment.

In the past 50-plus years, the technology and design of equipment used on distribution systems have changed very little. Even today, they still constitute a set of elements designed without any consideration for visual unity. Hydro-Québec has therefore begun a process aimed at developing and marketing a new generation of distribution systems that are more respectful of the environment without compromising safety and service quality and without increasing costs.

With this in mind, the ORIEL program has helped bring together manufacturers of the various technical components and industrial designers. Consortiums of distribution-equipment manufacturers were consequently formed to propose new system concepts.

Research entrusted to the Université de Montréal's Environmental Design Chair was used to formulate the specifications the consortiums had to comply with and to develop tools for the better utilization of the ORIEL catalogue of options, published in 1997.

Customer satisfaction with these options was evaluated in pilot projects undertaken in Le Gardeur and Laval to improve the appearance of transformers on bases. Supported by the recommendations of a study conducted by the Université de Montréal's School of Industrial Design, these pilot projects dealt more specifically with:

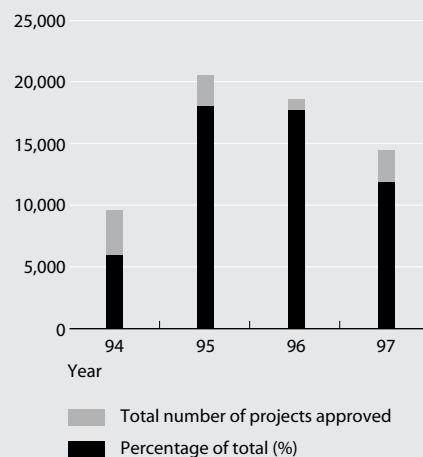
- the acceptability of a range of colors used in several regions of Québec;
- equipment design;
- measures intended to improve the form of certain equipment.

A report stating the results achieved in these pilot projects was tabled in 1997, and an action plan designed to make the best possible use of these results will be implemented in 1998.



New transformer proposed under the ORIEL program

Distribution projects subjected to an internal environmental assessment





Amendment of agricultural soil using ramial chipped wood

In another area, different options for disposing of waste from initial deforestation and maintenance work were the subject of experimentation. The goal: to permit the use of less costly disposal methods, in compliance with environmental protection standards and our customers' expectations. In light of the results obtained in 1997, new disposal methods have already been proposed. The frame of reference and a grid showing disposal method options will be developed in 1998.

Recovery of Poles

An internal directive regarding the recovery and reuse of treated wood poles removed from the distribution system came into effect on July 3, 1997. Under this directive, Hydro-Québec personnel and the contractors assigned to pole removal must return the poles to specially designated storage yards. There the poles are inspected and classified in anticipation of reuse; those that cannot be reused are, as far as possible, recycled for other purposes in accordance with objectives for tree protection and reduction of the quantity of waste produced (see Reclamation of non-reusable treated wood poles, p. 33). This measure naturally permits a reduction in costs and in the quantity of new poles to be bought.

Reclamation of pruning chips

Hydro-Québec produces between 100,000 and 300,000 m³ of ramial chipped wood annually. This wood, which generally comes from shredding pruning waste, possesses valuable biological properties. Hydro-Québec therefore began reclaiming ramial chipped wood several years ago. In 1997, some 300,000 m³ of recovered wood was used for such purposes as amendment of agricultural soil.

Vegetation

Research in integrated-vegetation control

The real effects of pruning on vegetation must be studied carefully. Accordingly, in collaboration with researchers at the Institut de recherche en biologie végétale (IRBV), Hydro-Québec is currently working to design a predictive model for growth and structure of tree tops after pruning. It seems that plant regrowth after pruning can be considerably reduced by taking the pruned tree's stage of development into account. As a result of this research, Hydro-Québec could consider some changes in intervention methods that will help protect its systems while also improving the health of trees.



Charlevoix region, view from Île aux Coudres

Ecosystem Management

Research

The 1997 research programs on the environmental impacts of distribution are listed in the table below.

Measures to Protect Ecosystems

Reclamation, for energy purposes, of used oil from thermal power plants in off-grid systems

The project for reclaiming used oil from the Kuujjuarapik thermal power plant set out to:

- reclaim used engine oil for energy purposes;
- generate heat for the warehouse adjoining the Hydro-Québec power plant.

This project offers the following environmental benefits:

- utilization, for energy purposes, of used engine oil from the power plant;
- reduction in the risk associated with transferring this oil and transporting it by boat (once a year, because of the ice) to southern Québec for disposal at an authorized centre;
- decreased consumption of fuel oil needed to heat the warehouse (a reduction at source estimated at 11,000 L/year for this power plant alone).

Carrying out this project meant adding a special furnace to burn used oil on the power plant site.

Laying of an underwater cable at Île aux Coudres

To improve visual integration in this area that forms part of the Charlevoix World Biosphere Reserve (UNESCO designation), part of the 25-kV distribution system was buried, at a total cost of \$500,000.

All necessary environmental protection measures were taken concerning the location and installation of the underground and underwater cables. Copies of the environmental monitoring reports and the impact assessment study are available on request.

Field of research	Research result expected	Scheduled end	Total cost (in thousands of dollars)
Bioremediation of contaminated sites (in collaboration with the École polytechnique de Montréal's Industrial Chair)	• Technologies for decontaminating sites contaminated by PCP and diesel fuel, applicable in northern environments	June 1999	150
Landscape and environment (in collaboration with the Université de Montréal's Environmental Design Chair)	• Landscape design methods and criteria for integrating distribution facilities	June 2001	500
Restoration	• Methods of plant restoration of degraded sites	1998	3,500
Structural analysis of tree growth	• Predictive model for tree growth and the structure of tree tops	1998	300

The task of Hydro-Québec's Procurement and Services directorate is to carry out the utility's activities related to the acquisition and management of goods and services. It is also in charge of the transportation, storage, recycling, treatment, and disposal of hazardous waste as well as building maintenance.

Acquisition and of Goods and S

Management of Environmental Aspects Related to Goods and Services

The 3 REs: Recovery, Reuse, Recycling and Energy Recovery

A key condition for ensuring the effectiveness of the 3RE approach is the initial recovery and sorting stage. Accordingly, we are stepping up the systematic establishment of workplace areas for recovery at source. At the end of 1997, 130 of these recovery areas were in place.

A number of 3RE practices have now been integrated into our regular operating activities and are yielding tangible results.

In 1997, for example:

- 2,000 printer cartridges were recycled and reused;
- 400 tonnes of paper and cardboard was recovered;
- 12,500 tonnes of metal was recovered for recycling;
- 3,000 distribution transformers were recovered for recycling;
- 75 tonnes of batteries was recovered for recycling;
- 35 tonnes of leftover food from the head office cafeteria was recovered for composting;
- 8 tonnes of glass, metal and plastic was recovered;
- 4.3 million litres of insulating oil was recovered and reused. The percentage of insulating mineral oils recycled by Hydro-Québec amounted to 91% at the end of 1997; the remaining 9% was reclaimed for energy purposes.



Hydro-Québec is becoming an active partner in a variety of projects for recycling:

- certain distribution transformers (major breakdowns) with three manufacturers, with a view to reintegrating them into the system;
- certain distribution transformers, with two outside firms, with a view to external marketing.

Management ervices



Reclamation of non-reusable treated wood poles

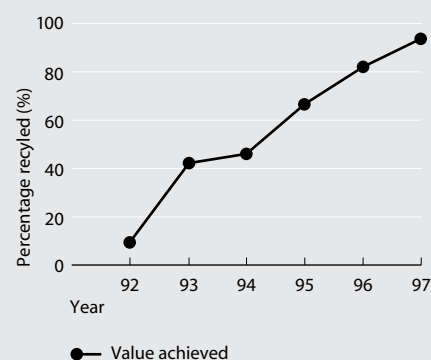
In view of the success of the pilot projects for the recovery and reuse of poles removed from the distribution system (see Recovery of Poles, p. 30), Hydro-Québec has drafted guidelines and established a management structure to ensure the systematic implementation, throughout the utility, of this management method for non-reusable wood poles.

The logical consequence of this first stage in the 3RE cycle was the signing of a partnership agreement with a sawmill to recover non-reusable poles. Accordingly, approximately 7,000 poles were turned into lumber, representing some 120,000 fbm. For the moment, the non-recyclable waste is buried in safe sites. Promising recycling or energy recovery solutions for this waste are currently being studied.

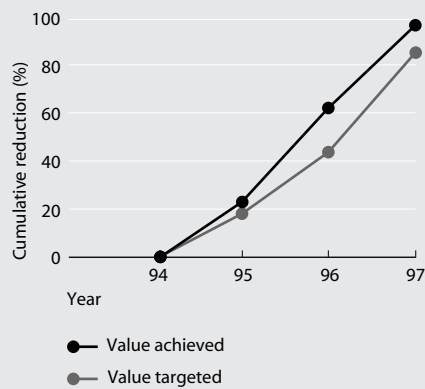
Hydro-Québec is becoming an active partner in two recycling projects with organizations involved in integrating young people in difficulty into the workplace:

- recycling of distribution line accessories with Victoriaville's Centre de formation en entreprise et récupération (CFER);
- recycling of office furniture, with the Fondation du Mont Saint-Antoine inc., Les bureaux d'Antoine.

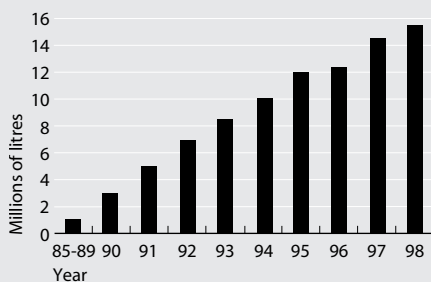
Percentage of insulating oils recycled by Hydro-Québec



Cumulative reduction in PCB-contaminated material (< 50 ppm)



Cumulative volume of insulating mineral oils decontaminated



Recovery of hazardous waste

Management of Hazardous Waste

In their daily activities, a large number of Hydro-Québec employees use or handle more than 4,400 different products whose recovery and treatment are regulated (used oil, solvents, batteries, porous materials soiled with hydrocarbons, etc.). These products are necessary for certain regular operations in hundreds of facilities (substations, generating stations, administrative centres, etc.) throughout Québec, and generate thousands of tonnes of hazardous waste every year. In 1997, Hydro-Québec recovered, treated, recycled, or safely disposed of more than 2,500 tonnes of electrical equipment, 425 tonnes of various solids and 3.2 million litres of various contaminated liquids.

To support its employees' recovery efforts, Hydro-Québec is working to set up an infrastructure that provides for the establishment of several hundred recovery zones, the development of collection logistics and the installation of four recovery and management centres, two of which are to begin operation in 1997. At the same time, training programs on hazardous-waste management have been developed and will be moved forward in 1998.

PCBs: From Management to Elimination

In 1997, Hydro-Québec successfully continued with its plan for eliminating PCB-contaminated waste, which it adopted in 1995. As of December 31, 1997, nearly 98% of the 7,000 tonnes of waste containing PCBs, accumulated for more than 10 years, had been decontaminated, recycled, or destroyed in safe facilities.

The results — which surpass the objectives set — are as follows:

- elimination of 49,800 capacitors insulated with PCBs;
- decontamination and recycling of 9,150 transformers contaminated with PCBs;
- recycling of 3,445 tonnes of metal parts, which are then sent to authorized firms for reintroduction on the market;
- destruction by incineration of 2,940 tonnes of material containing PCBs.

The remaining quantities (200 tonnes) will be incinerated in 1998. Hydro-Québec's PCB management plan placed priority on the removal from the system of PCB-insulated equipment, its storage, and the search for technological solutions of treatment with a view to PCB elimination. Accordingly, since 1985, Hydro-Québec has invested more than \$100 million in PCB recycling and destruction efforts.

At the same time, Hydro-Québec is continuing its efforts to decontaminate insulating mineral oils used in its system. Since 1985, more than 15 million litres of oil have been treated.

Ecosystem Management

Research

The following programs of research related to the environmental impacts of the management of goods and services were carried out in 1997.

Field of research	Research result expected	Scheduled end
Packaging products	• Optimization of packaging products and methods	Ongoing program
Wiping products	• Environmental criteria for purchases of such wiping products as rags and absorbents	Ongoing program
Recycling and reclamation of treated wood	• See Reclamation of non-reusable treated wood poles, p. 33.	



PCB destruction site

Community Relations



Anse-Saint-Jean interpretation centre

Aboriginal Communities

Approximately 70,000 Aboriginal people live in Québec, divided among 11 nations and 55 communities. Nearly 90% of Hydro-Québec's generating facilities are in territories inhabited and harvested by Aboriginal people. Over the years, these groups have become suppliers of goods and services required for our activities, and are thus active participants in a number of conservation and environmental enhancement projects.

It is in the utility's interest to properly understand the situation and needs of Aboriginal people, the issues of specific concern to them and the administrative mechanisms governing them. In 1997, Hydro-Québec therefore organized 12 awareness sessions, attended by 130 employees.

During the same year, Hydro-Québec:

- carried out remedial and mitigative measures on Rivière Vincelotte and in the Laforge 1 reservoir, in cooperation with Crees from the Cree nation of Chisasibi, under the Opimiscow-SOTRAC corporation;
- carried out remedial and mitigative measures in the Sainte-Marguerite area, in cooperation with the Montagnais of Uashat-Malietenam, under the SOTRAC (Sainte-Marguerite) corporation;
- began discussions with the Montagnais of the Betsiamites band on the environmental impacts of the proposed diversions in the Betsiamites area.

Land-Use Planning

In 1997, Hydro-Québec formed internal committees for regional cooperation. The mandate of these committees is to develop effective coordination for community interface, strategic management of socioeconomic issues and regional business opportunities. These committees play a part in establishing appropriate mechanisms to ensure continuing cooperation with the authorities responsible for planning and development and in synchronizing the planning of our activities with regional activities.

Regional Development

One of Hydro-Québec's priorities centres on regional development. Our customers are spread throughout Québec, as are our generating and distribution facilities and our administrative centres. In addition to the spinoffs associated with our new construction projects, we are involved in the life of the regions in a number of ways: purchases of goods and services, operation of administrative centres, partnerships, and social and cultural commitments. The following table cites some examples of regional partnerships. The amounts shown in the Expenditure column represent total goods and services ordered from regional suppliers.



*Remedial work at the Laforge 1 reservoir:
weir on Rivière Vincelotte*



Francofolies festival, Montréal

Overview of Hydro-Québec's Regional Activities in 1997

Administrative region of Québec	Average number of employees working in the region	Expenditure (\$M)	Number of jobs supported (person-years)	Example of partnership and social commitment
(01) Bas-Saint-Laurent	503	18.0	98	<ul style="list-style-type: none"> • Université du Québec à Rimouski • Tourism and convention bureau • École de musique de Matane
(02) Saguenay – Lac-Saint-Jean	917	19.8	157	<ul style="list-style-type: none"> • Université du Québec à Chicoutimi • Saint-Félicien zoological society • Institut de recherche et d'études sur les populations
(03) Québec	1,385	202.2	1,294	<ul style="list-style-type: none"> • Institut national de la recherche scientifique — Eau • Musée de la civilisation • Université Laval • Société des florales internationales de Québec
(04) Mauricie	1,182	155.1	1,178	<ul style="list-style-type: none"> • HQ - NSERC Chair, Université du Québec à Trois-Rivières • Shawinigan seniors' centre • Orchestre symphonique de Trois-Rivières • Classique internationale de canots de la Mauricie
(05) Estrie	118	11.0	88	<ul style="list-style-type: none"> • Université de Sherbrooke • Centre hospitalier de Sherbrooke • Orford Arts Centre
(06) Montréal	7,971	701.1	4,753	<ul style="list-style-type: none"> • Six university chairs • Three universities • Four hospitals • L'Opéra de Montréal • Centre d'entreprise et d'innovation de Montréal • Les Francofolies
(07) Outaouais	576	5.3	44	<ul style="list-style-type: none"> • Chambre de commerce et de l'industrie de l'Outaouais • 150th anniversary of the town of Aylmer
(08) Abitibi-Témiscamingue	642	15.4	172	<ul style="list-style-type: none"> • Centre d'exposition de Rouyn-Noranda • Festival du cinéma international en Abitibi-Témiscamingue
(09) Côte-Nord	1,233	46.5	434	<ul style="list-style-type: none"> • Vieux quai en fête de Sept-Îles • Pointe-aux-Outardes regional park • Forestville industry and trade fair
(10) Nord-du-Québec	532	2.8	31	<ul style="list-style-type: none"> • 12,026 visitors to the region
(11) Gaspésie – Îles-de-la-Madeleine	230	2.3	24	<ul style="list-style-type: none"> • Gaspésie tourist association
(12) Chaudière-Appalaches	481	51.1	431	<ul style="list-style-type: none"> • Beauce Grand Prix of cycling • Diffusion culturelle de Lévis
(13) Laval	367	53.5	418	<ul style="list-style-type: none"> • Orchestre symphonique de Laval • Association de conservation du boisé Papineau • Laval Chamber of Commerce
(14) Lanaudière	265	29.2	135	<ul style="list-style-type: none"> • Créneau industriel de l'habitation • Corporation de développement économique de la région de Joliette
(15) Laurentides	1,007	50.3	270	<ul style="list-style-type: none"> • Laurentians tourist association - 13th Grand Prix • Société de développement Thérèse-de-Blainville
(16) Montérégie	2,952	258.6	1,589	<ul style="list-style-type: none"> • Orchestre symphonique de la Montérégie • 250th anniversary celebrations for Saint-Hyacinthe • Société montréalaise de développement
(17) Centre-du-Québec	1,095	43.7	345	<ul style="list-style-type: none"> • Production Plateforme
TOTAL	21,527	1,665.8	11,461	

Source: Hydro-Québec, Profil régional des activités d'Hydro-Québec 1997, 2nd quarter 1998.



Promenade des capitaines, Matane

Environmental Enhancement

In 1985, Hydro-Québec introduced an environmental enhancement program. The program was expanded in December 1993 to become the Integrated Enhancement and Development Policy. In addition to environmental enhancement, this policy now covers support for regional development and for the development of Aboriginal communities. It applies when new generating and transmission facilities are built.

Summary of Environmental Enhancement Initiatives and Funding Credits (in thousands of dollars)

Type of initiative	Number of initiatives	Hydro-Québec funding	Additional financing	Total cost
Accessibility to natural sites	3	384.7	0	384.7
Improvement in drinking water quality	3	227.1	508.7	735.8
Park landscaping	19	936.0	216.5	1 152.5
Measures for aquatic wildlife	1	131.5	452.8	584.3
Creation of green spaces	3	170.2	28.5	198.7
Landscaping of buildings and public infrastructures	4	99.3	29.3	128.6
Recovery and recycling of resources used	2	69.8	7.0	76.8
Heritage restoration and enhancement	8	758.2	90.2	848.4
Wastewater treatment	3	1 490.8	2 971.7	4 462.5
Regional development	2	49.5	0	49.5
Total for 1997	51	4,341.7	4,304.7	8,646.4
Total since 1985	698	51,410.7	35,580.9	86,991.6

Source: Hydro-Québec.

Note: These totals do not include amounts provided in support of regional development and development of Aboriginal communities.

Conclusion

At Hydro-Québec, 1997 featured the consolidation of the new administrative structure. This structure arose out of the major changes begun in 1996 as part of the utility's reorganization. In the environment field specifically, expertise in a number of specialties, apart from operational activities, was decentralized to the business units. The managers have been given newly increased responsibility for the environmental performance of their activities, and now possess the means necessary to ensure full control of the significant environmental aspects and impacts associated with those activities.

The next stage in implementing these tools consists of establishing an environmental management system in compliance with the ISO 14001 international standard. In May 1997, Hydro-Québec therefore created an environmental management network with a view to setting up such a system by the year 2000. As of the end of 1997, the principal planning stages were under way, and work groups had begun designing elements of the management system's implementation and operation. This involves activities such as training, communications, documentation and the drafting of procedures and guidelines for the system's users. In addition, the formulation of indicators enabling us to better show the evolution of our environmental performance should commence during 1998.



For several years already, Hydro-Québec has devoted substantial efforts to managing the environmental issues related to its activities and facilities. The environmental management system will give a logical order and organization to all the programs, action plans and studies which Hydro-Québec has been undertaking for more than 20 years now.

The wish to obtain recognition for our environmental management system by an international standardization organization, our joining in the Canadian Electricity Association's ECR program, and the formation of the Environment and Corporate Citizenship Committee by the Board of Directors clearly demonstrate our desire to carry out our projects and activities in a spirit of respect for the environment and in cooperation with local communities.

The coming years promise many highly motivating challenges in both business and environmental terms. Hydro-Québec consequently intends to remain a major partner in the development and exploitation of energy resources, following a sustainable development approach, for the benefit of present and future generations.

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Index of Acronyms

Acronym	Meaning
3 REs	Recovery, reuse, recycling and energy recovery
ACECA	Hydro-Québec's Advisory Committee on the Environment and Community Affairs
AECB	Atomic Energy Control Board
ARET	Accelerated Reduction/Elimination of Toxics
CEA	Canadian Electricity Association
CO₂	carbon dioxide
ECR	Environmental Commitment and Responsibility Program
EMF	electric and magnetic fields
EMS	environmental management system
FBM	foot board measure (unit of measure used in lumber production)
FERC	Federal Energy Regulatory Commission (United States)
FQSA	Fédération québécoise pour le saumon atlantique
GHG	greenhouse gases
GPS	global positioning system
IAIA	International Agency for Impact Assessment
IEA	International Energy Agency
IEA	internal environmental assessment
IHA	International Hydropower Association
IRBV	Institut de recherche en biologie végétale
IREQ	Hydro-Québec's research institute
ISO (14001)	International Organization for Standardization
MEFQ	Ministère de l'Environnement et de la Faune du Québec
NO_x	nitric oxide
NSERC	National Sciences and Engineering Research Council of Canada
ORIEL	Local Environment-Oriented Network Options
PCB	polychlorinated biphenyls
PCP	pentachlorophenol
SF₆	sulphur hexafluoride
SO₂	sulphur dioxide
SOTRAC	Société des travaux de correction (remedial works corporation)
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIPEDE	Union internationale des producteurs et distributeurs d'énergie électrique
UQAM	Université du Québec à Montréal
ZEC	controlled-used zone

Glossary

Canadian Electricity Association (CEA)	Canadian association made up of 36 electric utilities representing 95% of installed capacity in Canada, 34 major manufacturers of electrical equipment and several hundred other companies and stakeholders involved directly or indirectly in the sphere of electricity.
diagnosis	Determination of the characteristics of an animal or plant species in order to learn its physiological conditions.
energy conversion efficiency	Percentage of energy efficiency of the different types of electric generation equipment, calculated on the basis of the energy source used (e.g., natural gas, coal, biomass, nuclear energy, etc.).
environmental audit program	<p>Program designed to assess compliance by Hydro-Québec facilities with laws, regulations and internal guidelines.</p> <p>It allows situations presenting/posing risk(s) to the environment to be identified and appropriate corrective measures to be applied.</p>
environmental management system (EMS)	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.
Federal Energy Regulatory Commission (FERC)	An autonomous agency of the United States Department of Energy that controls access to American energy transmission systems and wholesale markets.
hazardous waste	Any solid, semi-liquid at 20°C, liquid or gaseous waste, confined within a transportable container, that is combustible, corrosive, leachable, radioactive, reactive or toxic, along with categories of waste mentioned in Schedule 1 of Québec's Regulation respecting hazardous waste.
ichthyofauna	All fish species present in a given region.
infraction notice pending	<p>Notice issued by a government department (federal or provincial) following observation of non-compliance with an environmental law or regulation, upon which Hydro-Québec must act in order to resolve the non-compliance observed.</p> <p>After a certain time (the period of which is not fixed), the department may exercise its discretionary power and decide to institute legal proceedings to resolve the pending notice.</p>
internal environmental assessment	Assessment designed to determine whether a project is likely to alter the quality of the environment and, consequently, to prescribe mitigative measures in connection with certain projects, even if these projects do not require authorization under the Environment Quality Act.
melatonin	Hormone secreted by the pineal gland which, among other things, helps regulate physiological cycles in humans and which could have an effect on the reproductive system.
mercury methylation	<p>Microbial activity that transforms mercury into methylmercury, a toxic compound that accumulates throughout the food chain.</p> <p>Following the flooding of land caused by reservoir creation, a portion of the mercury already present in organic soils and vegetation becomes subject to methylation. This is consequently not a new source of mercury added by reservoirs, but rather a transformation of inorganic mercury already present in the terrestrial environment that is flooded.</p>
off-grid power system	Regional generation, transmission and distribution system in northeastern Québec which is not connected to Hydro-Québec's province-wide system.
Paleolithic	Earliest period of prehistory.
pentachlorophenol	Chemical compound, insoluble in water, used as a wood preservation product.
pheopigment	A brown pigment present in certain plants and algae.
plume (freshwater)	A trail of fresh and slightly salty (briny) water that spreads out on top of salt water.

polychlorinated biphenyl (PCB)

Askarel (insulating liquid) in the family of chlorinated hydrocarbons, which is a component of certain electric insulators and which comprises more than 200 compounds.

A property of askarels is that they do not release any combustible or explosive gases when an electric arc passes through them.

ramial chipped wood

Biomass from the mineral-rich branches (ramial wood) of many varieties of trees that are turned into chips in order to be used as agricultural and forest fertilizers.

At Hydro-Québec, ramial chipped wood is the product of waste from tree pruning.

riprap

Wall or layer of dry stone that protects a structure from water damage, or prevents the earth in a slope from collapsing.

selective herbicide

A herbicide is a chemical agent that destroys plants.

A selective herbicide is designed to destroy certain plants in order to encourage others to grow.

substrate

Mineral surface or material on which an organism or community lives, or substance used for nutrition by living creatures.

sustainable development

A planning, intervention and management concept that calls for rational use of environmental resources in order to achieve a viable economy, so as to meet the needs of present and future generations worldwide while ensuring the active participation of the populations concerned.

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
Some Indicators of Hydro-Québec's Environmental Performance	<input type="checkbox"/>	<input type="checkbox"/>
Introduction	<input type="checkbox"/>	<input type="checkbox"/>
Environmental Management System	<input type="checkbox"/>	<input type="checkbox"/>
Specific Issues Related to Contaminants	<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"/>
Acquisition and Management of Goods and Services	<input type="checkbox"/>	<input type="checkbox"/>
Community Relations	<input type="checkbox"/>	<input type="checkbox"/>
Conclusion	<input type="checkbox"/>	<input type="checkbox"/>
Index of Acronyms	<input type="checkbox"/>	<input type="checkbox"/>
Glossary	<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

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

	Too much	Enough	Not enough
Some Indicators of Hydro-Québec's Environmental Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Introduction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental Management System	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Specific Issues Related to Contaminants	<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"/>
Acquisition and Management of Goods and Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community Relations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conclusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Glossary	<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

Thank you for your cooperation.

Please return to:

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Integration

Partnership

Compliance

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