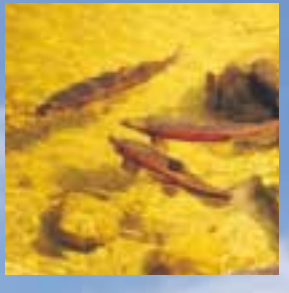
Hydro Québec

The Environment: More Than a Commitment



Environmental Performance
Report **2000**

Table of Contents

Projects and Construction and Technical Studies

Generation

...Concrete Action

Procurement and Corporate Services

Transmission

Distribution

Message from the President and Chief Executive Officer and the Chairman of the Board

L. Jacques Ménard

André Caillé

In the year 2000, Hydro-Québec made significant strides in carrying out initiatives that reflect its environmental commitment.

Hydro-Québec produces clean, renewable and safe energy through its generation of electricity from water resources. In keeping with its Strategic Plan 2000-2004*, the company intends to continue developing Québec's hydroelectric potential. In November 2000, Hydro-Québec consequently adopted a new directive on the environmental acceptability and favorable reception of new projects, refurbishing work and operating and maintenance activities. This directive is an essential tool aimed at enabling us to meet the expectations of our customers and the general public about the way we design and carry out our projects.*

Last fall, Hydro-Québec earned two more ISO 14001 registration certificates, one of which was for the Distribution unit. The deployment of a single environmental management system for the entire unit, which serves over 3.5 million customers throughout Québec, is, in itself, a remarkable feat. Such an environmental management system clearly demonstrates that Hydro-Québec is a responsible company intent on adopting the means it needs to anticipate and attenuate the environmental impacts of its operations. The environmental management systems of the other administrative units are being implemented on schedule and are expected to be in place by December 31, 2002.

Hydro-Québec continues to promote the benefits of hydropower in the effort to reduce CO_2 and greenhouse gas emissions. In addition to being profitable, hydropower exports allow neighboring utilities to reduce their use of thermal generating stations. This ultimately contributes to improved air quality in Québec and throughout North America. According to information audited by Deloitte & Touche, each terawatthour sold by Hydro-Québec generates 18.5 times less CO_2, 11.7 times less SO_2 and 15 times less NO_x than the regional average for electric utilities in New Brunswick, Ontario, New York State and the six New England states.

For the Environment and Corporate Social Responsibility Committee, which makes recommendations to the Board of Directors in its areas of activity, the year 2000 was an opportunity not only to examine various environmental issues and events, but also to lay the groundwork for Hydro-Québec's foundation for the environment. The mission of the foundation, to be launched in 2001, is to contribute to the long-term protection and enhancement of the environment. To fulfill its mission, the foundation will be participating in the funding and implementation of various initiatives throughout Québec, and not just where Hydro-Québec projects are located. Initiatives that provide environmental benefits are now being considered.

Hydro-Québec makes every effort to improve customer service and provide the Québec market with a sufficient supply of electricity at a reasonable cost, without global environmental repercussions. At this point in time, hydroelectricity is the only power generation option that enables us to achieve these objectives in accordance with the principles of sustainable development.

L. Jacques Ménard
Chairman of the Board

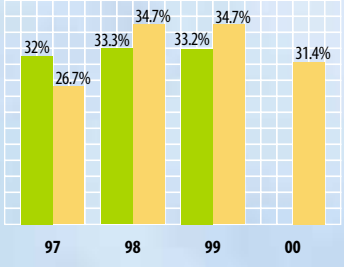
André Caillé
President and Chief Executive Officer

Our Environmental Performance Compared with the Canadian Electricity Industry

In 1997, the Canadian Electricity Association (CEA) member utilities adopted the Environmental Commitment and Responsibility (ECR) Program in response to public demand for greater environmental accountability and a firm environmental commitment from the electricity industry. The ECR Program is aimed at enhancing the industry's image and credibility and boosting the trust it enjoys from governments, customers, employees and other interested parties.

Hydro-Québec plays an active role in the development and implementation of the Program by participating in the different committees and task forces concerned. The Program enables Hydro-Québec to compare its environmental performance with that of other electric utilities, through a series of indicators used by all CEA members. In most areas, Hydro-Québec's performance compares favorably with that of other Canadian utilities, as indicated below.

Energy Conversion Efficiency of Thermal Generating Facilities



CEA Hydro-Québec

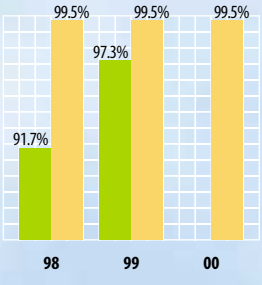
Year 2000 data for the CEA are not available.

Energy Conversion Efficiency of Thermal Generating Facilities

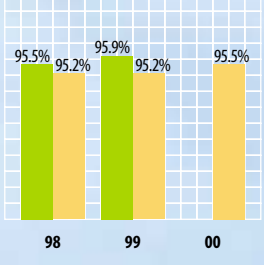
Energy conversion efficiency is the total net energy output of a thermal power plant divided by the total energy input needed to generate the electricity (net energy output/energy input).

The higher the percentage, the better the energy conversion efficiency.

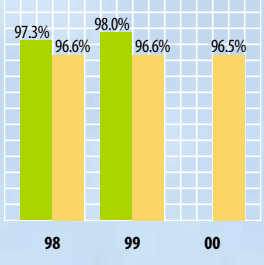
Generating Facilities



Transmission System



Distribution System

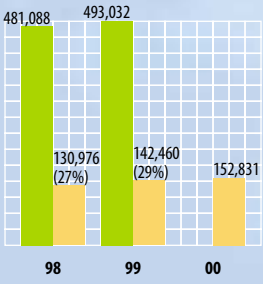


Internal Energy Efficiency

The internal energy efficiency of a power system is the total quantity of electricity delivered divided by the total quantity of electricity generated or purchased. This indicator is used to assess internal energy consumption as well as line losses on transmission and distribution systems.

The higher the percentage, the better the internal energy efficiency.

Net Electricity Generated (GWh)

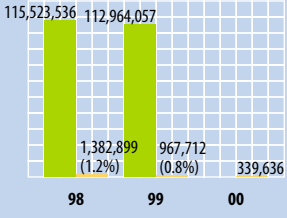


Atmospheric Emissions

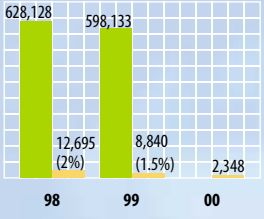
Although Hydro-Québec generated 29% of all Canada's electricity in 1999, the company accounted for only 0.8% of the CO_2, 1.5% of the SO_2 and 1.8% of the NO_x emitted by Canadian electric utilities.

The figures for Hydro-Québec do not include the extremely low CO_2 emission rates for hydroelectric reservoirs.

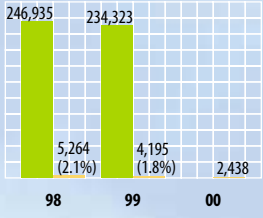
Tonnes of CO_2 Emitted into the Environment



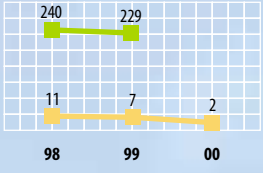
Tonnes of SO_2 Emitted into the Environment



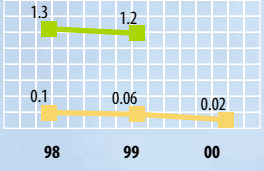
Tonnes of NO_x Emitted into the Environment



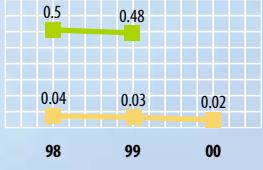
Average Emission Rates in t/GWh (CO_2 Emitted per Unit of Electricity Generated)



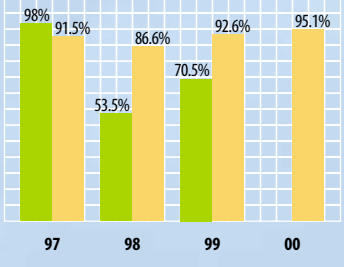
Average Emission Rates in t/GWh (SO_2 Emitted per Unit of Electricity Generated)



Average Emission Rates in t/GWh (NO_X Emitted per Unit of Electricity Generated)

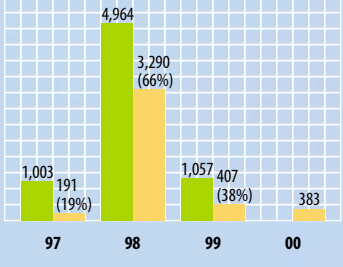


Reuse of Insulating Oil



The higher the percentage, the higher the rate of reuse.

Number of Spills



Number of Spills

Of the 3,290 spills reported by Hydro-Québec in 1998, 3,028 occurred during the January ice storm, which destroyed more than 3,400 km of distribution lines.

Highlights

A new corporate directive on the environmental acceptability and favorable reception of new projects, refurbishing work, and operating and maintenance activities was approved by Hydro-Québec in November 2000. This directive, based on the commitments made in the policies titled *Our Environment* and *Our Social Role*, sets out the company's requirements as well as the criteria for environmental acceptability and the factors conducive to it. The directive also lays down general rules designed to help ensure that the company's new projects, refurbishing work, and operating and maintenance activities are well received by the communities concerned.

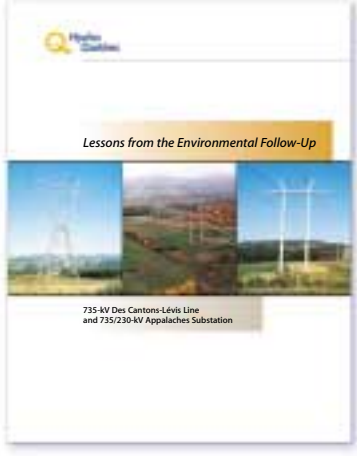
The environmental management system (EMS) of Hydro-Québec's Distribution unit earned ISO 14001 registration on October 18, 2000, following an audit by ITS Intertek. The EMS covers all electricity distribution operations throughout Québec as well as the generating operations of the two thermal power plants on the Îles de la Madeleine.

Québec's Ministère de l'Environnement and Ministère des Ressources naturelles acknowledged, under the ÉcoGESte program, that the company's hydroelectric generation helped avoid the emission of 78.2 million tonnes of CO_2 equivalent between 1991 and 1998.

In conjunction with Makivik Corporation, Hydro-Québec participated in the Indigenous Peoples, Industry and SIA: Moving towards the Development of Guidelines portion of the annual conference of the International Association for Impact Assessment. At this conference, Hydro-Québec and Makivik were given the Indigenous Peoples Corporate Industry Award of excellence. This award, presented for their contribution to the advancement of relations between industry and Aboriginal communities, recognized the spirit of partnership between the two organizations and their mutual interest in protecting the natural and social environment.

On September 13, the Procurement and Services Department earned its second ISO 14001 registration, for its Island of Montréal operations. The Centre-Sud territory maintained its 1999 registration, after passing an audit on November 8 and 9. These two administrative units are responsible for all operations associated with the company's procurement of goods and services in their respective territories.

The transmission division, TransÉnergie, published a report on the lessons learned from the environmental follow-up conducted on the 735-kV Des Cantons–Lévis line and the 735/230 kV Appalaches substation, which were commissioned in 1996. The environmental follow-up dealt with the main impact on land wildlife, threatened or vulnerable vascular plants, right-of-way planting, farming operations, municipal water intakes and the landscape. Generally speaking, the study showed that the actual impact of the project was lower than anticipated and that most of the mitigative measures recommended and applied proved effective.



On May 11, Hydro-Québec received an award for excellence from the Canadian Institute of Steel Construction for the design of the west building of Beauharnois generating station. The Institute described the architecture as simple, modern and carefully designed, and said it gives the building a new dimension in keeping with the project objectives. On November 18, the Québec association of architects gave the newly modernized west building an honorable mention in the industrial architecture category.

Our Environment Policy

General Principles

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

Sustainable Development

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

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

Continuous Improvement of Environmental Performance

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

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

Public Health and Safety

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

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

Research

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

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

Hydro-Québec and the Environment

The Company and Its Business Context

Hydro-Québec is a publicly owned company with a single shareholder—the Québec government. A major producer and distributor of energy in North America, the company provides its customers with energy services either directly or through its TransÉnergie division, its subsidiaries or other companies in which it has a stake.

This environmental performance report includes all Hydro-Québec operations that may have an impact on the environment, except those of subsidiaries and affiliates.

Most of Hydro-Québec's generating output is sold to the Québec market according to terms set by law, under a social pact established when the industry was nationalized in 1963. This market has a customer base of over 3.5 million and enjoys low, stable rates.

Hydro-Québec also does business with dozens of electric utilities in Ontario, New Brunswick and the Northeastern United States.

Hydro-Québec began the process of implementing environmental management systems in compliance with the ISO 14001 international standard in 1997 and expects to complete the process by 2002. The company contributes to greenhouse gas (GHG) reduction and to improvement of air quality in North America through its hydroelectric generating capacity, which represents nearly 97% of its total output.

Hydro-Québec at a Glance

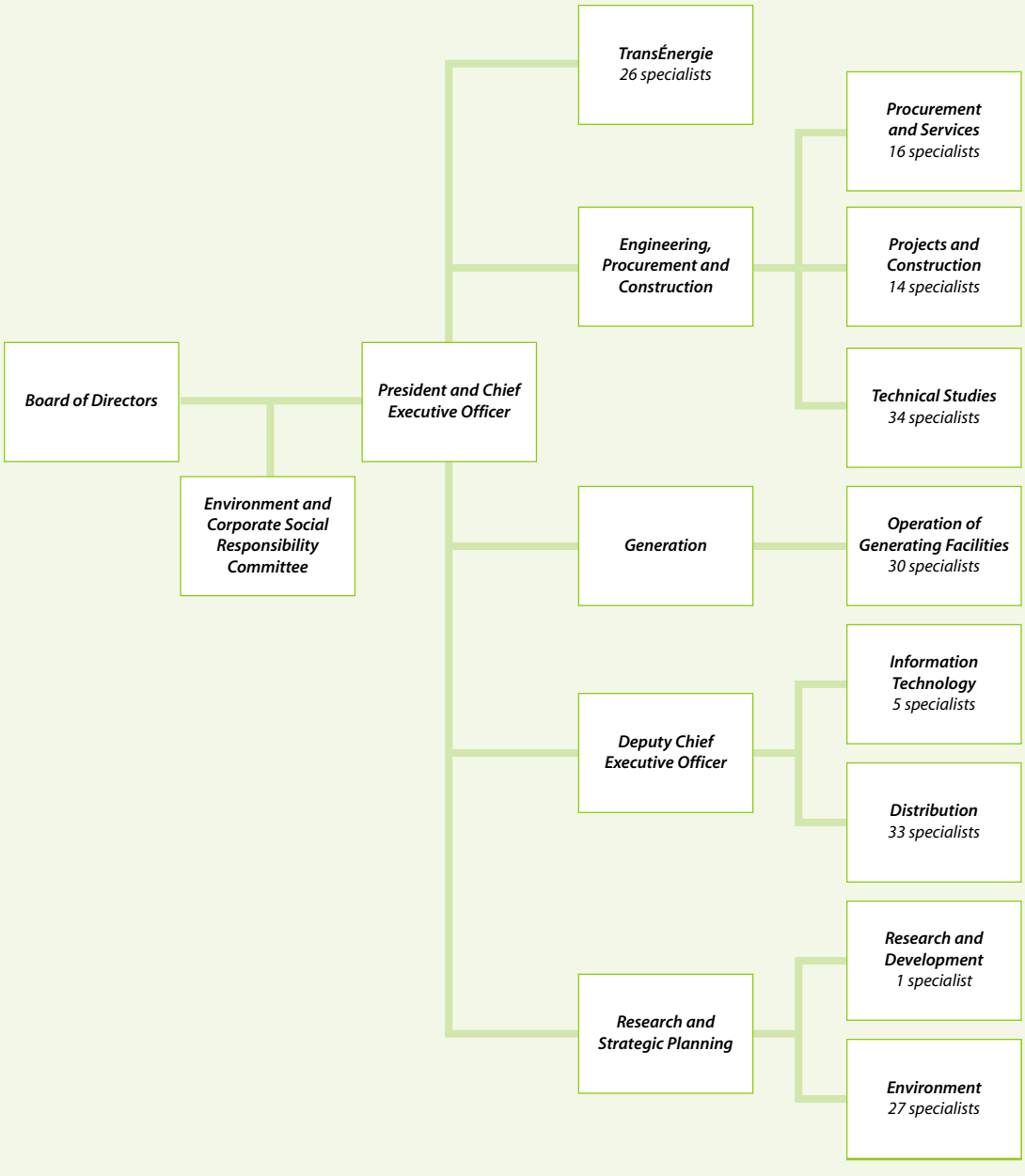
Category	2000	1999	1998	1997	1996
Total installed capacity (MW)*	31,512	31,505	31,472	31,397	31,413
Hydroelectric generating stations (MW)	29,246	29,235	29,203	29,203	29,220
Nuclear generating station (MW)	675	675	675	675	675
Thermal generating stations (MW)	1,591	1,595	1,594	1,519	1,518
Total sales (TWh)	190	172	161	163	163
Exports (TWh)	37	25	19	15	19
Transmission system (km)	32,283	32,227	32,144	32,036	30,557
Distribution system (km)	106,448	105,898	105,705	104,640	104,078
Customer accounts	3,528,825	3,505,400	3,481,030	3,456,768	3,427,260
Work force					
Permanent (at December 31)	17,277	17,277	17,468	17,164	19,553
Temporary (year average)	3,399	3,126	3,379	3,252	3,767
Sales ($M)	10,174	8,499	8,041	7,927	7,669

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

Organization of the Environment Function

The company's different business and support units employ 186 environment specialists. Their role is to provide the company's managers with support and expertise in their particular fields. The Environment unit is responsible for monitoring key environmental issues, proposing corporate strategies and assuring senior management that the company has the tools it needs to control all environmental aspects of its performance.

Implementing an ISO 14001 compliant environmental management system (EMS) is a requirement of the company's environment policy. Accordingly, the administrative units whose operations may have an impact on the environment began implementing an EMS in 1997. This approach is enabling the company to achieve two primary objectives: to ensure that the administrative units concerned have the tools they need to take charge of their environmental responsibilities; and to demonstrate the company's commitment to the environment and sustainable development, through the registration and certification of its ISO 14001 systems by third parties.



Environment and Corporate Social Responsibility Committee

The role of the Environment and Corporate Social Responsibility Committee is to advise the Board of Directors primarily on matters of environmental management. The Committee is made up of six Board members, including the Chairman, L. Jacques Ménard, and the President and Chief Executive Officer of Hydro-Québec, André Caillé.

During 2000, the Committee focused on setting up Hydro-Québec's foundation for the environment and familiarized itself with the International Energy Agency's comparisons of the environmental impact of the various power generation options. It reviewed the environmental performance inspection program and ensured the continued implementation of ISO 14001. As part of its examination of environmental issues and events affecting the company, the Committee looked into the latest studies on electric and magnetic field exposure, nuclear waste management at Gentilly-2 power plant, and landscape protection in terms of power distribution pole siting.

Gentilly-2 nuclear power plant

Advisory Committee on the Environment and Community Affairs

The Advisory Committee on the Environment and Community Affairs advises the Vice President of Research and Strategic Planning, who is responsible for overseeing the company's environmental performance and defining key directions. The Committee also analyzes and comments on environmental and social issues of concern to the company in order to propose measures and strategies in line with corporate objectives and strategic orientations. The Committee is made up of eight members from outside the company. In 2000, it dealt with the following issues:

- environmental acceptability and favorable reception of the company's projects and activities by the local communities concerned
- water management and watershed management
- review of Québec's environmental protection plan
- the company's positioning with respect to climate change and the comparison of power generation options
- regional development
- strategic environmental assessments

Hydro-Québec's Environmental Management System

In 1997, Hydro-Québec began the process of implementing an environmental management system (EMS) in accordance with ISO 14001. Two administrative units were registered in 2000: Procurement and Services for its Island of Montréal operations; and the Distribution unit for its distribution activities throughout Québec and a portion of its generation operations associated with off-grid power systems. Hydro-Québec's distribution system covers the entire inhabited area of Québec, serves over 3.5 million customers and spans more than 106,000 km. Its management, construction, operation and maintenance require the services of over 3,500 employees. Deployment of a single EMS of this scope is, in itself, a remarkable feat.

The following business and support units expect to complete their EMS implementation process by the dates indicated:

Business or support unit requiring an EMS	Implementation start date	Expected date of ISO 14001 registration			
		1999	2000	2001	2002
Operation of Generating Facilities	1997			■	
TransÉnergie	1997				■
Distribution					
Distribution operations	1997		■		
Generating operations (off-grid power systems)					
Îles-de-la-Madeleine	1997		■		
Northern region	2000				■
Engineering, Procurement and Construction					
Procurement and Services					
Centre-Sud	1997	■			
Montréal	1999		■		
Other territories	1999			■	
Specialized units	2000				■
Projects and Construction	1998			■	
Technical Studies					
Environment	1998			■	
Information Technologies	2000				■
Research and Development (IREQ)	2000			■	

The company has also adopted a number of environmental management mechanisms enabling senior management and the Board to exercise due diligence in environmental matters, including:

- the Environment and Corporate Social Responsibility Committee described earlier on
- the policy *Our Environment* as well as the environmental content of six other corporate policies
- five corporate environmental directives
- the environmental inspection program
- an annual management review conducted by the President and Chief Executive Officer (the 2000 management review focused on ISO 14001 implementation by the business and support units)
- a biannual report presented to the Board on the environmental risks related to compliance with laws and regulations and the main environmental issues
- annual accounting to the Board on the application of the policy *Our Environment*

2000 and one better ways to protect the environment

In Québec, May is *Environment Month*. Each year, Hydro-Québec marks this occasion by organizing activities for employees on an aspect of its environmental performance. These events emphasize how important it is for employees to take the environment into account in their daily activities. Since our environmental practices are evolving and continually improving, we decided to associate the year 2000 with *2000 and one better ways to protect the environment*.

During Environment Month, Hydro-Québec distributed a brochure to all its employees presenting examples of good environmental practices in each of the company's main areas of activity and including information on:

Generation Numerous environmental studies and follow-up reports on the James Bay complex

Distribution Practices regarding PCP-treated poles

Transmission New methods of landscape integration

Buildings Energy efficiency measures

Substations Noise reduction measures

Procurement Reclaiming and reuse of insulating mineral oils used in distribution and transmission transformers

Close to 400 employees attended a luncheon talk given by André Bolduc, historian and retired Hydro-Québec employee, on the evolution of environmental concerns at Hydro-Québec since the company was founded in 1944.

Employee Training and Awareness

To ensure continuous improvement of the company's environmental performance, employees are given ongoing training on the environmental impacts associated with their work as well as information on ways and means of controlling such impacts. The administrative units assess the training needs of their employees and develop mandatory annual skill acquisition programs, as part of their environmental management system.

During 2000, over 8,000 employees took part in training and awareness sessions on environmental topics:

Topic	Number of participants
Environmental management system	2,359
Recovery of residual hazardous materials	1,934
Emergency measures in the event of spills	1,749
Internal environmental assessment	1,541
Management of contaminants	234
Transportation of hazardous materials	134
Environmental legislation	41
Atmospheric emissions	11
Acoustics	11

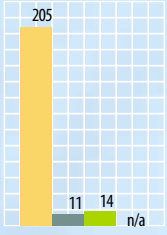
In addition to these specialized courses, training sessions focusing specifically on activities related to potential environmental impacts are offered to the employees concerned. This training is aimed at ensuring operational control of activities.

Since the ISO 14001 implementation program was initiated in 1997, over 5,000 employees have attended EMS training and awareness sessions.

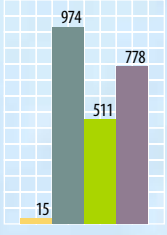
Employees in training

Hydroelectricity: Clean Energy

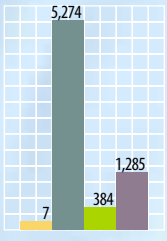
Energy Payback Ratio*



Greenhouse Gas Emissions (CO_2) (kt CO_2 eq./TWh)



SO_2 Emissions (t SO_2/TWh)



Hydroelectric with reservoir
Coal
Natural gas (combined-cycle turbines)
Diesel

* *Energy payback ratio is the energy produced divided by the energy consumed to build and operate the generation option.*

Note: NO_x emissions associated with the various power generation options are not included in this table because the results of analyses tend to vary widely. They depend mainly on the combustion method and to a lesser extent on the fuel used.

Benefits of Hydropower

Hydro-Québec has provided Québec with one of the most competitive hydroelectric generation capacities in North America. Today, the company is one of the leading producers of electricity on the continent. Nearly 97% of Hydro-Québec's output is generated from water resources. This type of generation has many environmental advantages, including the fact that it contributes to a reduction in greenhouse gas emissions, acid precipitation and other atmospheric pollutants. Hydro-Québec ordinarily uses thermal power plants only in winter or during periods of low runoff.

Environmental Advantages of Hydropower Generation

Hydroelectric generating plants emit much lower quantities of pollutants than thermal plants fired by coal, oil or natural gas.

Energy Payback Ratio

The energy payback ratio of a generating station is the total quantity of electricity produced by the station during its normal life cycle divided by the energy required to build, maintain and fuel it. Hydropower facilities, which have an energy payback ratio of 205, perform far better than fossil-fuel generating facilities, which have payback ratios ranging from 11 to 14.

La Grande 1 reservoir

Québec emits only half as much CO_2 per capita as the rest of Canada and the United States.*

** Source: Ministère des Ressources naturelles,* L'Énergie au Québec, *Édition 2000*

Greenhouse Gases

Hydroelectric generating stations with reservoirs produce low greenhouse gas (GHG) emissions, at a rate that varies with the site. A portion of the biomass flooded in the reservoirs decays and creates greenhouse gases. The emission factor for typical hydroelectric power plants is about 60 times lower than that for coal-burning generating stations. The emission factor for natural gas–fired systems with combined-cycle turbines is about 35 times higher than that for hydroelectric power plants.

Acid Precipitation

One of the main causes of acid precipitation is SO_2, which leads to the creation of sulphuric acid. Acid precipitation remains a major issue in many parts of the world. Even in North America, where programs have cut SO_2 emissions, specialists consider that the current levels of these substances are still reducing the productivity of many lakes, rivers and forests. SO_2 and NO_x emission factors for hydroelectricity are hundreds of times lower than those for coal-fired generating stations without purification equipment. In other words, generating stations fired by coal, oil or diesel fuel contribute substantially to the formation of acid precipitation. Natural gas, during combustion, can also be an important source of acid precipitation and ozone formation.

Environmental Advantages of Hydroelectricity Exports

In the last decade, hydropower development in Québec and Labrador has enabled Hydro-Québec to export more electricity to its neighbors than it imports. The company's main customers are located in New York State, New England, Ontario and New Brunswick.

At first glance, these transactions appear to be purely financial, with no bearing on the environment. However, another story lies below the surface. Each electric utility uses different types of generating facilities which pollute the atmosphere to varying degrees. Thanks to its use of hydropower, Hydro-Québec has a very good record in this regard, compared with its neighbors. According to an audit conducted by Deloitte & Touche, each terawatthour (TWh) sold by Hydro-Québec generates

- 18.5 times less CO_2,
- 11.7 times less SO_2,
- 15 times less NO_x

than the regional average for the electric utilities in the six New England states, New York State, Ontario and New Brunswick.

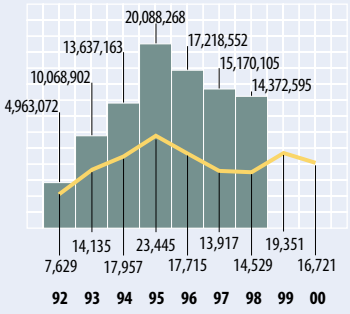
Atmospheric emissions of CO_2, SO_2 and NO_x can have local, regional or even global impacts.

CO_2 (carbon dioxide): the predominant greenhouse gas created by human activity and causing climate change.

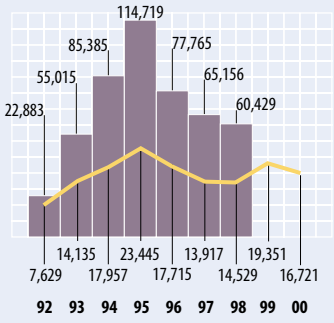
SO_2 (sulphur dioxide): a key precursor of acid deposits and small particulates.

NO_x (nitrogen oxide): a key precursor of ground-level ozone (a component of urban smog) and acid deposits.

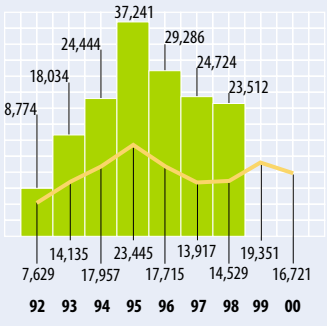
CO_2 Emissions (t) Avoided



SO_2 Emissions (t) Avoided



NO_x Emissions (t) Avoided



Net exports* (GWh)

** Net exports equal energy exported minus energy purchased.*

Greenhouse Gas Emissions Avoided by Hydro-Québec Exports

Each purchase or sale of electricity by Hydro-Québec can affect atmospheric emissions. Neighbor utilities normally use their thermal generating stations to meet peak demand, particularly in summer. Since Hydro-Québec exports electricity primarily in summer, it enables these utilities to avoid using their thermal stations when the demand is high.

Hydro-Québec exports much more electricity than it imports. This ultimately results in avoided emissions, because our customers outside Québec (New England, New York, Ontario and New Brunswick) can avoid operating their oil- or coal-burning facilities when they purchase electricity from Hydro-Québec.

Avoided CO_2 emissions can be as much as 20 million tonnes a year, which is the equivalent of annual emissions from nearly six million automobiles.

Data concerning emissions avoided in 1999 and 2000 were not available at the time of publication. Nevertheless, in view of the fact that net exports reached a similar level to previous years, it is likely that avoided emissions followed an equivalent curve.

Thanks to hydropower development, Québec reduced its CO_2 emissions by 25% between 1979 and 1998.

The current CO_2 emission level is far below the Canadian and U.S. averages and is closer to the levels found in Sweden and Japan.

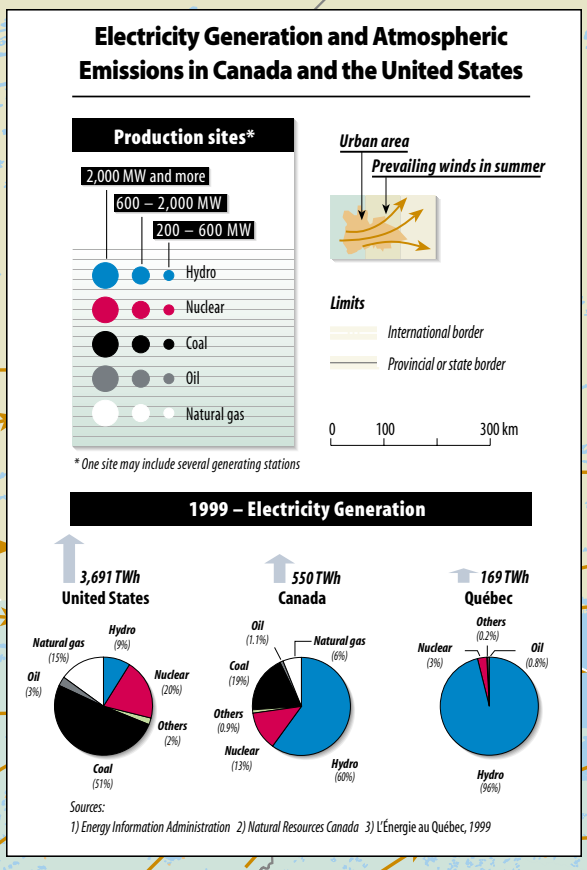
Tracy thermal power plant

Highlights on GHG Emissions Avoided

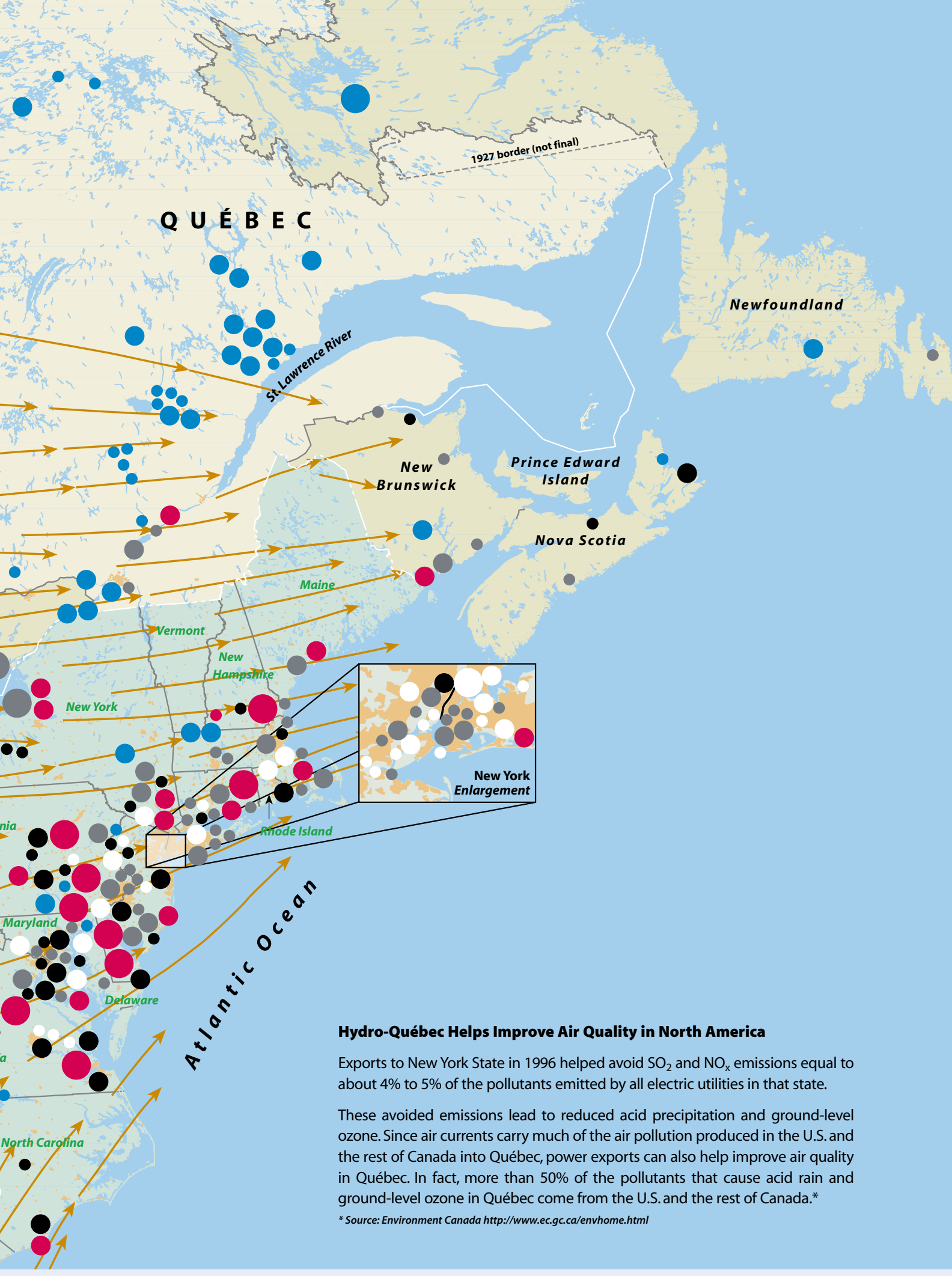
Commissioning of Lac Robertson hydroelectric generating station in 1995 allowed the replacement of three diesel-fired power stations, for an emission reduction of over 117,000 tonnes of CO_2 equivalent over a three-year period.

The use of Tracy power plant to generate electricity varies widely from year to year, resulting in significant fluctuations in its GHG emissions. Over the last 10 years, emissions have consistently been lower than in 1990, the benchmark year, when the power plant generated 1.7 TWh of electricity and emitted 1.3 million tonnes of CO_2 equivalent. For example, in 1998, 1999 and 2000, the power plant generated 1.5 TWh, 1.0 TWh and 0.2 TWh, respectively.

The increase in hydroelectric and nuclear generation between 1990 and 1998 made it possible to avoid emitting 65 million tonnes of CO_2 equivalent.


Electricity Generation and Atmospheric Emissions in Canada and the United States
Production sites*
2,000 MW and more
600 – 2,000 MW
200 – 600 MW
Hydro
Nuclear
Coal
Oil
Natural gas
* One site may include several generating stations
Urban area
Prevailing winds in summer
Limits
International border
Provincial or state border
0
100
300 km
1999 – Electricity Generation
3,691 TWh
United States
Natural gas (15%)
Hydro (9%)
Oil (3%)
Nuclear (20%)
Others (2%)
Coal (51%)
550 TWh
Canada
Oil (1.1%)
Natural gas (6%)
Coal (19%)
Others (0.9%)
Nuclear (13%)
Hydro (60%)
169 TWh
Québec
Others (0.2%)
Nuclear (3%)
Oil (0.8%)
Hydro (96%)
Sources:
1) Energy Information Administration 2) Natural Resources Canada 3) L'Énergie au Québec, 1999

James Bay
CANADA
Ontario
Lake Superior
Lake Huron
Lake Michigan
Lake Ontario
Lake Erie
Minnesota
Wisconsin
Michigan
Iowa
Illinois
Indiana
Ohio
Pennsylva
West Virginia
Virgini
Kentucky
Missouri
Tennessee
Arkansas
South Carolina
UNITED STATES



Hydro-Québec Helps Improve Air Quality in North America

Exports to New York State in 1996 helped avoid SO_2 and NO_x emissions equal to about 4% to 5% of the pollutants emitted by all electric utilities in that state.

These avoided emissions lead to reduced acid precipitation and ground-level ozone. Since air currents carry much of the air pollution produced in the U.S. and the rest of Canada into Québec, power exports can also help improve air quality in Québec. In fact, more than 50% of the pollutants that cause acid rain and ground-level ozone in Québec come from the U.S. and the rest of Canada.*

** Source: Environment Canada http://www.ec.gc.ca/envhome.html*

Recognition of Our Performance

The ÉcoGESte program recognizes the voluntary measures taken by any company or organization to stabilize GHG emissions.

ÉcoGESte

With the ratification of the United Nations Framework Convention on Climate Change and the Kyoto Protocol, climate change has become one of the top issues on the global agenda. To stabilize greenhouse gas emissions at their 1990 level as targeted in the Kyoto Protocol, the Québec government has set up a program called ÉcoGESte for keeping track of measures taken voluntarily by companies and organizations operating in Québec.

In December 2000, Québec's Ministère de l'Environnement and Ministère des Ressources naturelles recognized, under the ÉcoGESte program, that the power production characteristics and business practices of Hydro-Québec avoided emissions of 78.2 million tonnes of CO_2 equivalent between 1991 and 1998.

Hydro-Québec a Finalist for the *Financial Times Energy* Award

Hydro-Québec ranked among the five finalists in the Best Renewables Company category in the annual competition sponsored by *Financial Times Energy* and aimed at recognizing the best companies working in the field of energy. This international recognition confirms the renewable nature of the main generating source used by Hydro-Québec — hydropower.

Better Communications on Environmental Benefits of Hydropower and Our Performance

Hydro-Québec published a number of brochures on the environmental benefits of hydropower generation. These publications deal with electricity generation options as they relate to GHG emissions, the main issues related to climate change, atmospheric emissions avoided through exports, and Hydro-Québec's part in our neighbors' pollution reduction. Various brochures are available on the company's Web site at the following address: www.hydroquebec.com/environment.

Impact Management

Some Indicators

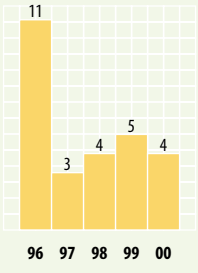
Legal Proceedings

An injunction issued in 1999 in favor of the town of Saint-Timothée required Hydro-Québec to fill the municipality's basin so the beach could be used. Hydro-Québec was unable to complete this work by the scheduled date because of a strike by some of its employees. Talks held in 2000 resulted in an out-of-court settlement. The town was awarded $25,000 for loss of revenue and $5,000 for legal expenses.

Violation Notices

The company was issued four violation notices this year by Québec's Ministère de l'Environnement.

Number of Violation Notices Issued for the Entire Company

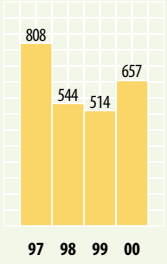


Unit Concerned	Type of Violation Notice	Measures Taken
Projects and Construction	Unauthorized work on a river ford at the work site for the Arnaud–Sainte-Marguerite-3 315-kV line: noncompliance with mitigative measures.	Hydro-Québec restored the water flow and repaired the damaged banks.
TransÉnergie	Violation regarding quarterly inspection registers for residual hazardous material storage facilities and the absence of safety mechanisms to prevent pipes from being used except when tanks are being filled or drained.	Hydro-Québec advised the Ministère in writing of the measures taken to rectify the situation.
Procurement and Services, Distribution and TransÉnergie*	Violation regarding residual hazardous material recovery areas at several distribution centres in the Gaspé region.	Hydro-Québec advised the Ministère in writing of the measures taken to rectify the situation.
Procurement and Services	Violation regarding quarterly inspection registers for residual hazardous material storage facilities.	Hydro-Québec advised the Ministère in writing of the measures taken to rectify the situation.

* *Violation notice covering all three administrative units but addressed to Procurement and Services.*

Environment-Related Complaints

Number of Environment-Related Complaints



Source: Hydro-Québec.

Most of the environment-related complaints received (68%) involve distribution operations. About 47% of the 657 complaints received this year were related to property or crop damage, 20% to pruning, and less than 13% to contamination due to spills.

As part of their environmental management system (EMS), the units have introduced a procedure for handling environment-related complaints, forwarding them to the people in charge, processing them within reasonable periods of time, and making sure they are taken into consideration in the company's decision-making process.

The higher number of complaints in 2000 than in 1999 can be explained by the fact that the implementation of these new procedures led to a greater number of cases being identified and recorded in the complaints system.

Environment-Related Complaints

Type of Complaint	Distribution	Generation	Procurement and Services	TransÉnergie	Projects and Construction	Total
Property damage	167	7	0	81	17	272
Crop damage	0	0	0	37	0	37
Pruning	126	1	1	1	0	129
Quality of life, noise, lighting	27	7	0	3	0	37
Visual impact	15	2	0	1	0	18
Erosion, wildlife, vegetation	4	12	1	8	0	25
Contamination	82	2	2	1	0	87
Poor site maintenance	16	2	0	3	0	21
Electric and magnetic fields	10	0	0	0	0	10
Water management	0	10	0	0	0	10
Deforestation	0	1	0	1	0	2
Breakage	0	0	0	2	0	2
Contaminant measurement instruments	0	0	1	0	0	1
Other	0	2	0	4	0	6
TOTAL	**447**	**46**	**5**	**142**	**17**	**657**

Residual Materials

4RE-D Program

Hydro-Québec continued its 4RE-D program, which calls for reduction, recovery, reuse, recycling and energy recovery before disposal of resources as a last resort. This sustainable development initiative has allowed the recovery of numerous products that would otherwise have been treated as waste. It has also generated gross income of some $9.3 million (including income from the sale of surplus assets) and resulted in substantial savings.

Compared with the previous year, Hydro-Québec increased the number of poles reused in its system by 40%. The poles, often bleached by time and weather, are used mostly in areas that are sensitive from environmental and health standpoints, such as near wells or waterways. These results are largely attributable to improved control over recovery operations carried out by contractors.

Hydro-Québec continued the work begun in 1999 to recover energy from recycled treated-wood poles. By using over 3,500 tonnes of wood chips (accumulated since 1997) in cogeneration facilities, we are fulfilling our commitment to eliminate all production of such wood waste. In addition to energy recovery, Hydro-Québec reclaimed lumber from more than 12,500 poles. The power-line hardware reconditioning program was expanded, enabling the company to double the amount of material recovered, for an increase from 50 tonnes in 1999 to 99 tonnes in 2000.

The table below provides statistics on recycling, reuse and energy recovery from residual materials.

Product	Unit of Measure	Quantity		
		Recycled	Reused	Used for Energy Recovery
Power-line hardware	tonne		99	
Lead batteries	tonne	150.4		
Antifreeze	litre		1,000	
Electrical equipment	tonne	141.1		
Light fuel	tonne			22.8
Printer cartridges	unit	1,109		
Aerosol containers	tonne	11.0		
Contaminated water*	litre	578,486		
Vehicle filters	tonne	18.5		
Grease	tonne			7.9
Insulating mineral oil	litre		3,674,883	187,627
Used oil	litre			577,308
Mercury and sodium lamps	tonne	3.9		
Various liquids	tonne			17.9
Metal	tonne	8,725.4		
Office furniture	dollar		3,155	
Paper and paperboard	tonne	1,000		
Paint and glue	tonne			3.0
Wood poles	unit/unit/tonne	12,567 u	830 u	3,511 t
Contaminated containers	unit	2,390	3,178	
Binders	unit		6,027	
Used solvents	tonne			20.1
Distribution transformers	unit		2,406	5,782
Fluorescent tubes	tonne	21.1		

** Includes oily water, contaminated water and cutting oil.*

RHM recovery area at the Jarry West service centre

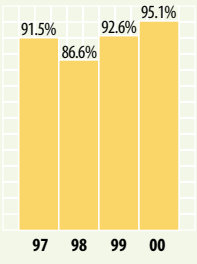
Residual Hazardous Materials

To comply with Québec regulations on the management of residual hazardous materials (RHMs), Hydro-Québec adopted a two-year action plan under which 383 recovery areas were set up throughout its Québec facilities, at a substantial cost to the company. RHMs are now recovered and segregated at source, on the work site, then gathered in secure transfer sites before being quickly transported to one of the company's four recovery centres. There the materials are processed according to 4RE-D program criteria. In 2000, only 468.7 tonnes of RHMs had to be disposed of, which amounts to less than 5.7% of the 8,317.9 tonnes recovered.

Type of RHM Recovered	Quantity Recycled and Eliminated (tonnes)
Hazardous liquids	3,322.8
Hazardous solids	621.8
Electrical equipment	4,373.3
TOTAL	**8,317.9**

Used Oil

Reuse of Insulating Mineral Oil



Source: Hydro-Québec.

Hydro-Québec decontaminated and reconditioned 3,674,883 litres of insulating mineral oil for reuse in its equipment or for sale to certain outside suppliers. This boosted the recovery rate for insulating mineral oil to 95.1% in 2000. Although this rate has remained fairly stable over the past four years, the amount of oil reused increased by 53% between 1999 and 2000. Oil that cannot be reconditioned to meet the required quality standards is used to produce energy. No insulating mineral oil is simply discarded.

Energy recovery from used motor oil at Kuujjuarapik thermal power plant continued. The oil is used to heat a warehouse adjacent to the plant. In 2000, some 4,845 litres of used oil (64% of the used oil generated) were recycled in this way.

Management of Contaminants

Ozone-Depleting Substances

As a result of the ozone-layer depletion that has been observed in recent years by scientists around the globe, the international community, including Canada, has joined together to deal with the problem. The Montréal Protocol was adopted in 1987, and federal and provincial regulations on this topic followed. The objective of the Protocol is to reduce and eliminate the production and use of a number of chemicals considered to be responsible for ozone depletion. These are known as ODSs (ozone-depleting substances).

In its day-to-day operations, Hydro-Québec uses a number of ODSs in its air conditioning and refrigeration systems, for fire protection and as solvents (degreasing, laboratories). The most frequently used ODSs in the company are chlorofluorocarbons (CFCs), hydrochlorofluorocarbons and halons.

To comply with current regulations and be proactive in reducing the use of ODSs, Hydro-Québec adopted an ODS action plan under which a number of activities were carried out in 2000.

- According to an inventory that was 75% completed as of December 1, 2000, Hydro-Québec had 33,228 kg of ODSs (excluding trichloroethane), of which 12,994 kg were used in refrigeration or air conditioning, and 20,234 kg for fire protection. The company has established environmental criteria to guide the selection of products to replace ODSs.
- The use of trichloroethane (TCE) has been prohibited since January 2000: all units in the company that used it, other than laboratories, have opted for replacement products, in accordance with current regulations. All stocks of TCE-containing products have been or are currently being routed through the elimination process managed by Procurement and Services.
- Three halon 1301 depots (in Québec City, Rouyn and Saint-Hyacinthe) have been set up to recover the gas from saturation systems that will be dismantled. Uniform management procedures for these depots will be developed in 2001, as will the environmental criteria to be used to guide the selection of ODS replacement products.

Contaminated Soil

In 2000, 50 sites belonging to the company underwent soil characterization and decontamination (treatment or disposal). The total cost of these operations to date is estimated at nearly $8.3 million. All the contaminated soil has now been removed from the site of the former Port-Menier thermal generating station on Anticosti Island, and treatment is expected to be completed in 2001. Decontamination of groundwater at the site of the former Cap-aux-Meules diesel power plant is ongoing; nearly 11,000 litres of oil have been recovered to date.

Soil Decontamination Projects (cost to date over $100,000)

Site and Type of Operation	Volume to Be Treated	Volume in 2000		Volume to Date		Total Volume (%)		Cost to Date ($000)
		Removed	Treated	Removed	Treated	Removed	Treated	
Anticosti Island Former diesel power plant	9,538	1,935	2,190	9,538	7,440	100%	78%	1,900
Cap-aux-Meules Former diesel power plant	oil on groundwater	80 litres		10,910 litres		N/A	N/A	5,000
Saint-Augustin Diesel power plant (*in situ* and in biopiles)	2,000 (biopiles) 5,000 (*in situ*)	2,000 N/A*	0 0	2,000 N/A*	0 0	100% N/A*	0% 0%	180
Nemiscau (former firefighter training centre)	1,675	0	0	675	675	40%	40%	200
Saint-Jérôme (distribution substation, fuel and generator) Added pumping and treatment of 55,900 litres of water	730	730	730	730	730	100%	100%	117
Victoriaville (pole yard)	2,000	2,000	2,000	2,000	2,000	100%	100%	180
Trois-Rivières substation	2,700	2,700	2,700	2,700	2,700	100%	100%	255

** For this type of operation, soil is cleaned in place instead of being removed.*

Spills

In 2000, 383 spills occurred in connection with the company's operations. The data collected indicate that:

- in nearly 70% of cases, the spill consisted of insulating oil
- 80% of the spills involved a volume of less than 100 litres
- 73% of the spills occurred on the distribution system
- in most of these cases, small amounts of insulating oil were spilled from equipment installed on the overhead distribution system

Spills of Contaminants, by Business or Support Unit

Business / Support Unit	1997	1998	1999	2000
Distribution	147	219	297	282
TransÉnergie	26	16	40	39
Procurement and Services	11	3	39	31
Generation	7	23	16	26
Projects and Construction	N/A*	N/A*	12	2
Information Technologies	N/A*	1	3	2
IREQ	N/A*	N/A*	N/A*	1
TOTAL	**191**	**262****	**407**	**383**

* *N/A: data not available at the time of writing.*
** *Excludes the 3,028 spills that occurred during the January 1998 ice storm as a result of extensive damage to the distribution system.*

Polychlorinated Biphenyls (PCBs)

In 1998, Hydro-Québec completed its plan, begun in 1985, to remove all PCBs from its high-volume power-system equipment. A new, systematic inventory of all facilities that may still contain pure PCBs or contaminated equipment was done in 2000 at the request of the company's senior management. The following conclusions were reached.

- The company's system no longer contains any high-volume equipment insulated with PCBs.
- An estimated 16,675 low-volume devices are still in service on the system. These are mostly lamp ballasts containing about 150 g of PCB and can be considered PCB-insulated. The devices should be removed at the end of their useful lives. Their removal has already begun, in fact: they form the bulk of the 1.6 tonnes mentioned in the table below.
- For another 7,089 devices, PCB contamination could not be completely ruled out. On the basis of our experience with elimination of residual hazardous materials over the past years, however, only a few of these devices are thought to be PCB-insulated.

PCB-Contaminated Equipment in Storage

Type of PCB	1997	1998	1999	2000
High-level	3 t	2.7 t	0 t	1.6 t
Low-level	190 t	9.7 t	5.5 t	0 t

Energy Efficiency

As part of the company's program for energy efficiency in administrative buildings, the year 2000 saw a 20% reduction (nearly 64,000,000 kWh) in net energy consumption, compared with 1991, the benchmark year. In all, 99 administrative buildings located throughout Québec and representing a total area of 700,120 m^2 were evaluated for energy efficiency.

Public Safety and Safety at Our Facilities

Hydro-Québec conducts its operations so as not to jeopardize public health and safety. It is also responsible for informing the public of the hazards inherent in its product and on the ways to use it safely.

Nine incidents involving the general public occurred in 2000: most of these were caused by property owners attempting to do their own pruning near distribution lines. There were no incidents involving the public at our facilities, and the number of deaths caused by electrical accidents has decreased steadily over the past years. These results can be attributed to awareness campaigns targeting the general public and workers.

In addition to these awareness campaigns, the safety of our facilities is monitored and audited. Every year, Distribution and TransÉnergie check certain aspects of safety at their facilities and the Industrial Security unit performs risk analyses and inspects the facilities. This past year, more than 150 facilities underwent inspections focused on public safety.

Pruning near power lines

Environmental Issues and Initiatives

Projects and Construction and Technical Studies

Stocking brook trout proves successful

To offset fish habitat losses downstream from Sainte-Marguerite-3 generating station and to offer anglers in the area potential resources, Hydro-Québec stocked a virgin lake with 47,300 brook trout fry and two other lakes with 2,100 spawners. The company also developed spawning grounds over more than 1,350 m of tributaries. Follow-up studies indicate that these two initiatives have been successful.

Dismantling a four-circuit line in downtown Montréal

A study was conducted on the impact of dismantling an obsolete 120-kV four-circuit line and replacing it with a 315-kV line on tubular steel poles and a 120-kV underground line in Montréal's downtown core. The study found that this project would mean a considerable improvement in the urban landscape for all area residents.

Moose tracking and impoundment of Sainte-Marguerite-3 reservoir

The radio tracking of some 20 moose revealed that the reservoir impoundment has not had any measurable effect on the movement of the animals or their birth and survival rate.

Facility optimization and new projects

Hydro-Québec studied a number of facility optimization or new development projects with low environmental impacts. These include the new Toulnustouc generating station, partial diversion of the Portneuf, Manouane and Sault aux Cochons rivers, and the Mercier power plant project.

Main Environmental Aspects

When construction projects are being planned, their managers take the main environmental aspects into account. Studies are then conducted to determine the environmental impacts of each project. The mitigative measures identified by the studies are applied when the projects are built in order to minimize the negative effects and maximize the positive ones.

The potential environmental aspects of construction projects can be summarized as follows:

Project	Environmental Studies	Potential Environmental Aspects
Construction, maintenance or modernization of line, substation or generating facilities, water-related civil engineering structures, reservoirs, camps, access roads and borrow pits	• Environmental assessments • Characterization of contaminated sites • Archaeological studies • Forest studies • Biological inventories	• Residual material management • Human and social aspects • Management of the impacts of machinery (noise, vibration, dust) • Management of the impacts of certain site work (blasting, drilling, river crossings, clearing) • Management of contaminated soil and wastewater • Management of backfill and excavated material • Management of plant debris • Tapping of natural resources • Management of plant and animal wildlife • Cultural heritage

Environmental Management Systems

In 1998, the Projects and Construction department and the Technical Studies department each began implementing an environmental management system (EMS) in accordance with the requirements of ISO 14001. However, in 1999, the Engineering, Construction and Procurement Group was created. This organizational change resulted in major modifications to the scope of the environmental management systems mapped out in 1998 and to the related documentation. EMS implementation was consequently delayed, but is now going ahead in both cases. At the end of 2000, the process was 74% complete in Projects and Construction and 91% complete in the Technical Studies environmental unit. Both departments expect their environmental management systems to receive ISO 14001 registration in 2001.

A sample mitigative measure: A fish-pass

Impoundment of Sainte-Marguerite-3 reservoir

New Projects and Projects Under Way

Sainte-Marguerite-3 hydroelectric generating station

This project involves the construction of an 882-MW powerhouse, a dam 171 m high and a 100-km road, as well as the impounding of a 252-km^2 reservoir.

Environmental issues

- land use
- regional economic spinoffs

Mitigative measures taken in 2000

- signing of an agreement between Hydro-Québec and the controlled-use zone
- creation of an economic spinoffs committee
- provision of drinking water
- building of a boat ramp at Sainte-Marguerite-3 reservoir
- work carried out by the Société des travaux de correction (remedial measures corporation) for the benefit of the Montagnais community
- follow-up of an operation in which a virgin lake was stocked with 47,300 brook trout fry, two lakes near the site were stocked with 2,100 spawners, and spawning grounds were developed over a distance of 1,350 m in the tributaries

Work carried out in 2000

- excavation of the tailrace canal
- concreting of the surge chamber and powerhouse
- grouting of the headrace tunnel
- cleanup of certain project sites
- installation of electrical and mechanical equipment
- continued impounding of the reservoir, which began in April 1998

Grand-Mère hydroelectric generating station

This project calls for the construction of a new 220-MW powerhouse and a new spillway. It also involves increasing the spillway capacity and establishing a new hourly-peak generation method at Grand-Mère, Shawinigan and La Gabelle power stations.

Environmental issues

- continued snowmobiling on the reservoirs
- erosion of banks
- riparian vegetation

Mitigative measures planned

- development of multi-species spawning grounds downstream from the dam
- construction site noise control
- snowmobile access
- stabilization of banks, if necessary

Work carried out in 2000

- clearing
- excavation
- construction of the cofferdam

Grand-Mère lateral cofferdam

Toulnustouc hydroelectric generating station

The feasibility study covers the construction of a 517-MW powerhouse, a dam 80 m high and a 20-km^2 enlargement of the reservoir, which is called Lake Sainte-Anne. In 2000, Hydro-Québec filed its draft-design report and answered questions from federal and provincial government authorities.

Environmental issues

- regional economic spinoffs
- flooding of cottages

Mitigative measures planned

- controlled flow
- rerouting of flooded roads
- financial compensation for cottages torn down
- creation of an economic spinoffs committee

Betsiamites optimization: Diversion of the Portneuf, Sault aux Cochons and Manouane rivers

The feasibility study deals with the partial diversion of the Portneuf, Sault aux Cochons and Manouane rivers into the Betsiamites, for additional power production of 714 GWh.

Hydro-Québec answered questions from federal and provincial government authorities about the diversion of the Portneuf and Sault aux Cochons rivers, and took part in public hearings held by the Bureau d'audiences publiques sur l'environnement (BAPE—environmental hearings board).

The company filed its draft-design report with the Ministère de l'Environnement regarding the diversion of the Manouane River, and answered questions from federal and provincial government authorities.

Environmental issues

- sediment dynamics in the Portneuf River estuary
- brook trout habitat in the Portneuf and Sault aux Cochons rivers
- landlocked-salmon habitat in the Manouane River
- release of waste wood in the Sault aux Cochons River
- navigation on the Péribonka River

Mitigative measures planned

- controlled flow
- construction of weirs and deflectors

Mercier hydroelectric generating station

The feasibility study covers the construction of a 60-MW powerhouse adjacent to Mercier dam on the Gatineau River. The environmental and technical studies were carried out in 2000, and the draft-design report was begun.

Environmental issues

- modification of walleye habitat
- temporary interruption in recreational use of the area

Mitigative measures planned

- development of walleye spawning grounds

Transmission system reinforcement projects

The following projects are part of the transmission system reinforcement begun after the ice storm of January 1998, which caused serious power outages in the Outaouais (Ottawa Valley), Montréal and Montérégie areas.

Montérégie loop: 735-kV Saint-Césaire–Hertel line and 735-120/230 kV Montérégie substation

In December 1999, Hydro-Québec filed a draft-design report with the Ministère de l'Environnement. In August and September 2000, hearings were held by the BAPE. The BAPE report should be completed in January 2001.

Environmental issues

- routing of the line in Chambly
- visual impact along the Eastern Townships autoroute
- impact of the construction work on a heavily agricultural area

Mitigative measures planned

- installation of four tubular portal structures at the Richelieu River and Chambly canal crossing
- signing of an agreement between Hydro-Québec and the Union des producteurs agricoles (Québec farmers association)

Outaouais loop: 315-kV Grand-Brûlé–Vignan line

In March 2000, Hydro-Québec filed its draft-design report with the Ministère de l'Environnement. The public hearings were held in October and November 2000.

Environmental issues

- line crossing through the Papineau-Labelle wildlife reserve and a white-tailed deer containment area
- visual impact

Mitigative measures planned

- signing of agreements between the Société de la faune et des parcs du Québec (wildlife and parks association) and the Société des établissements de plein air du Québec (association of outdoor establishments)
- optimization of the line route

Interconnection with Ontario: 315/230 kV Outaouais substation

The company's draft-design report was filed with the Ministère de l'Environnement, public hearings were held, and Hydro-Québec received the government authorizations required to carry out the project.

Environmental issues

- noise
- visual impact of the substation

Mitigative measures planned

- application of strict ambient noise criteria
- building of two embankments to help the substation blend in with the environment

315-kV line on tubular steel poles

Downtown Montréal loop: Dismantling of a four-circuit line

This project involves the construction of a 315-kV line on tubular steel poles and a 120-kV underground line in downtown Montréal as well as the dismantling of an obsolete 120-kV four-circuit line.

In addition to ensuring a more reliable power supply to the downtown core, the project means a significant improvement in the quality of the urban landscape.

Mitigative measures taken

- current mitigative measures are aimed at reducing the project's impacts on vegetation, traffic circulation and public safety

Work carried out in 2000

- electric connections to the substations
- beginning of the dismantling of the obsolete line

New Maclaren interconnection substation and a 120-kV double-circuit line

This project involves improving the interconnection between TransÉnergie's system and the Maclaren Energy grid by modifying the Maclaren substation facilities and reinforcing the line connecting the two systems.

Environmental issues

- choice between refurbishing the existing substation or constructing a new substation elsewhere on Maclaren's property
- integration of the substation into the environment

Mitigative measures taken

- various measures taken on this site near a river and in an urban environment
- landscaping around the substation

Work carried out in 2000

- dismantling of the old substation and a portion of the old line
- construction of the new line
- landscaping around the substation

Reinforcement of the Québec urban community transmission system

This project entailed building a 15-km 230-kV line between Laurentides, Québec and La Suète substations.

230-kV line on tubular steel poles between Laurentides, Québec and La Suète substations

Environmental issues

- visual impact of the steel towers

Mitigative measures taken

- installation of tubular steel poles
- landscaping

Work carried out in 2000

- completion of draft-design report
- receipt of government authorizations
- completion of all construction work

Relocation and protection of 120-kV and 315-kV lines in the Lachine Canal

As part of the revitalization of the Lachine Canal by Parks Canada, three underground lines must be moved; three others running along the canal bed must be protected. In 2000, Hydro-Québec completed the environmental assessment and obtained the government authorizations.

Environmental issues

- possibility of stirring up contaminated sediments
- management of contaminated soil and effluents

Mitigative measures taken

- construction of a sedimentation basin
- installation of geotextile membranes

In addition to these projects, close to a dozen improvement, refurbishing and construction projects involve 161-kV, 120-kV and 69-kV lines as well as substations in the Saguenay, Eastern Townships, Gaspé and James Bay regions.

Hydro-Québec replaced Deverick dam, near La Tuque. In the interest of the environment and the local community, Hydro-Québec replaced the dam with a fixed-crest weir, and kept the reservoir filled for the benefit of users.

Monitoring of the social impact of the La Grande complex (eastern sector) on Aboriginal people

In 2000, the Generation Group initiated a follow-up study on the social impact of the La Grande complex, eastern sector. The study was carried out in close collaboration with the coordinators and Cree trappers from Mistissini, Chisasibi and Whapmagoostui who, together with Hydro-Québec, defined the objective of the research and the area involved.

Eelgrass protected

After the eelgrass along the James Bay coast was found to be dying back in 1999, measures were taken and a slight improvement was noted in 2000. These results support the hypothesis that the increased flow from the Grande Rivière helped protect the Tees Bay community from the dieback observed elsewhere along the coast.

Decline of the caribou herd and presence of reservoirs

The results of a study carried out by the Centre d'études nordiques for Hydro-Québec indicate that there is no relationship between the presence of reservoirs and the decline of the George River caribou herd. The herd has been dwindling for several years as a result of a number of factors, including the advanced degradation of the summer habitat, which limits the vegetation available for the caribou to graze on.

Environmental Aspects, Objectives and Targets

Significant Environmental Aspects	Objective	Action Plan	Target	Results as of Dec. 31, 2000
Residual hazardous materials management	Improve management of residual hazardous materials, emissions and effluents	• Take inventory of trichlorethanes (TCEs)	• Take inventory of 100% of the trichlorethanes at the power plants	• Fully completed
		• Take inventory of ODSs (other than TCEs)	• Take inventory of 100% of the ODSs at the power plants	• Fully completed
		• Take inventory of oils and greases at Beauharnois generating station as a priority	• Take inventory of 100% of the oils and greases at Beauharnois generating station	• Fully completed
		• Set up an additional residual hazardous material recovery site at Gentilly-2 nuclear power plant	• Set up the site	• The site is 94% ready
Use of natural resources (fish)	Reduce fish mortality caused by headrace canal at Gentilly-2 nuclear power plant	• Evaluate the current technology and propose solutions as part of the draft design for refurbishing the plant	• Collect fish mortality data	• Data collection completed
Discharge of gaseous pollutants	Acquire better knowledge of Gentilly-2 nuclear power plant gaseous effluents	• Install new measurement instruments	• Install the instruments	• Completed
		• Analyze samples	• Analyze the samples	• Completed
		• Determine the volume of discharged air	• Determine the volume of discharged air	• 50% completed
Management of bodies of water	Improve management of bodies of water and properties in accordance with environmental commitments and requirements	• Update operating rules for bodies of water	• Improve the management method in 60% of facilities in the Beauharnois-Gatineau area	• 100% completed
Management of properties	Review all agreements regarding facilities	• Draw up a list of agreements and leases	• List 85% of properties under agreements	• 100% of properties listed

Environmental Management System

The process undertaken by the Generation Group to implement an environmental management system in accordance with the requirements of ISO 14001 has been 98% completed. System registration is expected in March 2001.

As part of this initiative, the Generation Group planned to provide all its employees and managers with ISO 14001 training by the end of 2000. According to the indicators, 100% of managers and 85% of employees have received this training.

Studies

Context	Activity Carried Out in 2000	Environmental Result or Benefit
Management of Natural Resources		
Betsiamites salmon agreement	• Minimum flow increased to an ecologically favorable level during winter 2000-2001 (new minimum flow under trial)	• Protection of the salmon habitat • Increasing the flow will prevent the spawning grounds from drying out during key phases in the reproductive cycle
A rock sill in the Manouane River downstream from dam A in Kempt reservoir was preventing walleye from reaching their spawning grounds in spring, despite the presence of an adequate spawning flow	• Sill dynamited in the summer	• Spawning grounds now accessible
An agreement with the Société de la faune et des parcs du Québec provides for various measures as part of the monitoring of efforts to restore lake trout to Lake Manouane (reservoir)	• Reservoir stocked with 30,000 fry (over one year old) from Lac-des-Écorces fish farm (June 2000) • Spawners caught and 100,000 fertilized eggs collected, of which 10,000 were deposited in the main spawning grounds and 90,000 were sent to fish farms for stocking in summer 2002	• Building up of Lake Manouane (reservoir) lake trout stocks
Study of harlequin duck under Canada's new endangered species law	• Inventory taken of harlequin duck along high-potential sections of various rivers on the North Shore	• Presence of harlequin duck on a number of North Shore rivers • The harlequin duck population is much larger in Québec and Labrador than was indicated by the evidence used to classify it as an endangered species
Development of a methodology for acquiring information on migratory birds in northern environments	• Shortcomings in the studies on the populations and habitat of migratory birds in northern environments were analyzed	• Development of a graphic information system for the storage and analysis of spatial data • Review of knowledge on birds in northern environments • Development of appropriate methods of studying the relationship between species and habitat • Preparation of a bibliography of studies on birds in northern environments
Assessment of the fish population and habitat along the south dike of Carillon generating station, at the request of Fisheries and Oceans Canada for authorization purposes	• Fishing carried out • Development plan drawn up	• The results indicate that the habitat is in very poor condition and is little used by the fish population
Management of Bodies of Water		
Use of local ecological knowledge of ice conditions in the estuary to fill gaps in scientific knowledge	• Study divided into two parts: one ethnological and one technical • A lack of research specifically covering local knowledge of ice conditions and ice in the estuary was noted • Interviews conducted with informants from Sainte-Anne-de-Portneuf and Betsiamites • Local informants were present when technical surveys of the estuary were conducted	• More knowledge of ice conditions vocabulary thanks to Sainte-Anne-de-Portneuf and Betsiamites Innu informants • Research now has a new focus, namely the load-bearing capacity of the ice cover
Measures to protect the banks at Chisasibi and to improve access to the Grande Rivière, in accordance with the Chisasibi and La Grande (1986) agreements	• Riverbank protection structure built and maintained	• Dock built by a Cree contractor from Chisasibi
Safety measures applied to unstable riparian zones	• Signs identifying unstable riparian zones made mandatory	• Inventory and replacement of safety signs by the Crees concerned
Overall approach to environmental management of reservoirs in the Saint-Maurice basin	• Overview established of the characteristics and use of the river basin • Conflicts pinpointed between the different uses of the water and the banks • Main expectations of the community determined • Possible approaches defined regarding the various uses of the Saint-Maurice and its basin; community expectations, concerns and relations with Hydro-Québec established	A report was tabled in November 2000 presenting the research findings: • description of the social and the biophysical environment • concerns, expectations and issues

Context	Activity Carried Out in 2000	Environmental Result or Benefit
Management of Contaminants		
Studies on mercury in relation to environmental and human health risk management	• Fish mercury levels monitored in La Grande 1, Robert-Bourassa, La Grande 3 and Opinaca reservoirs • Information brochure produced on fish mercury levels in Robertson reservoir and the surrounding area, in collaboration with the public health department of the North Shore regional health and social services board	• Mercury levels in non-piscivorous fish, measured 10 to 20 years after reservoir impoundment, are equal to those of fish in natural lakes in the region; mercury levels in piscivorous fish return to natural conditions after 20 to 30 years • This brochure intended for anglers makes recommendations on fish consumption frequency to limit mercury exposure, and on the exceptional nutritional value of this resource
Management of Social Impacts		
Survey and analysis of comments made during the public consultation on water management in Québec (part two)	• Summary made of the participants' positions and recommendations, and regional issues highlighted	• Determination of the participants' main positions and recommendations • Analysis of the Beauchamp report

Environmental Follow-Up

Context	Activity Carried Out in 2000	Environmental Result or Benefit
Monitoring of experimental bank protection on the Manicouagan coast, in collaboration with the Baie-Comeau priority intervention zone committee	• Benchmarks installed at the Baie Saint-Ludger (7 level lines) and Pointe aux Outardes (14 lines) sites • Seven topographical surveys carried out between June and December 2000	• The surveys show that the structures are retaining the sand, but that the effect is very localized • The real effectiveness of the structures will be known in 2001
Monitoring of eelgrass and the coastal habitat affected by the La Grande-2-A and La Grande-1 projects	• Eelgrass sampled at six permanent stations • Eelgrass beds observed along the James Bay coast • Ten control points monitored, along with vegetation changes in a coastal marsh, and the temperature and salinity of water in two coastal bays	• Slight recovery of the plant along the coast despite climatic conditions that are not very conducive to growth • Water from the Grande Rivière is protecting eelgrass in Tees Bay from dieback. Rapid colonization of bare areas of the lower coastal marsh under the effect of isostasy
Monitoring of hydrological and biological features of the Grande Rivière downstream from the La Grande-2-A structures, in accordance with the authorization permits	• Flow, water level and temperature monitored at eight hydrometric stations and one weather station; ice monitored • Water quality monitored • Fish mercury levels monitored	• Better knowledge of the hydrometric parameters, water and ice quality, and mercury concentrations downstream from La Grande-2-A generating station
Monitoring of fish communities and social impact in the La Grande complex (eastern sector), in accordance with the authorization permits for the Laforge-2 and Brisay projects	• Summary produced of follow-up studies at stations in the environmental monitoring network of the La Grande complex over two decades • Traplines viewed from the air with Cree trappers from Mistissini, Chisasibi and Whapmagoostui	• Better knowledge of the changes in fish in the eastern sector between 1980 and 1999 • Common awareness of the impacts
Monitoring of mitigative measures applied to the riparian habitat in the Grande Rivière downstream from La Grande-1, in accordance with the authorization permits	• Selective clearing carried out by the families of trappers concerned along 28 ha corresponding to 4 riparian sites	• Effective measure to increase vegetation grow-back and attract small game
Construction of a spur dike in Hungry Bay, in accordance with the Suroît memorandum of agreement: • Monitoring of how fish have used the bay in the area of the dike since it was built to protect against erosion • Monitoring of the natural renewed buildup of sand in Hungry Bay following construction of the dike, which has modified flow patterns	• Fish community sampled and fish population evaluated • Reproduction, diet, hatching, etc., studied • Substrate described in the area near the riverbank • Natural evolution of the substrate characterized in order to specify the nature of accumulation processes caused by changes in flow patterns	• Better knowledge of how the fish use the environment • An environment more conducive to fish reproduction and hatching. Walleye, white sucker, Québec red trout and char spawned close to the spur dike • Knowledge of the reference environment so that changes can be monitored in the coming years

Eel fish-pass at Chambly dam

Fish-pass

Context	Activity Carried Out in 2000	Environmental Result or Benefit
Monitoring of sturgeon spawning grounds near Rivière-des-Prairies generating station, in accordance with the authorization permit to build a fish deterrent. This involved evaluating silting in the canal, a factor that may explain the declining use of the spawning grounds in recent years	• Bed of the spawning grounds studied *in situ* • Eggs and larvae collected	• The results indicate that the silting is not responsible for the declining use of the spawning grounds
Construction of sturgeon spawning grounds to meet the needs of both anglers who want to use the Cascades River, and the sturgeon which have to be able to get past the Cascades structure	• Second year completed of monitoring sturgeon in spawning grounds built at one of the outlets at Beauharnois	The results indicate: • Use of the spawning grounds by other species, including walleye • The presence of sturgeon around the spawning grounds, but not their use of it • The possibility that the topography of the spawning grounds and water management at the station are inappropriate for sturgeon Efforts will be made to check this last point during the 2001 campaign
Monitoring, as part of the follow-up of increased access to northern Québec, of the repercussions of opening up the territory following the construction of the La Grande and Manic-Outardes complexes	• Land surveys made along the James Bay road system • Areas in which the road system is being intensively developed were examined from the air • Reconnaissance surveys conducted on the North Shore, for a comparative study on the problems associated with opening up a territory (James Bay in comparison with the North Shore)	• Preliminary maps on a scale of 1:250,000 on the developments and services along the road system (James Bay and North Shore) • Summary of activities carried out between 1989 and 2000 in the James Bay region
Monitoring of fish entrainment into Chute-Bell generating station, in connection with the application for authorization to recommission the station	• Trashracks installed on three occasions (in spring, summer and fall) to capture all debris in the turbine water and check for fish	The results indicate that: • Several species of fish pass through the turbines accidentally • Mortality is low given the small size of the fish entrained • The presence of the generating station does not greatly compromise the fish community
Monitoring of eel fish-pass at Chambly dam, in accordance with the authorization permit for refurbishing work on the spillway crest	• Breakwater built (slightly late) • Eel fish-pass built and put into use	• Some 300 eels have used the pass. This low number is no doubt due to the late construction of the breakwater (difficult hydraulic conditions) and the possibility

Transmission

The final report on biodiversity in northern transmission line rights-of-way, produced as part of the wildlife and biodiversity program, indicates that in all, over 250 vascular plant species may be found within rights-of-way. It also reveals that some 20 species of birds nest in rights-of-way in the boreal forest and that predation of nests bordering the rights-of-way is similar to that observed in the neighboring forest.

A study of the visual impact of 735-kV towers has been undertaken so that aesthetics and integration with the landscape can be factored into new transmission line projects, to improve their social acceptability.

Environmental Aspects, Objectives and Targets

Control of operations with significant environmental repercussions is one of the cornerstones of implementation and maintenance of an EMS. TransÉnergie is currently in the implementation phase: it drew up a list of such environmental aspects and selected one, management of ozone-depleting substances (ODSs), as the focal point for its performance objective in 2000.

Environmental Aspects of Power Transmission

Management	• residual materials • hazardous materials • residual hazardous materials • ozone-depleting substances (ODSs) • greenhouse gas (GHG) • contaminated soil • pesticides
Contaminant disposal	• gases • dust • noise • light • wastewater • hazardous and residual hazardous materials • electric and magnetic fields
Resource consumption	• water resources • fossil-fuel resources
Terrain modification	• soil and topography
Presence of facilities	• visual impact

2000 Performance Objective

In 2000, TransÉnergie's objective was to inventory ODSs in its facilities. The action plan objective was to complete 60% of the inventory. The results at year-end show that 100% of the inventory has been completed.

Environmental Management System

Vegetation management in transmission line rights-of-way

For the year 2000, TransÉnergie's objective was to implement its EMS according to the action plans developed by the various units. As of December 31, 2000, the 10 units reporting to the President of TransÉnergie had achieved their ideal implementation objectives, bringing total progress in the implementation process to 85.8%.

To ensure that significant environmental aspects are taken into account in day-to-day operations, TransÉnergie has adopted numerous tools for incorporating environmental, legal, and other requirements. TransÉnergie has circulated an ISO 14001 environmental management system manual as a guide to facilitate the work of employees and managers, who have also been made aware of TransÉnergie's environmental principles. ISO 14001 registration is targeted for 2002.

Studies

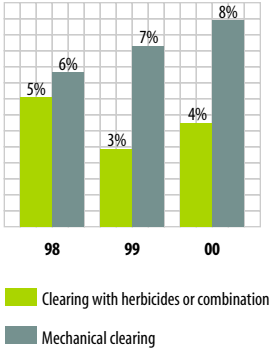
Context	Activity Carried Out in 2000	Environmental Result or Benefit
Wildlife-Related Nuisances		
A Hydro-Québec property was invaded every evening by over 40,000 crows that roosted there	A technique for permanently scaring away the crows was evaluated.	Recordings of various crow distress cries make the Hydro-Québec site unattractive for these birds.
Study of outages caused by birds in substations	Inventory made of birds in four Abitibi transmission substations and possible solutions recommended.	The problem is caused primarily by birds nesting and feeding in the substations. The American crow is the most troublesome species.
Studies of woodpecker damage to wood poles	Woodpecker activity inventoried using experimental poles and results presented at the 7th symposium on the environment and rights-of-way.	The 2000 inventory was the first to be done. It revealed damage to 10% of the experimental poles.
Wildlife Habitat		
Study of wooded strips in northern transmission line rights-of-way	Study completed and results presented at the 7th symposium on the environment and rights-of-way.	The wooded areas are used by wildlife, including rare species. Prudent management of this type of habitat is recommended.
Biodiversity		
Study of the wealth of species in northern transmission line rights-of-way	Study completed and results presented at the 7th symposium on the environment and rights-of-way.	Northern rights-of-way are fairly rich in species of vegetation and wildlife, including rare species.

Environmental Follow-Up

Context	Activity Carried Out in 2000	Environmental Result or Benefit
Commitments made in the draft-design report for Des Cantons-Lévis-Appalaches (DCLA) Terms of the decree	Environmental follow-up report produced, entitled *Lessons from the Environmental Follow-Up, 735-kV Des Cantons-Lévis Line and 735/230-kV Appalaches Substation*.	• Brochure for distribution to anyone interested in our research on our lines. • The report provides an overview of the environmental follow-up for the DCLA project in terms of natural and social environments and landscapes. • The report gives anyone concerned with future projects a general idea of what we learned from the follow-up. This knowledge can be used in impact studies for future projects.

Vegetation Management

Clearing Operations: Area Treated and Type of Treatment (Based on Total Wooded Area)



Hydro-Québec must control woodland vegetation on more than 135,000 hectares of transmission line rights-of-way. To ensure facility safety and reliability, incompatible vegetation must also be removed from transformer stations, dikes and dams.

For vegetation control, Hydro-Québec adheres to the principle of "integrated vegetation management." This concept, now applied by almost all Canadian and U.S. electric utilities, means using the right method, in the right place, at the right time. One or more methods are therefore used, alone or in combinations.

Before any vegetation control operation, the environment is analyzed to identify the sensitive elements: rivers and streams, drinking water intakes, wildlife habitats, etc. Once this inventory is completed, the people responsible for the work issue environmental specifications for the treatment method chosen. In the long term, selective use of herbicides reduces the density of vegetation that is not compatible with facility operation, and less intense treatments are required.

In the search for complementary solutions or alternatives to the treatments currently available, we keep a close watch on electric utilities and other organizations in this field. If certain practices used elsewhere in the world appear promising, we try them out in a Hydro-Québec environment. We also have a research and development program to determine the advantages and limitations of current methods of vegetation control and to assess the potential impact of these operations.

Herbicide Use in Transmission Line Rights-of-Way

	1999		2000	
Transmission Territory	Mechanical Cutting (ha)	Selective Application of Herbicides (ha)	Mechanical Cutting (ha)	Selective Application of Herbicides (ha)
North	1,927	2,125	2,699	1,448
South	2,175	100	2,231	0
East	5,520	970	4,951	2,839
West	206	1,564	732	1,075
Total by type of treatment	9,828	4,759	10,613	5,362
Proportion	67%	33%	66%	34%
Total area treated	**14,587**		**15,975**	

Electric and Magnetic Fields

Exposure to electric and magnetic fields (EMFs) is an environmental issue associated with the construction of new power lines, the refurbishment of existing lines, and system operation for energy transfers. Under Hydro-Québec's action plan, adopted in June 1986, research has been done on the impact of EMFs on the environment, public health and the health of the company's employees. In 1996, Hydro-Québec adopted a corporate stance and in 1999, the company issued a corporate directive to ensure that the EMF issue was managed prudently. A multidisciplinary team of engineering, medical and environmental experts continually monitors developments in this area.

The World Health Organization is currently attempting to harmonize the procedures used to set EMF exposure limits by various regulatory organizations like the International Commission of Non-Ionizing Radiation Protection (ICNIRP) and the Institute of Electrical and Electronics Engineers (IEEE). These exposure limits are essentially based on the acute effects of current passing through the body, and not on the long-term effects of exposure, which these organizations do not consider to have been proven.

In Québec, during public hearings on interconnection projects with Ontario and on the Outaouais and Montérégie loops, the issue of EMF exposure and its possible effects on health was discussed. In May 2000, the Ministère de la Santé et des Services sociaux (MSSS) tabled its task force's report on evaluation and management of the risks of EMF exposure from power lines.[1] This report reviews scientific developments and the precautionary approach as a safety strategy. However, the task force does not recommend that an exposure limit be established, nor does it specify a minimum distance from electric transmission lines. The interdepartmental government committee, formed by government decree to study the health effects of high-voltage lines, has incorporated the conclusions and recommendations from the MSSS task force report in its new position filed with the BAPE in October 2000.

This year's activities carried out under the Hydro-Québec action plan included the publication, in a scientific journal, of the results of a study by the Institut Armand-Frappier on animal carcinogenicity.[2] The strict methodology for exposure of laboratory animals was also discussed in the same publication.[3] Another study, by the Centre hospitalier universitaire de Québec (Québec City university hospital), dealt with melatonin concentrations in people who live near 735-kV high-voltage lines. The hormone melatonin is linked to biorhythms and may be a cause of cancer. Overall, the report indicates that exposure to EMFs generated by 735-kV lines has no impact on melatonin concentration. Hydro-Québec has also developed a new tool to improve management that combines geomatics with a software program to improve graphical representation of exposure to EMFs generated by electrical facilities. The resulting exposure profiles were presented at the public hearings on the interconnection with Ontario and on the Outaouais loop.

A measurement campaign was carried out towards the end of 2000 as part of the characterization of EMFs generated by distribution systems. The data collected will be analyzed during 2001. Magnetic fields generated by underground systems will also be measured in 2001.

References

1. MSSS, Consensus sur l'évaluation et la gestion des risques associés à l'exposition aux CÉM provenant des lignes électriques*, 34 p., May 2000.*

2. R. Mandeville et al., Bioelectromagnetics*, 21 : 84-93, 2000.*

3. P. S. Maruvada et al., Bioelectromagnetics*, 21 : 432-438, 2000.*

Distribution

Every year, the environmental protection organization "Attention fragîles" presents a merit award to an outstanding company. The Méritas 2000 was awarded to Hydro-Québec for its protection and enhancement of the natural heritage of the Îles de la Madeleine, where the company replaced an old thermal generating station with a new, more efficient one and decontaminated the site of the old station. At the end of the project, about 20% of the restored site was made into green space.

A pilot project to clean graffiti off the bases of Hydro-Québec's pad-mounted equipment was carried out in August 2000. Sixty bases in Brossard were cleaned, and the project provided temporary employment for two young students. In addition to improving the appearance of our equipment, the project proved the efficiency of a product for removing graffiti from painted surfaces.

In November, the company launched a program for undergrounding the distribution system in new residential developments and on heritage sites. Part of the program is also for existing municipal power grids.

Main Environmental Aspects

The introduction and maintenance of an environmental management system (EMS) requires the company to control the environmental aspects of its operations. For this purpose, Distribution has set objectives and targets to enable it to meet the requirements of its EMS. The table opposite outlines the unit's achievements in 2000.

Significant Environmental Aspect	Objective	Action Plan	Target	Result as of Dec. 31, 2000
Presence of the system	Integrate the distribution system with the environment.	Perform internal environmental assessments (IEAs) for all projects.	• Proportion of projects for which an IEA was completed (92%) • Customer satisfaction rating (87%)	81% 86%
Visual aspect	Improve environmental integration of facility maintenance operations.	Maintain the appearance of pad-mounted equipment.	• Inspection method introduced for pad-mounted equipment (November 30)	Inspection form developed by December 31.
Vegetation management	Improve environmental management of vegetation.	Develop operating procedures for integrated vegetation management.	• Procedures and tools developed (November)	Completed in September.
Recovery of equipment, site cleanup, refurbishment of surfaces	Improve and intensify recovery of distribution system components.	Recover wood poles.	• Proportion of poles returned to pole storage yards (90%) • Proportion of poles reused in the system (12%)	98.2% 8.6%
		Recover power-line hardware: make employees aware of the importance of proper recycling.	• Proportion of employees informed about recovery (85%).	82%
Production of residual materials (hazardous or not hazardous)	Improve environmental management of residual materials and contaminants.	Create recovery areas for hazardous materials.	• Proportion of areas created (90%)	82%
Atmospheric emissions from thermal power generation	Reduce atmospheric emissions (off-grid generating stations).	Reduce fuel consumption by making motors more efficient.	• Île-d'Entrée: consumption per kWh (3.1 kWh/L) • Northern region: consumption per kWh (3.54 kWh/L) • Cap-aux-Meules generating station: consumption per kWh (203 g/kWh)	3.13 kWh/L 3.61 kWh/L 207 g/kWh

Environmental Management System

The Distribution unit's EMS was registered under ISO 14001 on October 18, following an audit performed by ITS Intertek. The EMS covers all power distribution operations throughout Québec, as well as power production operations at the two thermal generating stations on the Îles de la Madeleine. Introduction of the EMS in the off-grid power plants on Québec's North Shore will be completed by the end of 2002.

A monthly monitoring program, under which all managers responsible for operations with potential environmental repercussions fill out a special form, is reviewed periodically by a regional steering committee. This program ensures that the EMS is followed and that any noncompliance is dealt with as soon as it is detected.

Studies

Type of Study	Context	Activity Carried Out in 2000	Environmental Result or Benefit
Contaminant Management			
Environmental assessment and prioritization of Hydro-Québec facilities	Hydro-Québec has over 1,500 sites with potential for spills. The company must be able to determine which sites represent the greatest risk for the environment.	Risk assessment guide produced by each of the units concerned.	Prioritized our operations (characterization, restoration, and implementation of preventive measures) to limit the possible impact of our facilities on the environment.
In situ treatment of PCP-contaminated soil under treated-wood storage areas	Poles are stored for 20 to 30 years in special pole yards. Leaching by rainwater causes contaminants to migrate into the soil, surface water and groundwater. Contaminants accumulate over time.	Low-cost *in situ* treatment method developed that is easy to maintain and does not interfere with operations.	Reduced the amount of contaminants so as to decrease the risk of contamination of surface water and groundwater. At the same time, reduced residual soil contamination at the end of the facility's useful life.
Cleanup of surfaces soiled with oil	When a spill occurs in the distribution system, various surfaces, such as wood, asphalt, concrete and vinyl, are soiled by oil.	Cleaning protocols developed for every type of surface, based on a review of scientific literature and consultation with specialized firms.	Optimized our cleanup operations and reduced the cost of cleaning or replacing contaminated materials.
Model of PCP behavior in the environment	Hydro-Québec uses pole-siting criteria based on environmentally sensitive elements. These criteria are empirical and need to be better documented.	Current criteria validated with a mathematical model based on data obtained in the laboratory and in the field.	Confirmed that the current criteria are safe.
Changes undergone by dioxins and furans in the environment	The oil-PCP solution used to treat poles contains contaminants that may have an impact on the environment and health.	Scientific literature reviewed for a better understanding of the changes undergone by these microcontaminants and improved assessment of the actual risks for the environment and health.	Acquired a better understanding of the environmental and human health hazards related to these microcontaminants.
		Extent of dioxin and furan contamination around treated poles analyzed	Reviewed pole-siting criteria in light of the amount of microcontaminants in the environment.

PCP-treated wood poles

Environmental Follow-Up

Type of Follow-Up	Context	Activity Carried Out in 2000	Environmental Result or Benefit
Presence of the System			
Follow-up of Distribution's internal environmental assessments	The company must follow up on projects for which a more in-depth environmental assessment was done as part of the ISO 9001 registration of the Distribution Projects unit.	Sixteen projects followed up in 2000.	Monitored the implementation of mitigative measures.
Restoration of vegetation	To comply with new regulations on public forests, Hydro-Québec must adapt its vegetation restoration methods to allow the use of commercial plant species.	Efficiency of new vegetation restoration methods using commercial plant species was assessed.	Identified viable options for restoring borrow pits and deposits of loose materials.
Vegetation Management			
Biological control of vegetation in distribution line rights-of-way	The diversity of the environments crossed and their sensitivity to right-of-way clearing operations call for the development of various methods of controlling vegetation.	Follow-up conducted on experiments with various biological vegetation control methods for distribution line rights-of-way.	Two reports discuss the follow-up of experimental planting and seeding. This follow-up showed that: • seeding with commercial mixtures is not worthwhile • seeding with allelopathic species appears promising, especially when seeding with mulch.
Follow-Up Related to Certificates of Authorization			
Lac-Robertson generating station	The company must meet the commitment in the decree and the authorization certificates issued for construction of the facility.	Changes monitored in vegetation on the banks of the reservoir.	Clearing above the reservoir's maximum level encouraged shrub regeneration and diversification of the vegetation.
		Use of the banks by semiaquatic wildlife observed.	• Overall, the reservoir banks are not currently used much by wildlife, although cleared areas are used slightly more. • Along the banks, sites with wildlife habitat potential are rare and are found only in the cleared areas.

Equipment Improvements

In addition to construction projects to extend the distribution system and connect new customers, Hydro-Québec makes improvements to the grid and equipment. To ensure that the environment is taken into consideration in all its projects, the company conducts internal environmental assessments (IEAs) when planning construction and maintenance operations. This results in significant improvement of the environmental performance of equipment.

Here are some examples of achievements in 2000.

Title	Context or Project	Work Carried Out in 2000
Overhead System		
Reinforcement of the distribution system	Following the January 1998 ice storm, various system reinforcement projects were undertaken in the Richelieu, Laurentides and Montmorency regions.	The use of new design criteria gave rise to comprehensive IEAs and, in some cases, government authorizations. A second program deals with vegetation management under high-priority lines.
L'Assomption	Project using concrete poles.	A line with existing concrete poles was extended.
System with steel poles—Amqui	The system had to be moved when changes were made to highway 132 in downtown Amqui. An agreement was signed with the community to install a system with a lower impact at a cost acceptable to the Ministère des Transports.	Civil and electrical engineering completed on the project (32 poles over 1.5 km). This unconventional project required a great deal of effort in both engineering and construction.
Underground System		
Deux-Montagnes	Overhead-underground project with concrete poles.	Project completed in a new development.
Candiac, phase 2, Dali Avenue	System undergrounding.	Direct-burial conduit system.
Candiac, Dauphiné Street	System undergrounding.	Standard underground system.
Four pilot projects	In-ground installation of dry-type transformers. This is a test of a new type of oil-free, and therefore spill-free, underground transformer.	Fourteen of these transformers were installed in the four pilot projects carried out in the Montréal area.
Lafontaine	Eaux-Vives housing development, at Wilson Falls.	Underground dry-type transformers. Direct-burial conduit system.
Installation of an underwater cable between the North Shore and Île aux Coudres	Installation of a three-phase cable to replace the cable installed in 1997 (due to breakage). Agreement with Fisheries and Oceans Canada on monitoring of the fish habitat to assess potential loss.	Underwater cable installed to supply power to the residents of Île aux Coudres.
Decontamination around pad-mounted equipment in Lorraine	As part of the program to replace equipment, some 30 devices showing signs of oil leaks, advanced rusting or instability were inventoried on the Lorraine power grid.	After a meeting with residents, decontamination was carried out under the supervision of Dessau-Soprin. In all, 15 m^3 of contaminated soil were sent to the Saint-Jérôme recovery centre.
Generating Equipment on Off-Grid Power Systems		
Reforestation of property around an Îles de la Madeleine generating station	Following a complaint about noise from the generating station, a noise-control embankment was built. As part of a reforestation program sponsored by the Îles-de-la-Madeleine RCM, the entire lot and part of the site of the old generating station were reforested.	A total of 1,150 shrubs (green alder, Siberian pea tree) and 3,000 trees (Austrian pine and white spruce) were planted.
Povungnituk generating station: heat recovery	Shops and warehouses of northern generating stations are traditionally heated with oil furnaces. Recovery of heat directly from the engine block reduces the consumption of nonrenewable resources.	A hot-water loop was installed on the engine radiators to carry energy for redistribution to rooms heated with a heat exchanger.

Lineworkers at Povungnituk generating station

Procurement and Corporate Services

Procurement and Services signed two agreements with the municipality of James Bay. The first makes Hydro-Québec responsible for collection, treatment and disposal of sludge from the septic system used by outfitters along the Transtaiga highway (following the Grande Rivière from Robert-Bourassa generating station to Brisay) from 2000 to 2003. Under the second agreement, the company will collect and dispose of waste from the outfitters along the highway during the year 2000. Both agreements represent a significant benefit for the fragile environment in this increasingly frequented region.

Main Environmental Aspects

The introduction and maintenance of an EMS requires the company to control the environmental aspects of its operations. For this purpose, Procurement and Services has set objectives and targets to enable it to meet the commitments of its EMS. The table below outlines the unit's environmental achievements in 2000.

Significant Environmental Aspect	Objective	Action Plan	Target	Result as of Dec. 31, 2000
Air contaminants (selection of methods, materials and equipment according to their impact on the environment)	Reduce ODS use.	ODS action plan – Procurement and Services – Buildings	Check at least 75% of ODS-containing equipment inventoried in the equipment procurement and management system to see whether it still has ODSs.	Checking 100% completed.
	Compile an inventory of ODS-containing equipment.	ODS action plan	Complete 75% of the inventory by December 2000.	The ideal objective was exceeded, with 76% of the inventory completed. The inventory of overhead transmission equipment and road transport equipment is 100% completed.
	Create halon depots (November 2000).	ODS action plan	Complete the construction of three halon depots in Québec City, Rouyn and Saint-Hyacinthe.	The three depots were operational by summer 2000.
	Develop criteria for purchasing goods and services.	ODS action plan	Develop technical clauses to include in service agreements.	Technical clauses were developed by Procurement and Services to facilitate preparation of service agreements for ODS-containing equipment.
Water and soil contaminants (selection of methods, materials and equipment according to their impact on the environment)	Introduce an electronic gauge system for fuel tanks.	Action plan dealing with implementation of the *Petroleum Products and Equipment Act*	Arrange for 100% of the facilities inventoried to be outfitted with appropriate equipment.	At the end of 2000, all facilities inventoried had received appropriate equipment.

Environmental Management System

The EMSs of two of Procurement and Services' four regional units are now registered under ISO 14001. The units concerned are Centre-Sud (registered in December 1999) and Île-de-Montréal (registered in September 2000). In addition, a maintenance audit of Centre-Sud carried out in 2000 by the external registrar showed that its EMS was flawless. The other two regional units plan to complete the introduction of their EMSs during 2001.

The two Procurement and Services regions registered under ISO 14001 have implemented the program to monitor and measure compliance with environmental laws and regulations. The Nord-Ouest and Est regions are in the implementation phase and are ahead of schedule, having begun the program of self-review exercises (done by the operation managers) and environmental inspections (performed by environment advisors). Following these operations, various corrective measures were implemented by the regions concerned.

Environmental Improvement of Facilities

To improve the environmental performance of its facilities and ensure that legal requirements are met, Procurement and Services takes readings and inventories, and analyzes various problems related to building operations. During 2000, groundwater quality was monitored at nine sites and applications were submitted for certificates of authorization for the management of five septic facilities, including sludge management and disposal.

Storage yard for PCP-treated wood poles

Studies and Follow-Up

Type of Study or Follow-Up	Context	Activity Carried Out in 2000	Environmental Result or Benefit
Evaluation of odor emissions from the Bout-de-l'Île pole yard in accordance with a violation notice issued by the Montréal Urban Community in 1999	According to a violation notice issued by the MUC regarding emission of a contaminant (odor), research was conducted to identify the sources of the odor and to model the level of exposure of the residents who might be affected, depending on various weather-related factors.	Volumes of treated wood and poles characterized according to their appearance, length and diameter Area of ground stains measured Odor flow measured using a flow chamber Odor dispersion modeled Residents in the Bout-de-l'Île area consulted	The areas northeast of the yard are generally the most exposed. The standard of 1 ou (odor unit) is occasionally exceeded slightly on very hot days. The information from the residents, however, did not appear to establish a direct link between the odors perceived and those that may have come from the pole yard during the summer of 2000.
Water treatment system for the Rimouski pole yard	Modifications were made to the water treatment system after the limit authorized by Québec's Ministère de l'Environnement was exceeded. The impact of the changes made were evaluated in a follow-up.	Efficiency of a granular activated-carbon filter medium studied Existing filter mediums replaced with activated carbon Periodic follow-up conducted (sampling and analysis)	Full compliance with the criterion of 20 µg/L of pentachlorophenol at the treatment system output. Compliance with the certificate of authorization.
Effluent from an oil-water separator	A study in 1999 showed that the effluent from certain separators exceeded the standard for sewage disposal of mineral oils and greases.	Pumping chamber installed in the pumping well Efficiency of the changes followed up and compliance with sewage standards verified	The sewage standard was met throughout the follow-up period after installation of the pumping chamber.
Dust collector	Action taken by the Ministère de l'Environnement following cleanup of a dust collector used in Saint-Jérôme.	Summer internship • scientific literature reviewed • benchmarking conducted with users • liquid effluent characterized	The faulty dust collector was taken out of service. Operating procedure for dust collectors. Report on characterization of dust-collector effluent.
Pole yards	Contamination of soil, and sometimes surface water and groundwater, by wood preservation chemicals.	Study in 1999 and 2000: • performance of absorbents in 10 pole yards evaluated • pole yard characterization records analyzed (impact assessments)	Improvement of the environmental performance of this type of facility.
Residual materials	Amendments to the *Environment Quality Act* in 1999 require producers of residual materials to provide the RCMs concerned with an inventory.	Summer internship • scientific literature reviewed • inquiry conducted to determine current regional management methods • overview of the situation produced	Better understanding of residual material management in buildings administered by Procurement and Services. The data collected will enable us to develop and propose a sampling and characterization methodology in 2001.

Our Social Role

A Special Foundation for the Environment

In December 1999, the company's Board of Directors authorized the creation of the Fondation Hydro-Québec pour l'environnement, a non-profit organization whose mission is to contribute to the long-term protection and enhancement of the environment. To carry out its mission, the Foundation provides funding and other support for various initiatives that have significant environmental benefits and meet local needs in a spirit of conservation and sustainable development.

During 2000, the company defined various programs and project evaluation criteria. Entirely funded by Hydro-Québec, the Foundation will be actively involved in various regions of Québec, in partnership with local organizations.

The Foundation will accept eligible projects in any of the three fields below.

- **Conservation and restoration of natural habitats in Québec**

  Projects to preserve or restore natural habitats, or protect endangered or vulnerable species and their habitats.

  Projects to improve conditions for species of wildlife or vegetation.

- **Support for local environmental initiatives**

  Environmental projects that support local awareness and stewardship of local and community environmental issues.

  Projects that combine enhancement of local features and environmental protection.

- **Environmental enhancement of Hydro-Québec properties**

  Projects to enhance the environmental features of Hydro-Québec properties and those of its subsidiaries and TransÉnergie and of the environments affected by their facilities.

  Biodiversity conservation projects on Hydro-Québec properties as part of the biodiversity support program developed and approved by Hydro-Québec, the Société de la faune et des parcs du Québec and Québec's Ministère de l'Environnement.

Environment Chairs

Hydro-Québec – NSERC – UQAM Environmental Research Chair

In conjunction with the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Université du Québec à Montréal (UQAM), Hydro-Québec renewed its sponsorship of the Environmental Research Chair for a third five-year term, from January 1, 2000, to December 31, 2004. The company has the option of reviewing its commitment in 2002. In 2000, Hydro-Québec contributed $520,000 to this Chair, which conducts research in two different fields: mercury and greenhouse gases (GHGs).

Mercury

The latest findings of a study to assess the effectiveness of intensive fishing as a way of reducing fish mercury levels reveal that about 50% of the methymercury in the lakes under investigation is found in fish. Intensive fishing should therefore significantly reduce the total amount of methylmercury in these lakes, and hence the mercury concentration in the fish that live in them.

Greenhouse Gases

The objectives of the Chair were to acquire additional data for evaluating the net amounts of GHGs emitted by northern reservoirs and to garner scientific recognition for the company by disseminating this information nationally and internationally. A comparison of the new findings on GHG emissions from Robert-Bourassa, Laforge 1 and other reservoirs with the results obtained for several reference lakes helped determine the actual local and global contribution of hydroelectric reservoirs to total GHG emissions. The work of the Chair was instrumental in optimizing the research and development program, which included the invention of a portable infrared laser for measuring CO_2 and CH_4 simultaneously.

Laforge 1 reservoir

Université de Montréal Environmental Design Chair

Hydro-Québec continued its commitment to the Environmental Design Chair at the Université de Montréal for this final year of a five-year term. The Chair, to which the company contributed $200,000 in 2000, promotes university research in the field of landscape design. This year, the Chair focused on:

- development and organization of seminars on river landscapes, the first of which was held in December 2000
- tower design and development of siting criteria and visual-integration guidelines for power-line highway crossings, in cooperation with Québec's Ministère des Transports
- the impact of river diversion on the landscape and development of a landscape-oriented approach
- a survey and analysis of opinions expressed during public consultations on water management in Québec, in order to determine the participants' main positions and recommendations
- evaluation of different types of smaller 735-kV towers for their aesthetics and usability in various environments, with a report on the main results

Hydro-Québec, in conjunction with Québec's Ministère de la Culture et des Communications, also continued to fund an extensive research project on the concept of "landscape in practice."

With the cooperation of several partners (government departments, RCMs, etc.), the Chair's research was published in December 2000 in a report entitled *Évolution du territoire Laurentidien* (changes in the Laurentian landscape).

École Polytechnique de Montréal–NSERC Industrial Chair in Site Bioremediation

Hydro-Québec supports the NSERC Industrial Chair in Site Bioremediation in cooperation with a number of industrial partners, including Alcan, Bell Canada, Cambior, Canadian Pacific, the Centre d'Expertise en analyse environnementale du Québec, Elf Aquitaine, Petro-Canada, Solvay and the City of Montréal. This was year two of a second five-year commitment for the company, which invested a basic sum of $75,000 in the Chair. The goals of this research include developing simple, low-cost biotechnologies for treating organic and inorganic pollutants in soil and groundwater, improving bioremediation process performance, and increasing the reliability and accuracy of automated decision-making tools. In 2000, a total of 24 research projects were completed on various topics, including confinement and treatment biotechnology, the changes undergone by environmental contaminants, economic analysis of rehabilitation options, automated decision-making tools, and environmental assessment of the life cycle of rehabilitation measures. The results have been used to develop a bacterial consortium for bioactivation treatment of soil contaminated with intractable contaminants, fine-tune real-time control systems to optimize techniques, and improve knowledge of the behavior of chromated copper arsenate in the environment.

Agreements and Partnerships

To reduce negative environmental impacts and determine the most appropriate mitigative or compensation measures for its projects and operations, Hydro-Québec advocates partnership agreements with the communities concerned. In 2000, the company signed 20 such agreements with RCMs and other municipalities, band councils, companies and various government and other public agencies.

Type of Organization	Partner	Hydro-Québec's Commitment
Town, municipality, parish	Des Trois-Rives	Mékinac Reservoir Management Agreement: Agree with the community on the reservoir level to be maintained in summer.
	Gatineau	Lease land at Vignan substation to put up a fence.
	Vanier	Landscape two properties.
	Saint-Jovite Parish	Lease property and build culverts for the snowmobile trail.
	Lac-Saint-Charles	Construct a bypass road.
	City of Montréal	Create a park along the De Montigny creek to beautify the area traversed by the Duvernay–Anjou line.
		Set up a Hydro-Québec/City of Montréal management committee to study projects of mutual interest. The committee examines projects, coordinates operations and recommends joint projects.
		Partially fund construction of an under-river power line between Marie-Victorin substation in Longueuil and the entrance to La Ronde amusement park on Parc des Îles.
	Mascouche	Lease land near Mascouche substation and create a park.
	Grondines	Allow public use of the park. Lease the Grondines river crossing interpretation centre property and building to the municipality.
	Étang-du-Nord	Comply with the procedure and obligations regarding discharge of treated process water from Cap-aux-Meules thermal generating station into the Étang-du-Nord sewer system.
	Les Cèdres	Lease lots for a bicycle path and a dock to operate a shuttle across the river between Saint-Timothée and Les Cèdres.
	Coteau-du-Lac	Lease lots for a bicycle path and the Soulanges river crossing.
	Manicouagan RCM	Find a satisfactory settlement for the parties involved in property tax and rental disputes from 1998 to 2000.
Government and other public agencies	Fédération québécoise des municipalités	Sign an agreement defining the terms for Hydro-Québec funding of $25,000 for the Urgence-municipalités pilot project.
	Natural Resources Canada	Install a seismograph on the Pointe-aux-Anglais telecommunications site.
	Société de transport de la ville de Laval	Lease land for a bus turning area.
	Recyc-Québec	Share information, implement 4RE-D programs and develop and test recycling techniques.
	CRCD Saguenay–Lac-Saint-Jean	Collect and share all relevant information to optimize understanding of the various project aspects. Assess potential economic spinoffs, as well as ways and means of optimizing them.
Group or company	Nunaturlik Landholding Corporation of Kangiqsujuaq	Provide the necessary land to operate a generating station at Kangiqsujuaq.
	Conseil des Atikamekw, Wemotaci	Allow the community to operate Weymontachie thermal generating station.
	Conseil des Atikamekw, Opitciwan	Allow the community to operate Obedjiwan thermal generating station.
	Comité de la zone d'intervention prioritaire de la rive nord de l'estuaire	Develop a master plan for enhancing and protecting the Portneuf sandbank.
	Centre de formation en entreprise et récupération (CFER)	Recover ferrous metals to enable the organization to recondition and sell power-line hardware (CFER–Victoriaville).
	Les Bureaux d'Antoine	Recover surplus furniture for the organization to restore and sell.

Enhancement

As part of its integrated enhancement program, Hydro-Québec funds local initiatives dealing with the natural or social environment in communities affected by its major construction projects. Since the program began in 1985, Hydro-Québec has supported 820 initiatives across Québec.

Summary of Integrated Enhancement Program Initiatives and Funding Since 1985

Type of Initiative	Number of Initiatives	Hydro-Québec Funding (in dollars)	Counterpart Funding (in dollars)	Total Cost (in dollars)
Improvement of drinking water quality	3	5,163,221	6,036,277	11,199,498
Environmental introduction and awareness	2	21,690	5,880	27,570
Recovery and recycling of used resources	1	50,000		50,000
Regional development	3	541,000	365,000	906,000
Linear recreational facilities	3	1,525,956	588,633	2,114,589
Restoration and enhancement of historical buildings and natural heritage	8	118,338	1,465,737	1,584,075
Community facilities	11	1,361,731	56,952	1,418,683
Total in 2000	**31**	**8,781,936**	**8,518,479**	**17,300,415**
Total since 1985	**820**	**75,633,384**	**121,546,213**	**197,179,597**

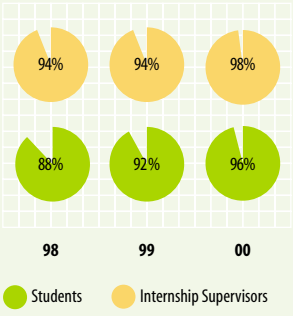
In 2000, the following projects were funded through the integrated enhancement program.

HQ Project	Beneficiary	Beneficiary's Project
Sainte-Marguerite-3 hydropower development	Sept-Îles	Construction of the Promenade du vieux quai
	Sept-Rivières RCM	Improvements to Les Goélands nature park
Saint-Blaise–Val d'Or 120-kV line	De La Corne	Improvements to the community centre
	Landrienne	Improvements to the youth centre
Chissibi–Jacques-Cartier line	Pont-Rouge	Improvement of drinking water quality
	Domaine-du-Roy RCM	Purchase of suitable containers for industries, businesses and institutions for introduction of a selective recycling program
Reinforcement of Thetford power system	Black Lake	Bicycle path

A special addition to Deschaillons train station as part of the Integrated Enhancement Program

University Internship Program

Participant Satisfaction with the Internship Program



The environmental university internship program continued for the third consecutive year in 2000. This year, 23 students—4 more than in 1999 and 9 more than in 1998—were given internships by the company. Most of the interns worked on implementation of the environmental management system (EMS) in accordance with ISO 14001. The overall level of satisfaction of internship supervisors was a record 98%. This very high rating is mainly due to the calibre of the interns and the smooth operation of the program, which has been steadily improved over the years. The interns' satisfaction also was very high, at 96%. This can be attributed to the quality of the planning and follow-up by the various administrative units that supervised the interns.

Heritage Management

Hydro-Québec, with other partners, works hard to maintain its built and technological heritage. A substantial number of historical objects have been preserved by heritage specialists with the cooperation of company employees and managers. Through these conservation efforts, Hydro-Québec has built up a large collection of objects that illustrate the evolution of electrical technology and the history of the company. Hydro-Québec's desire to protect and enhance its own heritage contributes to the preservation of historical artifacts.

Chute-Bell generating station

Hydro-Québec undertook the following heritage projects in 2000.

- Chute-Bell (1915) and Sept-Chutes (1916) power stations were recommissioned after being closed for many years. The buildings were renovated with due consideration for their architectural features; some of the original parts that were replaced have been added to Hydro-Québec's historical collection.
- Enhancement of the sites of old generating stations continued. The remains of Brown power plant (1909) in La Tuque were reinforced and opened to the public. In the Québec City area, archeologists uncovered the remains of Saint-Gabriel power station (1899). A development project is in the planning stage with La Jacques-Cartier RCM and the municipality of Shannon. On the site of Chutes-Wilson power station (1924), near Saint-Jérôme, interpretation displays have been set up to explain the operating principle of the penstock and surge chamber and inform the public about the remains of the dam and power station.
- Hull-1 generating station (1902) is in the protected area near the old Eddy mill, which the Ministère de la Culture et des Communications plans to classify as a historical monument. Conservation and development for interpretation purposes are being considered for the power station, which has been out of operation since 1969.

Access to Our Facilities

We are all responsible for imparting scientific and technological knowledge to young people who are the leaders of tomorrow.

André Caillé, President and CEO of Hydro-Québec

Part of our action plan is to meet this objective by allowing the public to tour some of our facilities. Each year, Hydro-Québec receives around 100,000 visitors to 14 of its facilities. The generating stations of the La Grande complex and the Manicouagan and Beauharnois developments attract the most visitors. Hydro-Québec also supports organizations doing tours on its properties; the Cité de l'énergie corporation in Shawinigan is one example. If we include the visits to partner organizations, over 225,000 people a year demonstrate their interest in electricity in this way.

Robert-Bourassa Park

International Environmental Affairs

Our Contribution to International Committees and Working Groups

Hydro-Québec played an active role in numerous provincial and international organizations that deal with the environmental aspects of hydropower projects.

International Energy Agency

The company participated in writing the final report entitled *Hydropower and the Environment*. This three-volume report includes recommendations for taking environmental issues into account in hydroelectric developments and analyzing the effectiveness of measures to mitigate environmental impacts.

NAFTA Commission for Environmental Cooperation

Hydro-Québec was involved in the Commission's consultation and analysis of the environmental impact of the restructuring of North American electricity markets. Hydro-Québec's Director of the Environment is a member of an advisory committee charged with assisting the Commission in its analysis.

International Hydropower Association

Hydro-Québec chairs the Environment Committee and promotes the company's environmental know-how among the Association's members.

World Commission on Dams

Hydro-Québec also participates in the activities of the World Commission on Dams, created by the World Bank and the World Conservation Union. The company plays an active role on the committee responsible for defining the positions of the hydropower industry.

International Commission on Large Dams

Hydro-Québec chairs the Commission's Environment Committee and shares its know-how and experience in the topical reports produced by this technical committee.

International Activities and Projects

Members of the International Energy Agency's* Hydropower and the Environment *team

As part of the CIDA Partnerships for Tomorrow Program – Central and Eastern Europe, we exchange information on an ongoing basis with Polish researchers concerning assessment of fire risks involving transformers insulated with PCB-contaminated oil.

Hydro-Québec was part of a mission to France organized by the Conseil du paysage québécois (Québec landscape council) to observe the management of regional nature parks from the standpoint of landscape preservation and enhancement. Meetings on this topic were also held with representatives of Électricité de France (EDF).

As a member of the E7 Network of Environmental Expertise, Hydro-Québec remained a partner in the pilot phase of an electrification project along the Parc du W in Benin, Niger and Burkina Faso.

In Laos, Hydro-Québec collaborated in a seminar organized by the E7 on environmental assessment of hydroelectric developments, as part of a project funded by the Asian Development Bank to provide technical assistance and support for environmental institutions.

In Hong Kong, the E7 Social Trust Working Group, chaired by Hydro-Québec, organized a workshop on social trust, the power industry and rural electrification. This workshop brought together over 60 specialists on energy in developing countries. The working group also coordinated the publication of two reports on social trust during 2000.

As part of its E7 work in Thailand, the company helped set up a project to strengthen the role of environmental agencies, the departments of the Environment, Industry and Mines, and the Electricity Generating Agency of Thailand.

In Ivory Coast, Hydro-Québec produced the environmental section of the generation master plan for the Ivory Coast Electric Company.

Hydro-Québec also helped set up an environment department at the Senegal power company. Hydro-Québec's contribution involved drafting an environment policy and suggesting an organizational structure and an environmental action plan.

Hydro-Québec offered its services for environmental assessments of various types of electrical generating and transmission facilities, for training, and for establishing environment units. The company also hosted foreign delegations from several countries, including China, Guinea, Morocco and Russia.

In cooperation with Senghor University in Alexandria, Egypt, Hydro-Québec gave its fifth seminar on environmental project management. As part of the collaboration between the university and Hydro-Québec, the company also offers internships to Senghor students.

Finally, at the request of Québec's Ministère des Ressources naturelles, Hydro-Québec completed its forestry aid project with the Chongqing Forest Research Institute in China, where it had provided technical assistance with reforestation and hydroelectric reservoir management.

Conclusion

Jean-Étienne Klimpt
Director – Environment

The company's efforts to introduce an environmental management system (EMS) in compliance with ISO 14001 were rewarded this year with two registration certificates, obtained by the Procurement and Services unit for the Island of Montréal, as well as the Distribution unit for its distribution operations across the province and for generating operations at the thermal power plants on the Îles de la Madeleine. Distribution's ISO 14001 registration is a first in Canada, for a system of this size.

Hydro-Québec approved a corporate directive on the environmental acceptability and the favorable reception of its new developments, rehabilitation projects, and operating and maintenance activities by the communities concerned. The directive includes the company's requirements and criteria for reducing negative project impacts and maximizing positive spinoffs for the environment and the community.

Our ISO 14001 registrations, management methods and internal guidelines enable us to improve day-to-day administration of our projects and operations by taking the environment into consideration.

Since the latter part of the industrial revolution some 120 years ago, the concentration of greenhouse gases in the atmosphere has increased drastically. According to the Intergovernmental Panel on Climate Change (IPCC), this concentration could more than double in 50 to 100 years, causing very rapid global warming. These climate changes reinforce the need to support hydroelectricity as a source of renewable energy that produces very little greenhouse gas and makes a crucial contribution to controlling climate change. Indeed, without it, Canada would have tremendous difficulty achieving the targeted greenhouse gas emission reductions set by the Kyoto Protocol.

In Québec, during the year, Québec's Ministère de l'Environnement and Ministère des Ressources naturelles recognized, as part of the ÉcoGESte program, that the development of hydropower helped avoid the emission of 78.2 tonnes of CO_2 equivalent between 1991 and 1998.

The demand for electricity in Québec and North America continues to grow at a rate of 1.5% to 2% per year. In Canada, therefore, if hydropower developments are not built, generating stations that use natural gas in combined-cycle gas turbines will most likely be built instead. It should be remembered that the greenhouse gas emission factor of natural gas is about 35 times higher than for hydroelectric power.

The electricity generation options chosen to meet this new demand will be a determining factor in Canada's ability to meet the Kyoto objectives.

Acronyms, Abbreviations and Symbols

4RE-D
Reduction, recovery, reuse, recycling and energy recovery, plus disposal

BAPE
Bureau d'audiences publiques sur l'environnement

CEA
Canadian Electricity Association

CRCD
Conseil régional de concertation et de développement

CFER
Centre de formation en entreprise et récupération

CH_4
Methane

CIDA
Canadian International Development Association

CO_2
Carbon dioxide

DCLA
Des Cantons-Lévis-Appalaches

ECR
CEA's Environmental Commitment and Responsibility Program

EDF
Électricité de France

EMF
Electric and magnetic fields

EMN
Environmental monitoring and follow-up network

EMS
Environmental management system

FAPAQ
Société de la faune et des parcs du Québec

GHG
Greenhouse gas

ICNIRP
International Commission on Non-Ionizing Radiation Protection

IEA
Internal environmental assessment

IEEE
Institute of Electrical and Electronics Engineers

IPCC
Intergovernmental Panel on Climate Change

IREQ
Hydro-Québec's research institute

ISO 14001
Environmental management standard of the International Organization for Standardization

MSSS
Ministère de la Santé et des Services sociaux

NO_X
Nitrogen oxide

NSERC
Natural Sciences and Engineering Research Council of Canada

ODS
Ozone-depleting substance

PCB
Polychlorinated biphenyl

PCP
Pentachlorophenol

RCM
Regional county municipality

RHM
Residual hazardous material

SEPAQ
Société des établissements de plein air du Québec

SO_2
Sulphur dioxide

TCE
Trichloroethane

UNESCO
Union Nations Educational, Scientific, and Cultural Organization

UQAM
Université du Québec à Montréal

Units of Measure

$M	:	millions of dollars
kV	:	kilovolt
kt CO_2 eq.	:	kilotonne CO_2 equivalent
kW	:	kilowatt
kWh	:	kilowatthour
MW	:	megawatt (one million watts)
MWh	:	megawatthour (one million watthours)
GW	:	gigawatt (one million kilowatts)
GWh	:	gigawatthour (one million kilowatthours)
TWh	:	terawatthour (one billion kilowatthours)
m	:	metre
km^2	:	square kilometre
ha	:	hectare
g	:	gram
L	:	litre
t	:	tonne

Glossary

acid precipitation; acidic precipitation; acidified precipitation
Rain or snow with a pH of less than 5.6.

allelopathic species
Plants that secrete substances inhibiting the germination of seeds or the growth of other nearby species.

ballast
A device placed between the power supply and an electric-discharge lamp and whose main function is to limit the lamp current to the required value.

Bureau d'audiences publiques sur l'environnement (BAPE)
Public review board responsible for analyzing various projects that may have an impact on the environment, established under article 6 of Québec's *Environment Quality Act*.

Canadian Electricity Association (CEA)
Organization made up of 29 electric utilities (representing 95% of installed capacity in Canada), 25 major manufacturers of electrical equipment, and several hundred other companies and stakeholders involved directly or indirectly in the electricity industry.

E7
An organization comprising the largest electric utilities in the countries of the G7. It is concerned, in particular, with environmental matters and social issues related to the electricity industry.

eelgrass; zostera; sea grass; grass-wrack
A submerged perennial marine plant with branching stems that grows in communities or beds over large areas of shallow water.

energy conversion efficiency
Energy efficiency of the different means of electricity generation, calculated on the basis of the energy source used as input (e.g., gas, coal, biomass, nuclear energy) and expressed as a percentage.

environmental aspect
Element of an organization or company's activities, products or services likely to have an impact on the environment.

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 environmental policy.

greenhouse gas
A gas that absorbs the energy given off by the Earth (in the form of infrared radiation) and radiates it back toward Earth, thereby warming the surface of the planet. The principal greenhouse gases are water vapor, carbon dioxide and methane.

halon; halocarbon
Chemical compound used as a wet fire extinguisher and a refrigerant.

herbicide
A chemical agent that destroys plants. A selective herbicide is designed to destroy certain plants in order to encourage others to grow.

internal environmental assessment (IEA)
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 those projects do not require authorization under the *Environment Quality Act*.

isostasy
State of hydrostatic equilibrium existing between different portions of the Earth's crust that are of different densities.

Kyoto Protocol
An agreement on climate change, signed in Kyoto in December 1997, that sets targets for an overall reduction in greenhouse gas emissions by industrialized countries.

landscape in practice
Integration of landscape as an aspect of land use planning tools (e.g., a municipality's town plan, development plan of a regional county municipality).

nuclear generation
Generation of thermal power by means of nuclear reaction.

pentachlorophenol (PCP)
Chemical compound, insoluble in water, used as a herbicide, insecticide and wood preservative.

polychlorinated biphenyl (PCB)
Askarel in the family of chlorinated hydrocarbons, used in certain electric insulators and comprising more than 200 compounds. Like all askarels, it does not release any combustible or explosive gases when an electric arc passes through it.

spur dike
A structure made of rock, placed in a river at right angles to the shore and designed to curb erosion by retaining a portion of the material carried along by the river's current.

tributary
A stream that feeds or flows into a larger stream or a lake.

tubular portal structure
A structure consisting of two or three poles that are widely spaced and joined at the top by one or more crossarms.

violation notice
Notice issued by a government department (federal or provincial) following observation of noncompliance with a law or regulation.

For more information:

Denis Sirois
Advisor –
Environmental Performance
Direction – Environnement
Tel.: (514) 289-2211, ext. 4914
Fax: (514) 289-4977
E-mail: sirois.denis@hydro.qc.ca

Julie Sbeghen
Advisor –
Environmental Performance
Direction – Environnement
Tel.: (514) 289-2211, ext. 5356
Fax: (514) 289-4977
E-mail: sbeghen.julie@hydro.qc.ca

Michel Bourbonnière
Senior Advisor –
Environmental Performance
Direction – Environnement
Tel.: (514) 289-4933
Fax: (514) 289-4977
E-mail: bourbonniere.michel@hydro.qc.ca

www.hydroquebec.com/environment

Hydro-Québec Environmental Performance Report 2000

2000G487A

Ce document est également publié en français.

Legal deposit - 1st quarter 2000
National Library of Canada
Bibliothèque nationale du Québec
ISBN 2-550-37206-9
ISSN 1205-6464

Hydro Québec