
Atomic Energy Control Board
Commission de contrôle de l'énergie atomique
Nuclear Safety

Contents

Foreword		ii
President's Message		1
Section I	**The AECB and its Authority**	2
	Mission	3
	Organization	3
	Regulatory Control and Requirements	6
Section II	**The Past Year**	10
	Nuclear Facilities	11
	Radiation and Environmental Protection	17
	Radioactive Waste Management	19
	Nuclear Materials	22
	Compliance Monitoring	26
	Regulatory Research and Support	26
	Non-Proliferation, Safeguards and Security	27
	Other International Activities	30
	Management and Administration	31
Section III	**Looking Ahead**	34
	Canadian Nuclear Safety Commission	35
	Strategic Directions	36
	Regulatory Challenges	38
	Prospects for Regulation	41
Annexes		43
Financial Statement		60

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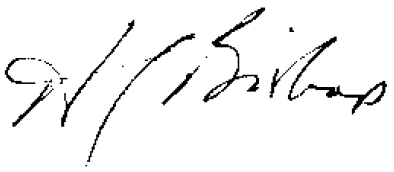
Atomic Energy Control Board | Commission de contrôle de l'énergie atomique

The Honourable Ralph Goodale
Minister of Natural Resources Canada
Ottawa, Ontario

Sir:

I have the honour to present to you the attached Annual Report of the Atomic Energy Control Board for the year ending March 31, 1999. This report has been prepared and is submitted in accordance with the *Atomic Energy Control Act*, section 21(1).

On behalf of the Board,



Agnes J. Bishop, M.D.
President

Canada

FOREWORD

This, the fifty-second annual report of the Atomic Energy Control Board (AECB), is for the fiscal year ending March 31, 1999.

Additional information on the AECB and its programs may be found in the Estimates of the Government of Canada, specifically the AECB's 1997-98 Performance Report and its 1999-2000 Report on Plans and Priorities.

The Board acknowledges the assistance it has received from federal and provincial departments and agencies which, by their participation in matters relating to the Board's regulatory activities and by allowing members of their staff to act as inspectors and medical advisers, have contributed to the Board's effectiveness. It also acknowledges the valued advice obtained through the participation of experts from industry, academia and research institutions in the work of its advisory committees and other ad hoc committees.

The Board also recognizes the many comments received from the public on regulatory and licensing issues, which provided valued input to the decision making process.

PRESIDENT'S MESSAGE

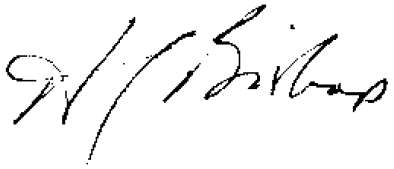
If an annual report were to have a dedication, this one would read "to the AECB staff." The past year has been a very challenging one for the personnel who carried on with all the obligatory licensing and compliance activities while preparing for the transition to a new regulatory body under the *Nuclear Safety and Control Act* (NSC Act).

The staff also managed impending, safety-related issues such as the Y2K "millennium bug" problem, and the deregulation of the electricity market in Ontario. In addition, there were a variety of key planning sessions and training courses to fit in, making effective time management a must for staff at all levels.

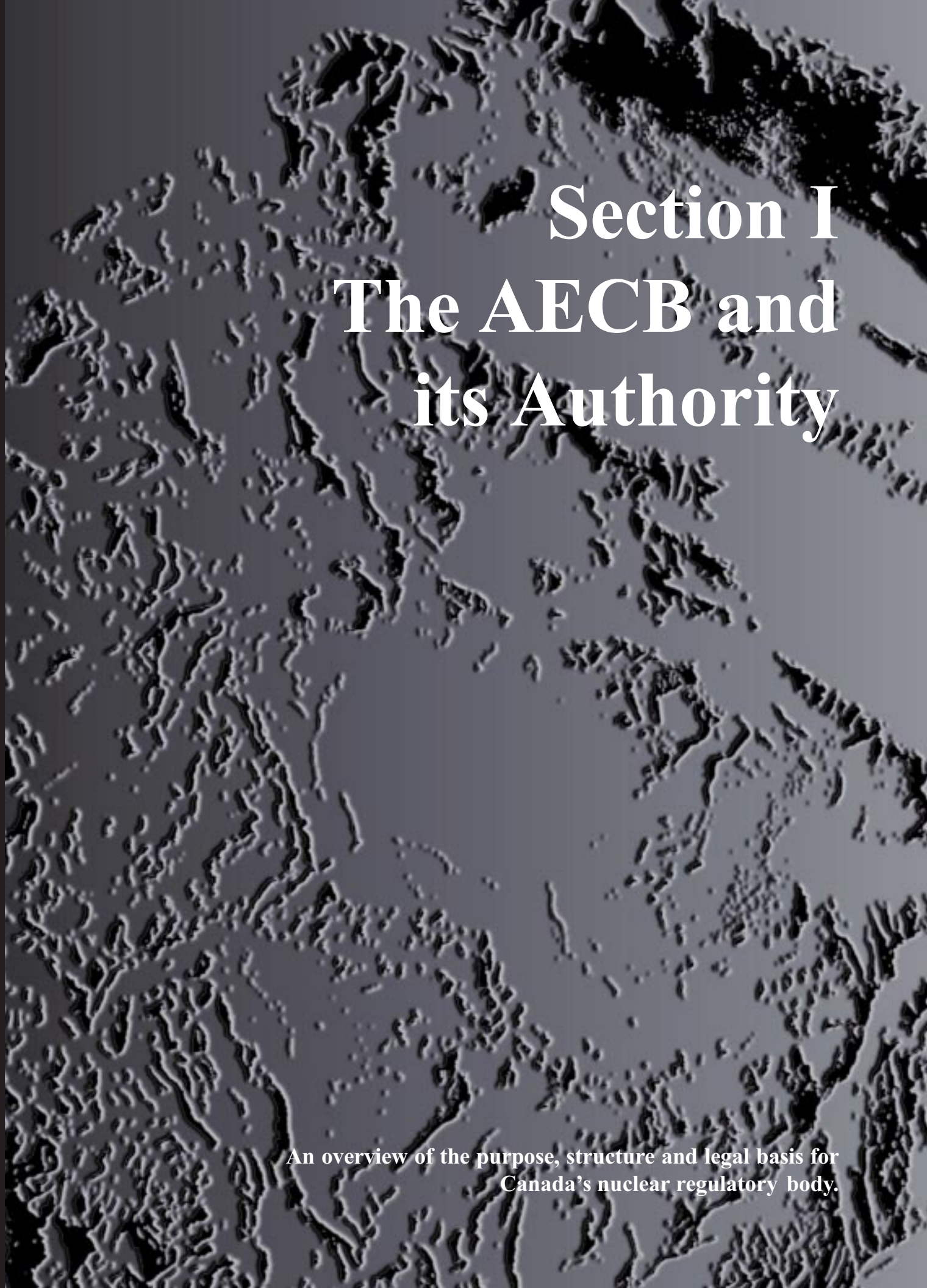
It would be comforting to think that as the new millennium approaches, the demands facing the Board and its staff would diminish or at least level off, but this is unlikely to happen. By its nature, the nuclear regulatory business is continually faced with new challenges, which must be dealt with promptly and effectively in the public interest.

I have every expectation that the NSC Act will come into force in 1999 or early 2000, which means Canada's nuclear regulator will enter the new millennium as the Canadian Nuclear Safety Commission (CNSC). Though different in many ways from its predecessor, the CNSC will carry on with the vital job of protecting workers, the public and the environment in much the same manner, albeit with an enhanced set of operational and legal tools.

In the AECB's strategic plan adopted during the reporting period, implementation of the NSC Act has top priority. The other "back to basics" directions in the plan support this by mandating reforms and improvements in the organization, so that the CNSC will have a strong corporate foundation.



Agnes J. Bishop, M.D.



Section I
The AECB and its Authority

An overview of the purpose, structure and legal basis for Canada's nuclear regulatory body.

MISSION

The Atomic Energy Control Board (AECB) was established in 1946 by the *Atomic Energy Control Act.* It is a departmental corporation, named in Schedule II of the *Financial Administration Act*. The AECB reports to Parliament through the Minister of Natural Resources Canada.

The mission of the AECB is to ensure that the use of nuclear energy in Canada does not pose an undue risk to health, safety, security, and the environment. This mission extends to the control of the import and export of nuclear materials and other prescribed substances, equipment and technology, and includes involvement in Canada's participation in international activities related to the *Treaty on the Non-Proliferation of Nuclear Weapons*.

The AECB achieves its mission through regulations and a comprehensive licensing system operated on a cost recovery basis. Licensing is administered so that the responsibilities of federal and provincial government departments in such areas as health, environment, transport, and labour are taken into account.

The AECB also contributes to international agencies and, through co-operation agreements, assists other countries in improving their regulatory controls over nuclear materials and facilities.

ORGANIZATION

The Board

The Atomic Energy Control Board ("the Board") is constituted as a corporate body with five members, four of whom are appointed to the Board by the Governor in Council, while one is a member *ex officio*.

FIGURE 1

Members of the Atomic Energy Control Board

The composition of the current Board is as follows:

Dr. Agnes J. Bishop
President of the Atomic Energy Control Board, Ottawa, Ontario

Dr. Arthur J. Carty
President of the National Research Council of Canada, Ottawa, Ontario

Dr. Christopher R. Barnes
Director of the Centre for Earth and Ocean Research and of the School of Earth and Ocean Sciences at the University of Victoria, Victoria, British Columbia

Dr. Yves M. Giroux
Assistant to the Rector, Laval University, Québec, Québec

Mr. Alan R. Graham
Rexton, New Brunswick

During the reporting period, Dr. Agnes J. Bishop was President of the Board as well as Chief Executive Officer, and Dr. Arthur J. Carty was a member by virtue of his position as President of the National Research Council of Canada. Other members who served during the entire reporting period were Dr. Yves M. Giroux and Dr. Christopher R. Barnes.

Dr. Kelvin K. Ogilvie served until December 31, 1998, and Mr. Alan R. Graham was appointed to the Board effective January 1, 1999. The composition of the current Board is shown in Figure 1 on page 3.

The Board functions by making licensing decisions for major nuclear facilities, establishing legally binding regulations, and setting policy direction on matters relating to health, safety, security and environmental issues affecting the Canadian nuclear industry. It delegates responsibility for licensing matters in a number of areas to officers within its supporting staff.

The Board met ten times between April 1, 1998, and March 31, 1999. Eight meetings were held at the AECB headquarters in Ottawa; the others were in Pembroke, Ontario, and Bécancour, Quebec.

Independent Advisers
Through the President, the Board receives advice from two advisory committees plus a medical liaison officer.

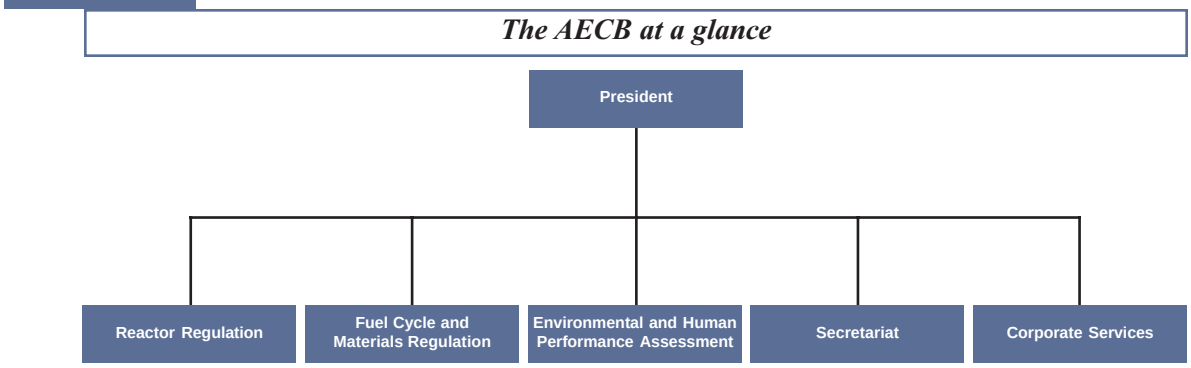
The Advisory Committee on Radiological Protection (ACRP) and the Advisory Committee on Nuclear Safety (ACNS) are independent committees made up of technical experts from outside the AECB. The ACRP and ACNS provide advice on generic issues and are not involved with licensing activities. During the reporting period, the committees met six times in plenary session. As well, committee working groups met 18 times. Annexes II and III list the members of the two advisory committees.

The medical liaison officer represents the Group of Medical Advisers (GMA). The GMA is composed of senior medical professionals nominated by the provinces, Atomic Energy of Canada Limited, the Department of National Defence, and Health Canada, who are appointed as Medical Advisers by the Board pursuant to the *Atomic Energy Control Regulations*. Joint working groups of the advisory committees and the Group of Medical Advisers met a total of three times. Annex IV lists the Medical Advisers.

Legal Services Unit
The Board receives legal advice from a Legal Services Unit staffed by Department of Justice lawyers.

The Staff Organization
The functions of corporate management and corporate policy development are carried out by the Executive Committee, which consists of the President, Senior Legal Counsel and the senior officer of each of the five organizational units. Figure 2 shows the AECB's organization at a glance.

FIGURE 2



The **Directorate of Reactor Regulation** is responsible for the regulation of nuclear power reactors, including the development of safety standards and licence conditions; the assessment of licence applications and reactor operations; the preparation of licensing recommendations to the Board; and compliance activities.

The **Directorate of Fuel Cycle and Materials Regulation** is responsible for the regulation of uranium mining and its processing into fuel; research facilities and particle accelerators; radioisotope production and use; decommissioning; radioactive waste management; the preparation of licensing recommendations to the Board; and the transport of radioactive materials.

The **Directorate of Environmental and Human Performance Assessment** is responsible for the assessment of licensees' performance in the areas of radiation and environmental protection, quality assurance, training and human factors. Other responsibilities include technical training for AECB staff and foreign staff under co-operation agreements; AECB obligations under the *Canadian Environmental Assessment Act*; significant events analysis; accident investigation; research programs; and the development of standards.

The **Secretariat** is responsible for the administrative support to the Board and its advisory groups; external relations, corporate documents and public communications; corporate planning and coordination services, including implementation of the *Nuclear Safety and Control Act*; non-proliferation, safeguards and security activities; and AECB responsibilities under the *Nuclear Liability Act,* the *Access to Information Act* and the *Privacy Act*.

The **Directorate of Corporate Services** is responsible for supplying services to the AECB to enable it to manage its human, information, financial and physical resources. The Directorate is also responsible for administering the AECB's security and conflict of interest programs.

The Audit and Evaluation Group which is responsible for examining corporate management accountability and program performance issues, and for making recommendations for improvement, also reports directly to the President.

Annex I provides more detail on the management of the AECB.

During the reporting period, the AECB expended 438 FTEs (full-time equivalent) of effort in carrying out its mission. As of March 31, 1999, there were 391 indeterminate staff on strength: 332 in Ottawa at the AECB headquarters, and 59 at site and regional offices. In addition, there were three staff members on leave from the AECB, engaged in various international activities related to nuclear energy.

REGULATORY CONTROL AND REQUIREMENTS

Regulatory Control

The *Atomic Energy Control Act* and its regulations impose requirements on all persons who produce, import, export, transport, refine, possess, own, use or sell nuclear materials, as well as on others who are identified in the regulations or in licences. Under law, regulated persons must comply with these requirements.

MISSION

The Atomic Energy Control Board's mission is to ensure that the use of nuclear energy in Canada does not pose undue risk to health, safety, security and the environment.

The AECB maintains regulatory control over the following:

- power and research reactors
- nuclear research and test establishments
- uranium mines and mills
- uranium refining and conversion facilities
- fuel fabrication facilities
- heavy water production plants
- radioisotope production and processing facilities
- particle accelerators
- radioactive waste management facilities
- prescribed substances and items
- radioisotopes

The AECB regulatory regime also includes the control of nuclear materials and other nuclear items, which provides assurance that Canada's national policies and international commitments relating to the non-proliferation of nuclear weapons and other nuclear explosive devices are met. This is carried out through licence conditions; by controlling imports and exports in co-operation with other federal government departments, according to the Canadian government's nuclear non-proliferation and export control policies; and by ensuring, in co-operation with the International Atomic Energy Agency and Canada's other nuclear partners, that Canada's obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons* are fulfilled.

Comprehensive Licensing System

Regulatory control is achieved by issuing licences containing conditions that must be met by the licensee. The requirements for licensing vary from those for nuclear generating stations, through the less complex facilities involved in fuel production, to the export and import of nuclear items, and the possession and use of radioactive sources in medicine, industry and research.

For a proposed new facility, licence applicants are required to submit comprehensive details of the design of the facility, its effect on the site that is proposed, and the manner in which it is expected to operate. AECB staff review these submissions in detail, using existing legislation, and the best available codes of practice and experience in Canada and elsewhere. The design must be such that emissions from the facility can meet strict limits in normal operation and under commonly occurring upset conditions. In practice, these emissions are kept so far below the limits that radiation doses to the public are insignificant, and are well within the variability of natural background radiation.

Regulatory control is also achieved by setting standards that licensees must meet. Some are set by the AECB, such as requirements for special safety systems at nuclear power stations. Other standards are set by provincial authorities, or have been based on codes established by organizations like the Canadian Standards Association (CSA) or the American Society of Mechanical Engineers (ASME).

Licensees are also required to identify the manner in which a facility may fail to operate correctly, to predict what the potential consequences of such failure may be, and to establish specific engineering measures to mitigate the consequences to tolerable levels. In essence, those engineering measures must provide a "defence in depth" to the escape of noxious material. Many of the analyses of potential accidents are extremely complex, covering a very wide range of possible occurrences. AECB staff expertise covers a broad range of engineering and scientific disciplines, and considerable effort is expended in reviewing the analyses to ensure the predictions are based on well-established scientific evidence, and the defences meet defined standards of performance and reliability.

The AECB's licensing system is administered with the co-operation of federal and provincial government departments in such areas as health, environment, transport and labour. The responsibilities of these departments are considered in the licensing process for many facilities.

Once a licence is issued, the AECB carries out compliance inspections to ensure that its requirements are continually met.

In all cases, the aim is to regulate in such a manner that health, safety, security and environmental protection requirements and are met, so that workers, the public and the environment are protected from exposure to radiation and to the radioactive or toxic materials associated with the operations.

Regulatory Documents

In addition to the various regulations issued pursuant to the *Atomic Energy Control Act*, the AECB issues regulatory documents in the form of Regulatory Policies, Regulatory Standards and Regulatory Guides. These further define or explain what the AECB expects for specific nuclear operations. Prior to being issued formally, these documents are issued for public and stakeholder comments as Consultative Documents. The AECB is giving high priority to those associated with implementing the new Act and regulations.

Nuclear Liability
The AECB is responsible for the administration of the *Nuclear Liability Act*, designating nuclear installations and, with the approval of Treasury Board, prescribing the amount of basic insurance to be maintained by the operator. Annex XI lists the designated installations and the amounts of basic insurance prescribed.

During the reporting period, the AECB continued to assist Natural Resources Canada in its ongoing policy role and review of the Act. This review, which was initiated by Natural Resources Canada, is consistent with renewed interest and efforts in the international nuclear community toward improved legislation and international agreements in the area of third-party liability.

Emergency Preparedness
The AECB must be prepared for emergencies involving AECB licensed facilities, radioactive materials located outside of licensed facilities, or foreign nuclear facilities that could affect the citizens or environment of Canada. In this capacity, the AECB co-operates with its licensees, provincial and federal government agencies, and international organizations.

One area of federal co-operation involves the Federal Nuclear Emergency Plan (FNEP), which is led by Health Canada. The FNEP would be activated if federal support to a Canadian province or a foreign country was required as a result of any domestic, Canada/United States or international incident. The AECB is a core member of each of the FNEP's four organizational groups, and participates in emergency planning activities with other FNEP core agencies.

An area of international co-operation is the arrangement between the AECB and the United States Nuclear Regulatory Commission to notify each other of significant events occurring in their respective jurisdictions, and to exchange information on those events. This arrangement is regularly tested when actual or simulated events (i.e. exercises) occur.

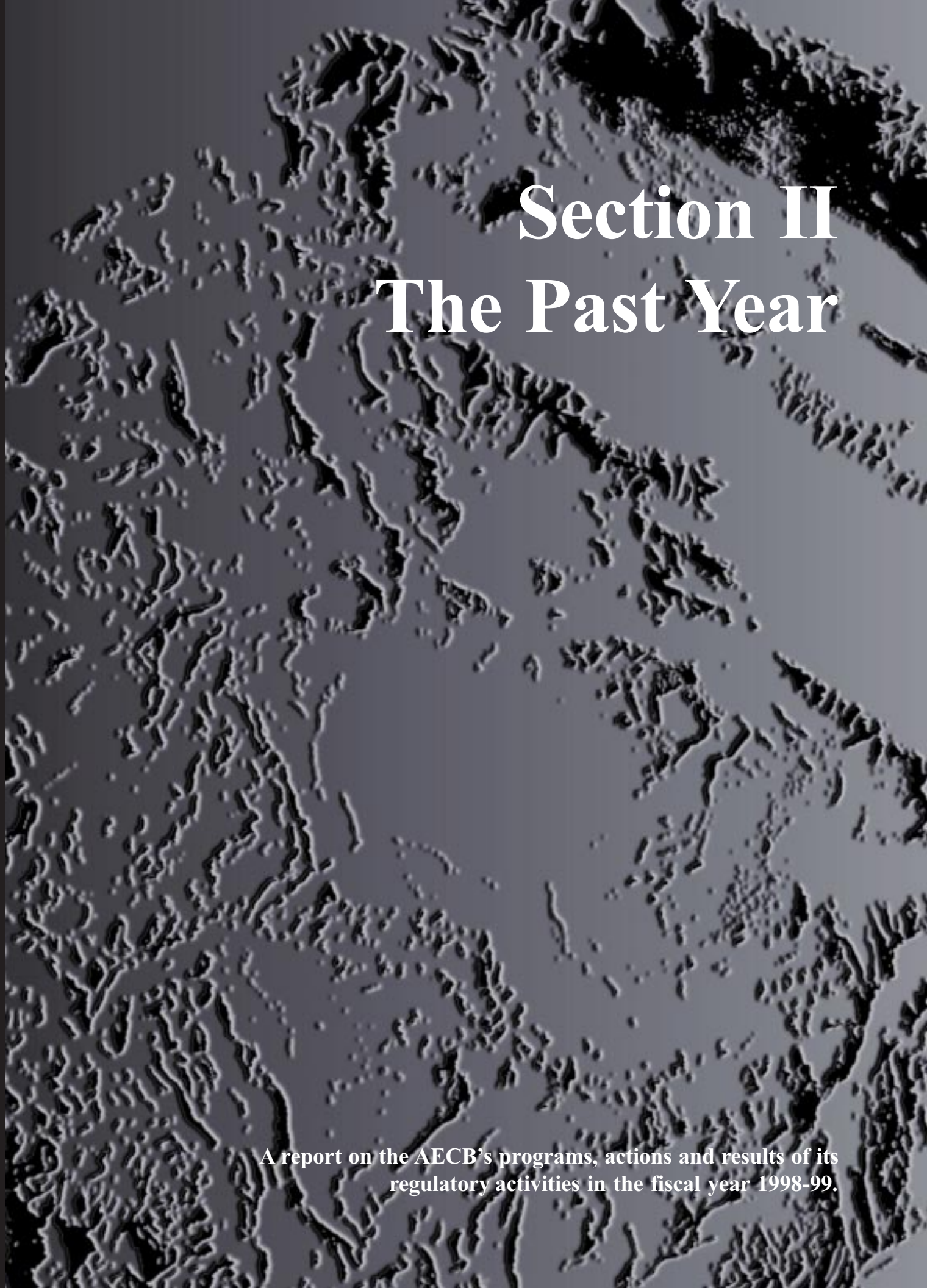
The AECB participates in simulated incidents to check its emergency response capability and enhance its knowledge. During the reporting period, staff participated in two AECB/licensee emergency exercises, which were based on simulated on-site events. In addition, Board project officers, located at nuclear generating stations in Canada, participated in several licensee emergency drills at each site.

In May of 1998, the President of the AECB approved the AECB Emergency Response Plan. The purpose of this plan is to provide directives, guiding principles and coordination to all AECB staff in the event of a nuclear emergency. This plan will be implemented and tested in 1999-2000 through emergency simulation exercises involving players from international, federal, provincial, regional and municipal organizations, as well as AECB licensees.

The AECB operates a duty officer program whereby anyone can seek emergency information, advice or assistance from the AECB, 24-hours a day, for incidents involving the actual or potential release of radioactive materials to the environment. During the reporting period, the AECB Duty Officer received calls for 179 separate occurrences: 64 for actual or potential incidents, 44 for simulated incidents, 12 for AECB administrative requirements, and 59 for non-emergency items.

New Legislation
On March 20, 1997, the *Nuclear Safety and Control Act* received Royal Assent. The new Act will come into force when its supporting regulations are approved. The AECB has intensified its efforts to develop new regulations that reflect the changes incorporated in the new legislation.

In May 1997, copies of the draft technical regulations were made available for comment. The comments received from stakeholders were reflected in revised regulations that were published in Part I of the *Canada Gazette* on October 10, 1998. The *Rules of Procedure* were published in Part I of the Gazette on February 13, 1999. AECB staff have carefully reviewed all comments and made changes to the drafts where appropriate. It is anticipated that the Act and associated regulations will be in force later in 1999 or early 2000.



Section II
The Past Year

A report on the AECB's programs, actions and results of its regulatory activities in the fiscal year 1998-99.

NUCLEAR FACILITIES

The *Atomic Energy Control Regulations* require a nuclear facility to be operated in accordance with a licence issued by the AECB.

Throughout the lifetime of the facility, the AECB monitors its operation to verify that the licensee complies with the *Atomic Energy Control Regulations* and the conditions of the licence. At the end of its useful lifespan, a facility must be decommissioned in a manner that is acceptable to the AECB and, if required, the facility site must be restored to unrestricted use, or managed until the site no longer presents a hazard to people or the environment.

The safety performance of Canadian nuclear facilities during 1998-99 is outlined in the following pages.

Power Reactors
As of March 31, 1999, there were 22 power reactors licensed by the AECB: four Bruce A and four Bruce B reactors near Kincardine, Ontario; four Pickering A and four Pickering B reactors near Pickering, Ontario; four at Darlington near Bowmanville, Ontario; one at Gentilly near Trois-Rivières, Quebec; and one at Point Lepreau near Saint John, New Brunswick.

Annex V lists power reactor licences.

A tritium removal facility is also located at the Darlington site. This facility is designed to remove tritium from the heavy water used in reactors, in order to reduce the hazards to the operating staff and the release of radioactive material to the atmosphere. For most of the reporting period, the facility was shut down for planned maintenance.

The AECB maintains staff at each of the power reactor stations to monitor licensee compliance with the *Atomic Energy Control Regulations* and licences issued by the Board. A total of 27 engineers and scientists are posted on a full-time basis at reactor sites. In addition to inspecting to verify safe operation and maintenance of the reactors, these specialists investigate any unusual events.

As well, the AECB has a number of specialists at its headquarters in Ottawa. In co-operation with the site staff, these specialists review the design, safety analyses and radiation protection provisions of all reactors to verify that the performance, quality and reliability of key components and plant systems and procedures are adequate to assure safety. This review includes an assessment of the management of the facilities. Head office staff also co-ordinates the review and resolution of generic safety issues.

Events at Operating Power Reactors
Although the AECB judged that reactor operation was acceptably safe, operation was not uneventful. In the 1998 calendar year, there were 702 events at the operating reactors which required a formal report to the AECB. Events ranged from minor spills of radioactive heavy water, to the unauthorized manual insertion of a single shutoff rod while a reactor was at high power, resulting in violation of the channel power licence limit.

None of the events had any impact on public or worker safety, or the environment. However, the AECB requires that all reportable incidents be analyzed by the licensee to determine the cause and the necessary remedial action to avoid recurrence. The AECB reviews these event reports to analyze trends and to develop "lessons learned" and recommendations to improve the regulatory regime.

Personnel Qualification Assessment
The AECB maintains a staff of specialists whose function is to obtain assurance that licensees' workers are competent to perform their duties.

Specifically, for nuclear power plants, this assurance is obtained through the evaluation of licensees' training programs, the evaluation of tests administered by the licensees, and written and simulator-based AECB examinations of key operations personnel.

During the reporting period, simulator-based performance testing of shift supervisor and control room operator candidates continued, as did written testing of their knowledge. Candidates from six of the seven nuclear power plants were presented for these examinations, and a combined total of 16 control room operators and shift supervisors were formally authorized to take up their duties. Discussions were held with the utilities on the need for them to develop improved methods for the requalification tests they are expected to have in place in the future for key operations personnel.

During this period, evaluations of training programs were carried out for supervisory staff of nuclear power plants, fuel handling operators, re-deployed staff at Ontario Hydro (see note below), and direct operating staff of the MAPLE 1 reactor at Chalk River. Radiation protection training for authorized staff and upgrade training for shift managers were also evaluated at Ontario Hydro plants. Evaluations of other training-related activities covered job and task analyses for control room operators and shift supervisors at Ontario Hydro plants, the evaluation of the upgrading of station systems training manuals, and the licensees' training self-assessment process. Significant effort was also directed to follow-ups of previous training program evaluations.

During the reporting period, significant progress was achieved in the formulation of regulatory documents concerning training and qualification of licensees' personnel in preparation for the promulgation of the *Nuclear Safety and Control Act* and related regulations.

Items of Interest – Power Reactors
During 1998-99, AECB staff developed a plan for the systematic review of Ontario Hydro's multi-year nuclear asset optimization plan, and continued the development of standards and licensing plans for evaluating the safety performance of power reactors.

Note: As a result of restructuring of the electricity market by the Province of Ontario, Ontario Power Generation Inc. was to become the operator and licensee of the Ontario Hydro nuclear facilities on April 1, 1999.

In January 1998, the AECB launched a one-year trial of the data collection process for a set of indicators that, when used with other assessment results, will give an objective measure of the safety performance of Canadian nuclear power plants. Full implementation of the indicator program began in January 1999.

On behalf of Canada, AECB prepared the *Canadian National Report for the Convention on Nuclear Safety*, in fulfilment of Canada's obligations as a signatory of the Convention on Nuclear Safety coordinated by the International Atomic Energy Agency (IAEA). The report demonstrates how Canada has implemented its obligations under the Convention. Contributions to the report were made by AECB staff, Atomic Energy of Canada Limited, Ontario Hydro, New Brunswick Power, Hydro-Québec, CANDU Owners Group, Health Canada, Natural Resources Canada, and the Department of Foreign Affairs and International Trade. The report was submitted to the IAEA in September 1998 for distribution to signatories to the Convention and was to be discussed at meetings scheduled for mid-April 1999, in Vienna, Austria.

Heavy Water Plants

Deuterium oxide (heavy water) is essential for the operation of the CANDU nuclear reactor, where it is used as a moderator for the fission reaction and as a coolant to transfer heat from the fuel. It is defined as a prescribed substance and thus is subject to regulation by the AECB. Although no radiation hazards result from the production of heavy water, the process uses large quantities of hydrogen sulphide, a highly toxic gas. Licensing conditions require heavy water production plants to be engineered and maintained to contain this gas, and to have adequate safety and emergency systems.

As of March 31, 1999, the Bruce Heavy Water Plant was licensed to operate at the Bruce Nuclear Development near Kincardine, Ontario. However, it has been shut down since March 1997, because Ontario Hydro plans to decommission and demolish the plant. Although operations have ceased, the facility is considered an operating facility until the licence is amended to permit decommissioning activities. AECB staff's review of Ontario Hydro's proposed decommissioning plans is ongoing.

Research Reactors

As of March 31, 1999, there were seven operating research reactors in Canadian universities: three in Ontario, two in Quebec, and one each in Nova Scotia and Alberta. There was also an operating research reactor at the Saskatchewan Research Council in Saskatoon. Six of these eight reactors are of the SLOWPOKE-2 type, designed by Atomic Energy of Canada Limited. The facility at McMaster University in Hamilton, Ontario, is a pool-type reactor, and the one at École polytechnique, Montreal, Quebec, is a subcritical assembly. The SLOWPOKE-2 reactor at the University of Toronto was shut down in December 1998. Plans to decommission the reactor are currently underway.

The McMaster University reactor operated throughout the year in a satisfactory manner. Conversion of the reactor core from high-enriched uranium (HEU) to low-enriched uranium (LEU) fuel was approved in December 1998, and the first LEU fuel assembly was added to the core in January 1999.

Annex VI lists research reactor licences. All other research reactors are very low-power facilities that have generally been operated in an acceptable manner.

Nuclear Research and Test Establishments
The Atomic Energy of Canada Limited research facilities at Chalk River, Ontario, and Pinawa, Manitoba, are licensed by the AECB. Routine compliance inspections during the reporting period indicated satisfactory operation of these facilities.

The Chalk River facilities include the NRU reactor and the zero power ZED-2 reactor. The AECB is currently assessing the safety of continued NRU operations through routine compliance inspections and the review of two major projects being implemented by AECL. The NRU Upgrades Project comprises the installation of seven major safety upgrades, and the Reactor Safety Evaluation Project involves the complete revision of the NRU safety analysis report. Both projects are scheduled to be completed by late 2000. NRU has been operated since 1957 and is expected to be shut down by the end of 2005.

Work on constructing the MDS Nordion Medical Isotope Reactor (MMIR) Project continued during the year. The MMIR project, located at the Chalk River Laboratories, consists of two MAPLE reactors and a new radioisotopes processing facility. It is being built and will be operated by AECL but owned by MDS Nordion. Its purpose is to produce radioisotopes for medical use.

During the year, AECB staff began reviewing the applications for operating licences for the MAPLE reactors and the new processing facility. These reviews are continuing. A decision on approval of the operating licences is scheduled for August 1999. The facilities are scheduled to be in-service and supplying medical isotopes by the year 2000.

Annex VII lists nuclear research and test establishment licences.

Particle Accelerators
A particle accelerator is a machine that uses electric and magnetic fields to accelerate a beam of subatomic particles to generate ionizing radiation that in turn is used for cancer therapy, research, analysis or isotope production. Machines that are capable of producing atomic energy (i.e. radioactive materials) require an AECB licence for their construction, commissioning, operating and decommissioning.

As of December 31, 1998, there were a total of 120 accelerators under construction, in use or being decommissioned. Of these, 97 were covered by 54 licences for medical accelerators and well-logging neutron generators. The remaining 23 devices were included under 15 licences for medical research accelerators. The four companies licensed under the well-logging licences were authorized to explore the underground formations around oil wells with portable accelerators.

During the reporting period, 20 inspections were performed and no serious violations were found. No overexposures of licensees' staff or the public resulted from any of these licensed activities. No serious incidents were reported to the AECB.

The AECB approved the first stages of commissioning the ISAC (Isotopes Separator and Accelerator) facility at Vancouver, British Columbia. This major extension to the TRIUMF accelerator research centre is expected to produce the world's highest intensity radioactive ion beam.

During the reporting period, the AECB also issued five new construction approvals for 11 medical accelerators. The AECB is seeing an increasing number of requests for medical accelerator licences as a result of the expansion in cancer treatment facilities in Canada.

Uranium Mine Facilities
As of March 31, 1999, there were 16 facilities licensed under the *Uranium and Thorium Mining Regulations*, located in Ontario, Saskatchewan and the Northwest Territories.

At COGEMA Resource Inc.'s Cluff Lake Operation, the mining of the two underground operations continued. On August 20, 1998, COGEMA announced its intention to indefinitely suspend operations at the Cluff Lake facility on December 31, 2000. Planning for the decommissioning of the facility started following the announcement.

COGEMA Resources Inc. continued mill construction and overburden mining at the Sue C Pit at the McClean Lake operation. Approval to construct the filter drain system for tailings management in the JEB Pit was issued in August. In late 1998, AECB inspectors discovered that the tailings management facility was not being constructed as required. The AECB staff issued a stop-work order until COGEMA could demonstrate that the filter drain had been constructed in accordance to licensing conditions. After discovering another deficiency, COGEMA decided to remove the material already there, replacing it using a new construction technique. Reconstruction of the JEB tailings management facility is continuing.

At Cameco Corporation's Rabbit Lake Operation, mining of the Eagle Point underground mine stopped on March 31,1999, and mill production was reduced to 2.7 million kilograms for the year. An environmental assessment to determine the acceptability of milling some Cigar Lake ore at the Rabbit Lake facility has been initiated.

Testing of prototype equipment continued throughout the year at the Cigar Lake Project.

Cameco's Key Lake Operation continued to process stockpiled ore until ore from the McArthur River project is available as feed to the Key Lake mill.

Cameco's McArthur River Project began constructing surface and underground facilities for the mining and processing of ore. A second shaft is being sunk as part of the mine development.

Annex VIII lists licences and approvals for uranium mines and mills.

Uranium Refining and Conversion Facilities
Uranium concentrate (yellowcake) from the mine/mill is upgraded by refining and conversion to uranium trioxide, and subsequently into uranium dioxide and uranium hexafluoride. The uranium dioxide is used directly in the manufacture of fuel bundles for CANDU-type reactors; the uranium hexafluoride is used as feed material for the uranium enrichment process, which increases the concentration of the fissile uranium-235 isotope. Approximately one quarter of the uranium mined in Canada is used for domestic nuclear energy production, while the remainder is exported. Some of the by-product material from the enrichment process carried out in other countries is returned to Canada for conversion into uranium metal.

The refining and conversion processes are carried out in facilities owned and operated by Cameco Corporation. The uranium trioxide from Blind River, Ontario, is shipped to Cameco's conversion facility, located in Port Hope, Ontario. There the uranium trioxide is converted to uranium dioxide intended for domestic reactor fuel production, and to uranium hexafluoride for export.

In addition to the mining and milling of uranium ore to produce uranium, uranium can be extracted from other sources.

Phosphate rock, which is used in the production of phosphoric acid, contains uranium as a contaminant. In the early 1980s, Earth Sciences Extraction Company (ESEC) built a small facility to extract uranium from phosphoric acid produced at the Western Co-op fertilizer plant in Calgary, Alberta. In 1987, that plant was shut down for economic reasons, and the ESEC facility has not operated since. It is being maintained in a safe state in accordance with the requirements of the AECB operating licence.

Annex IX lists uranium refinery and conversion facility licences.

Fuel Fabrication Facilities
The uranium dioxide powder produced by Cameco is used to manufacture fuel bundles for the CANDU reactors operated by Ontario Hydro, Hydro-Québec and the New Brunswick Power Corporation. The manufacturing process involves a series of operations: the powder is formed into small pellets; sets of pellets are loaded into zircaloy tubes; each tube is capped and sealed by welding; and finally, the completed tubes are assembled into bundles. These operations are carried out by two companies, General Electric Canada Incorporated, and Zircatec Precision Industries Incorporated.

Annex IX lists fuel fabrication facility licences.

RADIATION AND ENVIRONMENTAL PROTECTION

Dose Limits for Ionizing Radiation

The *Atomic Energy Control Regulations* prescribe the limits for doses of ionizing radiation and exposure to radon progeny resulting from the use and possession of radioactive prescribed substances and from the operation of nuclear facilities. The limits specified are based on scientific information, including advice collected and analyzed over many years, and the recommendations of international bodies. The dose limits are based on a value judgment that is derived not only from the scientific information, but also from knowledge of the level of risk for various hazards in normal life that people are willing to tolerate. Thus, the radiation dose limit is set at a level above which the risk for an individual is considered to be unacceptable.

For radiation protection purposes, the AECB assumes that there is no threshold below which there are no harmful effects, and subscribes to the principle that all doses should be kept as low as reasonably achievable, social and economic factors being taken into account. The regulatory process is therefore designed to ensure that the actual doses are very much lower than the limits.

As is the case with most nations having radiation-related activities, the Canadian *Atomic Energy Control Regulations* are based on the recommendations of the International Commission on Radiological Protection (ICRP). The current regulations are based on recommendations made in 1959. In 1990, the ICRP issued new recommendations supporting lower dose limits. These recommendations are largely based on the long-term research carried out on the survivors of the bombing of Hiroshima and Nagasaki, and on other groups such as patients who received radiation treatment.

As part of the larger effort to prepare new regulations to accompany the *Nuclear Safety and Control Act*, the AECB has developed new radiation protection regulations that will be consistent with the ICRP recommendations of 1990.

Doses from Nuclear Facilities

The health risk to workers and the public due to radiation exposure is controlled by ensuring that no person receives a dose that exceeds the regulatory dose limits specified in the *Atomic Energy Control Regulations*, and by ensuring that all doses are as low as reasonably achievable, social and economic considerations taken into account. The sievert (Sv) and the millisievert (mSv) are the standard units to express radiation doses.

Nuclear Power Reactors – In 1998, there were approximately 5,570 utility staff exposed to radiation at the nuclear power generating stations. Of these, no worker exceeded the current dose limits of 50 mSv per year. No worker exceeded the quarterly limit of 30 mSv. The total occupational collective dose, measured as the sum of all worker doses, was 10.60 person-sieverts in 1998, for an average worker dose of 1.90 mSv. The collective and average worker doses in 1997 were 11.39 person-sieverts and 1.74 mSv respectively. These results compare favourably with experience in other countries. In 1998, the doses to the most exposed members of the public (critical group) resulting from the routine operation of each station were less than 1% of the public dose limit.

Uranium Mines and Mills – Dosimetry carried out for uranium mining facility workers consists of the measurement of whole body doses as well as exposure to radon progeny. As with nuclear reactors, the maximum permissible whole-body annual dose limit is 50 mSv. The annual limit for exposure to radon progeny is 4 working level months (WLM). In 1998, whole body doses were measured for about 3,200 workers, and radon progeny exposure estimates were made for approximately 2,800 workers. No worker received more than 20 mSv whole-body dose, and 29 underground miners were exposed to more than 1 WLM of radon progeny. The average annual whole-body dose for mill maintenance workers was 1.6 mSv; for mill production workers 1.2 mSv; and for underground miners 3.4 mSv. The average annual exposure to radon progeny for mill maintenance workers was 0.16 WLM; for mill production workers 0.18 WLM; and for underground miners 0.46 WLM. No mine or mill worker exceeded the maximum permissible limits.

Uranium Refining and Conversion Facilities – Uranium refining and conversion is carried out in facilities owned and operated by Cameco Corporation. The mine-mill product, "yellowcake," is made into uranium trioxide at a plant in Blind River, Ontario. In 1998, the estimated radiation dose to members of the public due to uranium emissions to the environment from that operation was approximately 0.0029 mSv (0.058% of the public dose limit.) The average whole-body dose received by refinery workers was approximately 1.2 mSv (2.4% of the occupational dose limit.)

Cameco's conversion facility at Port Hope, Ontario, turns uranium trioxide into uranium dioxide for CANDU reactor fuel, and does other uranium processing. In 1998, the estimated radiation dose to the most exposed member of the public resulting from the operation of that facility was 0.19 mSv (3.8% of the public dose limit). No facility worker exceeded the occupational dose limits. The maximum dose received by a facility worker was 8.3 mSv (16.6% of the occupational dose limit). The average dose received by the facility workers was approximately 0.35 mSv (0.7% of the occupational dose limit.)

Fuel Fabrication Facilities – General Electric Canada Incorporated forms uranium dioxide pellets at its plant in Toronto, and then ships them to its plant in Peterborough, Ontario, where the fuel bundles are completed. The estimated radiation dose to the public at the perimeter of the Toronto plant was 0.025 mSv (0.5% of the public dose limit). The average worker whole-body dose at that facility was 5.4 mSv (10.8% of the occupational limit). No radiation dose to the public resulted from the operation of the Peterborough plant, because it releases essentially no uranium to the environment. The average worker whole-body dose at that facility was 1.76 mSv (3.5% of the occupational limit.)

Zircatec Precision Industries Incorporated conducts all the fuel fabrication and bundle assembly operations at one plant located at Port Hope. The estimated radiation dose to the public at the perimeter of this plant was approximately 0.08 mSv (1.6% of the public dose limit), and the average whole-body dose received by workers was approximately 1.92 mSv (3.8% of the occupational dose limit.)

Assessments Conducted under the Canadian Environmental Assessment Act

The *Canadian Environmental Assessment Act* (CEAA) was promulgated in January 1995. It places a range of obligations on the AECB relating to the conduct of environmental assessments. These obligations are clearly defined in the CEAA.

One of the underlying principles of the CEAA is that the public should be given ample opportunity to participate in environmental assessments. To support this objective, a public registry was established by the Canadian Environmental Assessment Agency to provide public access to information upon which environmental assessments are based. This provides the public a single point of reference, with electronic access, for all environmental assessments conducted by federal departments and agencies, including the AECB.

During the reporting period, a total of 13 environmental assessments were in progress at the AECB: three screening level environmental assessments were completed and six were ongoing; one comprehensive study was completed and three were ongoing.

The AECB, in concert with other federal departments and agencies, is working closely with the Canadian Environmental Assessment Agency to facilitate the application of the CEAA. The AECB staff is also working to harmonize its regulatory process and its obligations under the existing and new legislation with the requirements of the CEAA.

Environmental Information Management System
A considerable amount of effort is spent by the AECB regulating the environmental performance of nuclear facilities, to verify that AECB-licensed activities do not pose undue risk to the environment or ecosystem health, including public and worker safety. Much of this effort involves the review of a considerable amount of environmental data produced by licensed facilities.

In early 1999, the AECB began implementing a corporate Environmental Information Management System with the intent of providing a secure database of environmental information for use in monitoring the environmental compliance of licensee activities. The database will be continuously updated with the most recent environmental data from the major AECB licensees and will give AECB staff the capability to review and report on the environmental performance of facilities for use in both regulation and licensing issues.

RADIOACTIVE WASTE MANAGEMENT

Nuclear facilities and users of prescribed substances produce radioactive waste. The radioactive content of the waste varies with the source, and management techniques depend on the characteristics of the waste.

As of March 31, 1999, there were 19 licensed waste management facilities and activities in operation in Canada: 12 in Ontario, two in Quebec, two in Alberta, one each in Saskatchewan and New Brunswick, and one covering the Low-Level Radioactive Waste Management Office's decontamination activities at various locations. In addition, there were waste management facilities and activities associated with other AECB-licensed facilities, namely Atomic Energy of Canada Limited's (AECL) Chalk River Laboratories in Ontario and Whiteshell Laboratories in Manitoba, and active and decommissioned uranium mining/milling operations in the Northwest Territories, Saskatchewan and Ontario.

Annex X lists radioactive waste management licences.

Because of the construction, location and operation of waste management facilities, members of the public do not receive any significant dose of radiation from the contained radioactive waste. Only in a few facilities is it possible for workers to be exposed while handling the waste, and none received doses in excess of any regulatory limits during the reporting period.

Reactor Waste

Spent fuel from a power reactor is highly radioactive and remains so for a long time. It is stored initially under water in large pools at the reactor site. After a minimum number of years in pools, some of the spent fuel is stored in dry concrete containers until a permanent disposal facility becomes available.

The fuel from the Douglas Point, Gentilly-1 and NPD (nuclear power demonstration) reactors, all now permanently shut down, is stored dry, in welded steel containers inside concrete "silos". In each case, the reactor and associated facilities have been partially decommissioned and are in a "storage-with-surveillance" mode. Typically, the wastes from the decommissioning are stored within the reactor facility in a variety of ways appropriate to the hazard of the wastes.

Ontario Hydro stores irradiated fuel from the Pickering Nuclear Generating Station in a dry concrete container facility at the site. In August 1998, Ontario Hydro applied for AECB authorization to expand the concrete canister facility. This project is under review by AECB staff.

In July 1996, Ontario Hydro applied for a construction licence to build a dry-fuel storage facility at its Bruce Nuclear Power Development Radioactive Waste Site 2. The AECB determined that this project (named the Bruce Used Fuel Dry Storage Facility) required a comprehensive study under the *Canadian Environmental Assessment Act*. The comprehensive study was completed in August 1998 and submitted to the Canadian Environmental Assessment Agency in September 1998 for public consultation. A determination by the federal Minister of the Environment on the comprehensive study is expected in 1999.

Hydro-Québec stores irradiated fuel from its Gentilly-2 Nuclear Generating Station in an on-site modular-type (CANSTOR) concrete container facility.

New Brunswick Power also stores irradiated fuel from the Point Lepreau Nuclear Generating Station in an on-site dry concrete container facility.

Other radioactive wastes resulting from reactor operations are stored in a variety of structures in waste management facilities located at reactor sites. These wastes are much less radioactive than spent fuel. Prior to storage, the volume of the wastes may be reduced by incineration, compaction or baling. As well, there are facilities for the decontamination of parts and tools, laundering of protective clothing, and the refurbishment and rehabilitation of equipment.

IRUS Disposal Facility
In October 1996, AECL submitted a revised application for the construction of the IRUS (Intrusion Resistant Underground Structure) disposal facility at its Chalk River Laboratories. The IRUS facility would be used for the disposal of low-level solid radioactive waste presently held in storage at the Chalk River site. In April 1997, AECB staff provided preliminary comments to AECL on the revised application, and AECL has performed additional analyses and has prepared additional documentation in response to those comments. Regulatory review of the IRUS facility is expected to continue in 1999.

Refinery Waste
In the past, wastes from refineries and conversion facilities were managed by means of direct in-ground burial. This practice was discontinued in 1988. The volume of waste since then has been greatly reduced by recycling and reusing the material. The waste now being produced is stored in warehouses in drums pending the establishment of an appropriate disposal facility.

The seepage and runoff water from those waste management facilities where direct in-ground burial was practised continues to be collected and treated prior to discharge.

Radioisotope Waste
A number of waste management facilities process and manage the wastes that result from the use of radioisotopes for research and medicine. In general, these facilities collect and package waste for shipment to approved storage sites. In some cases, the waste is incinerated or allowed to decay to insignificant radioactivity levels, and then discharged into the municipal sewer system or municipal garbage system.

Historic Waste
The federal government has commissioned the Low-Level Radioactive Waste Management Office to undertake certain initiatives with respect to accumulations of so-called “historic” wastes (low-level radioactive wastes that accumulated prior to AECB regulation) in the towns of Port Hope, Ontario and Fort McMurray, Alberta, in anticipation of its ultimate transfer to an appropriate disposal facility.

As a consequence, the Office has consolidated some waste accumulations and established temporary holding facilities for wastes uncovered during routine excavation within the two towns. The activities of the Office are being monitored by the AECB and, where appropriate, licences have been issued for particular waste accumulations.

Decommissioning
The shutdown and decommissioning of facilities licensed by the AECB must be accomplished safely according to plans approved by the Board.

Major decommissioning projects are continuing at AECL's research facilities at Whiteshell and Chalk River, and at AECL's demonstration/prototype power reactor sites (Douglas Point, NPD, and Gentilly-1). These reactors, as well as the WR-1 reactor at Whiteshell and the NRX reactor at Chalk River, are now partially decommissioned and are in a state of "storage-with-surveillance". This surveillance period is to allow for the decay of radioactivity in the reactor, thus reducing radiation dose to workers involved in the final dismantling. AECL is continuing to submit conceptual and final decommissioning plans for components of its research facilities.

In December 1998, the Government of Canada announced the shutdown of research operations by AECL at the Whiteshell facility. AECL is preparing final decommissioning plans for the facility which will be submitted to the AECB for review.

Ontario Hydro announced its intent to decommission the Bruce Heavy Water Plant in 1998. The final decommissioning plans have been submitted to the AECB, and a comprehensive study under the *Canadian Environmental Assessment Act* is in preparation.

Decommissioning of the Stanrock and Denison (Denison Mines Limited) and the Stanleigh, Quirke and Panel (Rio Algom Limited) uranium mining facilities in the Elliot Lake area is continuing. Rio Algom Limited is also completing the process of submitting the documentation required by the AECB to license decommissioning activities at the other idle mines in the Elliot Lake area. These mine sites have not been operational for almost 40 years, and were not previously licensed by the AECB.

Indian and Northern Affairs Canada is conducting decommissioning work under AECB licence at the idle Rayrock mine site in the Northwest Territories.

The University of Toronto has announced its intent to decommission its SLOWPOKE research reactor and is expected to submit a final decommissioning plan to the AECB in 1999.

The *Nuclear Safety and Control Act* and its supporting regulations will explicitly address the decommissioning of facilities, and will authorize licence conditions to require licensees to provide financial guarantees to fund the decommissioning of their facilities. In preparation for the coming into force of these new requirements, AECB staff has prepared draft regulatory guides for decommissioning and financial guarantees for activities licensed by the Canadian Nuclear Safety Commission. These regulatory guides are expected to be issued in final form in 1999.

NUCLEAR MATERIALS

Persons who possess, sell or use nuclear materials must obtain a licence from the AECB. The information required to support applications for such licences is less detailed and complex than for a nuclear facility. However, the applicant must satisfy the AECB that the proposed activity will be conducted in accordance with the requirements of the *Atomic Energy Control Regulations* and the licence conditions.

The use of nuclear materials is widespread across Canada, and another of the AECB's responsibilities is to regulate the packaging of such materials for shipment.

Prescribed Substances
During the reporting period, there were 19 companies holding 23 Prescribed Substance Licences for uranium, thorium or heavy water. The types of activities licensed included possession and storage, analysis, research, experimental detection of solar neutrinos, and a wide variety of commercial uses, e.g. aircraft counterweights, radiation shielding, calibration devices, thoria dispersed nickel powder, and analytical standards.

Radioisotopes
Radioisotopes are used widely in research, in medicine for diagnostic and therapeutic purposes. Radioisotopes are also used for a number of industrial tasks including quality control, which uses radiography, and process control, which uses gauging techniques. Licences are required for all of these applications. For certain other devices such as smoke detectors and tritium exit signs, where the quantity of radioactive material is small and the device meets internationally accepted standards for safety, the user is exempt from licensing. However the manufacturer, distributor and importer of these devices must be licensed.

As of March 31, 1999, there were 3,700 radioisotope licences in effect. The distributions by type of user, and by province and territory, are shown in Table 1.

TABLE 1

Radioisotope Licences

Type of Users	
Commercial	2,242
Medical	801
Governmental	370
Educational Institutions	287
Distribution	
Ontario	1,400
Quebec	935
Alberta	433
British Columbia	402
Manitoba	117
Saskatchewan	112
New Brunswick	105
Nova Scotia	99
Newfoundland	50
Prince Edward Island	16
Northwest Territories	12
Yukon	7
USA and abroad	12

During the reporting period, 2,653 inspections of radioisotope licensees and 10 inspections of prescribed substance licensees were carried out. These inspections identified 265 violations of the *Atomic Energy Control Regulations* or licence conditions that could have directly affected radiation safety, and 859 other infractions and deficiencies in compliance with the regulations or licence conditions that did not directly affect radiation safety.

Incidents
Inspectors routinely respond to incidents involving radioisotopes and to other public concerns about ionizing radiation. The incidents are categorized in Table 2 on the following page.

During the reporting period, 142 incidents were reported to the AECB, compared to 97 the previous year. Reported incidents are expected to continue to increase in number as reporting requirements are more clearly defined and licensees are more aware of them.

TABLE 2

Incidents Involving Radioisotopes

Portable Gauges
11 crushed or damaged
5 stolen, four later recovered

Fixed Gauges
3 damaged in fire
3 equipment failures
1 found in scrap
1 shipped improperly
2 exposed workers
1 lost and recovered

Oil and Gas
3 sources stuck in a well, all recovered
1 abandoned/cemented in from 1991 incident
1 temporarily lost source
4 contaminated sites to be decommissioned

Industry
2 overexposures

Scrap Metal
52 shipments rejected and returned
15 visits by AECB inspectors
21 shipments identified as NORM (Naturally Occurring Radioactive Material - not AECB regulated)

Medical
9 facilities contaminated
1 major spill
1 source lost and recovered

Other
1 inadequate decommissioning
1 contaminated diaper at landfill site
1 radium contaminated home
1 radium watch
1 improper disposal of large quantity of smoke detectors

In one of the medical incidents, a large quantity of yttrium-90 was spilled and improperly cleaned up. The AECB questioned the adequacy of the licensee's radiation safety program and temporarily suspended the operating licence. The licensee has since addressed all radiation safety questions and a full operating licence has now been granted.

In another incident, radioactive contamination was discovered on an oil lease in Alberta. AECB staff investigated and subsequently visited various other sites where former licensees injected cesium-137 into wells as a radioactive tracer. Three other sites were found contaminated. All sites are being cleaned up to acceptable levels.

Much effort was expended following the discovery of a nuclear gauge in a trainload of scrap at a steel mill. AECB traced the ownership of the gauge to the Department of National Defence (DND) which discovered that the gauge was one of six that were inadvertently sent to scrap. DND mounted an extensive search for the other five gauges and AECB staff reviewed the methods and procedures used and conducted their own surveys. All gauges were eventually recovered.

During the reporting period, there were two cases of radiation overexposure in industrial radiography. In one instance, two workers were exposed to unnecessary radiation when a wrong lever was mistakenly used while dismounting a gauge. AECB alerted all fixed gauge licensees of this safety concern and is working with the supplier to resolve the problem. There was also a radiation exposure incident on another oil lease in Alberta where 24 workers were exposed. AECB staff conducted an on-site investigation. Exposure estimates for all workers are below regulatory limits and will be reported to the National Dose Registry of Health Canada.

To ensure that operators of radiography exposure devices have a basic knowledge of radiation protection and safe working practices, an examination is administered at various locations across the country, five times a year. During the reporting period, 238 persons passed the exam from a total of 393 exams written, a success rate of 60.6%. In January 1998, the administration of the qualified operator exam was turned over by contract to Natural Resources Canada.

Packaging and Transportation

In Canada, some one million packages of radioactive material are transported annually by road, rail, sea and air. Under the *Transport Packaging of Radioactive Materials Regulations* the AECB regulates the packaging of radioactive materials. As well, the AECB co-operates with Transport Canada in regulating the carriage of radioactive materials under the *Transportation of Dangerous Goods Act*.

These safety standards are based in large part on the *Regulations for Safe Transport of Radioactive Material* of the International Atomic Energy Agency (IAEA). The AECB has continued to contribute actively to the IAEA in the development of air and sea transport regulations through technical meetings and research programs. In addition, the AECB has assisted in the development of IAEA databases for accidents and for approved package designs for use internationally. It has also provided expert consultative assistance to the IAEA on regulatory matters.

During the reporting period, there was significant effort related to preparing proposed new transport regulations. These new transport regulations will bring Canadian requirements into line with regulations being used in the rest of the world.

During the reporting period, the AECB applied safety standards to the design of packages used to transport radioactive materials and to shipment approvals. The AECB issued 45 certificates that included 5 special arrangement certificates, 16 endorsements of foreign certificates, and 24 Canadian-origin package certificates, which include two special-form certificates. As of March 31, 1999, the AECB maintained 112 valid certificates, of which 71 were for Canadian packages and 41 were for endorsements of foreign-origin packages. These certificates are employed by over 265 registered users.

During the reporting period, there were 12 incidents involving the transport of radioactive material. None of these incidents resulted in any significant additional exposure of workers or the public to radiation, nor was there significant environmental degradation. The incidents are:

- On three occasions, packages were found to be improperly prepared;
- On seven occasions, the labelling, documentation or markings of the packages were found to be incorrect;
- On two occasions packages were lost. One package, which fell off a truck while being transported, was later recovered and was not damaged. The other package was temporarily misplaced in a warehouse and later found.

During the past year, the transportation staff and regional office inspectors conducted over 1,300 transport compliance actions and responded to a steady flow of requests for compliance assistance from licensees.

COMPLIANCE MONITORING

The AECB verifies that licensees comply with the *Atomic Energy Control Regulations* and the conditions of licences in a number of ways:

- inspectors are located at all nuclear power reactor sites, and in Saskatoon to facilitate access to the uranium mines in northern Saskatchewan;
- staff from regional offices located in Calgary, Alberta, Mississauga and Ottawa, Ontario, and Laval, Quebec, carry out routine and special inspections;
- staff at all locations review and respond to periodic emergencies, investigations, transport actions, and notices of abnormal occurrences, most of which are reported by licensees as a regulatory requirement.

To support its compliance program, the AECB maintains a Laboratory Services Section in Ottawa that has the capability of carrying out analyses of samples taken during compliance or environmental inspections of licensees. During the reporting period, laboratory staff performed approximately 5,000 chemical and radiochemical measurements on 2,500 samples. Approximately 400 field instruments used by AECB inspectors are supplied, serviced and calibrated by this laboratory. The Laboratory Services Section also assists other federal government organizations with radiation measurements, and international organizations in the prevention of nuclear smuggling.

REGULATORY RESEARCH AND SUPPORT

The AECB funds a mission-oriented research and support program to augment in-house effort on regulatory activities. This work is contracted out to the private sector and to other agencies and organizations. The objective of the program is to produce pertinent and independent information that will assist the AECB in making sound, timely and credible decisions. Where appropriate, joint programs are undertaken with other government agencies or other organizations to maximize the value obtained, and to benefit from related research needs.

TABLE 3

Regulatory Research and Support Program

Distribution of Funding for 1998-99	
Nuclear Reactors	48%
Health Physics	14%
Uranium Mines and Mills	11%
Waste Management	8%
Non-Fuel Cycle Applications	8%
Other Fuel Cycle Facilities, General	5%
Special Services	4%
Regulations and Regulatory Process Development	1%
Transportation	1%

During the reporting period, the total expenditure for mission-oriented regulatory research and support contracts was $1.69 million. For program management purposes, the regulatory activities addressed in the program are categorized into business areas for which the work is done. Projects in the program are also organized and managed in sub-program groups that reflect discipline-related research themes. The program for the reporting period comprised nine such sub-programs. The organization of the program into sub-programs provides a rational means for budget allocation and prioritization, and makes the purpose of work done in the program more visible and transparent to the Board, AECB staff, licensees and the public. Table 3 gives a breakdown of program expenditure by business areas.

NON-PROLIFERATION, SAFEGUARDS AND SECURITY

Physical Security

The AECB monitors the development and implementation by licensees of effective physical protection measures for Canadian nuclear facilities and nuclear material, in accordance with regulations made pursuant to the *Atomic Energy Control Act*. During the reporting period, AECB staff conducted six annual security inspections at Canadian nuclear facilities and at four waste management areas to verify compliance with the *Physical Security Regulations*. A few follow-up inspections were undertaken to ensure that licensees were taking appropriate corrective action. Additionally, there were 17 Inner Area Authorizations and 32 Security Guard Notices issued pursuant to regulatory requirements.

AECB staff monitored two security exercises conducted by licensees and their respective off-site response forces. These exercises evaluate the validity of licensee contingency plans and the licensee's competence to adequately handle emergencies initiated by a security incident.

The AECB, in conjunction with Department of Foreign Affairs and International Trade (DFAIT), ensures that measures for the physical protection of nuclear materials in Canada are consistent with Canada's international obligations, specifically the *Convention on the Physical Protection of Nuclear Material* and the IAEA recommendations, the *Physical Protection of Nuclear Material*. The AECB serves as the official Canadian point of contact for the physical protection convention. Approximately 400 applications for the export or import of nuclear materials were scrutinized for security implications pursuant to convention requirements.

AECB staff continued to participate in efforts by the IAEA to combat the illicit trafficking in nuclear materials and radioactive substances. In response to growing international concerns with the regulatory framework supporting the physical security of nuclear facilities, the IAEA has developed an International Physical Protection Advisory Service. During the reporting period, an AECB staff member participated as a cost-free expert on one such mission to the Czech Republic.

Safeguards

The AECB administers the agreement between Canada and the IAEA for the application of safeguards. This agreement is for the exclusive purpose of verifying that Canada's safeguards obligations under the *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT) are being met. AECB staff members coordinate the access and activities of IAEA inspectors who are authorized to carry out safeguards inspections at nuclear facilities in Canada, and also arrange for IAEA installation and maintenance of safeguards equipment at these facilities. At the end of the period, 34,061 tonnes of nuclear material were accounted for and were subject to IAEA inspection.

In September 1998, Canada signed the Additional Protocol to its safeguards agreement with the IAEA. The protocol gives the IAEA a legal basis to implement measures to strengthen the IAEA's safeguards system, particularly regarding assurances of the absence of undeclared nuclear material and activities. This protocol is the most significant change in safeguards in a quarter century. The AECB has concluded, *ad referendum*, subsidiary arrangements with the IAEA which detail the modalities for implementation of the Additional Protocol. In addition, the AECB continued with its industry outreach program to apprise the industry of the requirements of the Additional Protocol.

Canada is represented by an AECB staff member on the IAEA's Standing Advisory Group on Safeguards Implementation, which provides advice on a variety of safeguards implementation aspects. The AECB also provided the services of a staff member to serve on the IAEA Action Team set up under the terms of the UN Security Council to eliminate Iraq's weapons of mass destruction and the means to produce and use them.

Canadian Safeguards Support Program

Since 1976, Canada has undertaken a safeguards research and development program to supplement the resources of the IAEA and the operational efforts of the AECB in resolving specific safeguards concerns. This program is delivered by the AECB through the Canadian Safeguards Support Program (CSSP).

TABLE 4

CSSP Expenditures for 1998-99

Task Category	Thousands of dollars
Equipment Development	1,112
CFEs, Training and IAEA Travel	709
System Studies	149
Program Management Costs	87
Miscellaneous	23
Total	**2,080**

The CSSP undertakes safeguards tasks for system studies, development of equipment, techniques and procedures, and training, and provides cost-free experts to the IAEA. Equipment development includes projects such as development and installation of a new generation of radiation monitoring instrumentation, digital and remote surveillance systems, nuclear material sealing systems, and nuclear fuel verifiers. Successful solutions to safeguards problems must be affordable, reliable, maintainable, offer low intrusion to nuclear operators, and reduce the demand on IAEA inspectors.

During the reporting period, the CSSP undertook over 30 tasks at a cost of $2.1 million. Table 4 provides a breakdown of the funding. These tasks included the provision of four cost-free experts to the IAEA.

During the reporting period, AECB staff and contractors working under the CSSP made presentations at several international meetings. Information exchanges were held with several countries (Republic of Korea, Argentina and Romania) regarding safeguards implementation, research and development pertaining to CANDU reactors.

Nuclear Non-Proliferation

In support of Canada's nuclear non-proliferation policy, the AECB continued its activities to assure that Canada's nuclear exports are used only for peaceful, non-explosive purposes, and to contribute to the emergence of a more effective and comprehensive international nuclear nonproliferation regime.

The AECB participates with DFAIT in the negotiation of bilateral nuclear cooperation agreements between Canada and its nuclear partners. Currently there are 23 agreements in force (see Table 5) covering 37 countries.

The AECB also negotiates and implements administrative arrangements with its counterparts in other countries. These arrangements are aimed at ensuring that nuclear cooperation is conducted within the terms of Canada's nuclear cooperation agreements. Pursuant to the AECB mandate in this area, staff participated in high-level bilateral nuclear policy and/or technical consultations on matters of mutual interest with a number of Canada's nuclear partners including Australia, EURATOM, Japan, Republic of Korea, Russian Federation and the USA.

TABLE 5

Canadian Bilateral Nuclear Co-operation Agreements

Partner	Date in Force
Argentina	January 1976
Australia	October 1959
Brazil	April 1997
China	November 1994
Columbia	June 1988
Czech Republic	February 1995
Egypt	November 1982
EURATOM*	November 1959
Hungary	January 1988
Indonesia	July 1983
Japan	July 1960
Lithuania	May 1995
Mexico	February 1995
Philippines	April 1983
Republic of Korea	January 1976
Romania	June 1978
Russian Federation	November 1989
Slovak Republic	October 1996
Slovenia	April 1996
Switzerland	July 1958
Turkey	July 1986
Ukraine	January 1999
United States of America	July 1955
Uruguay	(signed; not yet in force)

* EURATOM: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

AECB staff participate in a number of multilateral nuclear non-proliferation forums to consider matters related to multilaterally-agreed nuclear export controls and nuclear transfers for peaceful purposes. The AECB also provides advice to DFAIT on the development and application of Canada's nuclear non-proliferation policy. As well, the AECB is involved in the implementation of Canada's uranium export policy and participates in the interdepartmental Uranium Exports Review Panel with DFAIT and Natural Resources Canada.

Import and Export Control

Pursuant to the *Atomic Energy Control Act*, the AECB continued to licence the export of nuclear materials, equipment and technology, and deuterium, in a manner consistent with Canada's nuclear non-proliferation and export policies. The AECB also licenses the import of nuclear materials and deuterium and the export of nuclear-related dual-use items.

TABLE 6

Canadian Uranium Exports in 1998

Destination	Tonnes
United States	5,962
Japan	1,310
Republic of Korea	444
United Kingdom	345
Sweden	147
France	67
Total	**8,275**

Proposed exports and imports of such items are evaluated by AECB staff, taking into account applicable requirements relating to Canada's nuclear non-proliferation policy, national law, bilateral agreements, the NPT, IAEA safeguards, health, safety and security. Proposed exports of Canadian uranium are also evaluated against uranium agreements accepted by the Uranium Exports Review Panel. Records of authorized exports and actual shipments are maintained by the AECB on behalf of the panel. The distribution of quantities of Canadian natural uranium that were exported during the 1998 calendar year, subject to licences issued by the AECB, is shown in Table 6.

During the reporting period, 619 nuclear export licences (including dual-use exports) and 276 nuclear import licences (including transshipments) were issued or amended. The value of nuclear exports licensed by the AECB was approximately $2 billion, and the value of nuclear imports, which included transshipments, was also approximately $2 billion.

OTHER INTERNATIONAL ACTIVITIES

The scope of international discussions on nuclear safety has grown in recent years, reflecting increased post-Chernobyl concern about trans-frontier risks. The experience and expertise of the AECB give Canada a major influence in the development of international safety guidelines.

AECB staff participate in activities of the International Atomic Energy Agency (IAEA), the International Commission on Radiological Protection (ICRP), the United Nations Scientific Committee on Effects of Atomic Radiation (UNSCEAR), the Nuclear Energy Agency (NEA) of the Organization for Economic Co-operation and Development, and other international organizations concerned with the peaceful uses of nuclear energy.

AECB staff continued its ongoing involvement in committees, working groups and technical meetings that dealt with a wide range of topics, such as the finalization of an international convention on the safety of radioactive waste and spent fuel management; preparation of inspection practices for nuclear power reactors; and planning for nuclear emergencies.

During the reporting period, AECB staff provided technical assistance to the South Korean regulatory agency regarding the Canadian-designed Wolsong reactor, and to the Romanian regulatory agency concerning the Cernavoda nuclear generating station.

The AECB is actively involved in the exchange of nuclear safety and regulatory information with other foreign regulators, and has formal agreements on such matters with the nuclear regulatory agencies of Argentina, China, France, Germany, Hungary, Indonesia, South Africa, South Korea, Spain, Switzerland, Romania, Russian Federation, Turkey, the United Kingdom and the United States. The AECB is also a member of the CANDU regulators group, set up under the auspices of the IAEA to verify safety activities in countries that have CANDU reactors in operation or under construction.

MANAGEMENT AND ADMINISTRATION

Cost Recovery
All AECB funding is voted by Parliament. The funds recovered through fees are returned directly to the Consolidated Revenue Fund. The AECB recovered 81% of its $44.9 million recoverable licensing costs through fees charged for licences and permits. In addition, costs of $4.6 million were incurred to license publicly-funded health care institutions, educational institutions and federal departments. As these organizations are exempted from the fees, their licensing costs are covered by Parliamentary appropriation.

Human Resources
Fiscal year 1998-99 marked a significant turning point in the AECB's human resources reform initiatives. A job evaluation plan specific to the AECB was developed and the AECB's occupational group structure and salary bands were completely redesigned. All positions and staff below the executive level were converted to the new structure effective March 1, 1999.

Leadership Competency Profiles were developed for each of the three levels of management. Training, selection and appraisal decisions are now based on these leadership competencies. The AECB expended a significant increased level of effort towards management training.

Technical Training
The Technical Training Group is responsible for the design, development, delivery, evaluation and management of training programs to meet the technical competency needs of AECB staff, and for providing regulatory training and assistance services to foreign clients under various international agreements.

Training on the new *Nuclear Safety and Control Act* (NSCA) and on the accompanying new set of 10 regulations was declared as a corporate strategic priority in 1998-99 and the subsequent fiscal year. Substantial effort was therefore devoted in 1998-99 to training courses designed to ensure that the AECB staff are familiar with the provisions of the new Act.

As for training on the new set of regulations that will come into force when the Act is proclaimed, major effort was expended to identify the training needs of each division of the AECB. A working group was formed to start the design and development of the training material. The training itself is scheduled to start in the fall of 1999 and continue into the year 2000.

During the reporting period, the AECB continued its agreement with the Canadian International Development Agency (CIDA) in support of the objective of the Canadian Nuclear Safety Initiative (CNSI), which is to enhance the short-term safety of Soviet-designed nuclear power stations. Under this agreement, the AECB provides training to the staff of nuclear regulatory agencies in the Russian Federation, Ukraine, Lithuania and Slovakia. Two training programs were offered to six Lithuanian regulators, one on safety assessment and the other on inspection and enforcement. For the Ukrainian inspectors, two programs on quality assurance and on commissioning were given to 12 participants. A workshop on safety and accident assessment was provided to four regulatory staff from the Russian Federation. The training program for the Slovak regulators was successfully concluded in early 1998.

The AECB continued to provide, in cooperation with Atomic Energy of Canada Limited, training in Canadian regulatory practices and standards as applied to CANDU nuclear power plants for regulatory staff in countries that own such plants or which are contemplating their procurement. A two-year assignment training for a Korean regulator concluded in April 1999. In addition, two training programs were offered to two inspectors from the Korean regulatory agency.

The AECB also hosted two scientific visits for two Turkish regulatory staff who were sponsored by the International Atomic Energy Agency fellowship program. Such visits offered training on the Canadian approach to licensing and inspection, and afforded visits to sites of nuclear power plants and fuel processing and fabrication facilities in Canada.

Internal Audit and Program Evaluation

The AECB has an Audit and Evaluation Group to examine corporate management accountability and program performance issues, and to make recommendations for improvement. The group reports directly to the President, and works under the guidance of a corporate Audit and Evaluation Committee, which is chaired by the President. It also assists management in carrying out self-assessments, and in identifying lessons learned and best practices.

Work continued during the reporting period on reporting and addressing implementation of the findings of the major corporate review of compliance inspection, enforcement and related follow-up. This review, carried out in 1997-98, looked at management framework, success and alternatives issues. During the reporting period, a management response was developed, and a corrective implementation plan was in preparation.

The audit group carried out a review of the effectiveness of AECB staff in making use of Legal Services. The draft report is now with management for response.

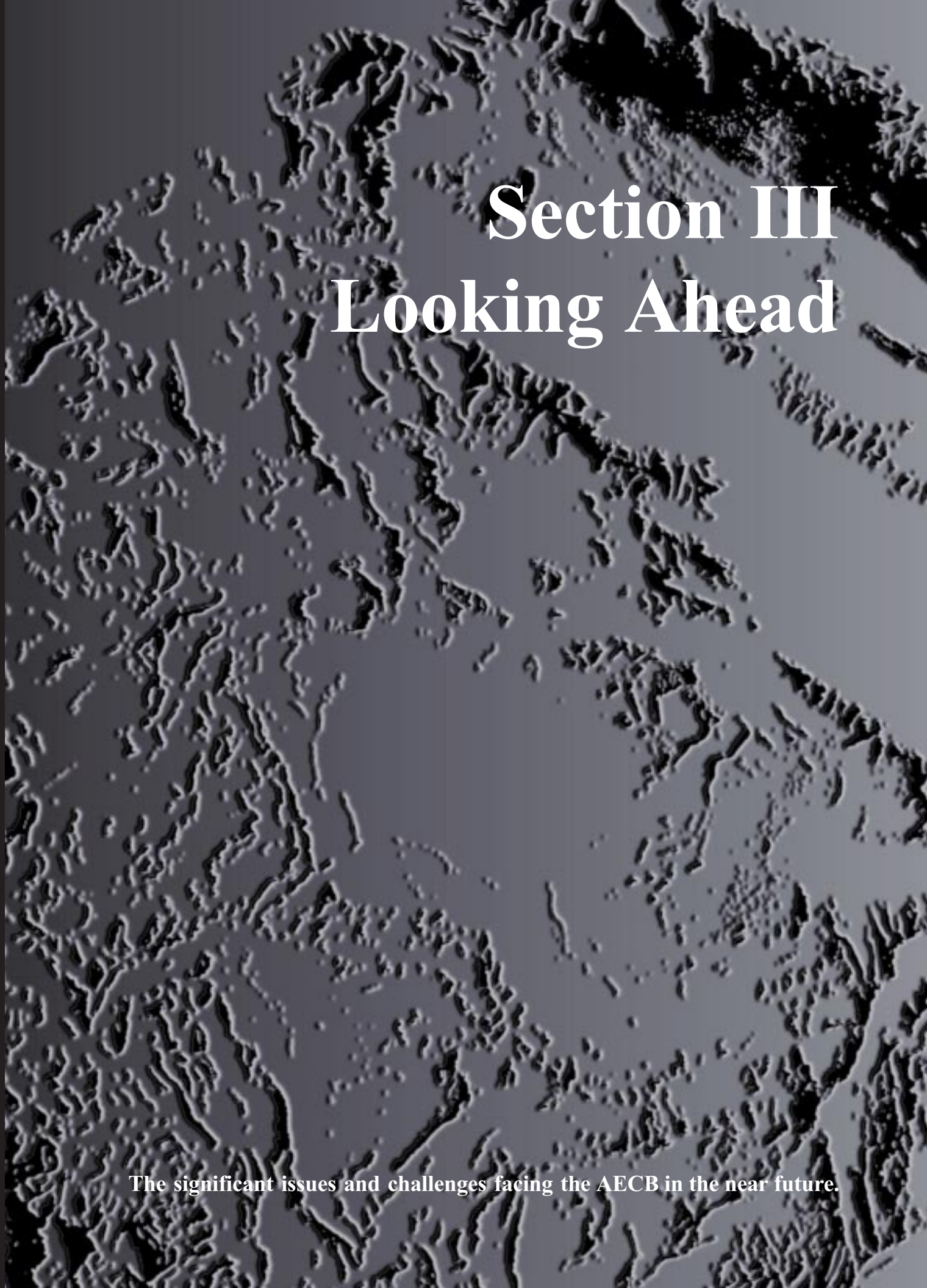
A review entitled Regulatory Assurance Process for Authorized Personnel in Canadian Nuclear Power Plants addressed regulator/licensee relationship matters and related management issues. A draft report is now with management for a response and action plan.

The group carried out the planning phase of an internal audit on internal Year 2000 preparedness issues. This review supplements work carried out by the Office of the Auditor General (OAG) earlier in the year relating to internal and regulatory preparedness.

The AECB audit group also liaised with OAG staff carrying out a follow-up on the federal government's preparedness for a major nuclear emergency (published in December 1998.)

The audit group finished a formative review of the 1998 AECB reorganization, and carried out a progress evaluation to assess success. The report found that progress to date was quite encouraging, and recommended continued communication and dialogue with staff, and related follow-up.

Financial Statement
The audited financial statement for the fiscal year ending March 31, 1999, may be found on pages 60-68.



Section III
Looking Ahead

The significant issues and challenges facing the AECB in the near future.

CANADIAN NUCLEAR SAFETY COMMISSION

In March 1997, the Parliament of Canada enacted the *Nuclear Safety and Control Act* (NSC Act), to replace the *Atomic Energy Control Act* and provide for more explicit regulation of nuclear energy in Canada. Under the Act, the federal nuclear regulatory body will be known as the Canadian Nuclear Safety Commission (CNSC). Once supporting regulations for the NSC Act are ready, the new legislation will come into effect.

The CNSC will have a clearer mandate to establish and enforce national standards in the areas of public and worker health and safety. The NSC Act also establishes a firm legislative basis for implementing Canadian policy with respect to security issues, particularly the non-proliferation of nuclear weapons. Of significance is the fact that the NSC Act explicitly includes the protection of the environment as a responsibility of the new Commission.

With the transition imminent, the AECB must ensure that the CNSC can carry out its revised and expanded mandate in an effective and efficient way. This includes developing clear documentation on regulatory requirements. It must also further cultivate arrangements with other federal and provincial government agencies to implement regulatory functions effectively, reduce the regulatory burden caused by duplication, and adjust procedures and methods of operation to reflect the new legislation.

While new regulations and essential regulatory documents will be in place when the NSC Act comes into effect, it will take further time to develop and implement some of the other regulatory tools that the CNSC will need to be fully effective and efficient. These include the development of a regulatory strategy document, development and implementation of assessment and compliance policies based on defined standards, and the design of systems to assess the effectiveness of regulatory activities.

The AECB will ensure a firm foundation for the CNSC by providing:

- a smooth transition to the new regulatory regime under the NSC Act and its regulations;
- directorate and divisional operational plans, priorities and activities that are aligned with the purpose of the NSC Act;
- fundamental statements of regulatory policy that are consistent with the purpose of the NSC Act and that form the basis for management plans and activities;
- standards, assessment tools and operational procedures that are consistent across all sectors of the new Commission, and that are clear, understandable and meaningful;
- clear information to staff and stakeholders about their obligations under the new Act and regulations and the CNSC's expectations; and
- consultative approaches that take the views of Canadians into account in the development of the CNSC's plans and activities.

STRATEGIC DIRECTIONS

Strategic Plan
For 1999-2000, the expected proclamation of the *Nuclear Safety and Control Act* will provide the focus for AECB plans and activities, apart from the ongoing regulatory activities and international obligations. Key strategic plans in the area of management, leadership and efficiency within the organization are intended to further enhance regulatory effectiveness in the context of the new regulatory regime provided for in the Act.

AECB management has accordingly articulated a strategic plan identifying five principal objectives or directions:

- implement the *Nuclear Safety and Control Act*
- improve the management and leadership culture
- reform the human resources framework
- communicate more effectively
- finalize the internal review *Project 96 and Beyond* (a broad spectrum of key recommendations to improve internal management policies and practices)

Meeting these strategic directions will ensure that the AECB continues to deliver high quality service while fulfilling its mandate. Several specific plans in support of these broad objectives have been formulated.

The AECB strategic plan is very much in harmony with current government initiatives for change and improvement to the public service.

Policy Directions
Three initiatives, already underway at the AECB, will provide critical policy direction for the next several years.

First, within the framework provided by the *Nuclear Safety and Control Act* and regulations, the AECB is in the process of developing a **comprehensive environmental protection program** that will be implemented by the Canadian Nuclear Safety Commission. This program will encompass a range of activities, including regulations and mechanisms for public consultation and participation in decision-making processes.

The nuclear industry has been regulated in a comprehensive manner in terms of measures required for the protection of humans from the hazards of ionizing radiation. In fact, it is more stringently regulated in this regard than most other industries dealing with hazardous substances. Most people within the nuclear industry believe there is sufficient scientific data to accept the concept that if you protect humans you will be protecting other species within the environment. Whether this concept is accurate or not, it is becoming increasingly clear that society is demanding that environmental programs be developed at nuclear facilities that demonstrate the environment is indeed being adequately protected.

These demands and expectations for the protection of the environment will be increasing and represent a significant challenge for both the nuclear regulator and operators. The new Act and regulations reflect this shift in thinking. For the first time, the Canadian regulator will have a clear mandate to establish and enforce national standards in the area of environmental protection.

A second initiative is the development of an **internal quality assurance system** that will describe the AECB's core management and operational processes. Internal quality assurance is an important part of the AECB's strategic direction on improving management. The system will set out comprehensive management policies and procedures that define for staff how the organization is to conduct its operations. These policies and procedures will provide the necessary direction, information, tools, support and environment for staff to do their work efficiently and effectively.

This system will result in a more systematic approach to regulatory activities. It will help develop consistency, cohesiveness and transparency in its work, and will provide a vehicle for fostering the required cultural change and for preserving corporate memory.

The third initiative is the development of a **corporate compliance strategy** for the new Canadian Nuclear Safety Commission.

There is a recognized need for Canada's nuclear regulator to perform compliance activities in a more transparent, systematic and consistent way. Promoting, verifying and enforcing compliance have always been part of the regulator's business, but often these activities have not been adequately documented or have varied significantly from activity to activity.

A policy document is currently being developed that will articulate the corporate philosophy on compliance. Also under development is a corporate compliance program to ensure consistent application of the policy across the organization. Each business area will then develop its own compliance program tailored to its specific types of operations. The project should be completed by the end of the year 2000, with the implementation of these compliance programs in all areas of activity.

Regulatory Harmonization

The AECB is making every effort to harmonize its regulatory requirements with those of other federal and provincial bodies that have responsibilities related to the nuclear industry.

Regulatory overlap and duplication is an issue that will continue to require significant attention. The AECB is committed to streamlining the regulatory regime, minimizing the regulatory burden and reducing administrative costs while ensuring an effective and efficient system.

At the federal level, the AECB is working with the departments of Health, Natural Resources, Transport, Environment, Human Resources Development, and Fisheries and Oceans to increase cooperation on regulatory issues that impact on or originate from the nuclear industry. This will continue to be a strategic priority for the Board and for the new Commission.

REGULATORY CHALLENGES

Year 2000 — "Y2K"

While providing for a smooth transition to the new CNSC organization is the number one priority for the AECB, as the new millennium approaches, another pressing issue requires attention — the potential impact of the Year 2000 computer date problem (Y2K) on nuclear operations.

Y2K is a significant issue for the safe and reliable operation of nuclear power plants and other installations. It is a challenging, risk-management project for the industry and regulators alike. The potential for problems was recognized some time ago, and since then the AECB and its licensees have been dealing with the Y2K issue in a comprehensive and consistent fashion.

While the primary responsibility for addressing the Y2K problem rests with nuclear operators, the regulator has an important role to play with respect to health, safety and the environment. The AECB has an obligation to satisfy itself that the industry is demonstrating Y2K readiness, and to act appropriately if this is not the case.

The AECB developed a comprehensive strategy for dealing with the Y2K problem. It has taken and will take appropriate steps to provide assurance that there is adequate protection for the health and safety of members of the public and workers, as well as the environment.

Licensees are required to demonstrate to the AECB their state of Y2K readiness by June 30, 1999. For power reactors, for example, this involves assurances that safety systems will function to shut down the reactor, provide continued fuel cooling and containment, and maintain safety, control and monitoring functions.

The June 30 deadline will leave the rest of 1999 for power plant staff to become familiar with any required operational changes and new procedures, and to prepare for a reliable transition to the new millennium. Equally important, it will give the AECB time to take action if it is not satisfied with a particular operator's Y2K readiness.

One element of the AECB's strategy involved establishing a dialogue with organizations responsible for issues over which it has no control but which can affect nuclear operations. This refers in particular to the stability of the electricity grid and of communications systems on January 1, 2000. The potential impact of the millennium bug on these external systems must be factored into the AECB's plans.

Domestically, Canada's nuclear Y2K implementation plans are proceeding well. But being ready on a national basis is not enough, since the consequences of serious nuclear accidents do not stop at geographical boundaries. That is why it has become critical for regulators and operators around the world to share information with each other, and the AECB has been working on Y2K issues with its regulatory counterparts in other countries for some time.

For example, during the reporting period, the AECB hosted a three-day international workshop in Ottawa on the impact of Y2K on the nuclear industry, sponsored by the Nuclear Energy Agency of the Organisation for Economic Cooperation and Development. Regulators and operators from around the world explored how different countries are responding to the year 2000 challenge, and heard about lessons learned to date, and plans for the future.

It was announced at this workshop that the Nuclear Energy Agency has initiated an international emergency Y2K exercise to assist in world-wide contingency planning. This exercise will provide a unique opportunity to coordinate emergency planning, communication and response systems relevant to nuclear power plants in the context of the Year 2000 issue. The AECB has been asked to take a leading role in this exercise and is currently in discussion with the NEA and licensees in Canada to define the expectations and develop the appropriate plans.

While the AECB is confident that Y2K issues are being adressed, it is developing contingency plans, particularly in relation to loss of power and telecommunications, which could affect the response to any nuclear emergency.

The AECB also needs to make sure its own house is in order. Like most other organizations, the AECB depends on information technology to deliver its programs, and that means it is exposed to Y2K risks with its internal systems. After extensive effort over a considerable period, the AECB can affirm that most of its systems are now Y2K compliant. Work is continuing on the remainder, and the AECB is confident that all systems for its internal operations will be Year 2000 compliant.

Deregulation of Electricity Markets

An issue that is in the forefront in Canada today is the deregulation of electricity markets — the transition to open competition among producers, distributors and marketers of electricity. In this country, with minor exceptions, electrical power has until recently been produced and marketed under monopoly conditions by publicly owned utilities.

The first province to initiate market deregulation of electrical power was Ontario through its *Energy Competition Act* of 1998. Ontario Hydro was to be divided into three separate components for power generation, transmission and marketing on April 1, 1999.

The market deregulation and supplier restructuring is of significant interest to the AECB since approximately 60% of the electricity generated by the new Ontario Power Generation Inc. comes from nuclear reactors. The three main issues are:

- that the changes do not compromise the safe operation of nuclear stations
- that the organization remains competent and in control of the day to day operation of the licensed facility
- that adequate financial guarantees remain available to cover the costs of decommissioning facilities and managing the associated radioactive wastes

Regardless of deregulation, the AECB has made it clear that the operators of nuclear power plants in Ontario are still required to comply with the licensing conditions set out by the AECB and, in the years ahead, by the Canadian Nuclear Safety Commission. The regulator will continue to verify that no undue hazard is posed by the rules for operation of the grid or by the relationship between the owners and operators of nuclear plants.

One important question is that the increased competition created by commercial deregulation may lead to decreased resources for safety issues in nuclear power plant operations, or that the need to meet power supply commitments could lead to less conservative safety decisions. In other words, the drive to remain fiscally competitive in a deregulated market could overshadow the fundamental need for safety in nuclear installations. The AECB will continue to monitor the situation in Ontario closely to ensure that this is not the case. It will also apply the same scrutiny to any future deregulation initiatives in other parts of Canada.

International Co-operation

It is becoming increasingly clear that international co-operation among nuclear nations is not an option, it is an imperative. Nuclear safety is of great importance not only to those countries with nuclear power, but also to those not using it. The consequences of severe nuclear accidents do not stop at the geographical boundaries of the country in which they occur. It is therefore critical for nuclear regulators to share information, knowledge and appropriate technology with each other.

Over the years, there has been ever-increasing co-operation between national regulators, both bilaterally and through multilateral organizations like the Nuclear Energy Agency and the International Atomic Energy Agency. Smaller international regulatory groups have developed, as well as others which provide a forum in which matters of specific mutual interest can be discussed candidly. These organizations fulfil a need which cannot be easily achieved in the much larger international agencies.

An excellent example of international co-operation is the Convention on Nuclear Safety, which came into force in October 1996. Canada will continue to play a role in encouraging all countries with nuclear power plants to commit to the Convention and its obligations. Canada will also support the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Other examples of very recent international co-operation are the sharing of information on the Y2K issue, the conduct of international emergency exercises, and the development of international standards and guides. International safety standards are important tools for developing and sustaining nuclear safety. They identify the basic requirements for the safe operation of nuclear facilities and form the framework on which individual countries develop their own standards.

Another issue in many nuclear nations, including Canada, is the question of succession. From where will the next generation of nuclear specialists come? In this country, it is evident that there is a lack of interest among young people in the area of nuclear technology, and most of the university programs in nuclear engineering have closed. Is there any way to ensure that there is a new generation of appropriately qualified personnel for both the industry and the regulators? From the regulators' point of view, discussions are already underway concerning the necessity for the international exchange of personnel for training purposes, but the succession problem is not yet solved.

The provision of adequate research programs to sustain the safety of nuclear operations is another area requiring increased co-operation among nations. Funding for research has diminished at universities, regulatory agencies and within the nuclear industry itself. However, regulators must require the industry to provide sufficient research to support its operations, and regulators should also be capable of some independent research activities.

As a country's universities become more and more dependent on support from industry for survival of their research programs, the national regulator may have a problem considering them as truly independent organizations to perform research activities on its behalf. This issue is being discussed by regulators in international forums, and it is likely that increased international co-operation and the sharing of resources for regulatory research will be necessary.

PROSPECTS FOR REGULATION

Nuclear Fuel Waste Management

The long-term management of used nuclear fuel is a particularly controversial issue in Canada as it is in many other countries, and the controversies surrounding this issue will probably not be resolved quickly.

A federal environmental assessment panel reviewed Atomic Energy of Canada Ltd.'s proposal for the deep geological disposal of nuclear fuel waste and found that the concept was technically safe but did not have broad public support. The proposal was for the fuel waste to be sealed in a container designed to last at least 500 years, which would then be buried in disposal rooms deep in the rock of the Canadian shield.

The government accepted the panel's recommendation that a special organization be created to manage and coordinate all activities dealing with nuclear fuel waste in the long term. The government's position is that this organization should be established and funded by the producers and owners of nuclear fuel waste, and will be subject to federal regulatory control, policy direction and public review.

Whatever national policy is developed on this important issue it will be the responsibility of the new Canadian Nuclear Safety Commission to regulate the facility or facilities in such a manner that there will be no undue risk to workers, members of the general public, national security or the environment.

Mixed Oxide Fuel Testing and Use
As part of an initiative by the United States and the Russian Federation to determine an acceptable method for disposal of the weapons plutonium being declared surplus, Atomic Energy of Canada Limited (AECL) will import small samples of mixed oxide (MOX) fuel from the US and Russia under the terms of its current licence for the Chalk River Laboratories.

The Canadian government has agreed in principle to the initiative and to studies and tests to be undertaken by AECL to prove the feasibility of using MOX fuel in Canadian-based CANDU reactors before they can be qualified as suitable for the disposition of surplus weapons-grade fissile materials.

If Canada is asked to consider participation in a full CANDU MOX project, the project would have to meet all applicable federal and provincial health, safety, transport and environmental assessment and protection requirements, including the opportunity for public participation through Canadian Environmental Assessment Act (CEAA) and AECB licensing processes.

It is expected that final decisions on this strategic issue will not be taken for a few years and, even if this option were selected, it would be many more years before the first MOX fuel would be used in Canadian reactors.

Future Prospects
More than 50 years ago, when the AECB was created, foreseeing the vast scope of its interests as they are today would have been impossible.

In the year 2000 and beyond, there will undoubtedly be other regulatory prospects to challenge the Canadian Nuclear Safety Commission (CNSC) and its staff. The nuclear industry will change over time, and the CNSC with it. But unchanged through it all will be the fundamental, vital responsibility for ensuring the protection of workers, the public and the environment from the harmful effects of ionizing radiation.

ANNEX I, MARCH 31, 1999
MANAGEMENT OF THE AECB

President and Chief Executive Officer		**A.J. Bishop**
Office of the President		
Executive Assistant to the President and Secretary of the Executive Committee		R. Potvin
Audit and Evaluation Group	Manager	R. Maddocks
Legal Services Unit	Senior Counsel/Manager	A. Nowack
Advisory Committee on Radiological Protection	Chair	A. Marko
Advisory Committee on Nuclear Safety	Chair	A. Pearson
Group of Medical Advisers	Chair	S. Vlahovich
Secretariat	**Director General**	**P. Marchildon**
Secretary of the Board		P. Marchildon
Board Services Group	Manager	B. Gerestein
Communications Division	Director	S. Copeland
External Relations and Documents Division	Director	C. Maloney
Non-Proliferation, Safeguards and Security Division	Director	H. Stocker
New Act Implementation Group	Manager	R. Brown
Directorate of Reactor Regulation	**Director General**	**J. Harvie**
Power Reactor Operations Division	Director	R. Leblanc
Power Reactor Evaluation Division	Director	M. Taylor
Safety Evaluation Division (Analysis)	Director	P. Wigfull
Safety Evaluation Division (Engineering)	Director (A)*	N. Anani
Directorate of Fuel Cycle and Materials Regulation	**Director General**	**M. Duncan**
Uranium Facilities Division	Director	T. Viglasky
Wastes and Decommissioning Division	Director	R. Ferch
Materials Regulation Division	Director	R. Thomas
Research and Production Facilities Division	Director	A. Aly
Directorate of Environmental and Human Performance Assessment	**Director General**	**J. Waddington**
Radiation and Environmental Protection Division	Director	M. Measures
Personnel Qualification Assessment Division	Director	G. Schwarz
Performance Evaluation Division	Director	K. Pereira
Technical Training Group	Manager	I. Grant
Research and Support Group	Manager (A)*	J. Riznic
Directorate of Corporate Services	**Director General**	**G. Jack**
Human Resources Division	Director	D. Vermette
Finance Division	Director	G. Bergeron
Information Management Division	Director	W. Goodwin

* Acting

ANNEX II, MARCH 31, 1999
ADVISORY COMMITTEE ON RADIOLOGICAL PROTECTION

Dr. A.M. Marko (Chair)	Consultant Deep River, Ontario
Dr. D.J. Gorman (Vice-Chair)	Director, Office of Environmental Health and Safety University of Toronto Toronto, Ontario
Dr. D.B. Chambers	SENES Consultants Ltd. Richmond Hill, Ontario
Dr. J.F. Lafortune	Consultant Ottawa, Ontario
Mrs. L. Normandeau	Centre hospitalier de l'Université de Montréal Montréal, Quebec
Dr. D.W.O. Rogers	National Research Council of Canada Ottawa, Ontario
Dr. J.B. Sutherland	Health Sciences Centre (retired) Winnipeg, Manitoba
Dr. B.L. Tracy	Radiation Protection Bureau Health Canada Ottawa, Ontario
Mr. M. White	Safety Management Services, Inc. Pickering, Ontario
Dr. R.J. Woods	Professor Emeritus, Department of Chemistry (retired) University of Saskatchewan Saskatoon, Saskatchewan
Dr. A. Pearson (*ex officio*)	Chair, Advisory Committee on Nuclear Safety
Mr. M.W. Lupien (Scientific Secretary)	Atomic Energy Control Board

ANNEX III, MARCH 31, 1999
ADVISORY COMMITTEE ON NUCLEAR SAFETY

Dr. A. Pearson (Chair)	Consultant Deep River, Ontario
Dr. A. Biron (Vice-Chair)	Associate Director Centre de recherche en calcul appliqué (CERCA) Montréal, Quebec
Dr. A.H. Boisset	Consultant Montréal, Quebec
Dr. M. Gaudry	Professor of Economics Université de Montréal Montréal, Quebec
Dr. J.R. Humphries	Consultant Nepean, Ontario
Dr. P.G. Mallory	Consultant Peterborough, Ontario
Dr. A.M. Marko (*ex officio*)	Chair, Advisory Committee on Radiological Protection
Mr. R.J. Atchison (Scientific Secretary)	Atomic Energy Control Board

ANNEX IV, MARCH 31, 1999
GROUP OF MEDICAL ADVISERS

Dr. P. Hollett	Newfoundland and Labrador
Dr. D.J. Neilson	Prince Edward Island
Dr. O.S.Y. Wong Dr. D. Barnes	Nova Scotia
Dr. J.M. Daly Dr. J. Schollenberg Dr. M. Taha	New Brunswick
Dr. J. Morais Dr. G. Grenier	Quebec
Dr. A.A. Driedger Dr. M. McQuigge	Ontario
Dr. J.B. Sutherland Dr. K.D. Jones	Manitoba
Dr. S.K. Liem Dr. V. Trivedi	Saskatchewan
Dr. A.W. Lees	Alberta
Dr. A.S. Belzberg Dr. J.T.W. Lim	British Columbia
Dr. S. Vlahovich* (Chair)	Health Canada
LCol. G. Cook	Department of National Defence
Dr. A. Clarke	Atomic Energy of Canada Limited
Mr. M.W. Lupien (Scientific Secretary)	Atomic Energy Control Board

* AECB Medical Liaison Officer

ANNEX V, MARCH 31, 1999
POWER REACTOR LICENCES

Facility and Location (Licensee)	Type and Number of Units/Capacity	Start-Up	Current Licence Number	Current Licence Expiry Date
Pickering Nuclear Generating Station A Pickering, Ontario (Ontario Hydro)*	CANDU-PHW 4 × 500 MW(e)**	1971	PROL 4/98	1999.03.31
Bruce Nuclear Generating Station A Tiverton, Ontario (Ontario Hydro)*	CANDU-PHW 4 × 750 MW(e)***	1976	PROL 7/98	2000.08.31
Pickering Nuclear Generating Station B Pickering, Ontario (Ontario Hydro)*	CANDU-PHW 4 × 500 MW(e)	1982	PROL 8/98	1999.03.31
Gentilly-2 Nuclear Generating Station Gentilly, Quebec (Hydro-Québec)*	CANDU-PHW 600 MW(e)	1982	PER 10/98	2000.10.31
Point Lepreau Nuclear Generating Station Point Lepreau, New Brunswick (New Brunswick Power Corporation)	CANDU-PHW 600 MW(e)	1982	PROL 12/98	2000.10.31
Bruce Nuclear Generating Station B Tiverton, Ontario (Ontario Hydro)*	CANDU-PHW 4 × 840 MW(e)	1984	PROL 14/97	1999.10.31
Darlington Nuclear Generating Station Bowmanville, Ontario (Ontario Hydro)*	CANDU-PHW 4 × 850 MW(e)	1989	PROL 13/98	2000.11.30

MW(e) — megawatt (nominal electrical power output)
PER — Reactor Operating Licence (*Permis d'exploitation de réacteur*)
PHW — pressurized heavy water
PROL — Power Reactor Operating Licence
* As a result of restructuring of the electricity market by the Province of Ontario, Ontario Power Generation Inc. was to become the operator and licensee of the nuclear facilities on April 1, 1999.
** PROL 4/98 requires the licensee to maintain all units in an approved shutdown state.
*** PROL 7/98 requires the licensee to maintain all units in an approved shutdown state.

ANNEX VI, MARCH 31, 1999
RESEARCH REACTOR LICENCES

Licensee and Location	Type and Capacity	Start-Up	Current Licence Number	Current Licence Expiry Date
McMaster University Hamilton, Ontario	pool-type 5 MW(t)	1959	RROL 1/97	1999.06.30
École polytechnique Montréal, Quebec	subcritical assembly	1974	PERR 9/95	2000.09.30
University of Toronto Toronto, Ontario	SLOWPOKE-2 20 kW(t)	1976	RROL 6A/97	2000.06.30
École polytechnique Montréal, Quebec	SLOWPOKE-2 20 kW(t)	1976	PERR 9A/97	2000.06.30
Dalhousie University Halifax, Nova Scotia	SLOWPOKE-2 20 kW(t)	1976	RROL 17/97	2000.06.30
University of Alberta Edmonton, Alberta	SLOWPOKE-2 20 kW(t)	1977	RROL 18/97	2000.06.30
Saskatchewan Research Council Saskatoon, Saskatchewan	SLOWPOKE-2 20 kW(t)	1981	RROL 19/97	2000.06.30
Royal Military College of Canada Kingston, Ontario	SLOWPOKE-2 20 kW(t)	1985	RROL 20/97	2000.06.30

kW(t) — kilowatt (thermal power)
MW(t) — megawatt (thermal power)
PERR — Research Reactor Operating Licence (*Permis d'exploitation de réacteur de recherche*)
RROL — Research Reactor Operating Licence

ANNEX VII, MARCH 31, 1999
NUCLEAR RESEARCH AND TEST ESTABLISHMENT LICENCES

Licensee and Location	Type and Capacity	Current Licence Number	Current Licence Expiry Date
Atomic Energy of Canada Limited Chalk River Laboratories Chalk River, Ontario	Nuclear Research and Test Establishment	NRTE 1.2/98	2000.10.31
Atomic Energy of Canada Limited Chalk River Laboratories Chalk River, Ontario	New Processing Facility	RPCA 03/97	*
Atomic Energy of Canada Limited Chalk River Laboratories Chalk River, Ontario	MAPLE 1 and 2 Nuclear Reactors 2 × 10 MW(t)	NRCA 62/97	*
Atomic Energy of Canada Limited Whiteshell Laboratories Pinawa, Manitoba	Nuclear Research and Test Establishment	NRTE 2.1/98	2000.10.31

(Continued on the next page)

MW(t) — megawatt (thermal power)
NRCA — Nuclear Reactor Construction Approval
NRTE — Nuclear Research and Test Establishment
RPCA — Radioisotope Processing Construction Approval
* Construction approval expires when an operating licence is issued.

ANNEX VII (CONTINUED)
NUCLEAR RESEARCH AND TEST ESTABLISHMENT LICENCES

Chalk River Laboratories
(AECL)

Current Licence Number — NRTE 1.2/98
Expiry Date — 2000.10.31

Facility	Description
NRU Reactor	Nuclear research reactor, maximum power 135 MW thermal
NRX Reactor	Permanently shut down, to be decommissioned
Recycle Fuel Fabrication Laboratories	Fabrication of small quantities of mixed oxide fuel for physics tests and demonstration irradiations
PTR Reactor	Permanently shut down, to be decommissioned
ZED-2 Reactor	Research reactor, less than 200 W thermal
Universal Cells, Building 234	Three isolation cells for examining radioactive material up to 4.9 m in length
Molybdenum-99 Production Facility	Recovery of Mo-99
Health Physics Neutron Generator	Electrostatic accelerator, 150 KeV
Waste Treatment Centre	Treatment of solid and liquid waste
Fuels and Materials Cells Facility	12 isolation cells for examining radioactive material
Waste Management Areas	Storage and handling of waste
Nuclear Fuel Fabrication Facility, Building 405	Production of low-enriched uranium fuel for research reactors
Nuclear Fuel Fabrication Facility, Building 429	Production of low and high-enriched uranium fuel for research reactors
Heavy Water Upgrading Facility	Permanently shut down, to be decommissioned
Combined Electrolysis, Catalytic Exchange Upgrading/Detritiation Test	Pilot scale facility to demonstrate means to treat downgraded heavy water

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ANNEX VII (CONTINUED)
NUCLEAR RESEARCH AND TEST ESTABLISHMENT LICENCES

Chalk River Laboratories (AECL)

Current Licence Number — RPCA 03/97 — NRCA 62/97

Facilities	Description
MDS Nordion Medical Isotope Reactor Project	
Maple 1 and 2	Two 10 MW reactors
New Processing Facility	To produce radioisotopes for medical use (under construction)

(continued on the next page)

ANNEX VII (CONTINUED)
NUCLEAR RESEARCH AND TEST ESTABLISHMENT LICENCES

Whiteshell Laboratories (AECL)

Current Licence Number — NRTE 2.1/98
Expiry Date —2000.10.31

Facility	Description
WR-1	Organically cooled experimental reactor. Undergoing decommissioning, phase 1 complete, remaining radioactive components in long-term storage with surveillance
WL Concrete Canister Storage Facilities	Storage of irradiated fuel
Van de Graaff Accelerator	Permanently shut down, to be decommissioned
14 MeV Neutron Generator	Permanently shut down, to be decommissioned
Active Liquid Waste Treatment Centre	Processing of liquid waste
WL Shielded Facilities	Post-irradiation examination of fuels, reactor core components and other radioactive material
WL Waste Management Area	Storage and handling of waste

ANNEX VIII, MARCH 31, 1999
URANIUM MINE/MILL FACILITY LICENCES

Facility and Location (Licensee)	Licensed Capacity or Activity	Current Licence Number	Current Licence Expiry Date
Kiggavik-Scissons Schultz Baker Lake Area Northwest Territories (Urangesellschaft Canada Limited)	ore removal	MFRL-157-3.5	indefinite
Cigar Lake Project Saskatchewan (Cigar Lake Mining Corporation)	underground exploration	MFEL-152-4.3	2000.07.31
McArthur River Project Saskatchewan (Cameco Corporation)	construction	MFCL-171-0.1	indefinite
Midwest Joint Venture Saskatchewan (Minatco Limited)	suspended operations	MFEL-167-0.3	indefinite
Cluff Lake Saskatchewan (Cogema Resources Inc.)	2,020,000 kg/a uranium	MFOL-143-7	2000.12.31
Key Lake Operation Saskatchewan (Cameco Corporation)	5,700,000 kg/a uranium	MFOL-164-4.1	1999.09.30
McClean Lake Project Saskatchewan (Cogema Resources Inc.)	construction and operation	MFOL-170-0.4	1999.09.30
Rabbit Lake Operation Saskatchewan (Cameco Corporation)	6,500,000 kg/a uranium	MFOL-162-5	2000.10.31

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kg/a — kilogram per year
MFRL — Mining Facility Removal Licence
MFEL — Mining Facility Excavation Licence
MFOL — Mining Facility Operating Licence
MFCL — Mining Facility Construction Licence

ANNEX VIII (CONTINUED)
URANIUM MINE/MILL FACILITY LICENCES

Facility and Location (Licensee)	Licensed Activity	Current Licence Number	Current Licence Expiry Date
Rayrock Northwest Territories (Indian and Northern Affairs Canada)	decommissioning	PSL-208/2000	2000.06.30
Stanrock Mine Elliot Lake, Ontario (Denison Mines Limited)	decommissioning	MFDL-353-0	indefinite
Stanleigh Mine Elliot Lake, Ontario (Rio Algom Limited)	decommissioning	MFDL-352-0.1	indefinite
Beaverlodge Mining Operations* Beaverlodge, Saskatchewan (Cameco Corporation)	decommissioning	MFDL-340-0.1	indefinite
Dawn Lake Project Saskatchewan (Cameco Corporation)	decommissioning	MFDL-347-0.1	indefinite
Denison Mine Elliot Lake, Ontario (Denison Mines Limited)	decommissioning	MFDL-349-0.3	indefinite
Dubyna Mine* Uranium City, Saskatchewan (Cameco Corporation)	decommissioning	MFDL-340-0.1	indefinite
Panel Mine Elliot Lake, Ontario (Rio Algom Limited)	decommissioning	MFDL-346-0.8	indefinite
Quirke Mine Elliot Lake, Ontario (Rio Algom Limited)	decommissioning	MFDL-345-0.9	indefinite
Madawaska Mine Bancroft, Ontario (Madawaska Mines Limited)	decommissioning	DA-139-0.6	indefinite

DA — Decommissioning Approval
MFDL — Mining Facility Decommissioning Licence
PSL — Prescribed Substance Licence
* These two facilities are included under the same licence.

ANNEX IX, MARCH 31, 1999
URANIUM REFINERY, CONVERSION FACILITY AND FUEL FABRICATION PLANT LICENCES

Licensee and Location	Licensed Capacity (tonnes/year uranium)	Current Licence Number	Current Licence Expiry Date
General Electric Canada Incorporated Toronto, Ontario	1,300 (fuel pellets)	FFOL-221-6	2000.12.31
General Electric Canada Incorporated Peterborough, Ontario	1,200 (fuel bundles)	FFOL-222-6	2000.12.31
Earth Sciences Extraction Company Calgary, Alberta	70 (uranium oxide)	FFOL-209-11	2000.11.30
Cameco Corporation Blind River, Ontario	18,000 (UO_3)	FFOL-224-5	1999.12.31
Cameco Corporation Port Hope, Ontario	12,500 (UF_6) 2,000 (U) — (natural and depleted metal and alloys) 3,800 (UO_2) 1,000 (ADU)	FFOL-225-4	1999.12.31
Zircatec Precision Industries Incorporated Port Hope, Ontario	1,500 (fuel pellets and bundles)	FFOL-223-5	1999.12.31

ADU — ammonium di-uranate
FFOL — Fuel Facility Operating Licence
U — uranium
UF_6 — uranium hexafluoride
UO_2 — uranium dioxide
UO_3 — uranium trioxide

ANNEX X, MARCH 31, 1999
WASTE MANAGEMENT LICENCES

Facility and Location (Licensee)	Treatment/ Type of Waste	Current Licence Number	Expiry Date
Radioactive Waste Operations Site 1 Bruce Nuclear Power Development Tiverton, Ontario (Ontario Hydro)	storage of old solid wastes from Ontario Hydro nuclear generating stations (no new waste)	WFOL-320-9.1	indefinite
Radioactive Waste Operations Site 2 Bruce Nuclear Power Development Tiverton, Ontario (Ontario Hydro)	incineration, compaction and storage of wastes from Ontario Hydro nuclear generating stations	WFOL-314-10	2000.05.31
Douglas Point Radioactive Waste Storage Facility Douglas Point, Ontario (Atomic Energy of Canada Limited)	storage of old solid wastes from Douglas Point Generating Station (no new waste)	WFOL-332-4.1	indefinite
Gentilly-2 Radioactive Waste Management Facility Gentilly, Quebec (Hydro-Québec)	storage of solid wastes from Gentilly-2 Nuclear Power Station and old solid wastes from Gentilly-1 Nuclear Power Station	WFOL-319-9	1999.12.31
Gentilly-1 Radioactive Waste Storage Facility Gentilly, Quebec (Atomic Energy of Canada Limited)	storage of old solid wastes from Gentilly-1 Nuclear Power Station (no new waste)	WFOL-331-4.2	indefinite
Point Lepreau Solid Radioactive Waste Management Facility Point Lepreau, New Brunswick (New Brunswick Power Corporation)	storage of solid wastes from Point Lepreau Generating Station	WFOL-318-10	2001.01.31
Pickering Used Fuel Dry Storage Facility Pickering, Ontario (Ontario Hydro)	storage of spent fuel from Pickering Nuclear Power Station	WFOL-350-2	2000.12.31
Edmonton, Alberta (University of Alberta)	incineration of low-level combustible liquid wastes and storage of aqueous and solid wastes from the University and Edmonton area	WFOL-301-11	2000.11.30
Port Granby, Ontario Newcastle, Ontario (Cameco Corporation)	storage of wastes from Cameco refinery and chemical treatment of drainage and run-off water	WFOL-338-3.2	indefinite

(continued on the next page)

WFOL — Waste Management Facility Operating Licence

ANNEX X (CONTINUED)
WASTE MANAGEMENT LICENCES

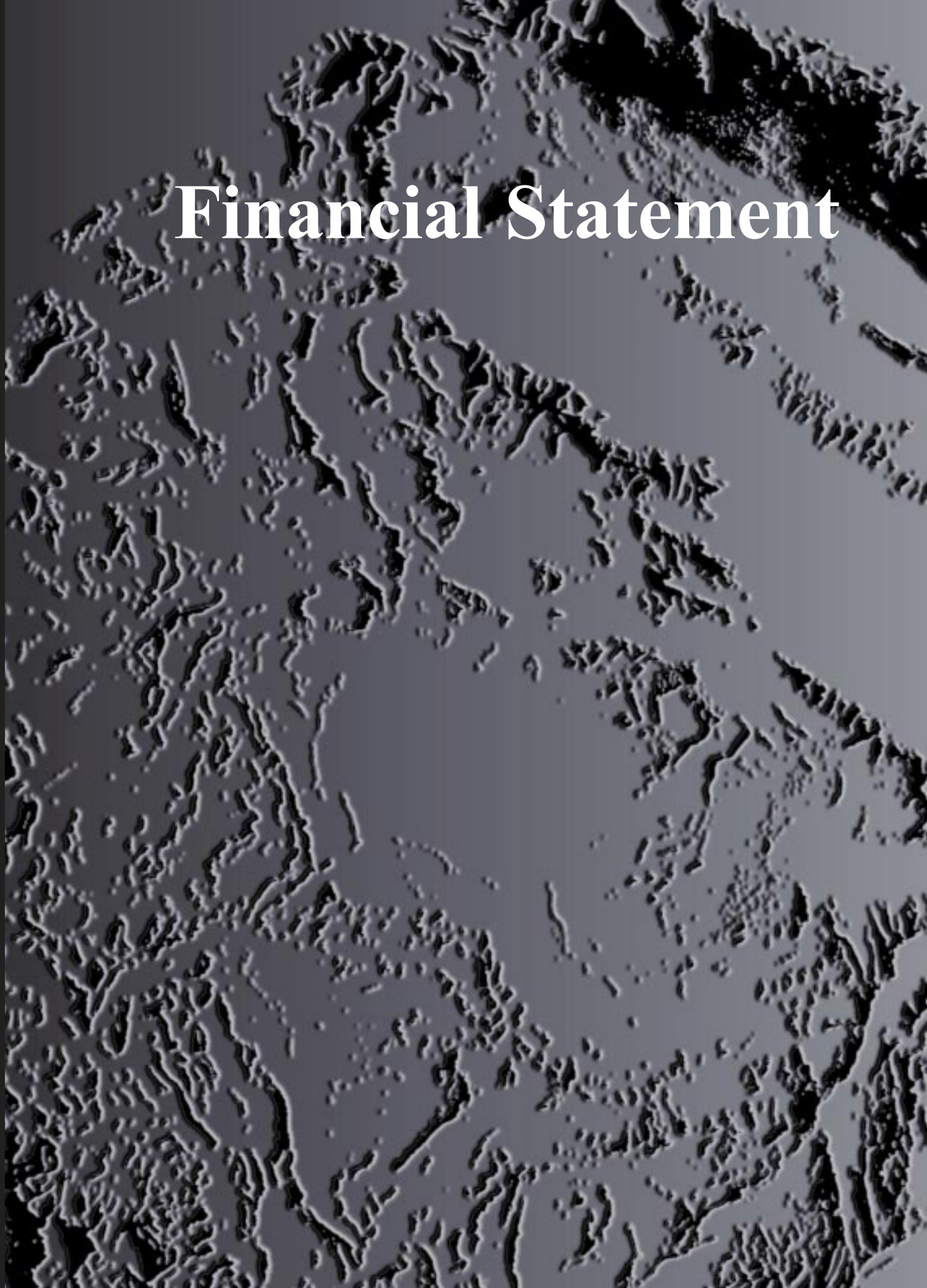
Facility and Location (Licensee)	Treatment/ Type of Waste	Current Licence Number	Expiry Date
Suffield, Alberta (Department of National Defence)	storage of old solid wastes from the Department of National Defence	WFOL-307-6.1	indefinite
Toronto, Ontario (University of Toronto)	storage and handling of wastes from the University and Toronto area	WFOL-310-12	2000.01.31
Welcome, Ontario (Cameco Corporation)	storage of old wastes from previous Cameco Port Hope operations and chemical treatment of drainage and run-off water	WFOL-339-2.2	indefinite
Bruce Nuclear Power Development, Central Maintenance Facility Tiverton, Ontario (Ontario Hydro)	handling of wastes from decontamination of equipment and tools, and general maintenance activities at BNPD	WFOL-323-8.1	1999.08.31
Mississauga, Ontario (Monserco Limited)	storage and handling of wastes from the Toronto area	WFOL-335-5	1999.12.31
Saskatoon, Saskatchewan (University of Saskatchewan)	storage and handling of wastes fromthe University and Saskatoon area	WFOL-336-5	2000.07.31
NPD Waste Management Facility Rolphton, Ontario (Atomic Energy of Canada Limited)	storage of solid wastes from the partial decommissioning program	WFOL-342-2.5	indefinite
Port Hope, Ontario (Atomic Energy of Canada Limited)	storage of wastes from the remedial program	WFOL-344-1.1	indefinite
Port Hope, Ontario (Low-Level Radioactive Waste Management Office, Pine St. Extension)	contaminated soil storage	PSL-182/99	1999.06.30
(Floating Locations) (Low-Level Radioactive Waste Management Office, decontamination projects)	decontamination of historic waste sites	PSL-202/99	1999.11.30

PSL — Prescribed Substance Licence
WFOL — Waste Management Facility Operating Licence

ANNEX XI, MARCH 31, 1999
NUCLEAR LIABILITY BASIC INSURANCE COVERAGE

Designated Nuclear Installation (Operator)	Basic Insurance
Bruce Generating Station A (Ontario Hydro)	$75,000,000
Bruce Generating Station B (Ontario Hydro)	$75,000,000
Darlington Generating Station (Ontario Hydro)	$75,000,000
Gentilly-2 Nuclear Power Station (Hydro-Québec)	$75,000,000
Pickering Generating Station A and B (Ontario Hydro)	$75,000,000
Point Lepreau Generating Station (New Brunswick Power Corporation)	$75,000,000
Port Hope Refinery (Cameco Corporation)	$4,000,000
Port Hope Fuel Fabrication Plant (Zircatec Precision Industries Incorporated)	$2,000,000
Research Reactor (McMaster University)	$1,500,000
SLOWPOKE Reactor (University of Alberta)	$500,000
SLOWPOKE Reactor (Dalhousie University)	$500,000
SLOWPOKE Reactor (École polytechnique)	$500,000
SLOWPOKE Reactor (Saskatchewan Research Council)	$500,000
SLOWPOKE Reactor (University of Toronto)	$500,000
Douglas Point Waste Storage Facility (Atomic Energy of Canada Limited)	*
Gentilly-1 Waste Storage Facility (Atomic Energy of Canada Limited)	*
Chalk River Laboratories (Atomic Energy of Canada Limited)	*
Whiteshell Research Laboratories (Atomic Energy of Canada Limited)	*
SLOWPOKE Reactor, Royal Military College (Department of National Defence)	*

* Installation excepted from carrying insurance under Section 32 of the *Nuclear Liability Act.*

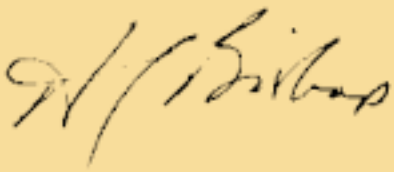

Financial Statement

MANAGEMENT REPORT

The management of the Atomic Energy Control Board is responsible for the preparation of all information included in its annual report. The financial statement has been prepared in accordance with the reporting requirements and standards established by the Receiver General for Canada for departmental corporations. The financial statement includes estimates that reflect management's best judgements. Financial information included elsewhere in the annual report is consistent with the financial statement.

Management is also responsible for developing and maintaining a system of internal control designed to provide reasonable assurance that all transactions are accurately recorded and that they comply with the relevant authorities, that the financial statement reports the Atomic Energy Control Board's results of operations and that the assets are safeguarded.

The Auditor General of Canada conducts an independent audit and expresses an opinion on the financial statement.



A.J. Bishop, M.D.
President

G.C. Jack
Director General of Corporate Services

Ottawa, Canada
June 4, 1999

AUDITOR'S REPORT

To the Atomic Energy Control Board
and the
Minister of Natural Resources Canada

I have audited the statement of operations of the Atomic Energy Control Board for the year ended March 31, 1999. This financial statement is the responsibility of the Board's management. My responsibility is to express an opinion on this financial statement based on my audit.

I conducted my audit in accordance with generally accepted auditing standards. Those standards require that I plan and perform an audit to obtain reasonable assurance whether the financial statement is free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statement. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In my opinion, this financial statement presents fairly, in all material respects, the results of operations of the Board for the year ended March 31, 1999 in accordance with the accounting policies set out in Note 2 to the financial statement.

John Wiersema, CA
Assistant Auditor General
for the Auditor General of Canada

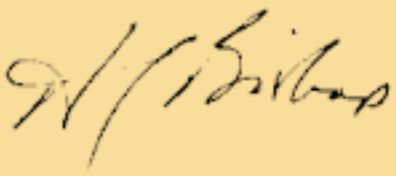
Ottawa, Canada
June 4, 1999

STATEMENT OF OPERATIONS *(FOR THE YEAR ENDED MARCH 31, 1999)*

Expenditures	**1999**	**1998**
Operations		
Salaries and employee benefits	$34,338,373	$31,170,659
Professional and special services	7,576,176	6,803,170
Accommodation	4,380,196	3,881,636
Travel and relocation	2,508,376	2,348,793
Furniture and equipment	1,683,382	1,393,285
Utilities, materials and supplies	972,054	696,850
Communication	669,088	796,509
Information	500,001	270,972
Board Members' expenses	381,064	376,628
Repairs	231,455	223,586
Equipment rentals	99,018	112,450
Miscellaneous	17,747	34,595
	53,356,930	48,109,133
Grants and contributions		
Safeguards Support Program	589,138	476,938
Other	45,000	91,381
	634,138	568,319
Total expenditures	53,991,068	48,677,452
Non-tax revenue		
Licence fees	36,486,929	33,551,979
Foreign training (Note 9)	712,506	1,700,924
Refunds of previous years' expenditure	72,644	93,928
Capital assets disposal	6,845	3,618
Design assessment for foreign sales	—	8,203
Miscellaneous	2,377	17,428
Total non-tax revenue	37,281,301	35,376,080
Net cost of operations (Note 3)	$16,709,767	$13,301,372

The accompanying notes are
an integral part of this statement.

Approved by:



A.J. Bishop, M.D.
President

G.C. Jack
Director General of Corporate Services

NOTES TO THE STATEMENT OF OPERATIONS

1. Authority, Objective and Operations

The Atomic Energy Control Board (AECB) was established in 1946, by the *Atomic Energy Control Act*. It is a departmental corporation named in Schedule II to the *Financial Administration Act* and currently reports to Parliament through the Minister of Natural Resources Canada.

The objective of the AECB is to regulate in such a manner that nuclear energy in Canada is only used with due regard to health, safety, security and the environment, and to support Canada's participation in international measures to prevent the proliferation of nuclear weapons. The AECB achieves this objective by controlling the development, application and use of nuclear energy in Canada, and by participating on behalf of Canada in international measures of control.

The AECB administers the *Nuclear Liability Act*, including designating nuclear installations and prescribing basic insurance to be carried by the operators of such nuclear installations, and the administration of supplementary insurance coverage premiums for these installations. The sum of the basic insurance and supplementary insurance totals $75 million for each designated installation (Note 10). The number of installations requiring insurance coverage is 14.

The AECB's expenditure is funded by a budgetary lapsing authority. Revenue, including licence fees, is deposited to the Consolidated Revenue Fund and is not available for use by the AECB. Employee benefits are authorized by a statutory authority.

On April 1, 1990, the AECB *Cost Recovery Fees Regulations* came into effect. The general intent of these regulations is the recovery of all operating and administration costs of the AECB's regulatory activities relating to the commercial use of nuclear energy from the users of such nuclear energy. Educational institutions, publicly funded non-profit health care institutions and federal government departments are exempt from these regulations. The AECB costs associated with exempt organizations and costs related to its international safeguards and import/export activities are to remain as a cost to the Government.

Fees for each licence type have been established based on the AECB's cost of carrying out its regulatory activities. These include the technical assessment of licence applications, compliance inspections to ensure that licensees are operating in accordance with the conditions of their licence, and the development of licence standards. Revised fees were implemented on August 21, 1996 and continue to be based on 1992/93 regulatory activities.

On March 20, 1997, the federal *Nuclear Safety and Control Act* received Royal Assent. It will replace the *Atomic Energy Control Act,* but will not come into effect until proclamation by order of the Governor in Council, which must await the development and approval of regulations to support the new statute. It is anticipated that this will be completed by late 1999. On proclamation of the new Act, the AECB will become the Canadian Nuclear Safety Commission (CNSC).

The *Nuclear Safety and Control Act* mandates the CNSC to establish and enforce national standards in the areas of health, safety and environment. It establishes a basis for implementing Canadian policy and fulfilling Canada's obligations with respect to the non-proliferation of nuclear weapons. Enactment will also provide CNSC compliance inspectors with clearer, fuller powers and will bring penalties for infractions in line with current legislative practices. The CNSC will be empowered to require financial guarantees, and order remedial action in hazardous situations. Responsible parties will be required to bear the costs of decontamination and other remedial measures. As well, the *Nuclear Safety and Control Act* provides for the recovery of costs of regulation from persons licensed under the Act.

NOTES TO THE STATEMENT OF OPERATIONS

2. Significant Accounting Policies

The Receiver General for Canada specifies the reporting requirements and standards for departmental corporations. The AECB's most significant accounting policies are as follows:

a) Expenditure recognition

i) Expenditures are recorded on an accrual basis with the exception of employee termination benefits and vacation pay which are recorded on a cash basis.

ii) Estimates of amounts for services provided without charge by Government departments are included in expenditures.

b) Revenue recognition

i) Licence fees are recorded as revenue on a straight-line basis over the life of the licence (normally one or two years), except for licence fees regarding an application for a construction approval of a nuclear reactor in which case they are recognized on a straight-line basis over the period of the work performed by the AECB.

ii) Revenue for foreign training is recognized over the period of the work performed by the AECB.

iii) Refunds of previous years' expenditure are recorded as revenue when received and are not deducted from expenditures.

c) Capital purchases

Acquisitions of capital assets are charged to operating expenditures in the year of purchase.

d) Contributions to superannuation plan

AECB employees participate in the superannuation plan administered by the Government of Canada and contribute equally with the AECB to the cost of the plan. Contributions by the AECB are charged to expenditure when disbursed.

NOTES TO THE STATEMENT OF OPERATIONS

3. Use of Parliamentary Appropriations

		1999	1998
Vote 20 — Atomic Energy Control Board		$46,163,233	$42,103,733
Less:	Frozen allotment*	(1,463,267)	(1,106,109)
	Lapsed	(1,321,987)	(1,281,304)
		43,377,979	39,716,320
Add:	Statutory contributions to employee benefit plans	5,386,000	4,107,000
Total appropriations used		48,763,979	43,823,320
Add:	Services provided without charge by other Government departments:		
	Accommodation	3,393,974	3,408,932
	Employee benefits	1,752,790	1,377,000
	Other	80,325	68,200
		5,227,089	4,854,132
Total expenditures		53,991,068	48,677,452
Less:	Non-tax revenue	(37,281,301)	(35,376,080)
Net cost of operations		$16,709,767	$13,301,372

* Funds not available for use in the year.

4. Accounts Receivable

	1999	1998
As of March 31, the amounts for accounts receivable are as follows:		
Licence fees	$1,454,730	$1,214,364
Foreign training	—	304,941
Total accounts receivable	$1,454,730	$1,519,305

5. Deferred Revenues

As of March 31, 1999, there are unearned licence fees received in the amount of $22,402,729 (1998 — $17,667,771). As of March 31, 1999 there are unearned foreign training fees received in the amount of $484,661 (1998 — nil).

NOTES TO THE STATEMENT OF OPERATIONS

6. Liabilities

	1999	1998
As of March 31, the amounts of liabilities are as follows:		
Accounts Payable and Accrued Liabilities	$4,888,874	$4,155,016
Salaries payable	543,053	1,586,571
Contractors' holdbacks	48,138	154,608
Total accounts and salaries payable	5,480,065	5,896,195
Vacation pay	2,243,165	2,152,180
Employee termination benefits	2,455,473	2,340,512
Total other liabilities	4,698,638	4,492,692
Total liabilities	$10,178,703	$10,388,887

Liabilities for vacation pay and employee termination benefits are not reflected in the statement of operations.

7. Licences Provided Free of Charge

The value of licences provided free of charge to educational institutions, publicly funded non-profit health care institutions and federal Government departments for the year ended March 31, 1999 amounted to $2,423,663 (1998 — $2,429,126).

8. Contingent Liabilities

At March 31, 1999, the AECB was defendant in two lawsuits amounting to $325,000.

One lawsuit seeks damages of $250,000 for breach of statutory duties related to radioactively contaminated soil. The plaintiffs have not taken any action in this litigation for the past several years.

The other lawsuit seeks damages of $75,000 for wrongful dismissal. The claim was dismissed by the Ontario Court of Justice on March 19, 1999 and is now under appeal.

No provision has been made in the accounts for these contingent liabilities. Any settlement resulting from the resolution of either case will be paid from the Consolidated Revenue Fund.

NOTES TO THE STATEMENT OF OPERATIONS

9. Related Party Transactions

The Corporation enters into transactions with other Government departments, agencies and Crown corporations, including Atomic Energy of Canada Limited (AECL), in the normal course of business.

AECB administers a special program for research and development in support of the safeguards program of the International Atomic Energy Agency. Atomic Energy of Canada Limited is the major contractor for this work by virtue of a contract that expired on March 31, 1999, which called for annual payments of up to $2.3 million a year. For 1999, AECB paid $237,887 (1998 — $616,252) to AECL under this program.

On behalf of AECL, the AECB continues to develop, deliver and administer regulatory services for Chinese and Korean regulatory staff over a period of five years ending March 31, 2001. In accordance with the terms of the contract, the cost of the service is recovered from AECL. For 1999, the AECB recognized revenue of $579,905 from this project (1998 — $1,070,537).

10. Nuclear Liability Reinsurance Account

Under the *Nuclear Liability Act*, all premiums paid by the operators of nuclear installations for supplementary insurance coverage are credited to a Nuclear Liability Reinsurance Account in the Consolidated Revenue Fund. Any claims against the supplementary insurance coverage are payable out of the Consolidated Revenue Fund and charged to the Account. There have been no claims against or payments out of the Account since its creation. The balance of the Account as at March 31, 1999, is $548,821 (1998 — $547,321).

The supplementary insurance coverage provided by the Government of Canada under the *Nuclear Liability Act*, as of March 31, 1999, is $590,000,000 (1998 — $590,000,000). Insurance coverage, by the Government of Canada, also includes a class of risks excluded as a liability of the principal insurers.

11. Uncertainty due to Year 2000 Issue

The Year 2000 Issue arises because many computerized systems use two digits rather than four to identify a year. Date-sensitive systems may recognize the year 2000 as 1900 or some other date, resulting in errors when information using year 2000 dates is processed. In addition, similar problems may arise in some systems which use certain dates in 1999 to represent something other than a date. The effects of the Year 2000 Issue may be experienced before, on, or after January 1, 2000, and , if not addressed, the impact on operations and financial reporting may range from minor errors to significant systems failure which could affect an entity's ability to conduct normal business operations. It is not possible to be certain that all aspects of the Year 2000 Issue affecting the AECB, including those related to the efforts of customers, suppliers, or other third parties, will be fully resolved.

REVENUE AND COST OF OPERATIONS BY ACTIVITY *(FOR THE YEAR ENDED MARCH 31, 1999)*

	1999				1998
	Revenue	Licences Provided Free of Charge	Total Value of Licences and Other Revenue	Cost of Operations	Cost of Operations
Regulatory Activities					
Nuclear reactors and heavy water plants	$25,720,905	$ —	$25,720,905	$29,058,936	$26,620,699
Research reactors	16,200	149,739	165,939	538,099	584,257
Nuclear research and test establishments	3,103,335	—	3,103,335	4,129,296	2,983,190
Uranium mines	2,162,767	—	2,162,767	3,417,106	3,111,417
Nuclear fuel facilities	872,250	—	872,250	1,125,905	806,075
Prescribed substances	92,096	5,347	97,443	187,435	79,177
Accelerators	119,420	276,935	396,355	756,047	447,169
Radioisotopes	3,319,931	1,861,221	5,181,152	9,297,772	8,433,035
Transportation	122,025	14,059	136,084	369,475	446,543
Waste management and decommissioning	930,260	114,300	1,044,560	1,774,795	1,504,575
Dosimetry	27,740	2,062	29,802	185,364	85,143
Import/export	—	—	—	497,430	443,569
	36,486,929	2,423,663	38,910,592	51,337,660	45,544,849
Non-Regulatory Activities					
Design assessment for foreign sales	—	—	—	—	5,508
Foreign training	712,506	—	712,506	849,113	1,521,663
Other	81,866	—	81,866	1,804,295	1,605,432
	794,372	—	794,372	2,653,408	3,132,603
Total	**$37,281,301**	**$2,423,663**	**$39,704,964**	**$53,991,068**	**$48,677,452**

Headquarters
Atomic Energy Control Board
280 Slater Street
P.O. Box 1046, Station B
Ottawa, Ontario
K1P 5S9

Regional Offices
Atomic Energy Control Board
220 - 4th Avenue S.E., Suite 850
Calgary, Alberta
T2G 4X3

Atomic Energy Control Board
101 - 22nd Street East, Suite 307
Saskatoon, Saskatchewan
S7K 0E1

Atomic Energy Control Board
6711 Mississauga Road, Suite 704
Mississauga, Ontario
L5N 2W3

Atomic Energy Control Board
2 Place Laval, Suite 470
Laval, Quebec
H7N 5N6

Published by Authority of
The Honourable Ralph Goodale, P.C., M.P.
Minister of Natural Resources Canada

Catalogue number CC 171-1999 E
ISBN 0-662-27965-4

AECB Catalogue number INFO-9999-1

Atomic Energy Control Board
280 Slater Street
P.O. Box 1046, Station B
Ottawa, Ontario
K1P 5S9

For information
Communications Division
Telephone: (613) 995-5894 or
1 (800) 668-5284 (in Canada)
Fax: (613) 992-2915
E-mail: info@atomcon.gc.ca
Website: www.gc.ca/aecb

Printed on recycled paper