Annual Report 1996-97

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

Canada

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Minister of Natural Resources Canada

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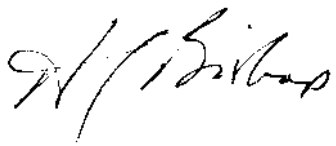
Atomic Energy Control Board | Commission de contrôle de l'énergie atomique

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, 1997. 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

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.

Evolvement of our Mission

Then and Now

The chief function of the Board is, as stated in the preamble to the 1946 Act, "to make provision for the control and supervision of the development, application and use of atomic energy, and to enable Canada to participate effectively in measures of international control of atomic energy which may hereafter be agreed upon".

— *Atomic Energy Control Act*, 1946.

Tomorrow

"The objects of the [Canadian Nuclear Safety] Commission are

(*a*) to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information in order to
  (I) prevent unreasonable risk, to the environment and to the health and safety of persons, associated with that development, production, possession or use,
  (ii) prevent unreasonable risk to national security associated with that development, production, possession or use, and
  (iii) achieve conformity with measures of control and international obligations to which Canada has agreed; and

(*b*) to disseminate objective scientific, technical and regulatory information to the public concerning the activities of the Commission and the effects, on the environment and on the health and safety of persons, of the development, production, possession and use referred to in paragraph (*a*)"

— *Nuclear Safety and Control Act*, 1997.

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President's Message

For the Atomic Energy Control Board, this Annual Report marks the end of an era and the beginning of a significant transition period. It is the second of two reports to Parliament in the interval embracing the 50th anniversary of the establishment of the Board, a very meaningful milestone for the oldest independent nuclear regulatory body in the world. The Board now enters a year of major change.

On March 20, 1997, the *Nuclear Safety and Control Act* received Royal Assent, making it a law of the land, although it won't actually come into force until proclamation, anticipated to occur by mid-1998.

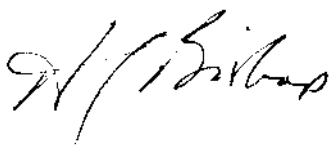
The delay is to allow for the preparation of regulations that detail how the provisions of the new Act are to be carried out. A set of 12 regulations are in development, and will be distributed for licensee and public comment early in the next reporting period.

The *Nuclear Safety and Control Act* will replace the *Atomic Energy Control Act*, which is now over 50 years old. Under the new statute, the Atomic Energy Control Board will be renamed the Canadian Nuclear Safety Commission, and its members will be referred to as Commissioners.

During the reporting period, the Board maintained its full complement of five members. On January 1, 1997, a new member was appointed to the Board, Dr. Kelvin K. Ogilvie of Summerville, N.S., President and Vice-Chancellor of Acadia University. He filled a vacancy on the Board created by the departure of Mr. William Walker of Vancouver, after eight distinguished years of service. The Nuclear Safety Commission will have two more members than the current Board.

In last year's report, I described a major undertaking to examine *inter alia* the AECB's internal management and related practices. *Project 96 and Beyond* came to a successful, on-time conclusion at the end of June 1996, with the submission to me of reports from over 20 staff-run task groups, presenting literally hundreds of key recommendations. A number of these recommendations have been implemented or the work necessary to achieve them started, e.g. the introduction of activity-based budgeting, the undertaking of reforms in the human resource area, clarification of the mandate and the establishment of corporate values and a strategic plan, the development of priority-setting and work management systems, and the review of all policy requirements as well as of relations with other agencies. Work will continue on implementing the recommendations well into the coming reporting period, and there will be organizational changes to accommodate a more business-like approach.

As the Board closes the books on its 50th year of operations, I am pleased to report that it has continued to serve Canadians well, maintaining its effectiveness in the interests of worker and public health, safety and security, and the protection of the environment.



Agnes J. Bishop, M.D.

Introduction

The 50th Anniversary of the AECB

In honour of the 50th anniversary of the AECB, this annual report contains photographs, anecdotes, and information which celebrate our history as Canada's nuclear regulator.

To distinguish them from this year's annual report information, historical elements are contained in boxes similar to this one.

This, the fiftieth annual report of the Atomic Energy Control Board (AECB), is for the year ending March 31, 1997.

Established in 1946 by the *Atomic Energy Control Act* (R.S.C., 1985, c. A-16), the AECB is a departmental corporation named in Schedule II to the *Financial Administration Act*, that 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 undue risk to health, safety, security and the environment. This is accomplished 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* (R.S.C., 1985, c. N-28), by designating nuclear installations and prescribing basic insurance to be carried by the operators of such nuclear installations.

The AECB achieves regulatory control of nuclear facilities and nuclear materials through a comprehensive licensing system. This control also extends to the import and export of nuclear items; and it involves Canadian participation in the activities of the International Atomic Energy Agency, as well as compliance with the requirements of the *Treaty on the Non-Proliferation of Nuclear Weapons* and other bilateral and multilateral agreements. The control covers both domestic and international security of nuclear materials, equipment and technology.

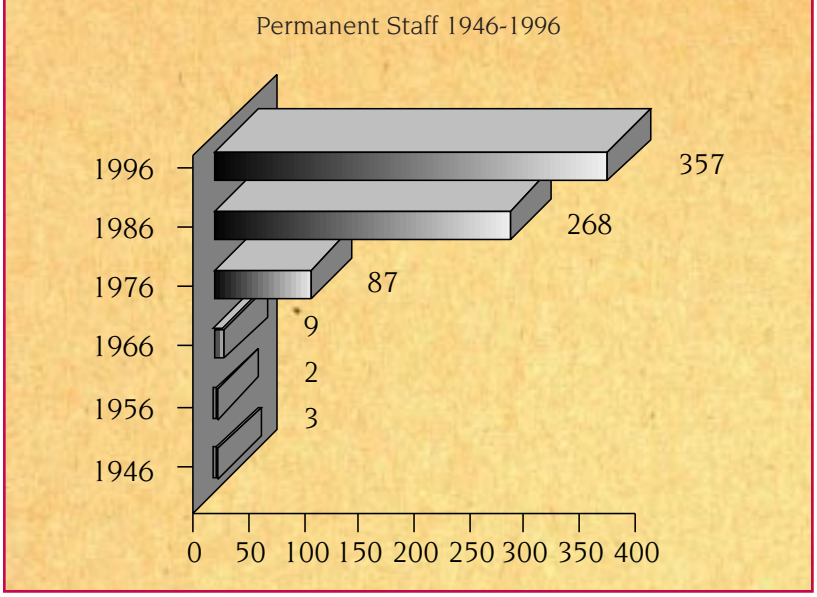
Acknowledgments

The Board acknowledges the assistance it has received from federal and provincial departments and agencies that, 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 effectiveness of the Board's regulatory role. 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.

Note to readers: Further information on AECB performance and activities may be found in Part III of the 1996-97 Estimates of the Government of Canada.

Organization

Growth of the AECB



The Board

The *Atomic Energy Control Act* establishes a five-member Board. Four members are appointed by the Governor in Council, one of whom is appointed President. The President is the Chief Executive Officer of the Atomic Energy Control Board and is the only full-time member. Another member is the President of the National Research Council, whose appointment is automatic under the *Atomic Energy Control Act*.

During the reporting period, Dr. Agnes J. Bishop was President of the Board and Dr. Arthur J. Carty was a Board member by virtue of his position as President of the National Research Council of Canada. Other Board members were Dr. Yves M. Giroux and Dr. Christopher R. Barnes. Dr. Kelvin K. Ogilvie was appointed as a Board member on January 1, 1997, succeeding Mr. William Walker who had served as a Board member for eight years. The composition of the Board is shown in Annex I.

The Board functions as a quasi-judicial decision-making body. It makes licensing decisions for major nuclear facilities and sets policy direction on matters relating to health, safety, security and environmental issues affecting the Canadian nuclear industry. The Board met nine times between April 1, 1996, and March 31, 1997. Seven meetings were held at the AECB headquarters in Ottawa, one in Saint John, New Brunswick, and one in Oshawa, Ontario.

The Staff

The AECB staff organization, shown in Annex II, comprises the President's Office, the Secretariat, the Directorate of Reactor Regulation, the Directorate of Fuel Cycle and Materials Regulation, the Directorate of Analysis and Assessment, and the Directorate of Administration.

The staff implements the policies of the Board and makes recommendations to the Board concerning the issuing of licences, and other regulatory matters.

During the reporting period, the AECB expended 396 person-years of effort in carrying out its mission. As of March 31, 1997, there were 362 permanent staff on strength: 300 in Ottawa at the AECB headquarters, and 62 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.

The functions of corporate management and corporate policy development are carried out by the Executive Committee, which consists of the President and the senior officer of each of

the five organizational units shown in Annexes I and II.

The **President**, who is the Chief Executive Officer of the AECB, directs the work of the organization. A Legal Services Unit assigned from the Department of Justice, a Medical Liaison Officer and an Official Languages Adviser report to the President.

Through the President, the Board receives advice from two advisory committees — the Advisory Committee on Radiological Protection (ACRP) and the Advisory Committee on Nuclear Safety (ACNS) — composed of independent technical experts from outside the AECB. They advise on generic issues and are not involved with licensing actions. During the reporting period, the Committees met in plenary sessions a total of nine times. In addition, Committee working groups met a total of 26 times. Annexes III and IV list the members of the two Advisory Committees.

Through the President, the Board also receives advice from the AECB's Group of Medical Advisers, composed of senior medical professionals nominated by the provinces, Atomic Energy of Canada Limited, the Department of National Defence, and Health Canada, and appointed as Medical Advisers by the Board pursuant to the *Atomic Energy Control Regulations*. During the reporting period, the Group met twice in plenary session. In addition, working groups met a total of four times on matters relating to the medical aspects of ionizing radiation. Annex V lists the Medical Advisers.

In addition, joint working groups of the Committees and the Group of Medical Advisers met a total of six times.

The **Secretariat** is responsible for the functions of Secretary of the Board, the Office of Public Information and the Advisory Committee Secretariat. It is also responsible for corporate planning, co-ordination of policy development, the regulatory process, emergency preparedness, implementation of internal audit and program evaluation plans, liaison with provincial, federal and international agencies, including the Minister's office. As well, it is responsible for administration of the *Nuclear Liability Act*, compliance with the provisions of the *Access to Information Act* and the *Privacy Act*, and compliance with the procedural aspects of the *Canadian Environmental Assessment Act*. In addition, the Secretariat is responsible for advising the Department of Foreign Affairs and International Trade on matters relating to the development and implementation of Canada's nuclear non-proliferation and nuclear export control policies, and for administering Canada's bilateral nuclear co-operation agreements; for issuing licences for the export and import of nuclear items; for implementing the agreement between Canada and the International Atomic Energy Agency for the application of safeguards in Canada; for managing the Canadian Safeguards Support Program; and ensuring compliance with the *Physical Security Regulations*. Finally, the Secretariat is responsible for the development and delivery of training programs for AECB staff and staff of foreign regulatory organizations.

The **Directorate of Reactor Regulation** is responsible for the regulation of power and research reactors, nuclear research and test establishments, and heavy water plants. It is also responsible for evaluating training programs for power reactor operations personnel and for examining the qualifications of Control Room Operators and Shift Supervisors.

The **Directorate of Fuel Cycle and Materials Regulation** is responsible for the regulation of uranium mines, mills, refineries and conversion plants, radioactive waste management facilities, particle accelerators, and the use of radioisotopes. Additional responsibilities include the analytical laboratory facilities, regulating the transport packaging of radioactive materials, and regulating the decommissioning of nuclear facilities.

The **Directorate of Analysis and Assessment** is responsible for the detailed review and assessment of the arguments submitted by licensees to demonstrate the safety of their facilities in both normal and potential accident situations, the adequacy of their quality assurance, and the protection of

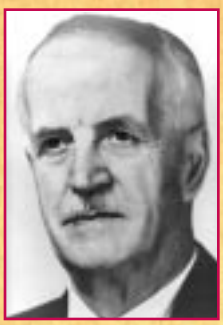
workers, the public and the environment from radiation hazards.

The **Directorate of Administration** is responsible for the management and administration of the AECB's human, information, financial and physical resources. The Directorate is also responsible for the management of projects in the mission-oriented regulatory research and support program that is designed to provide information for use in the AECB's regulatory functions.

In addition, the Directorate has responsibilities associated with official languages, departmental security, and administration of the *Conflict of Interest and Post-Employment Code*.

Presidents Over Five Decades

General A.G.L. McNaughton
President 1946-48



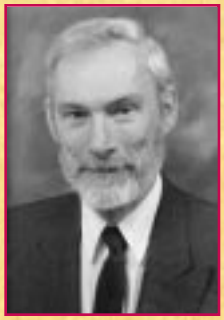
C.J. Mackenzie
President 1948-61

G.C. Laurence
President 1961-70

D.G. Hurst
President 1970-74

A.T. Prince
President 1975-78

J.H. Jennekens
President 1978-87



R.J.A. Lévesque
President 1987-93

A.J. Bishop, M.D.
President 1994-

Regulatory Control and Requirements

Original Act

10 GEORGE VI.

CHAP. 37.

An Act relating to the Development and Control of Atomic Energy.

[*Assented to* 31*st August*, 1946.]

WHEREAS it is essential in the national interest to make provision for the control and supervision of the development, application and use of atomic energy, and to enable Canada to participate effectively in measures of international control of atomic energy which may hereafter be agreed upon; THEREFORE, His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows: —

1. This Act may be cited as *The Atomic Energy Control Act*, 1946.

2. In this Act, unless the context otherwise requires,

(*a*) "atomic energy" means all energy of whatever type derived from or created by the transmutation of atoms;

(*b*) "Board" means the Atomic Energy Control Board established by section three of this Act;

New Act

45-46 ELIZABETH II

CHAPTER 9

An Act to establish the Canadian Nuclear Safety Commission and to make consequential amendments to other Acts

[*Assented to* 20*th March*, 1997]

WHEREAS it is essential in the national and international interests to regulate the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information;

AND WHEREAS it is essential in the national interest that consistent national and international standards be applied to the development, production and use of nuclear energy;

NOW THEREFORE, Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

SHORT TITLE

1. This act may be cited as the *Nuclear Safety and Control Act*.

INTERPRETATION

2. The definitions in this section apply in this Act.

"analyst" means a person designated as an analyst under section 28.

"Commission" means the Canadian Nuclear Safety Commission established by section 8.

Regulatory Control

Operators of nuclear facilities and those who use or possess nuclear materials must comply with the *Atomic Energy Control Act* and all regulations made pursuant to it.

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,
- particle accelerators,
- radioactive waste management facilities,

- prescribed substances and items, and
- 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 by licence conditions, by controlling the import and export of such materials and items in co-operation with other federal government departments according to nuclear non-proliferation and export control policies enunciated by the Canadian government, 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.

Licence applicants are required to submit comprehensive details of the design of a proposed 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 meet strict limits on the emissions that occur in 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 prepared within the AECB, such as requirements for special safety systems at nuclear power stations, or for radiation protection. Many others are set by provincial authorities, such as those for boilers and pressure vessels. Some are industry standards, such as those for seismic design.

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 concerns and responsibilities of these departments are taken into account before licences are issued by the AECB, providing that there is no conflict with the provisions of the *Atomic Energy Control Act* and its regulations.

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

In all cases, the aim of regulatory control is to ensure that health, safety, security and environmental protection requirements have been recognized and met, so that workers, the public and the environment are protected from exposure to radiation and the radioactive or toxic materials associated with the operations.

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 designed to ensure that the actual doses to the public are very much lower than the limit.

As with most nations having radiation-related activities, the *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*, (see below) the AECB is developing new radiation protection regulations that will be consistent with the ICRP recommendations of 1990. These may have a significant effect on the operations of many licensed activities, in particular uranium mines, hospitals and industrial radiography. An extensive public consultation process has been followed in the development of these regulations. This process has included a Canada-wide series of public meetings with female radiation workers, to discuss the implications of the proposed

Did you know...

- The *Atomic Energy Control Regulations* of 1947 empowered the AECB with the authority to requisiton prescribed substances and related patent rights, and expropriate mines, works or property for the production of, or research into atomic energy. This authority was removed from the Board's powers when, in 1960, the Regulations were thoroughly revised.
- Until the late 1950's the Board did not play a very active role in the regulation of health and safety standards in the nuclear industry, chosing to leave this up to the provincial governments. It was not until 1960 that a new section dealing with health and safety was incorporated into the revised *Atomic Energy Contol Regulations*. Among its most significant contributions, the new section defined an "atomic energy worker", and devised a schedule of the maximum levels of ionizing radiation to which such a worker, and the general public, could be exposed.

reduction in the dose limit for pregnant workers and to obtain their viewpoints.

In accordance with the new radiation protection regulations, licensees will have to supply all information on radiation exposures and doses to the National Dose Registry, maintained by Health Canada. The AECB will then use the National Dose Registry as a regulatory tool. AECB staff are currently working with Health Canada staff to develop the technical specifications and operational protocol.

New Legislation

On March 21, 1996, the then Minister of Natural Resources Canada, Anne McLellan, introduced in Parliament legislation to replace the 50-year-old *Atomic Energy Control Act*. Bill C-23, the *Nuclear Safety and Control Act*, received Royal Assent on March 20, 1997. It will replace current legislation with a modern statute to provide for more explicit and effective regulation of nuclear energy and will come into force when a suitable set of new regulations have been prepared.

While the existing Act encompasses both the regulatory and developmental aspects of nuclear activities, the *Nuclear Safety and Control Act* disconnects the two functions and provides a distinct identity to the regulatory agency. It will replace the Atomic Energy Control Board with the Canadian Nuclear Safety Commission, underlining its separate role from that of Atomic Energy of Canada Limited, the federal research, development and marketing organization for nuclear energy.

Since the existing Act was first adopted in 1946, the mandate of the regulatory agency has evolved from one chiefly concerned with national security to one which focuses primarily on the control of the health, safety and environmental consequences of nuclear activities. The new legislation provides the Canadian Nuclear Safety Commission with a mandate to establish and enforce national standards in these areas. It also establishes a basis for implementing Canadian policy and fulfilling Canada's obligations with respect to the non-proliferation of nuclear weapons.

It increases the number of members of the Commission from five to seven to provide a broader range of expertise, and permits them to sit in panels. The Commission will be made a court of record with powers to hear witnesses, take evidence and control its proceedings, while maintaining the flexibility to hold informal hearings. The new Act sets out a formal system for review and appeal of decisions and orders made by the Commission, designated officers and inspectors.

It also brings the enforcement powers of compliance inspectors and the penalties for infractions into line with current legislative practices.

The Commission will be empowered to require financial guarantees, to order remedial action in hazardous situations and to require responsible parties to bear the costs of decontamination and other remedial measures.

The new Act binds the Crown, both federal and provincial, and the private sector.

It provides authority for the Commission and the Governor in Council to incorporate provincial laws by reference and to delegate powers to the provinces in areas better regulated by them, or where licensees would otherwise be subject to overlapping regulatory provisions.

Finally, the new Act provides for the recovery of the costs of regulation from those licensed by the Commission.

The current *Atomic Energy Control Regulations* have not been substantially amended since 1974 and need to be updated to be consistent with the latest scientific information, to meet the regulatory standards prescribed by the federal government, and to reflect changes incorporated into the new legislation. In preparation for the possibility of new nuclear legislation being passed, the AECB began in 1994 to consider changes to its regulatory framework. At the end of the reporting period, the work on new regulations was ongoing and activity intensified upon passage of the new legislation. The AECB will consult widely with the public, interest groups,

licensees and other stakeholders on the development of new regulations prior to publication in the *Canada Gazette*. The AECB hopes to have the new legislation proclaimed and all supporting documentation, including regulations, in place and operative in 1998.

Regulatory Policies and Guides

In addition to the various regulations issued pursuant to the *Atomic Energy Control Act*, the AECB issues guidance documents in the form of Regulatory Policies and Regulatory Guides. These further define or explain what the AECB expects for specific nuclear operations. Prior to being issued formally, these documents are made public as Consultative Documents and may also be referred for review to one or both of the AECB advisory committees (Advisory Committee on Nuclear Safety and Advisory Committee on Radiological Protection). During the reporting period, the AECB undertook to review all its Regulatory Policies, Regulatory Guides and Consultative Documents, and this work is ongoing. The objective is to simplify the document structure and to ensure that legal obligations placed on licensees appear only in legislation, regulations and licences. The Standards Development Section was established to begin implementation of an improved documentation production and management system. The Consultative Document process will continue to ensure that all stakeholders have input into documentation relevant to them.

Nuclear Facilities

Bruce Nuclear Power Development

The various nuclear installations at Ontario Hydro's Bruce complex fall within the AECB's jurisdiction. This photograph shows the Bruce A Generating Station (background, start-up: 1976), the Heavy Water Plants (middle, start-up: 1974) and the Bruce B Generating Station under construction (foreground, start-up: 1984). The small domed building to the left is the Douglas Point power plant, a prototype for today's large nuclear stations, which began operating in 1966.

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

Before a licence is issued, the applicant must meet criteria established by the AECB for the siting, construction and operating stages. The AECB evaluates information provided by the applicant concerning the design and measures to be adopted to ensure that the facility will be constructed and operated in accordance with acceptable levels of health, safety, security and environmental protection.

Throughout the lifespan 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.

Power Reactors

As of March 31, 1997, there were 22 power reactors with a licence to operate: 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 VI lists power reactor licences.

A tritium removal facility is also located at the site of the Darlington reactors. This facility is designed to remove radioactive 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. During the reporting period, the facility operated at an average capacity factor of approximately 71%.

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 ensure safe construction, commissioning, operation and maintenance of the reactors, these specialists investigate any unusual events at the reactors.

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, construction, commissioning, 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, and codifies AECB regulatory requirements.

Late in the reporting period, the AECB completed its licensability review of the CANDU 9 power plant design. The final report was issued in January 1997.

Throughout the reporting period, the AECB continued its discussions with the International Thermonuclear Experimental Reactor (ITER) siting board to define Canadian siting requirements for fusion reactors. The ITER siting board will propose that the ITER council site the first experimental reactor in Canada at either the Darlington or Bruce site.

During the reporting period, 25 members of the AECB staff were assigned to the function of obtaining assurance that the nuclear generating station operations personnel are well trained and adequately competent. This assurance is obtained through training program evaluations, and written and simulator-based examinations of key operations personnel.

The move towards a new regulatory regime in this field continued during the reporting period. Evaluations of training programs were carried out for: supervisory, engineering and scientific staff; maintenance and chemical staff; field operating staff; and training for trainers. Specialized evaluations were performed of Contingency Strike Training at Ontario Hydro and as part of the Enhanced Assessment initiative at the Pickering Nuclear Division.

The evaluations of the revised science fundamentals and equipment principles training program for Ontario Hydro Control Room Operators continued. The evaluation of the revised radiation protection qualification training program at Ontario Hydro was completed, and the evaluation of the radiation protection authorization training was initiated. There were no changes for these subjects in the 1996-97 AECB regulatory examinations for Ontario Hydro. The evaluation of the radiation protection authorization training program at Gentilly-2 was completed, and the AECB radiation protection authorization examination was replaced by a utility-administered examination.

Significant effort was also directed to follow-ups of previous training program evaluations, and a study was carried out of Continuing Training at nuclear facilities worldwide.

During the reporting period, regulatory simulator-based performance testing of Shift Supervisor and Control Room Operator candidates continued, as did complementary written testing. Candidates from six of the seven nuclear generating stations were presented for these examinations, and a combined total of 19 Control Room Operators and Shift Supervisors were formally authorized to take up their duties.

Several procedures have undergone revision during the period. The most important revision was that of the procedure for training program evaluation, taking into account the experience gained since the beginning of the formal training program evaluations in 1991. The objectives and criteria used for regulatory training program evaluations have also been revised to ensure consistency in their interpretation, and they have been issued in both official languages. The revision of the procedure for simulator-based examination for Control Room Operator candidates has also been completed, taking into account the experience gained during the first two years of its implementation.

The combination of performance and written examinations for Shift Supervisors and Control Room Operators, plus the evaluation of training program activities for certain operations personnel, contributes significantly to ensuring that only highly competent people operate nuclear generating stations.

One measure of the safety of reactor operation is the radiation dose that workers receive. The health risk to workers due to radiation exposure is controlled by ensuring that no worker 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. In 1996, there were approximately 5,749 utility staff exposed to radiation at the nuclear power generating stations. Of these, no worker exceeded the current dose limits of 50 millisieverts per year and 30 millisieverts in a three-month period. Two workers exceeded 20 millisieverts in 1996. The total occupational population dose, measured as the sum of all worker doses, was 12.64 person-sieverts in 1996, for an average worker dose of 2.20 millisieverts. The collective and average worker doses in 1995 were 23.0 person-sieverts and 3.58 millisieverts respectively. These results compare favourably with experience in other countries.

A second measure of the safety of reactors is the amount of radioactive material that is discharged to the environment, resulting in radiation doses to the general public. Recent past experience has indicated that the doses to the most exposed members of the public (critical group) resulting from the routine operation of the different reactors were 0.05 millisievert or less (1% of the public dose limit). The dose to the critical group for all reactors operating in Canada for 1996 remained less than 0.05 millisievert.

Although the AECB judged that reactor operation was acceptably safe, operation was not uneventful. In the 1996 calendar year, there were 800 unusual events recorded at the operating reactors, of which 411 required a formal report to the AECB. (For each significant event, the AECB ensures that the underlying causes are understood and that necessary corrective action is taken by the operators.) The unusual events ranged from minor spills of radioactive heavy water to severe degradation in components providing safety barriers againts potential accidents at one plant.

In early 1997, Hydro-Québec notified AECB staff that, based on the results of inspections carried out in 1996, several fuel channels in Gentilly-2 were predicted to be operating under conditions where hydride blisters potentially could form in the pressure tubes. Hydride blisters form when the level of hydrogen absorbed by the pressure tubes during operation reaches a certain level. If the pressure tubes are left in service, the blisters will grow, crack, leak and eventually may cause the tube to rupture.

Since 1983, when hydride blisters caused the sudden failure of a fuel channel at Pickering, the AECB has taken the position that blister formation should be avoided in CANDU reactors. Accordingly, staff informed Hydro-Québec that continued operation under these conditions was unacceptable, and Hydro-Québec shut down Gentilly-2 on February 25, 1997. Before AECB approval to resume operation will be granted, Hydro-Québec will inspect the affected fuel channels and take corrective action.

Pressure tube life is also limited by their elongation, an effect of irradiation. To slow elongation of some pressure tubes to enable Bruce A, unit 1, to operate until the year 2000, Ontario Hydro received AECB approval to operate the unit with selected channels defuelled.

During in-service inspections of several CANDU reactors (Point Lepreau, Gentilly-2, Darlington and Bruce A), unexpected wall thinning of some outlet feeder tubes was found. The findings indicate that the rate at which wall thinning is occurring will result in a lifetime thickness reduction that is significantly higher than the allowance assumed in the original design of the feeder tubes. While there is no immediate safety concern arising from this problem, because the degradation is slow

and can be easily detected and managed, the AECB is concerned that the potential failure mechanism may be by rupture instead of by stable leaking, as originally assumed.

Although AECB staff recognizes that the conditions causing the degradation are not yet fully understood, it considers that it is important for licensees to demonstrate that they understand the processes involved and that appropriate limits are placed on the feeders' service life, if necessary. Therefore, the AECB has asked all licensees to review their inspection programs for the outlet feeders to determine the adequacy of these programs in detecting that neither the rate nor the extent of degradation goes beyond the permissible limits. Inspection programs, and a plan and schedule for determining the cause of this degradation, are to be submitted by the end of April 1997.

In early 1997, the Point Lepreau reactor was forced to shut down to repair a crack in an outlet feeder tube. Tests showed little wall thinning in the area of the crack, and thinning rates in the expected range. This is the first incident of a through-wall crack in 20,000 feeder tubes in service in CANDU reactors over the last 20 years.

Preliminary results of the laboratory analysis of the removed section of feeder tube indicate that the crack is likely to have been caused by stress corrosion. NB Power has verified by inspection that all other feeders are fit for service. AECB approval for restart was granted at the end of the reporting period.

Since 1993, Ontario Hydro has been pursuing design modifications to resolve the problems of possible fuel movement that could worsen the consequences of large loss-of-coolant accidents. Following the installation of the design modifications, the AECB approved, in late 1996, Ontario Hydro's request to raise power to 94% (previously at 90%) on all Bruce B reactors. Similar approval was given early in 1997 to raise power to 84% (previously at 75%) on all Bruce A operating reactors.

On April 21, 1996, all eight Pickering units were shut down for repairs and modification of valves in the emergency core cooling system. During shutdown, Ontario Hydro conducted an operations review to assess and carry out outstanding maintenance, and established a restart strategy. Prior to restart of each unit, AECB staff and Pickering management tour the unit to ensure it is in an acceptable state. At the end of the reporting period six of the eight units were operating. The remaining two units remain shut down for extended periods to carry out additional planned maintenance.

During 1996, an avoidable incident caused a potential for

Gentilly-2

Photo: Hydro-Québec

Hydro-Québec's Gentilly-2 station began construction in 1973, in Gentilly, PQ, near Trois-Rivières. G-2 first went critical in March of 1983, and was licensed to begin commercial operations with an output of 675 MW(e) in October of that same year.

significant radiation hazard. In May 1996, NB Power reported that prior to reactor start-up in December 1995, workers failed to replace two radiation shields which had been removed from flux detector housings during the annual outage. As a result, during reactor operation, two narrow radiation beams caused exposure to workers in the area. Assessment of radiation exposures received from this event was very difficult because of the narrowness of the beam, and the difficulty of determining workers' positions with respect to the beams. Fortunately, the area is subject to routine surveillance by International Atomic Energy Agency (IAEA) safeguards cameras. The IAEA cooperated fully in making available images from these cameras to assist in dose evaluation. NB Power's assessment, which AECB accepted, showed that the doses received did not exceed regulatory limits. Nevertheless, AECB staff judged that better control of work by NB Power could have prevented the incident.

As previously reported, the AECB has expressed concern that management and staff at the Pickering station were not giving appropriate consideration to operational safety. In mid-1995, the AECB sent a letter of warning to Ontario Hydro requiring management to demonstrate a rapid improvement in operational safety. In early 1996, following the occurrence of several more events having safety significance, the Board placed a requirement on Ontario Hydro to report, on a regular basis, on the effectiveness of actions taken to maintain a satisfactory level of safety. Although AECB staff observed that Ontario Hydro was making a concentrated effort to improve operational safety, it judged that Ontario Hydro management had not demonstrated the sustainability of their initiatives. Consequently, in December 1996, the Board renewed the operating licences for a six-month period only.

AECB staff has made similar observations of the performance of management at the Bruce B and Point Lepreau stations. In renewing the operating licence for Point Lepreau in 1996, the Board placed a requirement on NB Power to report regularly on the progress of measures to which it has committed to improve safety performance.

AECB staff is exercising extra vigilance at these three stations through routine inspections and assessment of specific programs and activities to ensure that the actions taken by management to correct the adverse trend in operational safety are effective and can be sustained.

Implementation of the results of the AECB's power reactor divisions' task analysis project will continue during 1997-98. This project, carried out during 1993-94, was a systematic and thorough examination of the duties required to be conducted by the divisions. During 1996-97, staff developed a divisional compliance program policy for incorporation into the corporate policy, and designed consistent and comprehensive compliance inspection procedures for special safety systems.

In 1997-98, the focus will be on the development of criteria for certification of AECB inspectors, the development of compliance inspection procedures for operating practice assessments, and finalization of a set of indicators that, used with other assessment results, will give an objective measure of the safety performance of Canadian nuclear power plant operators. Staff will also be involved in coordinating the Canadian report to be submitted pursuant to the international convention on nuclear safety.

Research Reactors

As of March 31, 1997, 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 5 megawatt, pool-type reactor, and the remaining one is a subcritical assembly. In addition, there is a subcritical assembly at the University of Toronto which is being decommissioned.

With the exception of the reactor at McMaster University, all of the research reactors are very low-power facilities that are

Canada's First Research Reactor

Canada's first research reactor was the National Research Experimental (NRX) reactor at Chalk River. It started-up in July of 1947, and at the time, had the highest neutron flux of any reactor in the world. On April 1, 1952, a new Crown company named Atomic Energy of Canada Limited, took over the operation of the Chalk River Project and the NRX reactor from the AECB.

inherently safe. Operations have been conducted generally in an acceptable manner.

The McMaster University reactor operated throughout the year in a satisfactory manner. The reactor was to have been shut down permanently in 1996 for decommissioning. However, in June 1996, the McMaster University Board of Governors approved continued operation. Commercial products and services compatible with research and education will be used to offset the operating costs.

Annex VII lists research reactor licences.

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 135-megawatt NRU reactor and the zero power ZED-2 reactor.

The AECB is currently assessing the safety of continued NRU operations. This reactor has been operated since 1957 and is expected to be shut down by the end of 2005.

The AECB continued to have discussions with AECL aimed at early resolution of key licensing issues for the Irradiation Research Facility (IRF) which is being designed to replace the NRU reactor.

In July 1996, AECL informed the AECB of its intention to construct a facility at Chalk River to produce radioisotopes for medical use. The facility, known as the MDS Nordion Medical Isotope Reactor Project, will consist of two 10-MW MAPLE reactors and a processing facility. It will be built and operated by AECL, but owned by MDS Nordion. The proposed facility was subjected to an environmental assessment, as required by the *Canadian Environmental Assessment Act*. The AECB will consider the environmental screening report and the public's comments on that report, in April 1997, and will make a determination on allowing licensing actions to proceed.

Annex VIII lists nuclear research and test establishment licences.

Uranium Mine Facilities

As of March 31, 1997, there were 17 facilities licensed under the *Uranium and Thorium Mining Regulations*, SOR/88-243, located in Ontario, Saskatchewan and the Northwest Territories.

A joint federal-provincial panel, set up under the *Federal Environmental Assessment and Review Process Guidelines Order*,

held a public review of the Midwest Project, the Cigar Lake Project and the McArthur River Project during September-October, 1996. The panel has issued a final report on the McArthur River Project, recommending that the project be allowed to proceed with conditions. The panel report is currently undergoing federal and provincial government review.

The panel suspended the public review of the Cigar Lake Project and Midwest Project until additional information regarding the common waste tailings disposal facility at the Cogema–McLean Lake site was made available for panel consideration.

The continuation of public hearings is expected to take place in June 1997. The AECB will continue its active participation in the upcoming public hearings.

The Cogema–McLean Lake Operation is currently in a construction and operational status, where the construction of the mill and support facilities are in the final stages while open-pit mining and stockpiling of ore continues. The AECB review of the application to contruct the JEB pit as a tailings disposal facility continues.

At Cogema's Cluff Lake Operation, the Dominique-Janine open-pit operation is near completion, while development of the new underground DP and DJU mine operations is under way.

At Cameco's Rabbit Lake Operation, underground mining at Eagle Point continues. The D-Zone open pit has been mined out, backfilled and flooded. The A-Zone open pit has been mined out and is currently being backfilled.

Rio Algom's Stanleigh Mine in Elliot Lake, Ontario, ceased all production activities on September 13, 1996. The facility is currently undergoing a general system clean-up. The company is preparing a comprehensive study of decommissioning options and proposals which will be submitted for regulatory review and action.

Previously, the AECB had referred the decommissioning of four uranium mine tailings management systems in the Elliot Lake area for public review by a panel in compliance with the *Federal Environmental Assessment and Review Process Guidelines Order*. A federal panel held hearings in late 1995 and early 1996. The panel submitted its report and recommendations in June 1996.

Dosimetry carried out for uranium mining facility workers consists of the measurement of whole body doses and exposure to radon progeny. The maximum permissible whole body annual dose limit is 50 millisieverts (mSv). The annual limit for exposure to radon progeny is 4 working level months (WLM). In 1996, whole body doses were measured for 2,900 workers and

Beaverlodge Mine

In 1953, Crown corporation Eldorado Mining and Refining Limited opened the Beaverlodge Mine in northern Saskatchewan, the first uranium mine in Canada after Port Radium, Northwest Territories.

radon progeny exposure estimates were made for 2,500 workers. One worker received more than 20 mSv whole body dose and 72 underground miners were exposed to more than 1 WLM of radon progeny. The average annual whole body dose for open-pit miners was 0.9 mSv; for mill workers 1.8 mSv; and for underground miners 4.4 mSv. The average annual exposure to radon progeny for open-pit miners was 0.07 WLM; for mill workers 0.13 WLM; and for underground miners 0.63 WLM. No mine or mill worker exceeded the maximum permissible limits.

During the next year, the AECB anticipates significant activity reviewing Cameco's applications for construction and operating licences for the McArthur River Project, and Cogema's applications to complete the construction of McClean Lake Project and to permit operation of the mill. The AECB will continue to participate in the public review process for the Cigar Lake and Midwest projects.

Annex IX lists uranium mine and mill licences and approvals.

Uranium Refining and Conversion Facilities

Uranium concentrate (yellowcake) from the mine/mill is upgraded by refining and conversion to uranium trioxide (UO_3), and subsequently into uranium dioxide (UO_2) and uranium hexafluoride (UF_6). The UO_2 is used directly in the manufacture of fuel bundles for CANDU-type reactors; the UF_6 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 yellowcake is made into UO_3 at a plant in Blind River, Ontario. In 1996, the estimated radiation dose to members of the public due to uranium emissions to the environment from that operation was approximately 0.0022 millisievert (0.044% of the public limit). The average whole body dose received by refinery workers was approximately 1.7 millisieverts (3.4% of the occupational dose limit).

The UO_3 from Blind River is shipped to Cameco's conversion facility, located in Port Hope, Ontario. There the UO_3 is converted to UO_2 for domestic reactor fuel production, and to UF_6 for export. In 1996, Cameco consolidated fluorine production into one building (at the West UF_6 plant).

In 1996, the estimated radiation dose to the most exposed member of the public resulting from the operation of the Port Hope facility was 0.23 millisievert (4.6% of the public dose limit). The average whole body dose received by the facility workers was approximately 1.9 millisieverts (3.8% of the occupational dose limit).

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. As a result, the ESEC facility has not operated since then. It is being maintained in a safe state in accordance with the requirements of the AECB operating licence. In 1996, the AECB allowed ESEC to modify the facility to process phosphoric acid without recovering the contained uranium. This will involve operating the main systems of the facility but not those related to uranium production.

Annex X lists uranium refinery and conversion facility licences.

Fuel Fabrication Facilities

The UO_2 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.

General Electric forms pellets at its plant in Toronto, Ontario, 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 0.04 millisievert (less than1% of the public limit). The average worker whole body dose at that facility was 5.07 millisieverts (10.1% 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 2.36 millisieverts (4.7% of the occupational limit).

Zircatec Precision Industries conducts all the fuel fabrication and bundle assembly operations at one plant located at Port Hope, Ontario. The estimated radiation dose to the public at the perimeter of this plant was approximately 0.13 millisievert (2.6% of the public dose limit), and the average whole body dose received by workers was approximately 2.5 millisieverts (5.0% of the occupational dose limit).

Annex X lists fuel fabrication facility licences.

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, 1997, one heavy water plant was licensed to operate at the Bruce Nuclear Power Development near Kincardine, Ontario. One construction approval has been in effect for another plant at the Bruce Nuclear Power Development since 1975; this plant, however, is only partially completed and remains in a "mothballed" condition.

Glace Bay Heavy Water Plant

Deuterium of Canada Limited built the Glace Bay Heavy Water Plant near Sydney, Nova Scotia in 1963, after winning a government contract guaranteeing the purchase of 1,000 tons of Heavy Water over a five-year period. The plant ran into several problems, including severe corrosion and process difficulties which caused the AECB to revoke its licence. The plant was shut down. After a series of major repairs, production was resumed in 1979 under the control of AECL. However, the project was eventually "mothballled".

During the reporting period, one heavy water plant employee was overcome by hydrogen sulphide. The victim was taken to hospital and returned to work the same day.

There were no hydrogen sulphide-to-air emissions or hydrogen sulphide-to-water emissions that exceeded regulatory limits.

Routine compliance inspections during the reporting period indicated satisfactory operation.

Particle Accelerators

A particle accelerator is a machine that uses electric and magnetic fields to accelerate a beam of subatomic particles and 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, operation and decommissioning.

As of December 31, 1996, there were 70 accelerator licences in effect. These authorized the construction, use or decommissioning of 98 cancer therapy machines and 19 accelerators used for non-medical purposes. In addition, four companies 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 incidents were reported to the AECB.

Note to readers: Additional information on the performance of the Canadian heavy water plant and nuclear generating stations may be found in the staff annual reports for each facility. These are available through the AECB Office of Public Information.

Radioactive Waste Management

Waste Controls Grow

- The first AECB report on radioactive waste did not appear until 1969.
- The Board approved the establishment of the Radioactive Waste Safety Advisory Committee in 1974.
- Until 1974, it was not explicitly stated that the disposal of radioactive waste was a licenced activity requiring Board authorization
- The first step of the development of the Board's regulatory policy on waste management was the publication of the *Guide for Licensing of Radioactive Waste Management Facilities*, in 1974.
- While other waste disposal sites were operating under terms of other licences, the first *Waste Facility Operating Licence* was granted to Ontario Hydro, for the Bruce Nuclear Power Development Site 2, in 1975.
- In 1978 the Board elaborated a licensing process for the operation of waste management sites. The four-phase process required Board authorization for each of the following activities: the approval of the site, construction of the facility, emplacement of the waste, and the eventual closure of the site. Each phase of the process is also subject to an environmental analysis.

Nuclear facilities (except heavy water plants) and users of prescribed substances produce radioactive waste. The AECB regulates the management of radioactive waste to ensure that it causes no hazard to the health and safety of persons, or to the environment.

The radioactive content of the waste varies with the source. Management techniques, therefore, depend on the characteristics of the waste. As of March 31, 1997, there were 20 licensed waste management facilities and activities in operation: 14 in Ontario, two in Quebec, two in Alberta and one each in Saskatchewan and New Brunswick. In addition, there were waste management facilities associated with Atomic Energy of Canada Limited's (AECL) Chalk River Laboratories in Ontario and Whiteshell Laboratories in Manitoba, and with uranium mining/milling operations.

Annex XI lists radioactive waste management licences.

Because of the construction and location 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.

In March 1996, the panel set up in accordance with the *Federal Environmental Assessment and Review Process Guidelines Order* to carry out a public review of a concept for disposal of high-level reactor wastes deep in rock formations, began public hearings. AECB staff attended the first two weeks of Phase I of the hearings covering general issues such as criteria, ethics, alternatives to deep geological disposal and transportation.

Staff took an active role in Phase II on technical issues in June and November 1996, and will play a very limited role in Phase III. The hearings are scheduled to end in March 1997 and the final report of the panel is expected in the Fall. The overall level of detail of the AECB work, however, still remains relatively low because a

facility licence is not being sought at this time. More intensive review will be required if the public review confirms the concept, and if a site is to be chosen and developed.

The fuel from the Douglas Point, Gentilly-1 and NPD 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 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 application is currently under review by AECB staff.

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

Hydro-Québec stores irradiated fuel from its Gentilly-2 Nuclear Generating Station in modular-type ("CANSTOR") concrete storage structures at the Gentilly-2 site.

Other less intensely radioactive wastes resulting from reactor operations are stored in a variety of structures in waste management facilities located at reactor sites. 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 will be used for the disposal of radioactive waste presently held in storage at the Chalk River site. The application is currently under review by AECB staff.

Refinery Waste

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

The seepage and runoff water from the 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" waste (low-level radioactive wastes that accumulated prior to AECB regulation) in the town of Port Hope, Ontario, 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 town. The activities of the Office are being monitored by the AECB and, where appropriate, licences have been issued for particular waste accumulations.

As part of its efforts with respect to historic wastes, the

federal government established a Siting Task Force with a mission to identify a community willing to accept a disposal facility built to receive the low-level radioactive waste from in and around the town of Port Hope. The AECB provided the Task Force with technical information about radioactive waste management and regulatory requirements for waste disposal. In 1995, the Siting Task Force submitted its final report and the compensation package developed by Deep River, as the community willing to accept a disposal facility.

As of March 31, 1997, the federal government and the town of Deep River are continuing with negotiations on compensation. Agreement between the town and federal government to proceed with the siting of the facility will initiate, among other things, a detailed characterization of the Deep River site and design of the disposal facility. The AECB will become involved as a regulatory body in the site characterization, review, assessment, and licensing of the disposal facility. The disposal facility, when built, will also receive the radioactive waste currently in the Port Granby Waste management Facility in the Municipality of Clarington, and in the Welcome Waste management Facility in the Township of Hope, near Port Hope. These wastes were placed directly into the ground in these facilities. Both sites are closed to receipt of further waste, and the AECB has directed that they be decommissioned. The decommissioning of these sites will be regulated by the AECB.

New Challenges

The main radioactive waste management challenges that await the AECB in 1997-98 include:

- the development of guidance documentation to help licensees and other proponents in submitting licensing applications and compliance reports to the AECB;
- the production of further documentation on AECB policies with respect to the storage of radioactive waste and decommissioning of nuclear facilities;
- the continued regulatory review of AECL's proposed Intrusion Resistant Underground Structure (IRUS) at the Chalk River Laboratories;
- the regulatory review of Ontario Hydro's proposed Used-Fuel Dry Storage Facility at the Bruce Nuclear Power Development; and
- the licensing and compliance activities surrounding the decommissioning of the uranium tailings in the Elliot Lake area.

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 Atomic Energy of Canada Limited's (AECL) research facilities at Whiteshell and Chalk River, and at AECL's demonstration/prototype power reactor sites (Douglas Point, NPD, and Gentilly-1). These reactors, and the WR-1 reactor at Whiteshell, 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 dismantlement.

AECL is continuing to submit conceptual and final decommissioning plans for components of its research facilities.

Decommissioning of the Denison Mines Limited Stanrock and Denison and the Rio Algom Limited Quirke and Panel uranium mining facilities is continuing. The panel appointed by the Canadian Environmental Assessment Agency to review the proposals by Denison and Rio Algom for decommissioning the tailings impoundments at these facilities has completed its hearings and its recommendations were issued in June 1996. The government of Canada has responded to these recommendations and they will be factored into subsequent licensing decisions by the Board. Rio Algom has announced the shutdown of its last operating uranium mining facility, Stanleigh, in the Elliot Lake region. A comprehensive study, incorporating a detailed decommissioning plan and an environmental impact assessment, is required by the *Canadian Environmental Assessment*

Act for the decommissioning of this facility. This study has been submitted to the Canadian Environnemental Assessment Agency for review by all stakeholders. The results of this review will be factored into future licensing decisions by the Board.

The AECB is continuing to bring idle uranium mine sites back under its regulatory umbrella to ensure that current decommissioning standards are applied to these sites. Rio Algom Limited has indicated that it will be submitting applications for prescribed substance licences for its idle sites in the Elliot Lake region in 1997. Indian and Northern Affairs Canada is conducting decommissioning work under AECB licence at the Rayrock idle site in the Northwest Territories. The work is expected to be completed in 1997 and performance monitoring of the decommissioned site will begin.

The University of Toronto is continuing the decommissioning of its subcritical assembly.

The U*ranium and* T*horium* M*ining* R*egulations* were amended on October 18, 1994, to require proponents and operators of uranium mining facilities to provide sureties (financial assurances) to fund decommissioning of their facilities, and to authorize the AECB to direct decommissioning of these facilities. Promulgation of these amendments followed consultation with industry, government and the public. AECB staff is implementing the new requirements.

Nuclear Materials

Birth of a Symbol

Following the recommendation of a Canadian Standards Association committee on the standardization of symbols or markers denoting the presence of radiation or radioactive materials, the Board adopted the magenta-on-yellow trefoil as its universal radiation warning symbol in 1961.

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 23 companies holding 31 Prescribed Substance Licences for uranium, thorium or heavy water. The types of activities licensed ranged from possession and storage, analysis and processing of material for research, and multiple commercial uses, e.g. radiation shielding, aircraft balance weights, calibration devices and analytical standards.

The average dose to workers for most of these operations was less than 0.5 millisievert (1% of the occupational limit). The estimated public dose was extremely low relative to the public dose limit.

Radioisotopes

Radioisotopes are used widely in research, in medicine for diagnostic and therapeutic purposes, and in industry for a variety of tasks including quality control, which uses radiography, and process control, which uses gauging techniques. Licences are required for these applications. However, 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. In cases of devices that are exempt from user-licensing, the manufacturer, distributor and importer must be licensed.

As of March 31, 1997, there were 3,761 radioisotope licences in effect. The distributions by type of user, and by province and territory, are shown in the table on the following page.

During the reporting period, 2,942 inspections of radioisotope licensees were carried out. These inspections identified 209 significant

Radioisotope Licences

Type of Users

2,205	Commercial
850	Medical
404	Governmental
302	Educational Institutions

Distribution

1,461	Ontario
966	Quebec
422	Alberta
393	British Columbia
116	Saskatchewan
110	Manitoba
104	Nova Scotia
102	New Brunswick
54	Newfoundland
16	Prince Edward Island
12	Northwest Territories
5	Yukon

violations of the *Atomic Energy Control Regulations* or licence conditions that could directly have affected radiation safety; and 729 other infractions, deficiencies in compliance with the *Atomic Energy Control Regulations* or licence conditions, that did not directly affect radiation safety. Inspectors carried out 93 investigations of unusual situations and issued 31 stop-work orders. Eight prosecutions were initiated.

During the reporting period, 65 incidents were reported to the AECB, compared to 33 last year. None of these incidents resulted in significant exposure to individuals or risk to the environment. The types of incidents are shown in the box on the following page.

During the reporting period, there were 17 cases of radiation overexposure; 12 to industrial radiographers. AECB staff is following up on this unusual increase (compared to the two reported overexposures in 1995) to determine if more stringent enforcement is required. It may be that an increase in radiography work is partially responsible. The trend in overexposures will be carefully monitored.

The requirements for calibration of survey meters and for leak testing of sealed sources were implemented in June 1996. As of March 31, 1997, over 250 submissions for recognition have been received, many of which are for in-house application. A total of 58 commercial services for leak testing and/or calibration have met AECB standards.

In order to ensure that operators of radiography exposure devices have a basic knowledge of radiation protection and safe working practices, the AECB administers an examination at various locations across the country five times a year. During the reporting period, 150 persons passed the exam from a total of 268 exams written, for a success rate of 55.9%, compared to 62% the previous year.

AECB staff participated in a major survey of the land to be returned to public use after being owned by uranium mine companies in the Elliot Lake region of Ontario.

Packaging and Transportation

In Canada, some one million packages of radioactive material are transported annually by road, rail, sea and air in support of AECB licensees and international trade. To ensure that this transport is conducted safely, the AECB regulates the transport of radioactive materials under the *Transport Packaging of Radioactive Materials Regulations*, SOR/83-740. 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 participated actively in the development of major revisions to these IAEA regulations. The 1996 version was approved by the IAEA during the year. Special efforts have been made by the AECB to contribute 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. During the reporting period, staff also provided expert consultative assistance to the IAEA on regulatory matters.

Incidents Involving Radioisotopes

Portable Gauges

11 crushed or damaged
7 stolen and later recovered
4 lost and not yet recovered
2 detached sources

Fixed Gauges

4 damaged in use
9 equipment failures
2 loss of radioactive material

Oil and Gas

7 source stuck in a well;
- 3 later retrieved,
- 3 abandoned/ cemented in, and
- 1 not yet retrieved

2 misplaced sources
5 over-exposures

Industry

12 over-exposures

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 63 certificates that included 15 special arrangement certificates, 23 endorsements of foreign certificates, 25 Canadian-origin package certificates and seven special-form certificates. As of March 31, 1997, the AECB maintained 128 valid certificates, of which 77 were for Canadian packages and 51 were for endorsements of foreign-origin packages. These certificates are in use by over 255 licensees.

A research project was conducted by the AECB to assess shipment activity in Canada to update a previous survey from 1981. On the basis of the preliminary results, it was estimated that approximately one million packages containing radioactive materials are transported each year in Canada. This estimate does not include some four million annual shipments of low-activity products such as static eliminators, smoke detectors and calibration sources.

During 1996, there were 20 incidents involving radioactive material. None of these incidents resulted in any significant increased exposure of workers or the public to radiation, nor was there significant environmental degradation. They are as follows:

- on six occasions packages were lost. Four packages were eventually recovered and two packages contained radioactive material with short half-lives, decaying away with no radiological consequences.
- on three occasions, packages were found to be improperly prepared. No significant radiological consequence was identified as a result of the non-compliance.
- on a total of 11 occasions, 30 packages were subjected to puncture, crush, drop or other impact forces as a result of handling or vehicle accidents. Seven packages were damaged. Although packages were subjected to significant forces in some of these accidents, there was no significant release of material.

Compliance efforts underwent major changes during the reporting period, through a reorganization and the establishment of new staff positions devoted to compliance. During the past year, the transportation staff and regional office inspectors conducted over 73 transport compliance actions and responded to a steady flow of requests for compliance assistance from licensees.

The legal action initiated in 1993 against a shipper because a returned package was marked empty even though it contained part of the original shipment, was resolved as the shipper pleaded guilty.

Compliance Monitoring

Development of the Laboratory

Inspectors and project officers use a variety of sensitive instruments for compliance monitoring which must be serviced and recalibrated on a regular schedule at the AECB laboratory in Ottawa.

- The Treasury Board approved the establishment of the AECB Laboratory in 1977.
- When it began operations in 1978 with a staff of four, the Lab was initially nestled into one end of the AECB Library at the headquarters building on Albert Street, in Ottawa.
- The Lab was relocated later that same year to the Pickering Building in Ottawa's east end, where it was mainly responsible for instrument calibration and repairs.
- While the Lab's object is to support the compliance monitoring of licensees, it was a victim of "non-compliance" with the law when it was robbed shortly after the relocation.
- During its first full year of operation, the Lab was charged with the supply, maintenance and calibration of the 400 radiation survey/analysis instruments which the AECB uses. It also processed some 1,500 samples stemming from inspections, which required about 5,000 measurements. An additional 1,000 read-outs were performed on thermoluminescent dosimeters.
- In October of 1989, following the ribbon-cutting by then president Dr. R.J.A. Lévesque, the Lab officially opened its new and current home in the Health Protection Building at Tunney's Pasture.

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

- inspectors are located at all nuclear power reactor sites, and in Saskatoon to more easily access the uranium mines in northern Saskatchewan;
- 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 reports and 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 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 the AECB inspectors are supplied, serviced and calibrated by this laboratory.

The laboratory also assists other federal government organizations with radiation measurements, and international organizations in the prevention of nuclear smuggling.

Regulatory Research and Support Activities

Revisiting Research

"The Board may, —
(a) undertake or cause to be undertaken researches and investigations with respect to atomic energy;"
– *Atomic Energy Control Act*, 1946.

- Between 1947 and 1976 the AECB disbursed over $35.6 million dollars in grants, mainly to Canadian Universities, for research projects relating to atomic energy.
- Mission-oriented research only surfaced at the AECB in the early 1970s. Then President Dr. D.G. Hurst, tabled a proposal in late 1971, which recommended that the AECB only consider grants for projects relating to the Board's mandate with regard to health, safety and safeguards. The Board adopted the proposition, and in the fiscal year 1972-73, the first mission-oriented research contracts were awarded for studies into nuclear power plant safety.
- In 1976, AECB funding of university research projects was handed over to the National Research Council, so that the Board could focus on mission-oriented research.
- In 1972-73, the first year of mission-oriented research, the Board awarded contracts totalling $127,200. In 1996-97, that amount had increased to $2.93 million.

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 departments or agencies, or other organizations to maximize the value obtained, and to benefit from related research needs.

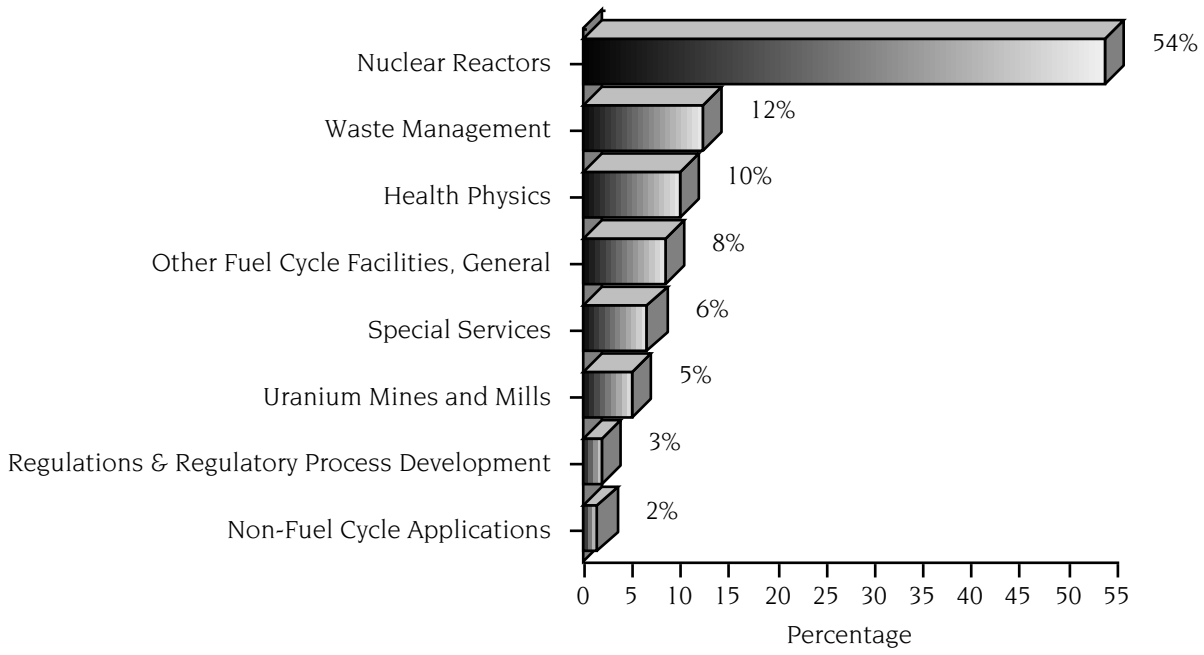
During the reporting period, the total expenditure for mission-oriented regulatory research and support contracts was $2.93 million. For program management purposes, the regulatory activities addressed in the program are categorized into mission object groups. These groupings reflect the business areas 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 13 such sub-programs and a small number of other projects outside the sub-program groups. 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. The diagram presented below gives a breakdown of program expenditure by mission object (business) areas.

Reports issued by contractors on work done in the research and support program have been made available for public information. Some of the reports have also been released as AECB INFO-series publications.

A major challenge undertaken during the reporting period was a reorganization of the manner in which the program and individual projects are managed. This change was instituted to reduce the overhead costs of the program, to simplify the approvals and implementation process, and to give clients of the program full control over the actual work done under contract. In the new process, the overall planning and management of the program is handled by the Research and Support Section.

A committee comprising five AECB directors was established to review and approve project proposals, and to make recommendations regarding program funding. Responsibility for definition of research and support contract needs, and the management of approved projects is retained by the clients of the program. Contracting and financial administration of work in the program is done by the Finance Division. The transition to the new process was initiated early in the reporting period and was completed towards the end of the period, with the preparation of a program for the 1997-98 fiscal year.

Regulatory Research and Support Program
Distribution of Funding for 1996



Non-Proliferation, Safeguards and Security

Nuclear Non-Proliferation

In support of Canada's nuclear non-proliferation policy, the AECB continued its activities to ensure 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 non-proliferation regime.

The AECB participates with the Department of Foreign Affairs and International Trade (DFAIT) in the negotiation of bilateral nuclear cooperation agreements (NCA) between Canada and its nuclear partners. During the reporting period, new NCAs with Argentina, Slovenia and Slovakia took effect, bringing the total number of such agreements currently in force to 21 (see table on this page), covering 35 countries. In addition, negotiations toward a similar NCA with Brazil were successfully concluded.

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 NCAs. Pursuant to the AECB mandate in this area, staff participated in high-level bilateral and technical consultations on matters of mutual interest with a number of Canada's nuclear partners, including Argentina, Australia, Euratom, Japan, the Republic of Korea, Romania and the USA. A new administrative arrangement was signed with China. Contacts with Brazil and Slovakia continued to be explored.

Canadian Bilateral Nuclear Co-operation Agreements

Partner	Date in Force
Argentina	July 1996
Australia	October 1959
Brazil	(signed; not yet in force)
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
Slovakia	October 1996
Slovenia	April 1996
Switzerland	June 1989
Turkey	July 1986
Ukraine	(signed; not yet in force)
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 continued to play an important role in multilateral nuclear non-proliferation fora, including the Zangger Committee and the Nuclear Suppliers Group (NSG), and their various Working Groups. An AECB staff member was elected to chair the NSG Dual-Use Consultations.

The AECB provides advice to DFAIT on those objectives, policies and procedures related to Canadian nuclear non-proliferation efforts and on matters related to verification. 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

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

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 NCAs, the *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT), International Atomic Energy Agency (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, by final destination, of quantities of Canadian natural uranium that were exported during the 1996 calendar year, subject to licences issued by the AECB, is shown in the table below. These exports total 11,222.6 tonnes.

During the reporting period, 443 export licences and 305 import licences (which included 202 transhipments) were issued or amended. The AECB facilitated, through the issuance of licences, export trade in excess of $1.7 billion, and imports, which included transhipments, in excess of $1.7 billion.

Safeguards

The AECB administers the agreement between Canada and the IAEA for the application of safeguards in Canada (IAEA: INFCIRC/164). This agreement is for the exclusive purpose of verifying that Canada's safeguards obligations under the NPT are being met. AECB staff coordinates the access and activities for IAEA inspectors who are authorized to carry out safeguards inspections at nuclear facilities in Canada. On behalf of the IAEA, the AECB arranges for the installation of safeguards equipment at these facilities. In addition, as part of its obligations, the AECB submitted to the IAEA, during the 1996 calendar year, 572 reports detailing 18,627 transactions involving nuclear material. At the end of the period, 30,843 tonnes of nuclear material were accounted for by the AECB and were subject to IAEA inspection.

Canadian Uranium Exports in 1996

Destination	Tonnes
United States	7,407.0
Japan	1,489.9
Germany	775.8
France	679.4
Republic of Korea	261.3
United Kingdom	250.0
Sweden	141.9
Belgium	114.8
Spain	102.5
Total	**11,222.6**

The AECB developed, implemented and monitored domestic policies on nuclear material reporting by licensees to ensure compliance with the *Atomic Energy Control Act*, the *Atomic Energy Control Regulations* and licence conditions in respect of Canadian nuclear facilities.

The AECB continued to be actively involved with the IAEA and its Member States in negotiations aimed at strengthening the effectiveness and improving the efficiency of the IAEA safeguards system. This undertaking, known as the IAEA's Programme 93+2, has received input from Canadian nuclear facility operators through information exchange sessions arranged by the AECB involving IAEA Secretariat representatives.

An AECB staff member was invited by the Director General of the IAEA to join the Standing Advisory Group on Safeguards Implementation (SAGSI). SAGSI provides advice to the Director General on a variety of safeguards implementation aspects, including developments under Programme 93+2, issues concerning the Safeguards Implementation Report, safeguards criteria and safeguards research and development requirements.

Canadian Safeguards Support Program

Since 1976, Canada has undertaken a safeguards research and development program to supplement the resources of the IAEA and of the AECB in resolving specific safeguards concerns. This program is delivered by the AECB through the Canadian Safeguards Support Program (CSSP). All tasks in support of the IAEA are initiated by the IAEA through a formal request and approval procedure, and are carried out under contract. CSSP staff act as an interface between the IAEA and the developers, balancing their understanding of the IAEA's needs against viable options from the developers.

The CSSP undertakes equipment development and system studies tasks as well as providing cost-free experts to the IAEA. Equipment development includes projects such as development and installation of a new generation of spent fuel bundle counters and core discharge monitors, 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 38 tasks at a cost of $2.5 million. A new generation of radiation monitoring equipment was developed, based on the industrial VXI instrumentation bus and interface standard, which the IAEA has come to accept as a standard. The heart of this equipment is the Autonomous Data Acquisition Module, which is versatile enough to accept many different detectors. The first application of this technology is a new generation of bundle counters. The second surveillance application is a powerful and affordable core discharge monitor, which can be retro-fitted into existing facilities. Field trials of both applications are currently under way; they are giving exceptionally good data. IAEA authorization for routine inspection use is expected imminently and the IAEA has ordered 30 of the new generation bundle counters.

The IAEA has purchased 67 of the Canadian-developed, Mark IV model Cerenkov Viewing Devices (CVDs). Being light, fast and non-intrusive, these units are very popular with inspectors and are widely used. However, to be able to verify older and lower burnup fuel, it was necessary to develop a system with an order of magnitude of higher sensitivity. In concert with the Swedish Support Program (SSP), experimental results proved that an advanced, high-sensitivity, digital video camera would work and would retain the basic ultraviolet light distribution verification principles of the Mark IV. This approach is improved by transcribing the picture output to a pseudo-colour image which makes the assessment somewhat quantitative as well as immediately evident to the observer. This proposal was presented to the IAEA and was very well received. The CSSP and the SSP were urged to continue to develop a prototype model for field use.

At the request of the IAEA, the CSSP developed and tested two models of a radiation-shielded surveillance camera for use in the reactor vault and fuelling machine maintenance areas of CANDU-6 facilities. The cameras give an excellent field of view and can be installed with the plant at full power. Their shielding should protect the commercially-available electronic components for a minimum of four years. This system will significantly reduce maintenance costs over existing systems. The reactor vault camera accommodates the co-installation of a core discharge monitor detector atop the camera shield. In November 1996, the CSSP assisted the IAEA with the installation of its new cameras at Wolsong Unit 2 in the Republic of Korea.

Officials of the Korean Technology Centre for Nuclear Control initiated discussion with the CSSP with a view to achieving cooperation in development of technology applicable to CANDU safeguards. Both agencies are concerned with achieving a reduction in the investment of inspection person-days by the IAEA.

Physical Security

The AECB ensures 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 10 in-depth annual security inspections at Canadian nuclear facilities to verify compliance with the *Physical Security Regulations*, SOR/83-77. Several follow-up inspections were undertaken to ensure that licensees were taking appropriate corrective action. Additionally, there were 74 Inner Area Authorizations and 17 Security Guard Notices issued pursuant to regulatory requirements.

AECB staff monitored three 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 handle adequately emergencies initiated by a security incident.

The AECB, in conjunction with 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* (IAEA: INFCIRC/274). Among other requirements, this convention sets minimum levels of physical protection for international transport of nuclear material.

AECB staff continued to participate in efforts by the IAEA and G7 nations to combat the illicit trafficking in nuclear materials and radioactive substances. The AECB serves as the official Canadian point-of-contact for the IAEA Illicit Trafficking Database.

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, AECB staff participated as cost-free experts on the first two such missions, one to Bulgaria as mission leader and one to Slovenia as a team member.

International Activities

The First IAEA Meetings

Photo: IAEA

"The Statute of the International Atomic Energy Agency came into force on the 29th of July, 1957, on ratification by 26 states including Canada, and the first meetings of the members and the Board of Governors of the Agency were held in September and October 1957", at Vienna's Konzerthaus. — *Twelfth Annual Report of the Atomic Energy Control Board of Canada*, 1957-58.

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 participates 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, which included: the finalization of an international convention on nuclear safety that came into force on October 24, 1996; the drafting of an international convention on the safety of radioactive waste and spent fuel management; preparation of inspection practices for nuclear power reactors; issues with respect to planning for nuclear emergencies; preparation and revision of safety codes and standards for nuclear facilities, and for radiation and environmental protection and training in the nuclear industry; and review of the international regulations for safe transport of radioactive materials. Additionally, staff continued to provide the IAEA with computer programming assistance for its transportation database.

During the reporting period, AECB staff provided technical assistance to the South Korean regulatory agency with respect to the Canadian-designed Wolsong reactor; to the Romanian regulatory agency concerning the Cernavoda nuclear generating station; to Indonesia in regard to regulatory expertise; and to Thailand with respect to the development of nuclear regulations.

AECB staff also took part in an international review of the Waste Isolation Pilot Plant (WIPP) in the United States. This review was done under the joint auspices of the NEA and the IAEA and was chaired by an AECB staff member.

The AECB, together with a sister agency in Sweden, co-hosted an international symposium on protection of the environment.

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 American, Argentine, British, Chinese, French, German, South Korean, Swiss, Romanian and Russian nuclear regulatory agencies. 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.

During the reporting period, AECB staff continued to meet regularly with regulators from the UK, USA and France on the use of computerized instrumentation, and control and protection systems. The participants in these meetings are now preparing a consensus report on regulatory assessment of safety-critical software.

Public Information

Public Information Then and Now

The role of the AECB with regard to public information has changed drastically since its inception in 1946. In the photo above, protesters picket the Board's offices in 1978 demanding freer access to information on nuclear safety. Today, the AECB has an active information program and regularly consults the public on regulatory matters.

In the early years, the Board's role was that of an information "gatekeeper", controling and limiting the access to information for the purposes of national security. The *Atomic Energy Control Act* of 1946 gave the Board the authority, subject to the approval of the Governor in Council, to make regualtions:

"*... for the purpose of keeping secret information respecting the production, use and application of, and research and investigations with respect to, atomic energy, as in the opinion of the Board, the public interest may require*" (*Atomic Energy Control Act*, 1946, c.37, 9(e))

Secrecy was the dominant philosophy until the first Declassification Conference involving the USA, the UK and Canada was held in 1947. With this and each subsequent conference, more information with respect to atomic energy was released to the public. The culmination occurred in 1954, when much "information relating to raw material production, reactor design and construction, health precautions and medical and biological research was declassified in time for publication" at the UN-hosted First Conference on the Peaceful Uses of Atomic Energy, which was held in Geneva in 1955.

While during the 60s and 70s the AECB began producing more papers, reports, news releases, and other materials geared to inform the public, it wasn't until March of 1985 that it decided that minutes from its Board meetings, dating back to 1946, be made public.

Information services are provided by the Office of Public Information (OPI), which responds to enquiries from the public and the news media, and issues news releases, notices and information bulletins. The OPI also publishes information about the AECB's regulatory role, responsibilities and mission-oriented research, as well as reports prepared by the Board's Advisory Committees. A full-time staff of nine is devoted to dealing with enquiries, orders for publications and other information materials, and communications initiatives.

A catalogue of publications is published annually. Anyone may have their name placed on the mailing list to receive this publication, as well as news releases, consultative documents (proposed regulations, policies and guides), the quarterly regulatory journal *Reporter*, the *Annual Report*, and Board meeting minutes and related documents.

During the reporting period, the OPI received 1,877 individual requests for documents and videos, and sent out 20,643 items in response. There were 41 new publications added to the catalogue, and 18

research reports were made available. The OPI issued 27 news releases, and dealt with over 350 news media contacts.

Three years ago, the AECB launched a new information bulletin in the Durham region of Ontario to inform the local public of the radiation exposure from the operation of the nearby Pickering and Darlington nuclear generating stations. The *Radiation Monitor* is updated and produced every three months by the AECB, and published in local newspapers.

In 1996, the five-member Board continued its practice of having meetings in communities that have a special interest in one or more nuclear facilities, visiting Saint John, New Brunswick (Point Lepreau Nuclear Generating Station), and Oshawa, Ontario (Pickering and Darlington Nuclear Generating Stations). Public interest in the Board's decision-making process has increased in recent years, and the dispatch of related documentation has become a sizable function. The OPI now handles all requests for Board meeting documentation, and maintains mailing lists for persons interested in documents on some or all of the subject matter with which the Board deals.

The OPI has also continued to expand its public notification and consultation activities related to the Board's regulatory and licensing process. Proposals for licensing actions are routinely distributed to local officials and interested groups and organizations. Through notices published in local media, the public is also given opportunities to make its views known. Any comments received are taken into consideration in the Board's decision making.

The AECB expanded its presence on the "Information Highway" by further developing its bilingual site on the World Wide Web. The Web site consists of an array of information about the Board, several AECB publications, and links to other nuclear-related Web sites. The AECB Web site is located at the following address: http://www.gc.ca/aecb.

The Office of Public Information may be reached, toll-free, by calling 1-800-668-5284. The regular phone number is (613) 995-5894, and the fax number is (613) 992-2915. Address for electronic mail on public information matters is: info@atomcon.gc.ca.

Corporate Administration

First Financial Statement of the AECB

Administration Expense, Atomic Energy Control Board, to 31 March 1947

(Vote 505, Demobilization and Reconversion Estimates, 1946-47)

Salaries	$10,186.21
Other Pay list items	25.75
Travelling Expenses	1,325.64
Printing and Stationery	685.97
Telephone, telegraph and postage	91.60
Miscellaneous	55.65
Total	**$12,370.80**

Cost Recovery

The AECB recovered 80% of its $37.5 million recoverable licensing costs through fees charged for licences and permits. In addition, costs of $4.0 million were incurred to licence 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.

All AECB funding is voted by Parliament. The funds recovered through fees are returned directly to the Consolidated Revenue Fund.

Emergency Preparedness

The AECB must be prepared for emergencies involving AECB licensed facilities, radioactive materials located outside of licensed facilities, or nuclear facilities outside of Canada that could affect the citizens or environment of Canada. In this capacity, the AECB must co-operate 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, trans-boundary (Canada/United States) or international incident. The AECB is a core member of each of the FNEP's four organizational groups (Coordination, Operations, Technical Advisory and Public Affairs), and participates in emergency planning activities with other FNEP core agencies.

One area of international co-operation is the arrangement that the AECB and the United States Nuclear Regulatory Commission have 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 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 165 separate occurrences: 53 for actual or potential incidents, 23 for simulated incidents, 25 for AECB administrative requirements and 64 for non-emergency items.

The AECB participates in simulated incidents to check its emergency response capability

and enhance its knowledge. During the reporting period, staff participated in one AECB-exclusive emergency exercise, one international exercise sponsored by the Nuclear Energy Agency of the Organization for Economic Co-operation and Development, and 23 checks of the AECB Duty Officer communications system. In addition, Board project officers, located at nuclear generating stations in Canada, participated in several licensee emergency drills at each site.

During the reporting period, the AECB continued implementation of a new emergency response plan. It is expected that full implementation should be completed by mid-1997.

Plans for fiscal year 1997-98 are to continue implementation of the new emergency response plan, increase AECB participation in drills and exercises, enhance operational effectiveness of the emergency operations centre, and work with federal and provincial agencies and licensees in improving overall nuclear emergency preparedness in Canada.

Training Centre

The AECB's Training Centre is responsible for developing and delivering training programs for AECB staff and for selected representatives of foreign regulatory organizations. These responsibilities are assigned to the Corporate Training Unit and the Foreign Training Unit, respectively.

During the reporting period, the Corporate Training Unit (CTU) delivered 159 customized training courses, resulting in 1084 person-days of training, and coordinated 156 courses from external sources. The Unit was also a major participant in training AECB staff for the Project 96 initiative, and continued the development and documentation of the Unit's operational procedures.

By coordinating courses on Activity-based Work Plans and Budgets, the CTU assisted staff in responding to initiatives resulting from Project 96 recommendations. The results of the work plans will enable the Unit to better plan and respond to the future training requirements of AECB staff. Since the forecasting of training requirements is now mandatory in advance of a fiscal year, the CTU will be able to plan training activities further ahead than in previous years.

The CTU continued its development of training materials that are available from the desktop.

In response to the new *Nuclear Safety and Control Act*, the CTU will be developing training modules on the diverse implications of the Act for the AECB. These modules will be customized for various job families. It is anticipated that much of the Unit's work in the next fiscal year will be driven by the new Act, and by the implementation of Project 96 recommendations.

During the reporting period, the Foreign Training Unit (FTU) continued to assist the Romanian regulatory body by coordinating the provision of an on-site licensing and safety compliance advisor at Romania's Cernavoda Nuclear Power Plant. The FTU also developed and delivered four major training programs for regulators from Korea, Thailand and the Slovak Republic, and participated in four scientific visits involving representatives from China, Egypt and Vietnam. Planning for further cooperation with the nuclear regulatory agencies of Russia, Ukraine and Lithuania, took place also.

In addition to other foreign training, a six-month session for an eight-person delegation from China began and was partially delivered during the reporting period. This project stemmed from a major cooperation agreement which was negotiated between the AECB and the Chinese regulatory body. The agreement provides for extensive training and expert assistance for China over the next five years, with the FTU as the lead group in the design, development and management of related activities.

In 1996-97, the FTU recovered costs from commercial contracts with foreign regulatory agencies, from two contribution agreements with the Canadian International Development Agency (CIDA), under the Canadian Nuclear Safety Initiative of the Department of Foreign Affairs and International Trade, and from commercial contracts with Canadian

industries, totalling approximately $1.25 million.

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 XII 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 policy role with respect to the Act, and in its 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.

Project 96 and Beyond

The efficient and effective discharge of the AECB regulatory mandate is clearly linked to the management framework which prevails in the organization. During the previous reporting period, the President had launched a special initiative, *Project 96 and Beyond*, an extensive internal review of the AECB 's management processes and practices, aimed at ensuring that the agency operates in an optimum fashion. The recommendations of *Project 96 and Beyond* were submitted to the President during the current reporting period. The President and Executive Committee are in the process of reviewing the recommendations. Implementation of accepted recommendations has already begun.

Environmental Assessment

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 (EA). 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 EAs. To support this objective, a Public Registry was established by the Canadian Environmental Assessment Agency to provide public access to information upon which EAs are based. The AECB has established electronic links with the Agency for the purpose of recording information in the Public Registry with respect to projects for which the AECB is required to conduct an EA. All such projects are listed in the Federal Environmental Assessment Index (FEAI), which offers the public a single point of reference, with electronic access, for all EAs conducted by federal departments and agencies.

During the reporting period, the AECB filed 19 EAs with the FEAI: 17 screenings and two comprehensive studies. Ten of these are completed and nine are ongoing. Environmental assessments begun under the *Environmental Assessment and Review Process Guidelines Order* (EARPGO), the precursor to the CEAA, are not registered in the FEAI.

The AECB, in concert with other federal departments and agencies, is working closely with the Agency to develop appropriate regulations and procedures to facilitate the application of the CEAA. The AECB is also working to harmonize its regulatory process and its obligations under the *Atomic Energy Control Act* with the requirements of the CEAA.

In 1993, the AECB referred plans for the decommissioning of four uranium mine tailings management areas in the Elliot Lake region to the Minister of the Environment for review by an independent panel under the *Environmental Assessment and Review Process Guidelines Order*. The panel submitted its report and recommendations in June 1996. The AECB, in collaboration with Natural Resources Canada, coordinated the preparation of the federal government response to the recommendations of the panel.

Near the end of the reporting period, the Joint Federal-Provincial Panel on Uranium Mining Development in Northern Saskatchewan (appointed under the *Environmental Assessment and Review Process Guidelines Order* and the *Saskatchewan Environmental Assessment Act*) submitted its report and recommendations on the McArthur River Project. The AECB, in collaboration with Natural Resources Canada, prepared the federal

government response to the panel's recommendations.

Financial Statement

The audited financial statement for the fiscal year ending March 31, 1997, is shown in Annex XIII.

The Board and Executive Committee

Annex I
March 31, 1997

Board Members

A.J. Carty
President,
National Research Council of Canada,
Ottawa, Ontario

Y.M. Giroux
Assistant to the Rector,
Université Laval,
Quebec, Quebec

A.J. Bishop
President of the Board and Chief Executive Officer of the AECB

C.R. Barnes
Director,
Centre for Earth and Ocean Research,
University of Victoria,
Victoria, British Columbia

K.K. Ogilvie
President and Vice-Chancellor,
Acadia University
Wolfville, Nova Scotia

Executive Committee

J.P. Marchildon
Director General of the Secretariat and Secretary of the Board

J.D. Harvie
Director General,
Reactor Regulation

R.M. Duncan
Director General,
Fuel Cycle and Materials Regulation

J.G. Waddington
Director General,
Analysis and Assessment

G.C. Jack
Director General,
Administration

Organization of the AECB

Annex II
March 31, 1997

President and Chief Executive Officer		**A.J. Bishop**
Advisory Committee on Radiological Protection	Chairman	A.M. Marko
Advisory Committee on Nuclear Safety	Chairman	A. Pearson
Legal Services Unit	General Counsel	L.S. Holland
Medical Liaison Officer		S. Vlahovich
Official Languages Adviser		J.P. Marchildon
Secretariat	**Director General**	**J.P. Marchildon**
Secretary of the Board		J.P. Marchildon
Office of Public Information	Chief	H.J.M. Spence
Corporate Affairs Division	Chief	P.J. Conlon
Advisory Committee Secretariat		J.P. Marchildon
Training Centre	Director	J.P. Didyk
Safeguards Division	Director	H. Stocker
Directorate of Reactor Regulation	**Director General**	**J.D. Harvie**
Power Reactor Division A	Director	B.R. Leblanc
Power Reactor Division B	Director	B.M. Ewing
Operator Certification Division	Director	R.A. Thomas
Studies and Codification Division	Director	A.M.M. Aly
Directorate of Fuel Cycle and Materials Regulation	**Director General**	**R.M. Duncan**
Uranium Facilities Division	Director	T.P. Viglasky
Wastes and Impacts Division	Director	C.M. Maloney
Materials Regulation Division	Director	M. Taylor
Standards and Services Division	Director	W.R. Brown
Directorate of Analysis and Assessment	**Director General**	**J.G. Waddington**
Safety Evaluation Division (Analysis)	Director	P.H. Wigfull
Safety Evaluation Division (Engineering)	Director	G.J.K. Asmis
Components and Quality Assurance Division	Director	R.L. Ferch
Radiation and Environmental Protection Division	Director	M.P. Measures
Directorate of Administration	**Director General**	**G.C. Jack**
Human Resources Division	Director	D. Vermette
Finance Division	Director	M. Dupéré
Information Management Section	Chief	W.D. Goodwin
Research Division	Director	H. Stocker

Advisory Committee on Radiological Protection

Annex III
March 31, 1997

Dr. A.M. Marko (Chairman)	Consultant Deep River, Ontario
Dr. D.J. Gorman (Vice-Chairman)	Director, Office of Environmental Health and Safety University of Toronto Toronto, Ontario
Dr. D.B. Chambers	SENES Consultants Ltd. Richmond Hill, Ontario
Dr. G. Dupras	Chief, Nuclear Medicine Hôtel-Dieu de Saint-Jérôme Saint-Jérôme, Quebec
Ms. K.L. Gordon	Health Sciences Centre Winnipeg, Manitoba
Dr. J.G. Hall	Professor and Head, Department of Pediatrics B.C. Children's Hospital Vancouver, British Columbia
Dr. J.R. Johnson	Chief Scientist, Health Protection Department Battelle Pacific Northwest Laboratories Richland, Washington, U.S.A.
Mrs. D.P. Meyerhof	Radiation Protection Bureau Health Canada Ottawa, Ontario
Dr. D.K. Myers	Consultant Pembroke, Ontario
Mrs. L. Normandeau	Medical Physics Department Hôpital général de Montréal Montréal, Québec
Dr. L. Renaud	Biomedical Engineering Unit Electromed International St-Eustache, Quebec
Dr. D.W.O. Rogers	National Research Council of Canada Ottawa, Ontario
Dr. J.B. Sutherland	Health Sciences Centre Winnipeg, Manitoba
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*)	Chairman, Advisory Committee on Nuclear Safety
Mr. M.W. Lupien (Scientific Secretary)	Atomic Energy Control Board

Advisory Committee on Nuclear Safety

Annex IV
March 31, 1997

Dr. A. Pearson (Chairman)	Consultant Deep River, Ontario
Dr. A. Biron (Vice-Chairman)	Associate Director Centre de recherche en calcul appliqué (CERCA) Montréal, Quebec
Dr. A.H. Boisset	Responsible for Environment Office of Technology Transfer McGill University Montréal, Quebec
Dr. A.E. Collin	Consultant Ottawa, Ontario
Dr. M. Gaudry	Professor of Economics Université de Montréal Montréal, Quebec
Dr. P.G. Mallory	Consultant Peterborough, Ontario
Dr. W.J. Megaw	Professor Emeritus York University North York, Ontario
Mr. A. Natalizio	Consultant Etobicoke, Ontario
Mr. J.A.L. Robertson	Consultant Deep River, Ontario
Dr. J.T. Rogers	Professor Emeritus of Mechanical Engineering Department of Mechanical and Aeronautical Engineering Carleton University Ottawa, Ontario
Dr. R. Sexsmith	Department of Civil Engineering University of British Columbia Vancouver, British Columbia
Dr. A.M. Marko (*ex officio*)	Chairman, Advisory Committee on Radiological Protection
Mr. R.J. Atchison (Scientific Secretary)	Atomic Energy Control Board

Medical Advisers

Annex V
March 31, 1997

Dr. O.J. Howell 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.J.B. McEwan Dr. A.W. Lees	Alberta
Dr. A.S. Belzberg Dr. J.T.W. Lim	British Columbia
*Dr. S. Vlahovich Dr. P.J. Waight	Health Canada
LCol. G. Cook Maj. R. Nowak	Department of National Defence
Dr. A.M. Marko Dr. A. Clarke	Atomic Energy of Canada Limited
Mr. M.W. Lupien (Scientific Secretary)	Atomic Energy Control Board

* AECB Medical Liaison Officer

Power Reactor Licences

Annex VI
March 31, 1997

Facility and Location (Licensee)	Type and Number of Units/Capacity	Start-Up	Current Licence Number	Current Licence Expiry Date
Pickering Generating Station A Pickering, Ontario (Ontario Hydro)	CANDU-PHW 4 × 500 MW(e)	1971	PROL 4/96	1997.06.30
Bruce Generating Station A Tiverton, Ontario (Ontario Hydro)	CANDU-PHW 4 × 750 MW(e)*	1976	PROL 7/96	1998.06.30
Pickering Generating Station B Pickering, Ontario (Ontario Hydro)	CANDU-PHW 4 × 500 MW(e)	1982	PROL 8/96	1997.06.30
Gentilly-2 Nuclear Power Station Gentilly, Quebec (Hydro-Québec)	CANDU-PHW 600 MW(e)	1982	PER 10/96	1998.10.31
Point Lepreau Generating Station Point Lepreau, New Brunswick (New Brunswick Power Corporation)	CANDU-PHW 600 MW(e)	1982	PROL 12/96	1998.10.31
Bruce Generating Station B Tiverton, Ontario (Ontario Hydro)	CANDU-PHW 4 × 840 MW(e)	1984	PROL 14/95	1997.10.31
Darlington Generating Station A Bowmanville, Ontario (Ontario Hydro)	CANDU-PHW 4 × 850 MW(e)	1989	PROL 13/96	1998.11.30

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
* PROL 7/96 requires the licensee to maintain Unit 2 in an approved shutdown state.

Research Reactor Licences

Annex VII
March 31, 1997

Licensee and Location	Type and Capacity	Start-Up	Current Licence Number	Current Licence Expiry Date
University of Toronto Toronto, Ontario	subcritical assembly	1958	RROL 6/97	1997.12.31
McMaster University Hamilton, Ontario	swimming pool 5-MW(t)	1959	RROL 1/95	1997.06.30
École polytechnique Montreal, Quebec	subcritical assembly	1974	PERR 9/95	2000.09.30
University of Toronto Toronto, Ontario	SLOWPOKE-2 20-kW(t)	1976	RROL 6A/94	1997.06.30
École polytechnique Montreal, Quebec	SLOWPOKE-2 20-kW(t)	1976	PERR 9A/94	1997.06.30
Dalhousie University Halifax, Nova Scotia	SLOWPOKE-2 20-kW(t)	1976	RROL 17/94	1997.06.30
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 20/94	1997.06.30

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

Nuclear Research and Test Establishment Licences

Annex VIII
March 31, 1997

Chalk River Laboratories (AECL)

Current Licence Number —NRTE 1/96
Expiry Date — 1998.08.31

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
Industrial Materials Processing Electron Accelerator	Electron accelerator, 10 MeV, 50 kW beam
Pulsed High-Energy Linear Accelerator Facility	Electron accelerator, 13 MeV, 4.5 kW beam
Tandem Accelerator Superconducting Cyclotron	15 MeV Tandem accelerator and superconducting cyclotron
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
Fuel Fabrication Facility, Building 429	Production of low and high enriched uranium fuel for research reactors
Heavy Water Upgrading Facility	Upgrading of activated heavy water

(continued on the next page)

Nuclear Research and Test Establishment Licences

Annex VIII Continued

Whiteshell Laboratories (AECL)

Current Licence Number —NRTE 2/96
Expiry Date — 1998.08.31

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	Proton accelerator, current less than 30 microAmps
14 MeV Neutron Generator	Shut down and mothballed
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
SLOWPOKE Demonstration Reactor	2 MW pool-type reactor. Permanently shut down, to be decommissioned
Whiteshell Irradiator	Electron beam accelerator, less than 1 kW, 9.3 MeV

Uranium Mine/Mill Facility Licences

Annex IX
March 31, 1997

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-157-3.3	indefinite
Cree Zimmer Project Saskatchewan (Uranerz Exploration and Mining Limited)	ore removal	MFRL-352-0	1997.09.31
Cigar Lake Project Saskatchewan (Cigar Lake Mining Corporation)	underground exploration	MFEL-152-4.1	1997.07.31
McArthur River Project Saskatchewan (Cameco Corporation)	underground exploration	MFEL-168-1	1997.06.30
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-143-6	1998.03.31
Key Lake Operation Saskatchewan (Cameco Corporation)	5,700,000 kg/a uranium	MFOL-164-3	1997.09.30
McClean Lake Project Saskatchewan (Cogema Resources Inc.)	construction and operation	MFOL-170-0.1	1998.03.12
Rabbit Lake Operation Saskatchewan (Cameco Corporation)	6,500,000 kg/a uranium	MFOL-162-4	1998.10.31

(continued on the next page)

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

Uranium Mine/ Mill Facility Licences

Annex IX Continued

Facility and Location (Licensee)	Licensed Activity	Current Licence Number	Current Licence Expiry Date
Stanleigh Mine Elliot Lake, Ontario (Rio Algom Limited)	shut down	MFOL-136-6.1	1998.04.30
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 Mines Elliot Lake, Ontario (Denison Mines Limited)	decommissioning	MFDL-349-0	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	indefinite
Quirke Mine Elliot Lake, Ontario (Rio Algom Limited)	decommissioning	MFDL-345-0	indefinite
Madawaska Mine Bancroft, Ontario (Madawaska Mines Limited)	decommissioning	DA-139-0	indefinite

DA — Decommissioning Approval
MFOL — Mining Facility Operating Licence
MFDL — Mining Facility Decommissioning Licence
t/a — tonne per year
t/d — tonne per day
* These two facilities are included under the same licence.

Refinery and Fuel Fabrication Plant Licences

Annex X
March 31, 1997

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-221-5	1998.12.31
General Electric Canada Incorporated Peterborough, Ontario	1,200 (fuel bundles)	FFOL-222-5	1998.12.31
Earth Sciences Extraction Company Calgary, Alberta	70 (uranium oxide)	FFOL-209-10	1998.11.30
Cameco Corporation Blind River, Ontario	18,000 (UO_3)	FFOL-224-4	1997.12.31
Cameco Corporation Port Hope, Ontario	10,000 (UF_6) 2,000 (U) — (depleted metal and alloys) 3,800 (UO_2) 1,000 (ADU)	FFOL-225-3	1997.12.31
Zircatec Precision Industries Incorporated Port Hope, Ontario	1,500 (fuel pellets and bundles)	FFOL-223-4	1997.12.31

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

Waste Management Licences

Annex XI
March 31, 1997

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	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-314-9	1998.05.31
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	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-319-8	1997.12.31
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	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-318-9	1999.01.31
Pickering Used Fuel Dry Storage Facility Pickering, Ontario (Ontario Hydro)	storage of spent fuel from Pickering Nuclear Power Station	WFOL-350-1	1998.12.31
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-301-10	1998.11.30
Port Granby, Ontario Newcastle, Ontario (Cameco Corporation)	storage of wastes from Cameco refinery and chemical treatment of drainage and run-off water	WFOL-338-3.1	indefinite

(continued on the next page)

WFOL — Waste Management Facility Operating Licence

Waste Management Licences

Annex XI
Continued

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-310-11	1998.01.31
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	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-323-7	1997.05.31
Mississauga, Ontario (Monserco Limited)	storage and handling of wastes from the Toronto area	WFOL-335-4	1997.12.31
Saskatoon, Saskatchewan (University of Saskatchewan)	storage and handling of wastes from the University and Saskatoon area	WFOL-336-4	1998.01.31
NPD Waste Management Facility Rolphton, Ontario (Atomic Energy of Canada Limited)	storage of solid wastes from the partial decommissioning program	WFOL-342-2.3	indefinite
Port Hope, Ontario (Atomic Energy of Canada Limited)	storage of wastes from the remedial program	WFOL-344-1	indefinite
Oakville, Ontario (Canatom Radioactive Waste Services)	temporary storage of radioisotope waste awaiting shipment to AECL Chalk River Laboratories	PSL-205	1997.06.30
Port Hope, Ontario (Low-Level Radioactive Waste Management Office, Pine St. Extension)	contaminated soil storage	PSL-182	1997.06.30
(Floating Locations) (Low-Level Radioactive Waste Management Office, decontamination projects)	decontamination of historic waste sites	PSL-202	1997.11.30

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

Nuclear Liability
Basic Insurance Coverage

Annex XII
March 31, 1997

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*.

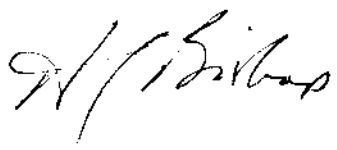
Management Report

Annex XIII

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 AECB'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 Administration

Ottawa, Canada
June 9, 1997

Auditor's Report

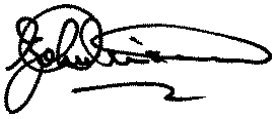
Annex XIII
Continued

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, 1997. 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, 1997, 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 9, 1997

Statement of Operations for the Year Ended March 31, 1997

Annex XIII
Continued

Expenditure	**1997**	**1996**
Operations		
Salaries and employee benefits	$30,478,634	$29,215,747
Professional and special services	7,802,528	7,439,397
Accommodation	3,693,980	3,635,055
Travel and relocation	2,840,544	2,710,598
Furniture and equipment	1,632,105	1,394,138
Utilities, materials and supplies	857,890	730,455
Communication	755,142	804,147
Information	375,513	432,712
Board Members' expenses	348,538	288,662
Repairs	189,982	186,910
Equipment rentals	114,798	108,786
Miscellaneous	34,783	27,106
	49,124,437	46,973,713
Grants and contributions		
Safeguards Support Program	502,166	497,850
Other	147,585	141,740
	649,751	639,590
	49,774,188	47,613,303
Non-tax revenue		
Licence fees	30,072,647	27,923,061
Design assessment for foreign sales	2,678,326	1,825,877
Foreign training	1,248,243	985,635
Refunds of previous years' expenditure	193,061	164,049
Capital assets disposal	4,133	18,199
Fines and penalties	2,650	4,229
Miscellaneous	14,374	1,960
	34,213,434	30,923,010
Net cost of operations (Note 3)	$15,560,754	$16,690,293

The accompanying notes are
an integral part of this statement.

Approved by:

A.J. Bishop, M.D.
President

G.C. Jack
Director General of Administration

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 ensure 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 (see 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 that will be applied under the new statute. It is anticipated that this will be completed by mid-1998. 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 enforcement powers along with penalities for infractions in line with current legislative practices. The CNSC will be a court of record with powers to hear witness, take evidence and control its proceedings. It will be empowered to require financial guarantees, to order remedial action in hazardous situations and to require responsible parties 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.

2. Significant Accounting Policies

The statement of operations has been prepared in accordance with the reporting requirements and standards established for departmental corporations by the Receiver General for Canada. The most significant accounting policies are as follows:

Notes to the Statement of Operations

a) Expenditure recognition

Expenditures are recorded on an accrual basis in the year they are charged to the Board's appropriation, with the exception of employee termination benefits and vacation pay which are recorded on a cash basis.

b) Revenue recognition

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 it is recognized over the period of the work performed by the AECB.

Revenue for foreign training and design assessment for foreign sales is recognized over the period of the work performed by the AECB.

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

c) Capital purchases

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

d) Related party transactions

The Corporation enters into transactions with other Government departments, agencies and Crown corporations in the normal course of business. Estimates of amounts for services provided without charge by Governement departments are included in expenditure and are measured at cost.

e) 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.

f) Reclassification of comparative figures

Certain 1996 comparative figures have been reclassified to conform with the presentation adopted in1997.

3. Parliamentary Appropriations	**1997**	**1996**
Vote 20 — Atomic Energy Control Board	$43,611,550	$43,194,000
Less: Frozen allotment*	41,068	2,074,699
Lapsed	2,840,369	2,031,079
	40,730,113	39,088,222
Add: Statutory contributions to employee benefit plans	3,831,000	3,411,000
Total appropriations used	44,561,113	42,499,222
Add: Services provided without charge by other Government departments:		
Accommodation	3,387,140	3,414,005
Employee benefits	1,476,000	1,424,088
Other	349,935	275,988
	5,213,075	5,114,081
	49,774,188	47,613,303
Less: Non-tax revenue	34,213,434	30,923,010
Net cost of operations	$15,560,754	$16,690,293

* Funds not available for use in the year.

Notes to the Statement of Operations

4. Accounts Receivable	1997	1996
As of March 31 the amounts for accounts receivable are as follows:		
Licence fees	$371,124	$738,323
Design assessment for foreign sales	588,921	836,867
Foreign training	230,771	481,932
	$1,190,816	$2,057,122

5. Licence Fees — Deferred Revenue

As of March 31, 1997, there are unearned licence fees received in the amount of $20,364,094 (1996 — $17,390,371).

6. Liabilities	1997	1996
As of March 31 the amounts of liabilities are as follows:		
Accounts Payable and Accrued Liabilities	$4,723,021	$4,282,540
Salaries payable	1,245,935	1,138,325
Contractors holdbacks	332,424	244,558
Total accounts and salaries payable	6,301,380	5,665,423
Vacation pay	2,017,877	1,879,595
Employee termination benefits	2,236,413	2,152,958
Total other liabilities	4,254,290	4,032,553
Total liabilities	$10,555,670	$9,697,976

The costs represented by contractors holdbacks, accounts and salaries payable are reflected in the statement of operations.

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, 1997 amounted to $2,315,150 (1996 — $2,384,663).

Notes to the Statement of Operations

8. Contingent Liabilities

At March 31, 1997, the AECB was defendant in a lawsuit amounting to $250,000. The lawsuit seeks damages 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. Therefore, no provision has been made in the accounts for this contingent liability. Any settlement resulting from the resolution of this case will be paid from the Consolidated Revenue Fund.

9. Related Party Transactions

The AECB is related to Atomic Energy of Canada Limited (AECL) by virtue of common ownership by the Government of Canada.

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 expires on March 31, 1999 which calls for annual payments of up to $2.3 million a year. For 1997, AECB paid $1,094,584 (1996 — $1,280,627) to AECL under this program.

The AECB undertook a project to conduct special safety and licensability assessments of new nuclear facility designs which AECL plan to sell on the foreign market. The cost of the review was recovered from AECL in accordance with the terms of the contract which expired in 1997. For 1997, the AECB recognized revenue of $2,678,326 (1996 — $1,825,877) from this project.

This year, the AECB commenced a new project at the request of AECL to develop, deliver and administer regulatory services for a period of five years for Chinese and Korean regulatory staff. In accordance with the terms of the contract, the cost of the service is recovered from AECL at a rate of $1,000,000 per year. For 1997, the AECB recognized revenue of $665,368 from this project.

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, 1997, is $545,821 (1996 — $544,321).

The supplementary insurance coverage provided by the Government of Canada under the *Nuclear Liability Act*, as of March 31, 1997, is $590,000,000 (1996 — $590,000,000). Insurance coverage, by the Government of Canada, also includes a class of risks excluded as a liability of the principal insurers.

Revenue and Cost of Operations by Activity for the Year Ended March 31, 1997

Annex XIII
Concluded

	1997				1996
	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	$19,891,556	$ —	$19,891,556	$24,186,903	$24,690,058
Research reactors	16,200	146,609	162,809	497,643	410,832
Nuclear research and test establishments	1,699,795	—	1,699,795	1,921,062	1,660,475
Uranium mines	3,173,615	—	3,173,615	3,182,038	3,889,506
Nuclear fuel facilities	860,086	—	860,086	926,934	905,045
Prescribed substances	24,994	40,020	65,014	139,415	233,227
Accelerators	117,341	317,435	434,776	357,185	332,564
Radioisotopes	2,821,635	1,662,156	4,483,791	7,733,322	6,724,581
Transportation	177,958	18,228	196,186	634,003	481,410
Waste management and decommissioning	1,286,355	114,052	1,400,407	1,769,416	1,630,847
Dosimetry	3,112	16,650	19,762	143,216	175,115
Import/export	—	—	—	402,340	321,939
	30,072,647	2,315,150	32,387,797	41,893,477	41,455,599
Non-Regulatory Activities					
Design assessment for foreign sales	2,678,326	—	2,678,326	4,993,927	3,353,279
Foreign training	1,248,243	—	1,248,243	1,178,405	1,082,210
Other	214,218	—	214,218	1,708,379	1,722,215
	4,140,787	—	4,140,787	7,880,711	6,157,704
Total	$34,213,434	$2,315,150	$36,528,584	$49,774,188	$47,613,303