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Nuclear Legislation in OECD Countries

**Regulatory and
Institutional Framework
for Nuclear Activities**

Canada



Canada

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I. General Regulatory Regime

1. Introduction

There are 22 (CANDU) heavy water reactors in Canada, located at five sites. In 2007, there were 18 operational reactors with a combined installed capacity of 12.6 GWe. Nuclear power provided 89.1 TWh, comprising 14.6% of Canada's total electricity supply.

All of the reactors in Canada are government owned. The government of Ontario owns Ontario Power Generation Inc. (OPG), which operates four units at Darlington, each with a total installed capacity of 3 524 MWe, and eight units at Pickering, six of which are operational, with a combined installed capacity of 3 100 MWe. OPG has placed the remaining two units in a permanent shutdown state. Two of the six operating units were refurbished prior to going back into service in 2003 and 2005, and a decision is pending with respect to refurbishing the other four units.

In 2001, OPG leased the eight units at Bruce NPP to a private sector consortium of investors called Bruce Power for 18 years with an option to renew for 25 years. By the end of 2003, Bruce Power had restarted two previously laid up units, resulting in a combined capacity of the six operating units at Bruce of over 4 700 MWe. The two remaining units are undergoing complete refurbishment and will add a further 1 500 MWe when they return to service in 2009 and 2010.

The Quebec provincial government owns Hydro Quebec, which operates one power reactor, the Gentilly-2, which has an installed capacity of 675 MWe. Hydro Quebec has announced its decision to refurbish this reactor starting in 2011. New Brunswick Power Nuclear Corporation, a subsidiary of the public utility New Brunswick Power, operates Point Lepreau GS, which has one nuclear reactor with an installed capacity of 680 MWe. Complete refurbishment of this reactor was initiated in April 2008 for return to service by the end of 2009.

There are eight research reactors in operation in Canada, two of which are located at the Chalk River Laboratories site of Atomic Energy of Canada Limited (AECL). The other six are located at various universities across the country. The National Research Universal (NRU) reactor at Chalk River produces the majority of the world's supply of critical medical isotopes that are used for diagnosis and treatment of cancer and other illnesses. This 135 MW (thermal) reactor is licensed to operate to 2011 and extensive work is underway aimed at ensuring licence renewal to 2016.

Canada does not reprocess any of its commercial spent fuel. High-level nuclear waste is stored initially underwater in engineered fuel bays for up to ten years and subsequently in concrete canisters in above ground engineered dry storage facilities, all within the boundary of each reactor site. Low-level waste from the reactors in Ontario is stored at a central facility at the Bruce NPP site. Wastes from small producers are transported to and stored at AECL's Chalk River laboratories. Low-level radioactive waste is compacted into steel containers that are stored in an above ground storage facility. Other waste materials are packaged and stored in concrete bunkers.

The Canadian uranium mining output amounts to 22% of world production, more than any other nation. The principal mines in Canada are located at McArthur/Key Lake, McClean Lake and Rabbit Lake, which produced a combined 9 465 tons of uranium in 2007.

Since 31 May 2000, Canada's *Nuclear Safety and Control Act*¹ (hereinafter referred to as "the act") has been in force. This comprehensive legislation replaced the *Atomic Energy Control Act*,

¹ S.C. 1997, c. 9 (S.C. = Statutes of Canada).

first adopted in 1946, as the means by which the Canadian nuclear industry is regulated and by which Canada complies with its international commitments with respect to the peaceful uses of nuclear energy. The act establishes the Canadian Nuclear Safety Commission (hereinafter referred to as “the Commission” or CNSC) and clearly distinguishes the regulatory role of the Commission from that of the federal research, development and marketing organisation known as Atomic Energy of Canada Limited (AECL). The act is binding upon the Crown, both federal and provincial, and upon the private sector.

Under the act, the Commission’s mandate is to regulate

- the development, production and use of nuclear energy;
- the production, possession and use of nuclear substances, prescribed equipment and prescribed information in order to prevent unreasonable risk to the environment, to the health and safety of persons and to national security; and
- to achieve conformity with Canada’s international commitments regarding nuclear non-proliferation, safeguards and security.

Equally, it is charged with providing objective scientific, technical and regulatory information to the public concerning its own activities and concerning the effects of the nuclear industry on health, safety and the environment (Section 9). The Commission has extensive authority to make regulations respecting a broad range of activities involving nuclear energy or nuclear materials in Canada, including the import, export and transportation of nuclear materials and other prescribed substances, nuclear equipment and nuclear technology (Section 44).

a) Licensing system

The principal regulatory mechanism used by the Commission is a licensing system. Section 26 of the Act prohibits almost every activity associated with nuclear substances, prescribed equipment, prescribed information and nuclear facilities, except in accordance with a licence issued by the Commission. The Commission is also empowered to issue, renew, suspend, amend, revoke or replace a licence (*Nuclear Safety and Control Act*, Section 24). In Canada, there are close to 3 000 licences respecting activities in the areas of power and research reactors, uranium mines and mills, accelerators, waste management facilities, nuclear medicine, packaging and transport of radioactive materials, industrial gauges and research involving radioisotopes.

Under the Act, the Commission may issue a licence only if it is satisfied of two requirements: (i) that the applicant is qualified to carry on the activity that the licence will authorise; and (ii) that the applicant will, in carrying on the activity to be licensed, make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. In issuing a licence, the Commission may impose any term or condition it considers necessary for the purposes of the act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission [Subsections 24(4) and (5)].

Under its power to make regulations as it considers necessary for carrying out its objects and for the purposes of the act [Subsection 44(1)], the Commission has made specific regulations establishing regulatory requirements that are applicable to various substantive areas, including nuclear facilities, uranium mines and mills, packaging and transport of nuclear substances, radiation protection, nuclear security and the like. There are also regulations made by the Commission setting out the regulatory fees that are applicable to its activities and licensing work

(*CNSC Cost Recovery Fees Regulations*)² and *CNSC Rules of Procedure*³ which govern proceedings before the Commission.

There are general requirements for applications in respect of almost all types of licences issued under the act, and those requirements are found in Section 3 of the *General Nuclear Safety and Control (GNSC) Regulations*.⁴ Where they apply, the GNSC Regulations are in addition to the specific regulations applicable to the particular kind of activity sought to be licensed. An applicant for a licence must, for example, provide information on proposed measures for complying with radiation protection and nuclear security regulatory requirements, and for properly managing and disposing of any radioactive waste. An applicant must also submit information on its organisational management structure to the extent that such structure may affect its compliance with the act and any regulations made thereunder. Additional information requirements are imposed upon an applicant seeking authorisation to abandon a nuclear substance or facility, prescribed equipment or information. Other requirements are applicable in respect of an application for the renewal, amendment, revocation or replacement of a licence (Sections 4 to 6).

The GNSC Regulations also impose a number of general obligations on all licensees, such as taking all reasonable precautions to protect the environment, to maintain security, to protect the health and safety of persons, and to control the release of radioactive nuclear substances or hazardous substances into the environment. Licensees are equally obliged to train and instruct their workers properly and to ensure that they observe all required safety and health procedures, to implement measures for alerting the licensee to acts of sabotage and to take all necessary measures to facilitate Canada's compliance with safeguards agreements (Section 12). Obligations are also specifically imposed by the regulations upon workers, to ensure that they, too, comply with and respect the measures and precautions implemented by the licensee for whom they work (Section 17).

There are extensive reporting requirements imposed upon all licensees (Sections 27 *et seq.*), including the obligation to file both preliminary and full reports with the Commission of any potentially dangerous situation, such as unauthorised releases of radioactive nuclear substances, excessive exposure of persons to radiation, a breach of security or attempted act of sabotage, any component or system failure which could have serious adverse effects on the environment or is likely to constitute a serious risk to the health and safety of persons or the maintenance of security and any situation which could interfere with or interrupt the operation of safeguards equipment including theft, loss, sabotage, damage, illegal use, possession or removal of safeguards equipment or samples.

In Canada's federal system, the federal government has legislative jurisdiction over works and undertakings relating to the development, production or use of nuclear energy, nuclear substances, prescribed equipment and information (Section 71), while the provinces have specific legislative powers that may also touch upon certain nuclear activities. In order to minimise the possibility of overlapping or duplicative regulation by both the federal and provincial governments, the act empowers the Commission to establish administrative arrangements with departments or agencies of provincial governments [paragraph 21(a)] with a view to complementary regulation. The act also recognises the possibility of incorporating provincial laws or instruments into federal regulations [Subsection 44(6)], with a structure for making sure the administration of such regulations would not be duplicative [Subsections 44(8) and (9)]. The Commission also co-chairs the Federal-Provincial-Territorial Radiation Protection Committee that provides a national forum on radiation protection issues and develops standards and practices to protect people from radiation exposure.

2. SOR /2003-212; SOR = Statutory Orders and Regulations.

3. SOR/2000-211.

4. SOR/2000-202.

The Canadian Nuclear Safety Commission Cost Recovery Fees Regulations (SOR/2003-212) implement the Commission's authority under Section 44 of the act to prescribe fees that may be charged for the provision of information, products and services by the Commission and for licences or a class of licence. The regulations apply to most licence applications although publicly funded health care and educational institutions and federal departments and agencies are exempt from the requirement to pay fees.

b) Offences, compliance and enforcement

Regulatory offences are created in Sections 48 to 50 of the act. It is an offence to alter, except as permitted by the regulations or a licence, or to misuse, anything whose purpose is to protect the environment or the health or safety of persons from any risk associated with the development, production or use of nuclear energy or from any risk associated with the possession or use of a nuclear substance, prescribed equipment or prescribed information. It is equally an offence to alter or misuse anything whose purpose is to maintain national security or implement international obligations to which Canada has agreed, at a nuclear facility or place where nuclear substances are located. There are, in addition, many other offences, including failing to comply with the act, the regulations made thereunder or a licence condition, unauthorised disclosure of prescribed information, failure to comply with an order of the Commission and falsifying records required to be kept under the act.

The Commission is empowered under the act (Section 29) to designate trained inspectors who are authorised to inspect nuclear facilities and places where nuclear substances, prescribed equipment or prescribed information may be kept, for the purpose of verifying compliance with the act, any regulation, order, or decision made under the act, or any licence condition. Amongst others, inspectors are empowered to order a licensee to take any measures considered necessary to protect the environment or the health or safety of persons or to maintain national security or compliance with Canada's international obligations (Section 35). Nuclear power plant licensees have co-located inspectors from the Commission working full-time on site at their facilities.

In addition, the Commission has the authority to nominate and empower designated officers to perform a variety of duties, including certification of prescribed equipment, issuing, renewing, suspending, amending, revoking or replacing certain classes of licence, making any remedial action order that an inspector may take and confirming, amending, revoking or replacing any order made by an inspector (Section 37). In most cases, orders by inspectors or designated officers must be made in accordance with prescribed rules of procedure (Section 38) and it is an offence under the act to fail to comply with an order of a designated officer or an inspector [paragraph 48(e)].

Failures to comply with the act, the regulations, a licence or an order may result in regulatory action, including warnings, orders by inspectors, designated officers or the Commission, licence suspension or other necessary regulatory action, and possible prosecution in the case of the commission of an offence under the act, if applicable and the public interest would thereby be served. With regard to regulatory offences under the act, most are "hybrid" offences, punishable either on summary conviction by fines ranging up to 500 000 Canadian dollars (CAD) or imprisonment for up to 18 months or both, or as indictable offences by fines up to CAD 1 000 000 or imprisonment for up to five years or both [Subsection 51(3)]. A convicted offender may also be required by the court to pay compensation to any person who has suffered loss of, or damage to property as a result of the offence, or may be subjected to additional fines (Sections 61, 62). For unauthorised possession of a nuclear substance, prescribed equipment or prescribed information that is capable of being used to produce a nuclear weapon or a nuclear explosive device, the punishment is imprisonment for up to ten years [Sections 50 and 51(2)]. For all offences except the last, the defence of having exercised due diligence to prevent its commission is available to the accused (Section 51.1).

c) Regulatory documents

The Commission's legal framework includes, in addition to its legally enforceable instruments such as acts, regulations, licences and orders, non-binding regulatory documents that may be used to support and provide further information and guidance to the regulated community on these instruments. Regulatory documents can be a means of informing applicants of the Commission's regulatory expectations. During the development of regulatory documents, the Commission engages in extensive consultation on all aspects of the document with all those who may be affected by it.

d) Other relevant legislation

Certain activities that are regulated by the Commission also require an environmental assessment under the *Canadian Environmental Assessment (CEA) Act* (S.C. 1992, c.37). This act requires, subject to specific exclusions (Section 7), that an environmental assessment be carried out with regard to projects in respect of which a federal government authority is the proponent, provides land or funding, or issues a permit or licence to enable the project to be carried out (Section 5). It is in respect of this latter exercise of authority that the Commission is a federal authority under the CEA Act. The assessment identifies whether the project is likely to cause significant adverse environmental effects, and an "environmental effect" is defined as any change that a project may cause to land, water, air, living organisms or to the natural system in which these components interact. If potential adverse environmental effects can be identified before they occur, then decision-makers can modify the project or impose mitigation measures, so as to mitigate or eliminate such effects.

Under both the CEA Act and the Commission licensing process, the public is given ample opportunity to participate. The Commission maintains up-to-date information on all of its current environmental assessments and the Canadian Environmental Assessment Agency, which is established under the CEA Act (Section 61), maintains a public registry of all environmental assessments conducted by Canadian government departments and agencies, including the Commission (Section 55). When a licence is issued, after an environmental assessment, the Commission also monitors the environmental performance and compliance of the licensee to ensure that its activities are consistent with the act, the regulations and applicable licence conditions. As noted, one of the statutory purposes of the Nuclear Safety and Control Act is to limit the risks to the environment arising from the development, production and use of nuclear energy.

Another relevant statute is the *Transportation of Dangerous Goods Act 1992* (S.C. 1992, c. 34) and the *Transportation of Dangerous Goods Regulations* (SOR/2001-286). These regulations establish classes of dangerous goods, an identification list of common dangerous goods and the safety requirements for identification, packaging and shipment of these dangerous goods in a manner similar to the United Nations Recommendations on the Transport of Dangerous Goods. For radioactive material, the act and regulations refer to the *Nuclear Safety and Control Act* and the *Packaging and Transport of Nuclear Substances Regulations* (SOR/2000-208) for the specifics of health and safety protection requirements for packaging and transport. For international air and sea transport, the *Transportation of Dangerous Goods Regulations* refer to the appropriate international regulations of the International Civil Aviation Organisation (ICAO) and the International Maritime Organisation (IMO).

Another important Canadian statute passed by the Canadian Parliament in 1970 is the *Nuclear Liability Act*.⁵ This legislation addresses the issue of civil liability for damage suffered by third parties as a result of nuclear incidents at defined nuclear installations. The act is based upon the same principles that form the basis of international conventions in this field, even though Canada is not party to any such conventions. In October 2007, a bill entitled "an Act respecting civil liability and compensation for damage in case of a nuclear incident" (Bill C-5) was introduced to replace the *Nuclear Liability Act* with legislation that would bring Canada's nuclear civil liability

5. R.S.C. 1985, c.N-28; R.S.C. = Revised Statutes of Canada.

regime up to international standards. The bill made it as far as Third Reading Debate Stage in the House of Commons before the dissolution of parliament on 7 September 2008. Some of the features of the proposed legislation included increased liability of nuclear operators (CAD 650 million versus the CAD 75 million under the Nuclear Liability Act), a mechanism for periodic updating of the operator's liability, a longer limitation period for submitting compensation claims for bodily injury (30 years versus the current 10 years), clarification of a number of key concepts and definitions and greater definition of compensation procedures. It remains to be seen whether a similar bill will be introduced during the current parliamentary session.

At the international level, Canada is a party to the 1994 Convention on Nuclear Safety, ratified on 12 December 1995. It also ratified the 1986 Convention on Early Notification of a Nuclear Accident on 18 January 1990.

Certain nuclear activities in Canada are now also regulated by the *Regulations Implementing the United Nations Resolution on the Democratic People's Republic of Korea* and the *Regulations Implementing United Nations Resolutions on Iran*. These regulations were made under the *United Nations Act*, the instrument that allows Canada to fulfil its international obligation to give effect to binding decisions in United Nations Security Council (UNSC) resolutions. The UNSC has, since 2006, adopted several resolutions calling upon member states to implement certain economic measures against the DPRK and Iran (DPRK: UNSCR 1718; Iran: UNSCRs 1737, 1747 and 1803). Included in the measures are export and import bans on proliferation-sensitive goods, prohibitions on providing technical or financial assistance relating to these goods as well as assets freezes and travel bans against designated individuals and entities involved in proliferation activities. The Department of Foreign Affairs and International Trade is responsible for the regulations made pursuant to the *United Nations Act*.

2. Mining regime

Canada's constitutional arrangements result in a division of jurisdiction between the federal and the provincial governments in relation to uranium mining and milling activities. While the federal government has jurisdiction to legislate works or undertakings in relation to all nuclear substances, including uranium, the provincial governments have authority over the exploitation of mineral resources (including uranium) in the province. In order to avoid regulation by both levels of government or confusion about jurisdictional separation of powers, the *Nuclear Safety and Control Act* authorises the incorporation by reference of provincial laws or regulations into the regulations of the CNSC [Subsection 44(6)] and authorises the Commission to enter into arrangements with provincial jurisdictions that may provide for an integrated regulatory regime in respect of specific activities [paragraph 21(1)(a)].

In November 2000, the Commission and the Ministers of Saskatchewan Environment and Resource Management and Saskatchewan Labour signed a memorandum of understanding under which the Commission and the provincial regulators agreed to collaborate in the development and implementation of a harmonised regulatory regime for uranium mines and mills in Saskatchewan. Saskatchewan remains the only province in which there are currently operating uranium mines and mills.

Under the act, and subject to the regulations, no person may possess, mine, produce or refine a nuclear substance except in accordance with a licence. The term "nuclear substance" is defined in Section 2 of the act to include "uranium", although the CNSC Regulations exempt from the application of the act and its regulations "naturally occurring nuclear substances, other than those that are or have been associated with the development, production or use of nuclear energy" (Section 10). This results in the activities relating to natural uranium requiring a licence only once they involve the nuclear industry, such as mining. Under its statutory authority to make regulations "respecting the mining, production, refinement ... of a nuclear substance" [paragraph 44(1)(b)], the Commission has made the *Uranium Mines and Mills Regulations* (SOR/2000-206) which impose

comprehensive application requirements upon anyone who wishes to prepare a site for, construct, operate, decommission or abandon a uranium mine or mill. The regulations do not apply in respect of uranium prospecting or surface exploration activities [Subsection 2(2)].

Under the regulations, a licence application must be accompanied by detailed information on the activity to be licensed, the plan and description of the facility, associated environmental and waste management measures, health and safety concerns and security measures (Sections 3 and 5-8). In addition, a licence applicant (other than an applicant for a licence to abandon) must provide a proposed code of practice that describes the measures and procedures which the applicant will take where a specific dose of radiation or other parameter is reached, possibly indicating a loss of control of part of a licensee's radiation protection programme or environmental protection programme, and triggering a requirement for a specific action to be taken (Section 4).

In addition to setting out licence application requirements, the regulations impose a number of specific obligations upon licensees in respect of uranium mines or mills, with respect to operating procedures, worker training programmes, maintenance of ventilation systems, use of respirators, gamma radiation dose rate notices, and maintenance and availability of records required to be kept in respect of the licensed activity (Sections 9 to 16).

3. Nuclear substances and radiation devices

Under the *Nuclear Safety and Control Act*, the Commission is authorised to make regulations respecting, *inter alia*, the conversion, enrichment, processing, reprocessing, possession, import, export, use, management, storage, disposal and abandonment of nuclear substances [paragraph 44(1)(b)]. Pursuant to that authority, the Commission has made the *Nuclear Substances and Radiation Devices Regulations* (SOR/2000-207), supplementing the GNSC Regulations, and applying to all nuclear substances, sealed sources and radiation devices not already covered by other regulations. In April 2008, the Commission amended these regulations, to correct minor drafting errors, to update, in accordance with international levels, "exemption quantities", which are threshold values below which regulatory control is not required, and to introduce clearance levels and activity concentration limits in accordance with international standards.

A "nuclear substance" is broadly defined in the act as: deuterium, thorium, uranium, an element with an atomic number greater than 92 or any derivative or compound of any of them, a radioactive nuclide, a substance prescribed by regulation as being capable of releasing nuclear energy or as being required for the production or use of nuclear energy, a radioactive by-product of the development, production or use of nuclear energy; and a radioactive substance or thing that was used for the development or production, or in connection with the use, of nuclear energy [*Nuclear Safety and Control Act*, Subsection 2(2)]. A "radiation device" is defined in the regulations as a device that contains more than the exemption quantity of a nuclear substance and that enables the nuclear substance to be used for its radiation properties, as well as a device that contains a radium luminous compound (Section 1). The regulations also contain criteria for consumer products such as smoke detectors and safety signs using tritium, such that if the products meet the criteria, possession and use of them does not require a licence. Given their broad application, these regulations apply to almost every licensee.

In general, the regulations reflect international practice, with some minor variations based upon Canadian policy and circumstances. Licence applicants must provide very detailed information concerning the substance or device in respect of which a licence is sought, including information on the methods, procedures and equipment to be used to carry on the licensed activity, to be used during or following an accident to monitor nuclear substance releases, to detect and record radiation dose rates and quantities and to limit the spread of radioactive contamination within and from the site. Information is also required on the methods, procedures and equipment used to calibrate radiation survey meters and dosimeters and to conduct leak tests and surveys as well as

on equipment and system inspection programmes, instructions for dealing with accidents, worker training programmes and a number of other safety related matters [Section 3(1)].

Activities that are exempt from the requirement to be licensed are set out in Sections 5 to 8.1 of the regulations. Generally, they include activities involving a nuclear substance which does not exceed its exemption quantity, conditional or unconditional clearance level, as those terms are defined in the regulations or where the quantity is considered to be an acceptable function of that exemption factor (Section 5). In addition, exempted activities extend, under specified conditions and circumstances, to smoke detectors containing a nuclear substance (Section 6), tritium-activated self-luminous safety signs (Section 7), other devices containing a radium luminous compound (Section 8) and, in certain circumstances, check sources which contain a radioactive nuclear substance (Section 8.1).

Many of the regulations' provisions deal specifically with radiation protection in the context of industrial radiography, imposing obligations with respect to the training and certification of exposure device operators, their training and supervision, and required procedures to be followed in their operation of devices (Sections 24 to 35). The regulations also impose detailed obligations on licensees and operators in respect of the use or possession of radiography equipment including dose limits applicable to workers and non-workers, the levels of maintenance and security to be observed in relation to the equipment, procedures to be followed by anyone operating the equipment, and measurement and recording of radiation doses received by anyone who has operated the equipment. They also provide for the certification of radiation devices (Sections 11 to 15) and impose general obligations upon licensees with respect to the safe and proper use of nuclear substances and radiation devices by workers or others who might come into contact with such substances and devices (Sections 16 to 23).

Every licensee is required to keep and retain detailed records of nuclear substances in its possession or which it received, disposed of or abandoned, of workers who handled nuclear substances and the training they received, and of inspections and servicing performed by the licensee [Section 36(1)]. Additional record-keeping is required of licensees who service radiation devices [Subsection 36(1.1)]. Similarly detailed record-keeping requirements are imposed on licensees of exposure devices (Section 37). Finally, licensees who become aware of potentially dangerous situations, such as where an exposure device or sealed source assembly is lost, are required to make both preliminary and full reports to the Commission concerning the circumstances of the situation and what corrective or remedial measures the licensee has taken or proposes to take (Section 38).

4. Nuclear facilities

Under the *Nuclear Safety and Control Act*, the definition of nuclear facility includes a reactor, a particle accelerator, uranium mines, mills or processing plants, waste management facilities and, according to their quantity of nuclear substances, plants that possess, process or use nuclear substances (Section 2). Since licensing criteria vary significantly for these various facilities, they are treated separately in regulations. There are two sets of regulations dealing specifically with nuclear facilities, the *Class I Nuclear Facilities Regulations* (SOR/2000-204), which apply to power reactors, high-energy accelerators and uranium processing and waste facilities, and the *Class II Nuclear Facilities and Prescribed Equipment Regulations* (SOR/2000-205) covering such facilities and equipment as low-energy particle accelerators, irradiators and radiation therapy installations because of the lower risk these types of facilities represent.

The act requires that a licence be obtained in order to prepare a site for a nuclear facility, to construct, to operate, to decommission and to abandon the facility [*Nuclear Safety and Control Act*, paragraph 26(e)]. The *Class I Nuclear Facilities Regulations* set out the licence application requirements for each of these stages of licensing in respect of Class I facilities (*Class I Nuclear Facilities Regulations*, Sections 4 to 8). These include (i) the general requirements provided for in

Sections 3 and 4 of the GNSC Regulations; (ii) more specific requirements such as providing a site description and plan, quality assurance programme, proposed worker health and safety policies, environmental protection policies and decommissioning plans; and finally (iii) the precise requirements relevant to each particular activity to be authorised.

The *Class I Nuclear Facilities Regulations* impose some separate requirements regarding facilities that are defined in the regulations as “Class 1A nuclear facilities”, as distinct from “Class 1B nuclear facilities” (see definitions, Section 1). Nuclear reactors are Class 1A facilities, while the processing plants and waste facilities are Class 1B facilities. In respect of all Class 1A facilities, the regulations set out the procedure and requirements for certification of specific personnel for positions referred to in a licence such as senior control room staff of nuclear power reactors. The certification, examination and decertification processes are set out in the regulations (Sections 9 to 13).

The *Class II Nuclear Facilities and Prescribed Equipment Regulations* apply to facilities and equipment comprising irradiators, radioactive source teletherapy machines and lower-energy particle accelerators, and prescribe the licence application requirements and other obligations in respect of these facilities and equipment, including a licence to service such equipment. Class II equipment must be certified either by the Commission or a designated officer authorised under the act, or be used in accordance with a licence authorising its use for development purposes (Section 10). The process for certification is set out in the regulations (Section 11). In addition, the Class II Regulations set out specific radiation protection requirements for both Class II facilities (Sections 15 to 17) and prescribed equipment (Sections 18 to 20) to ensure personal safety of both the user of the facility or equipment and the recipient of the radiation dose administered.

In April 2008, the Class II Regulations were amended by the Commission (SOR/2008-119) to introduce new requirements for brachytherapy remote afterloaders (used in the treatment of certain types of cancers, Section 16.1), and to improve the definitions of Class II nuclear facilities, prescribed equipment and servicing, for additional clarity. Safety requirements relating to the operation of facilities and equipment were also improved and streamlined.

Under both the Class I and Class II regulations, extensive record keeping requirements are imposed on licensees. For Class I facilities, these relate primarily to the results of effluent and environmental monitoring programmes, operating and maintenance procedures, the nature and amount of radiation, nuclear substances and hazardous substances within the facility, the status of each worker’s qualifications and training and special reports in respect of the decommissioning of the facility (Section 14). For Class II facilities and equipment, records shall be kept of, amongst others, radiation surveys, radiation output from equipment, employee training, the transfer of equipment and sealed source leak test results (Section 21).

5. Trade in nuclear materials and equipment

The import or export of prescribed equipment, prescribed information or a nuclear substance is prohibited except in accordance with a licence (*Nuclear Safety and Control Act*, Section 26). The Commission is authorised to issue licences for those activities (Section 24). In addition, the Commission is authorised to make regulations respecting the import and export of nuclear substances, prescribed equipment and prescribed information (Section 44). That authority has resulted in the *Nuclear Non-proliferation Import and Export Control Regulations* (SOR/2000-210) which apply to the import and export of controlled nuclear substances, controlled nuclear equipment and controlled nuclear information (Section 2). These include nuclear-related dual-use items. These regulations provide regulatory controls on the import and export of controlled nuclear substances, equipment and information in order to ensure that Canada’s nuclear non-proliferation policy and international export control commitments are fulfilled.

Controlled nuclear substances are listed in the schedule to the regulations as including in Part A certain categories of special fissionable material, source material, deuterium and heavy water, nuclear grade graphite and tritium. Controlled nuclear equipment is shown in the same schedule to include nuclear reactors, plants for the reprocessing of irradiated fuel elements, plants for the fabrication of nuclear reactor fuel elements, plants for the separation of isotopes of uranium, plants for the production or concentration of heavy water, deuterium and deuterium compounds, plants for the conversion of uranium and certain equipment especially designed or prepared for such reactors and plants together with parts for such reactors and plants. "Controlled nuclear information" is defined to include technical data of any kind and in any form, other than data available to the public, respecting any item listed as a controlled nuclear substance or controlled nuclear equipment. Part B of the schedule includes nuclear-related dual-use items.

Applicants for a licence to import or export any controlled substance, equipment or information must submit an application containing specific information such as its origin, its description, its supplier and final consignee, its intended end-use and its intended end-use location (Section 3). In general, the regulations increase the number of items for which import licences are required so that Canada will be in a better position to implement its international obligations with respect to the control of nuclear equipment. However, in practice, Canada imports relatively little of this equipment. Certain activities are exempt from licensing, such as the import of a controlled nuclear substance that is classified as a dual-use item and that is not a radioactive nuclide, or the import of controlled nuclear equipment that is classified as parts or a nuclear-related dual-use item (Section 4).

Currently, the Commission is in the process of amending these regulations, in order to update the provisions in light of advances in nuclear and nuclear-related technology and changing proliferation threats, as also reflected in the evolution since 2000 of the multilateral guidelines for nuclear and nuclear-related dual-use exports developed by the Nuclear Suppliers Group, which inform the regulations. The proposed changes to the regulations have been pre-published for consultation and are anticipated to be finalised in 2009.

a) Exports

Canada is a Party to the *Treaty on the Non-Proliferation of Nuclear Weapons*. Canada's exports of uranium, heavy water and nuclear equipment and technology for nuclear fuel cycle use are subject to Canada's nuclear non-proliferation policy (see Section 8 "Non-Proliferation and Nuclear Security", *infra*).

Canada exports uranium, heavy water, nuclear reactor and other fuel cycle equipment and technology for nuclear power use. Canada also exports radioisotopes, deuterium and uranium for agricultural, medical and industrial use. In addition to the *Nuclear Safety and Control Act* and the *Nuclear Non-proliferation Import and Export Control Regulations*, Canada's nuclear export activities are governed by the *Export and Import Permits Act* (R.S.C. 1985, c. E-19). That act permits the Governor in Council to establish an *Export Control List*, wherein goods and technology may be listed which the Governor in Council deems necessary to control, for a number of purposes, as outlined in Section 3 of the act, including:

- Where the item is considered to fall into the category of arms, ammunition, implements or munitions of war, or is capable of being converted therein, and is "...otherwise having a strategic nature or value, (to ensure that said article) will not be made available to any destination where their use might be detrimental to the security of Canada" [Section 3(1)(a)].
- To implement an intergovernmental arrangement or commitment [Section 3(1)(d)].
- To ensure that there is an adequate supply and distribution of the item in Canada for defence or other needs. [Section 3(1)(e)].

Anyone wishing to export or transfer an item on the *Export Control List* must apply to the Minister of Foreign Affairs for an export permit, which may contain specific terms and conditions (Section 7). Administrative arrangements ensure that terms and conditions described in the export permit issued under the *Export and Import Permits Act* do not duplicate conditions imposed on the licence issued by the Commission.

b) Other imports

The possession, sale and importation of certain categories of equipment emitting radiation, but not intended for the production of nuclear energy within the meaning of the *Nuclear Safety and Control Act*, are governed by the *Radiation Emitting Devices Act*⁶ (REDA). The Minister of Health and Welfare is responsible for implementing this act. The REDA regulates the sale, lease and importation of all devices capable of producing and emitting radiation except those that are designed primarily for the production of nuclear energy (Section 3). The act creates various classes of device, and regulations made under the act prescribe standards relating to the design, construction and functioning of each class. The sale, lease or importation of a radiation emitting device that does not comply with the appropriate standard is prohibited (Section 4). The prohibition is reinforced by the criminal law; a person convicted of an offence under the act may be fined or imprisoned or both (Section 14).

6. Radiation protection

The *Radiation Protection Regulations* (SOR/2000-203) contain the radiation protection requirements applicable to all licensees and people in Canada. Their primary focus is the protection of nuclear energy workers from the effects of ionising radiation and preventing unreasonable risk to the health of the general public. The regulations do not apply to medical doses, doses to non-professional caregivers and doses to volunteers in biomedical research [Section 2(2)].

Every licensee is required to implement a radiation protection programme which includes keeping the amount of exposure to radon progeny (defined as specific radioactive decay products of radon 222) and the effective dose and equivalent dose received by and committed to persons as low as reasonably achievable, social and economic factors being taken into account (Section 4). Amongst other obligations, licensees must also ascertain the quantity and concentration of any nuclear substance released as a result of the licensed activity, and must comply with specific obligations regarding methods of ascertaining and recording doses of radiation, actions to be taken when a specific dose of radiation is reached (action level), and providing nuclear energy workers with full particulars of the risks associated with radiation to which they may be exposed (Sections 5 to 9).

The regulations prescribe the maximum permissible doses and exposures for nuclear energy workers, pregnant nuclear energy workers and members of the public (Sections 13 and 14 and Schedules I and II). Except with respect to pregnant nuclear energy workers, the dose limits reflect the 1991 Recommendations of the International Commission on Radiation Protection (ICRP) which call for lowering the dose limits for nuclear energy workers from 50 millisievert (mSv)/year to 100 mSv for five years and for members of the public from 5 mSv/year to 1 mSv/year. As regards pregnant nuclear energy workers, the maximum effective dose to the worker during the period of pregnancy is set at 4 mSv/year.⁷ The regulations provide for exceptions to the dose limits in

6. R.S.C. 1985, c. R-1.

7. The 1991 ICRP Recommendations call for lowering the dose limits for pregnant nuclear workers from 10 mSv/year to 2 mSv/year. However, in light of comments received concerning the extent to which such a significant reduction could affect employment opportunities for women in the nuclear industry, and as a result of a comprehensive consultation process and a thorough review of the risks of radiation, the maximum effective dose was set at 4 mSv in the new regulations.

emergency situations (Section 15), as well as prescribing actions to be taken by licensees when the dose limits received by any person exceed the applicable limit (Sections 16 and 17).

Sections 18 and 19 of the regulations prescribe the requirements for a licence application in respect of the operation of a dosimetry service as well as the obligations imposed upon the licensee who operates such services. The latter include the obligation to file with the National Dose Registry of the Department of Health, specified information with respect to each nuclear energy worker for whom it has measured and monitored a dose of radiation.

Under the heading "Exceptional Powers", Section 46 of the *Nuclear Safety and Control Act* provides the Commission with the authority to hold a public hearing to determine whether contamination has occurred in any place and if so, to order certain persons to take measures to reduce the level of contamination [Subsection 46(3)]. The provision reads:

"Where, after conducting a hearing, the Commission is satisfied that there is contamination referred to in Subsection (1), the Commission may, in addition to filing a notice under Subsection (2), order that the owner or occupant of, or any other person who has the management and control of, the affected land or place take the prescribed measures to reduce the level of contamination."

Finally, Sections 20 to 22 of the *Radiation Protection Regulations* set out the labelling requirements in respect of containers or devices that contain a radioactive nuclear substance, together with the radiation warning symbol and sign posting requirements in respect of an area, room, enclosure or vehicle where there are specified quantities of radioactive nuclear substances or where there is a reasonable probability that a person will be exposed to a specified dose rate.

7. Radioactive waste management

Section 26 of the *Nuclear Safety and Control Act* prohibits the storage, disposal or abandonment of nuclear substances, the abandonment of prescribed equipment, and the decommissioning or abandonment of a nuclear facility or a nuclear-powered vehicle except in accordance with a licence issued by the Commission. As a result, disposal must be carried out in accordance with the act, all applicable regulations and the conditions of a licence that has been issued by the Commission in relation to that particular substance, equipment or facility. Licence conditions in relation to waste management are aimed at ensuring the protection of health, safety, security and the environment.

Radioactive waste management facilities are nuclear facilities for the purposes of the *Nuclear Safety and Control Act* (Section 2), and can therefore be operated only according to the terms and conditions of a licence issued under the relevant regulations. Also, the GNSC Regulations require all licence applicants to describe all radioactive wastes that may result from the activity to be licensed, as well as proposed methods for managing and disposing of waste [Subsection 3(1)].

An important innovation in the licensing system under the current legislation is the authority given to the Commission to impose a licence condition requiring a licensee to provide a financial guarantee in a form that is acceptable to the Commission [*Nuclear Safety and Control Act*, Subsection 24(5)]. Thus, the requirement to provide a financial guarantee to pay for the decommissioning and waste management costs associated with a licensed facility or other activity may be imposed through licensing. The GNSC Regulations require any licence applicant to provide information on its proposed financial guarantee relating to the activity sought to be licensed [Subsection 3(1)]. Substantial flexibility is permitted in the ways in which licensees can meet these financial requirements, but the objective remains constant: to eliminate the risk of such liabilities having to be borne by the public such as might occur in the case of a licensee's insolvency.

The *Nuclear Fuel Waste Act* (S.C. 2002, c. 23) entered into force on 15 November 2002. The act provides a framework for the long-term management of nuclear fuel waste in Canada by

putting the onus on the owners of the waste to study approaches to managing the waste, to recommend an approach to the government of Canada and to finance the long-term management of the waste.

Under the act, nuclear energy corporations were required to establish a non-profit waste management organisation (WMO). As required by the act, the WMO reported to government on an approach for the management of nuclear fuel waste. The WMO recommended the Adaptive Phased Management (APM) approach that includes:

- Ultimate centralised containment and isolation of used nuclear fuel in an appropriate geological formation.
- Optional shallow storage at the central site as a contingency.
- Continuous monitoring.
- Provision for retrievability. The recommendation followed extensive consultations with the general public, and in particular aboriginal peoples over a three year period beginning in 2003 and ending in 2005).

In June 2007, the Government accepted the WMO's recommendation of APM as the most appropriate option for the long-term management of nuclear fuel waste that safeguards the public and the environment and ensures that the present generation deals with its waste. The WMO is responsible to implement the APM approach, with the oversight of Natural Resources Canada.

Under the provisions of the act, nuclear energy corporations and AECL must finance the long-term management of nuclear fuel waste by establishing trust funds. The amounts that they must contribute to the trust funds are specified in the act. These amounts vary for each entity. Following the Government decision in 2007, the WMO was required to submit a funding formula which calculates the amount of funds that each of the nuclear energy corporations and AECL must set aside in trust to finance the APM approach. The Government is currently reviewing the WMO's proposed funding formula which requires the approval of the Minister of Natural Resources. The funds may be used by the WMO only to implement the approach selected by the Government and the first withdrawal of funds may only be made for an activity in respect of which a construction or operating licence has been issued under the *Nuclear Safety and Control Act* after the Government has made a decision on the approach. Pursuant to the act, the WMO is also required to offer its waste management services at a fair and reasonable cost to all owners of nuclear fuel waste produced in Canada.

The WMO must report to the government of Canada annually on its activities. The study, reports and financial statements that the WMO is required to submit to the Minister of Natural Resources must be made available to the public.

The act sets out offences and sanctions if a nuclear energy corporation, AECL or the WMO fail to comply with it.

At the international level, Canada ratified the 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management on 7 May 1998. Canada is also party to the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (ratified on 13 November 1975) and to its 1996 Protocol (ratified on 15 May 2000). Canada has ocean dumping control legislation⁸ which reflects its obligations under the convention, that is, the prohibition of dumping of high-level radioactive waste, but the legislation provides for the licensing of dumping low-level radioactive waste at sea. Recent

⁸. The Canadian Environmental Protection Act, assented to 14 September 1999 [S.C.. 1999, c.33].

amendments to the convention extending the ban on dumping to low-level radioactive waste⁹ mean that Canada is now obliged to prohibit the dumping at sea of all radioactive waste.

8. Non-proliferation and nuclear security

Canada ratified the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT) on 8 January 1969, as well as the 1996 Comprehensive Nuclear Test Ban Treaty on 18 December 1998 and it participates actively in international atomic energy control measures. The Department of Foreign Affairs and International Trade is responsible for negotiating Canada's bilateral nuclear co-operation agreements with other countries, covering trade in nuclear materials, equipment and technology, and it does so with the participation of the Canadian Nuclear Safety Commission. It is the Commission, however, which administers them through administrative arrangements with regulators in the other countries. There are currently 26 nuclear co-operation agreements signed by Canada, covering 43 countries. In accordance with Canada's nuclear non-proliferation policy, nuclear co-operation will be authorised only for those non-nuclear weapon states that have either ratified the NPT or have taken an equivalent binding step and have thereby accepted the International Atomic Energy Agency (IAEA) safeguards on the full scope of their nuclear activities. Furthermore, nuclear exports can go forward only to those states (both nuclear and non-nuclear weapon states) that have undertaken to accept in a formal nuclear co-operation agreement a number of additional requirements designed to minimise the proliferation risk associated with Canadian nuclear exports.

On 18 December 2001, the Canadian Government enacted the Anti-Terrorism Act (S.C. 2001, c. 41). The act provides for measures to identify, prosecute, convict and punish terrorist groups and provides new investigative tools to law enforcement and national security agencies. The Anti-Terrorism Act has relevance to the nuclear field in that it defines as "terrorist activity" the existing offences in the Canadian Criminal Code that implement the 1980 Convention on the Physical Protection of Nuclear Material (see Section 4 – which adds a new Part II.1 to the Criminal Code).

The Anti-Terrorism Act defines terrorist activity as an act or omission, in or outside Canada, that takes place or is threatened for political, religious or ideological purposes and threatens the public or national security by killing, seriously harming or endangering a person, causing substantial property damage that is likely to seriously harm people or by interfering with or disrupting an essential service, facility or system.

Safeguards inspectors from the IAEA carry out regular inspections of Canadian nuclear installations to ensure that Canada complies with its own NPT-type full scope safeguards agreement with the Agency. The Commission facilitates the implementation of this agreement (IAEA: INFCIRC/64) by providing information on and access to nuclear material for accounting and verification.

Canada ratified the 1979 Convention on the Physical Protection of Nuclear Material on 21 March 1986. The *Nuclear Security Regulations* (SOR/2000-209) were made by the Commission in 2000 under its power to make regulations respecting measures to ensure the maintenance of national security and compliance with Canada's international obligations, including prescribing the conditions under which access to nuclear facilities, substances or prescribed information is to be granted [*Nuclear Safety and Control Act*, paragraph 44(1)(m) and (n)].

These regulations were substantially amended and updated in 2006 (SOR/2006-191), following an order that was issued on 18 October 2001 aiming to increase security at major nuclear installations. Pursuant to the *Nuclear Safety and Control Act*, the Commission is empowered to make any order that it considers necessary to protect the environment or the health and safety of

⁹. The ban, which is to remain in force for 25 years, became effective on 20 February 1994.

persons or to maintain national security and compliance with Canada's international obligations (Section 47), and this order imposed specific security arrangements and measures on the five leading nuclear operators in Canada. Amending the *Nuclear Security Regulations* has allowed for the revocation of this order.

The *Nuclear Security Regulations*, as amended, impose enhanced security requirements with respect to Category I, II and III nuclear material and nuclear facilities. The composition of the three categories is set out in the Schedule to the regulations. Part 1 of the regulations sets out requirements applicable to Category I, II or III nuclear material and nuclear power plants. They include licence application requirements that are in addition to application requirements set out in other regulations under the legislation, which require, e.g., protection arrangements with off-site response forces, site plans, proposals for the structure of the nuclear security officer service and for plans to assess and respond to security breaches, as well as a threat and risk assessment, in respect of Category I, II or III nuclear material or nuclear power plants (Section 3). An application for a licence to transport Category I, II or III nuclear material must include a written transportation security plan which includes specific information (Section 5).

The regulations impose general obligations upon licensees with respect to nuclear material, including requirements for the areas in which nuclear materials may be processed, used and stored, such as equipping the areas with specific devices and making arrangements with off-site response forces (Section 7.2). High-security sites, as that term is defined in the regulations (Section 1) are the subject of other requirements which are set out at Sections 7.4 to 38. The Commission establishes a design basis threat analysis and provides it to every licensee who shall take that into account in designing their physical protection system (Section 7.4). Facility-specific threat assessments are required to be conducted by every licensee at least once a year, updated and provided to the Commission (Section 7.5). The requirements concerning the physical protection of protected, inner and vital areas are specifically set out in the regulations (Sections 9 to 16).

The regulations prohibit entry into a protected area except with the physical proof of the authorisation of the licensee (Section 17), and they impose requirements relating to mandatory escort, verification of identity, clearances and documentation (Sections 17 to 18.6). A licensee may revoke an authorisation issued for access to protected or inner areas in certain conditions (Section 21). The regulations exempt Commission appointed inspectors carrying out inspections from the authorisation requirements regarding entry into protected and inner areas (Section 29).

Every licensee of a high-security site must have at all times a sufficient number of nuclear security officers to enable the licensee to control the movement of persons, materials and vehicles, conduct searches and patrols, respond to and assess alarms, apprehend and detain or observe and report on, intruders and operate security systems (Section 30). The equipment required for these duties is set out in Section 31 and the licensee must provide this equipment. Every licensee must also maintain at all times an on-site nuclear response force capable of making an effective intervention (Section 32). The licensee must also make written arrangements with an off-site response force to provide for the protection of a facility at which the licensee conducts licensed activities (Section 35), and in addition, the licensee must develop a contingency plan and conduct security exercises biennially and security drills every 30 days to test the operation of physical protection measures and the readiness of its security personnel (Section 36).

With respect to the nuclear facilities that are listed in Schedule 2, which are not nuclear power plants, Part 2 of the regulations sets out some slightly different nuclear security requirements, and where provisions of both Part 1 and Part 2 apply to a licensee, the provisions of Part 1 relating to Category I and II nuclear material prevail, in the event of inconsistency (Section 40). This part contains specifications for access control (Section 42), security measures (Section 46), the mandatory development of a supervisory awareness programme (Section 48) and arrangements with an off-site response force (Section 47).

9. Transport

The Commission has the power to make regulations governing the transport of nuclear substances [*Nuclear Safety and Control Act*, Section 44(1)] and it has exercised this power by making the *Packaging and Transport of Nuclear Substances Regulations* (SOR/2000-208). These regulations were first based upon the 1985 IAEA Recommendations for such packaging requirements, as amended in 1990, and the regulations were amended in 2003 to update the regulations and make reference to the IAEA Regulations for the Safe Transport of Radioactive Material, 1996 Edition (revised), being Safety Standards Series No.TS-R-1 (ST-1, revised).

The regulations apply to all aspects of the packaging and transport of nuclear substances, including the design, production, use and maintenance of packaging and packages, and the preparation, consigning, handling, loading, carriage, storage during transport, receipt at final destination and unloading of packages [Subsection 2(1)]. They require a licence for the transport of Category I, II and III nuclear material in accordance with the Nuclear Security Regulations (see Section 8 “Non-Proliferation and Nuclear Security” *supra*), except where the nuclear substances are in transit or are packaged and transported under a “special arrangement” as defined in the IAEA Regulations (Section 3). In these latter two cases, for which licences are also required, Sections 4 and 5 describe the extensive information requirements imposed upon licence applicants. There are exemptions from the requirement to have a licence (Section 6) but requirements are imposed with respect to the certification and production of packages (Sections 7, 11, 12) and there are requirements also in respect of quality assurance programmes for packages, special form radioactive material and low dispersible radioactive material (Section 13), and registration of use of packages of certified design (Section 14).

The regulations impose general obligations on every person who transports, or causes transport of, radioactive material (Section 15), and these include the obligation to act in accordance with the Transportation of Dangerous Goods Regulations, which are regulations generally applicable to dangerous goods in Canada. The regulations stipulate different packaging requirements for each category of substance to be transported and set out in great detail the specifications and requirements for transport for each type of package.

The regulations impose requirements with respect to transport documents, radiation protection programmes and dangerous occurrences, requiring reports to be made to the Commission in the event of the latter (Section 19). Restrictions on the opening of packages are included in the regulations (Section 21), and finally, the regulations require every person who packages radioactive material in certain specified kinds of packages to keep and retain certain records for a two-year period after packaging (Section 23).

10. Nuclear third party liability

The *Nuclear Liability Act* was passed by the Canadian Parliament in 1970 and it came into force on 11 October 1976.¹⁰ It provides for compensation on a no-fault basis to third parties who have suffered injuries or damages as a result of a nuclear incident that has occurred at a designated nuclear installation or in the course of transport. The Canadian Nuclear Safety Commission is empowered under the Nuclear Liability Act to designate nuclear facilities as “nuclear installations” for the purposes of the act. Although Canada is not a party to any of the international conventions on nuclear third party liability, the *Nuclear Liability Act* is largely based on the principles laid down in the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy as amended, and in the 1963 Vienna Convention on Civil Liability for Nuclear Damage, as amended.

The major elements of the act are described below.

¹⁰. A consolidation of the act was passed in 1985 (R.S.C 1985, c.N-28).

i) Transboundary damage

The operator of a nuclear installation in Canada is not liable for damage occurring outside Canada. However, the act contains a mechanism for the conclusion of reciprocal arrangements with other countries [Section 33(3)]. This mechanism was used in 1976, resulting in the Canada – United States Nuclear Liability Rules. Under these rules, Canadian operators are liable for injury or damage that is suffered in the United States but caused by a nuclear incident in Canada.

ii) Nature of liability

The operator of a nuclear installation has a duty to ensure that no personal injury or property damage is caused by nuclear material within that operator's control (Section 3). In the event of a breach of this duty, the operator's liability is absolute; in other words, there is no need to establish fault on the operator's part (Section 4).

Two or more operators may be jointly and severally liable, but apart from this case, the operator's liability is exclusive; no other person is liable for the damage (Section 11).

iii) Time limits for making claims

A person seeking compensation from an operator of a nuclear installation for injury (other than loss of life) or for property damage must bring an action within three years from the date on which the person knew, or ought reasonably to have known, of the injury or damage. In the case of a claim for loss of life, the action must be brought within three years of the death. Regardless of these three-year rules, no action can be commenced after the end of the period of ten years from the date of the breach of the operator's duty (Section 13).

iv) Insurance and other financial arrangements

The Canadian Nuclear Safety Commission, with the approval of the Treasury Board, prescribes a basic level of insurance for each designated nuclear installation. The amount prescribed is not to exceed CAD 75 million (Section 15). Where the basic insurance amount for a particular facility is less than CAD 75 million, supplementary insurance to make up the difference must be obtained, with the Canadian Government acting as reinsurer (Section 16).

The act allows for the possibility of state intervention to provide compensation where either the CAD 75 million is likely to be insufficient to meet the claims, or the nuclear incident is such that it is in the public interest for special compensation measures to be provided (Section 18). In such a situation, the operator's liability to claimants ceases, but in its place a liability arises to indemnify the Government for amounts awarded by the Nuclear Damage Claims Commission (Sections 19 and 20). The Commission, consisting of judges or experienced barristers, has exclusive jurisdiction to hear every claim arising from the nuclear incident and to award amounts of compensation (Section 24).

Where there is no state intervention, a person seeking compensation as a result of a nuclear accident must bring an action against the operator of the nuclear installation that caused the accident. The action must be brought in a court exercising jurisdiction in the place in Canada where the injury or damage was suffered, or, if this would result in several courts hearing claims in respect of the same incident, in a court exercising jurisdiction in the same place as the nuclear facility which caused the incident (Section 14).

II. Institutional framework

In Canada, the Canadian Nuclear Safety Commission has the power to regulate nuclear activities and it exercises this power in co-operation with other federal and provincial Government departments concerned. However, with regard to promoting the peaceful uses of nuclear energy, it is the Crown Corporation, Atomic Energy of Canada Limited which is responsible for ensuring the transfer of nuclear technology for the benefit of private industry, and for supporting the Canadian nuclear industry in international markets.

1. Regulatory and supervisory authorities

a) Governor in Council

Regulations made by the Commission concerning the development, production and use of nuclear energy or any other matter in respect of which it is empowered to make regulations under the *Nuclear Safety and Control Act*, are subject to approval by the Governor in Council. In addition, the Governor in Council is empowered to make regulations as are considered necessary for carrying out the purposes of the *Nuclear Safety and Control Act* [Section 44(5)]. The Governor in Council appoints the members of the Commission and designates one of them as the Commission's President.

The Governor in Council may, by order, issue to the Commission directives of general application on broad policy matters with respect to the objects of the Commission. Such orders are binding upon the Commission and must be presented to each House of Parliament (Senate and House of Commons) [*Nuclear Safety and Control Act*, Section 19]. On 10 December 2007, the Governor in Council issued to the Commission a directive regarding the health of Canadians (SOR/2007-282). It directs the Commission to "take into account the health of Canadians who, for medical purposes, depend on nuclear substances produced by nuclear reactors" in the context of the Commission's "regulating the production, possession and use of nuclear substances in order to prevent unreasonable risk to the health of persons".

b) Minister of Natural Resources

The Minister of Natural Resources is currently the minister for the purposes of the *Nuclear Safety and Control Act* and for the *Nuclear Liability Act*.

Both the Canadian Nuclear Safety Commission and Atomic Energy of Canada Limited report to parliament through annual reports submitted to the Minister of Natural Resources.

c) Other Ministerial Authorities

Various other departments of the federal government have powers or functions that may relate to the nuclear energy field, the most important of which are Health, Environment, Foreign Affairs and International Trade, Human Resources and Skills Development and Transport.

d) Canadian Nuclear Safety Commission (CNSC)

The Canadian Nuclear Safety Commission is established by the *Nuclear Safety and Control Act* as an independent agency of the Government of Canada, replacing the Atomic Energy Control Board. It regulates the development, production and use of nuclear energy, nuclear substances, prescribed equipment and prescribed information to prevent unreasonable risk to the environment, the health and safety of persons, national security and to achieve conformity with Canada's international commitments on the peaceful uses of nuclear energy.

i) Legal status

The Commission is a departmental corporation. It is for all its purposes an agent of the federal Crown and may exercise its powers only in that capacity (*Nuclear Safety and Control Act*, Section 8). It submits an annual report on its activities to the Minister of Natural Resources, who in turn causes the report to be laid before Parliament. The Commission remains an independent agency and is not under the supervision of the minister.

ii) Responsibilities

The Commission is responsible for regulating the development, production and use of nuclear energy and the production, possession and use of nuclear substances, prescribed equipment and prescribed information. It does so in order to prevent unreasonable risk to the environment, to the health and safety of persons and to national security, and in order to achieve conformity with control measures and international obligations to which Canada has agreed. The Commission is also responsible for disseminating objective scientific, technical and regulatory information to the public concerning its activities, and concerning the environmental, health and safety effects of the activities which it regulates (*Nuclear Safety and Control Act*, Section 9).

Regulatory Powers

The Commission has the authority to regulate a broad scope of activities involving the development, production and use of nuclear energy in Canada. With the approval of the Governor in Council, it may make regulations covering activities in all stages of the nuclear fuel cycle, from the mining of nuclear substances to the disposal of a major nuclear facility and including the import, export and transportation of nuclear materials. It is also empowered to make regulations respecting measures to ensure national security and compliance with Canada's international obligations in the development, production and use of nuclear energy. A detailed description of its regulatory powers is provided in Part I of this study "General Regulatory Regime".

Administrative Powers

The *Nuclear Safety and Control Act* makes the Commission a court of record and it has all the powers necessary to carry out its duties with respect to the appearance, summoning and examination of witnesses, the production and inspection of records, the enforcement of its orders, and any other matter necessary for the due exercise of its jurisdiction (Section 20). In particular, any decision or order of the Commission may, for the purposes of enforcement, be made a rule, order or decree of the Federal Court or of a superior court of a province and be enforced accordingly.

The *Nuclear Safety and Control Act* requires the Commission to hold public hearings in certain specified situations and to give a reasonable opportunity for affected parties to be heard. Section 40 of the act, for example, sets out the circumstances in which the Commission is required to provide an opportunity to be heard in accordance with rules of procedure prescribed by it. For example, before refusing to issue or renew a licence, or before confirming an order made by an inspector or a designated officer requiring a licensee to take measures to protect the environment or the health or safety of persons. This section also sets out the circumstances under which the Commission may, on its own initiative, conduct proceedings in accordance with prescribed rules of procedure and under which it must hold public hearings. The *Canadian Nuclear Safety Commission Rules of Procedure* (SOR/2000-211) govern the Commission's proceedings and provide for things such as the possibility of intervention in proceedings before the Commission. Additional provisions in the act address the Commission's powers to rehear and redetermine decisions and orders and to hear appeals in specified cases (Section 43).

Pursuant to Section 15 of the act, the Commission has made bylaws with regard to the management and conduct of its affairs (SOR/2000-213; 31 May 2000). These bylaws determine the procedures to be followed in proceedings other than those to which the *Canadian Nuclear Safety Commission Rules of Procedure* apply. The bylaws are used for administrative requirements, such as when the Commission meets on internal matters or makes regulations or policies, or when it wishes to discuss matters of general applicability.

Other activities

The Commission provides public access to information on regulatory matters such as the granting of licences. Under this practice, the public may examine documents supporting licence applications, the reports of advisers to the Commission and the final report by the Commission's staff on any licence application, as well as the reports that licence holders are required to submit under the *GNSC Regulations* or the terms of licence. In addition, the Commission reports regularly, through the media, on the process of issuing licences for nuclear installations, on important events requiring that remedial action be taken or ordered and on situations where the Commission is aware of any present or future concern for the public and the environment.

Dissemination of this information to the public, which is part of the statutory mandate of the Commission [*Nuclear Safety and Control Act*, paragraph 9(b)], is conducted in accordance with the *Access to Information Act* (R.S. 1985, c. A-1) and the *Privacy Act* (R.S. 1985, c. P-21), which govern the management and sharing of information that is under the control of federal government institutions.

iii) Structure

The Canadian Nuclear Safety Commission consists of up to seven permanent members each of whom is appointed by the Governor in Council for a term of five years which may be renewed. The President of the Commission, designated to hold that office by the Governor in Council, is a full-time member of the Commission and is its Chief Executive Officer.

The President may establish a panel of the Commission, consisting of one or more members, to exercise or perform certain powers, duties and functions of the Commission (*Nuclear Safety and Control Act*, Section 22).

The Commission staff implements the policies of the Commission and makes recommendations to it concerning the issuing of licences, and other regulatory matters. Some decision-making with respect to licensing and other matters is done by "designated officers" who are so designated by the Commission and are authorised by it to perform certain functions under the act (*Nuclear Safety and Control Act*, Section 37).

iv) Financing

The Commission's financial resources derive in part from appropriations voted by Parliament, but as well from licensing fees or through fees charged for the provision of information, products or services. Such fees are authorised by Section 44 of the act and are prescribed in the *Canadian Nuclear Safety Commission Cost Recovery Fees Regulations* (SOR/2003-212).

The Auditor General of Canada is responsible for auditing the Commission's accounts and financial statements.

2. Public and semi-public agencies

a) National Research Council (NRC)

Created in 1916 under the National Research Council Act (R.S. 1985, C-N-15), the National Research Council (NRC) is a departmental Crown corporation reporting to Parliament through a designated minister. Since its inception, the NRC has played a major role in Canada's scientific development. Today, it constitutes a national scientific laboratory which performs much of its research in collaboration with industry and universities. It also operates a national library for science and engineering and provides support to industrial research through financial contributions and technical assistance.

b) Natural Sciences and Engineering Research Council

Formed in 1978, the Natural Sciences and Engineering Research Council is a departmental Crown corporation under the Natural Sciences and Engineering Research Council Act (R.S. 1985, C-N-21) and reports to Parliament through a designated minister. The Council promotes and supports research in the natural sciences and engineering, except the medical sciences, and advises the minister on aspects of such research, on request.

c) Atomic Energy of Canada Ltd. (AECL)

i) Legal Status

Atomic Energy of Canada Limited (AECL) was incorporated by the Minister of Natural Resources pursuant to powers granted under Section 10(2) of the former *Atomic Energy Control Act*, now renamed the *Nuclear Energy Act (Nuclear Safety and Control Act, Section 89)*. Its incorporation was carried out by way of patent letters issued in 1952 and, since 1977, AECL has continued its corporate status under the *Canada Business Corporations Act*. It is a Crown corporation wholly owned by the government of Canada. Its shares are held by the Minister of Natural Resources in trust for the Government of Canada under Section 11 of the *Nuclear Energy Act*.

ii) Activities

AECL is a full service nuclear technology company providing services to nuclear utilities around the world. Established in 1952, AECL is the designer and builder of CANDU® technology including the CANDU 6, one of the world's top-performing reactors. AECL delivers cutting edge nuclear services, R&D support, design, engineering, construction management, specialised technology, refurbishment, waste management and decommissioning in support of CANDU reactor products. More information on AECL and CANDU reactor technology can be found at www.aecl.ca.

iii) Structure

AECL is managed by a board of directors, comprising 12 to 17 members who are appointed by the Governor in Council for a three-year term that is renewable. The chairperson of the board and the president and chief executive officer of AECL are also appointed by the Governor in Council. The appointment of subordinate officers is the prerogative of the board of directors, and a two-tier structure of senior vice-presidents and vice-presidents responsible for various aspects of the corporation's activities is in place.

AECL operates through three business divisions:

- The CANDU Reactor Division, based in Mississauga, Ontario, Canada, is operated on a commercial basis and generates value through its core activities, which include the

management of nuclear reactor construction, life extension and servicing projects. The division also manages marketing and business development and the commercialization of AECL's evolutionary ACR-1000, a Generation III+ heavy water nuclear reactor.

- The Research and Technology Division contributes value to Canada through research, production of medical isotopes and management of nuclear waste. An important part of the Research and Technology Division's mission is to carry out the Government of Canada's policy mandate in support of Canadian nuclear technology and industry through its technology infrastructure, which includes nuclear laboratories and facilities.
- The Liability Management Unit manages waste and decommissioning liabilities on behalf of the Government of Canada. The programme has a long-term focus – spanning several decades – to safely, decommissioning and waste management obligations on AECL-managed sites and waste received for safe storage from universities, medical facilities, government and industry from across Canada. This is managed in accordance with CNSC regulations and in the best interests of Canadians. These liabilities include obligations associated with AECL's existing infrastructure, those stemming from activities before AECL was incorporated in 1952, third party radioactive waste from across Canada, and R&D waste in support of Canada's nuclear programme. The Research and Technology Division and private sector contractors perform decommissioning and waste management work. Liabilities such as operational waste, created after 31 March 2006, are separately accounted to reflect AECL's responsibility to manage and finance such wastes.

AECL has more than 4 800 staff. Its head office is in Mississauga, Ontario. It also has major research and development laboratories at Chalk River, Ontario, and at Pinawa, Manitoba. It has offices in Ottawa, Ontario; Bruce County, Ontario; Pickering, Ontario; Saint John, New Brunswick; and Montreal, Quebec.

AECL also has international offices in Buenos Aires, Argentina; Beijing, China; Cernovada, Romania; Seoul, South Korea; and Gaithersburg, Maryland, USA.

iv) Financing

The financial resources of AECL come from two primary sources: moneys which are appropriated by parliament and revenues derived from supplying goods and services to Canadian and foreign utilities and to other companies requiring nuclear or nuclear related goods, services or technology.

Despite AECL's commercial mandate, it is an agent of the federal Crown. As a result, its research and development expenditures, capital expenditures, loans, and major transactions or undertakings are ultimately subject to either government or parliamentary approval.

AECL's annual financial statements are audited by the Auditor General of Canada and an independent audit firm, and the financial statements, together with the auditors' report, are submitted annually to Parliament by the Minister of Natural Resources.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of 30 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities takes part in the work of the OECD.

OECD Publishing disseminates widely the results of the Organisation's statistics gathering and research on economic, social and environmental issues, as well as the conventions, guidelines and standards agreed by its members.

This work is published on the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the Organisation or of the governments of its member countries.

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1st February 1958 under the name of the OEEC European Nuclear Energy Agency. It received its present designation on 20th April 1972, when Japan became its first non-European full member. NEA membership today consists of 28 OECD member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities also takes part in the work of the Agency.

The mission of the NEA is:

- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues, as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information.

The NEA Data Bank provides nuclear data and computer program services for participating countries. In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

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