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Nuclear Safety in Canada

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This document can be viewed on the CNSC Web site at www.nuclearsafety.gc.ca.
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Nuclear Safety *in Canada*

Nuclear safety is everyone's business. Every day, millions of Canadians use nuclear energy, though we may not always be aware of how it contributes to our lives.

The Canadian Nuclear Safety Commission (CNSC) regulates the use of nuclear energy and materials to protect health, safety, security and the environment and to respect Canada's international commitments on the peaceful use of nuclear energy. Created in 1946 as the Atomic Energy Control Board, the name of the agency changed in 2000 with the enactment of the *Nuclear Safety and Control Act* (NSCA). Its vision is to be one of the best nuclear regulators in the world by being effective, efficient, transparent and an employer of choice.

Scientists began to conduct research and development into the physics of nuclear energy in 1895. Nuclear fission was first demonstrated in 1938, and after 1945, scientists focused their attention to using nuclear energy for its beneficial uses, such as the generation of electricity and the production of radioisotopes for use in agriculture, industry and medicine.

Nuclear energy's enormous potential has been harnessed for a variety of activities – to heat and light our homes, to perform valuable research at universities, to diagnose and treat illnesses, to preserve food and for use in scientific instruments. However, nuclear energy must be regulated and used safely in order to avoid causing harm to both citizens and the environment. Since 1946, the CNSC has worked to ensure Canada's nuclear exports are used for their intended peaceful purposes and has fulfilled Canada's international obligations not to manufacture or otherwise acquire nuclear weapons. It has also been ensuring that the production of nuclear energy does not pose an unreasonable risk to the public and the environment. Canadians can be confident that with over 55 years of experience, the CNSC continues to work hard to maintain Canada's reputation as a world leader in nuclear safety.





CNSC Mission:

To regulate the use of nuclear energy and materials to protect health, safety, security and the environment and to respect Canada's international commitments on the peaceful use of nuclear energy.

ORGANIZATION

The CNSC is an independent federal government agency, and is composed of two components: a decision-making Commission tribunal that makes legally binding decisions based on laws and regulations, and a staff organization with technical experts in various disciplines of nuclear safety and control. The CNSC is accountable to the Parliament of Canada through the Minister of Natural Resources Canada.

The Commission functions as a quasi-judicial tribunal. It sets regulatory policy direction and establishes legally binding regulations on matters relating to health, safety, security and environment issues affecting the Canadian nuclear industry, and respects Canada's international commitments on the peaceful use of nuclear energy. The Commission is responsible for making licensing decisions on nuclear activities in Canada.

The CNSC staff organization is comprised of more than 500 employees. It develops regulatory frameworks, makes recommendations on licensing activities to the Commission and conducts compliance activities (verification, safety promotion and enforcement) in support of an effective and efficient regulatory regime. The staff organization consists of a headquarters in Ottawa, site offices located at each of the five nuclear generating stations in Canada, and five regional offices.

Neither the Commission nor the CNSC staff organization has a role in promoting the use of nuclear energy or in the development of nuclear technology. The CNSC's concerns always remain regulation and safety, not commercial development or promotion.

The CNSC has both national and international nuclear safety and control responsibilities. National nuclear safety responsibilities focus on the regulation of nuclear energy to protect the public, nuclear workers and the environment in Canada. International responsibilities involve working to ensure that Canada's international nuclear non-proliferation obligations are upheld.

NATIONAL RESPONSIBILITIES

Canada has an active nuclear technology sector. Nuclear substances, activities and facilities must all be carefully regulated so that ongoing operations are safe for workers, the public and the environment. Regulation of these nuclear activities and facilities within Canada is one part of the CNSC's job.

Nuclear Facilities and Materials in Canada

Nuclear energy and activities are evident in many facets of our lives. The CNSC regulates a number of different nuclear activities:

- Nuclear generating stations (electricity);
- Non-power (research) reactors;
- Nuclear substances and radiation devices (radiography, industrial gauges, exploration, nuclear medicine, education, etc.);
- Uranium mines and mills;
- Uranium processing and fuel fabrication facilities;
- Medical particle accelerators;
- Non-medical particle accelerators;
- Waste management facilities;
- Irradiator facilities (in veterinary hospitals, research, medical and industrial institutions, etc.);
- Brachytherapy and teletherapy facilities;
- Nuclear substance processing facilities;
- Nuclear research and test establishments; and
- Packaging and transport of nuclear substances.

Keeping Nuclear Materials Safe

There are a number of regulations designed to address safety and control issues related to the nuclear operations and activities mentioned in the previous section. These regulations are made under the *Nuclear Safety and Control Act* (NSCA). The NSCA provides the CNSC with the necessary authority to create and enforce the regulations.

To help in enforcing regulations, the CNSC works in collaboration with other government departments and agencies such as Natural Resources Canada, Environment Canada, Health Canada, Transport Canada, and the Departments of Foreign Affairs and International Trade. Working in cooperation with these organizations strengthens the CNSC's ability to effectively regulate nuclear operations and activities.

Environmental Protection

As environmental awareness has increased in recent years, so has the strength and complexity of the regulations used to protect the environment. The *Canadian Environmental Assessment Act* (CEAA) aligns the federal environmental assessment process for the nuclear sector, under CEAA, with the requirements of the NSCA. This alignment works to ensure that nuclear projects continue to be subject to a high-quality and demanding federal environmental assessment process.

The CNSC verifies that licensed activities do not pose an unreasonable risk to the environment. Nuclear operations are first examined in the course of the regular licensing process, and then, if it is required, through the federal environmental assessment process under the CEAA.



Radiation Protection

Background radiation, from naturally occurring nuclear material, accounts for about 80% of our average lifetime exposure to radiation. The remaining 20% is man-made, and comes from a wide variety of activities that are regulated by the CNSC to protect Canadians and the environment from any harmful results.



Any activity which may result in radiation exposure is regulated by limiting the radiation dose that workers and the public receive. Radiation doses to workers from commercial products such as radiotherapy systems used in treating cancers are strictly limited, and radiation exposure to the public from Canadian nuclear facilities is regularly monitored. Radiation dose limits are based on Canadian and international standards. Under the Canadian regulatory regime, the public dose limit is 1mSv in one calendar year. The 1 mSv annual limit represents the upper limit to the combined exposure of an individual to all activities, excluding natural background radiation and medical treatments, based on risk perception. This dose limit is the lower limit of what is considered as unacceptable exposure to the public. The public dose limit is equivalent to about 10 chest x-rays. In comparison, a nuclear energy worker has a limit of 100 mSv in 5 years with an average of 20 mSv per year.

In addition to limiting the amount of man-made radiation to which any person is exposed, Canadian regulations also require that nuclear facilities have established multiple safety barriers or systems to protect workers, the public and the environment from accidental radiation exposure. This means that even the safety back-up systems have back-ups. These redundant safety systems provide extra protection against accidental radiation exposure.

Radioactive Waste

Radioactive waste requires careful management and is strictly controlled in Canada.

Nuclear waste originates at uranium mines and mills, at plants which produce fuel for nuclear reactors, at the reactors themselves, at industrial sites, hospitals, research laboratories and other facilities that use nuclear energy and radioactive substances. What is known as “high-level waste” consists of the used fuel from reactors. In contrast, “low-level waste” includes used medical and industrial radioisotopes, contaminated clothing, rags, mops, scrap and other items from nuclear facilities, and historic wastes from previously unlicensed contaminated sites. All radioactive waste does decay – some of it quickly, some over thousands of years, and some will take billions of years to decay. For instance, the radiation contained in much low-level waste will disappear within days of disposal, sometimes within hours.

Currently, Canada stores its nuclear waste. The CNSC’s goal in regulating nuclear waste is to ensure that it never creates unacceptable risks to health or the environment. Canadian nuclear power plants currently store their nuclear fuel waste at reactor sites under CNSC supervision. Most of this material is stored in specially constructed water-filled pools, and about five percent has been transferred to large concrete canisters built above ground.

Enforcing the Rules

Laws are in place to ensure the protection of the public, workers and the environment, and national security and to implement Canada's international obligations but they do not mean much if they are not enforced. It is necessary to have a strong compliance verification and enforcement program in addition to an effective set of laws. This works to ensure that any work conducted with nuclear substances is continually monitored to ensure the safety of workers and the public from radiological hazards.

The CNSC conducts regular compliance inspections and evaluations to verify that nuclear operators are complying with the laws and regulations, as well as the conditions of their licence. In this way, the CNSC can detect any problems before they occur. The enforcement and compliance program includes permanent CNSC staff located on-site at each nuclear power plant in Canada and at five regional offices located in Laval, Quebec; Ottawa, Ontario; Mississauga, Ontario; Saskatoon, Saskatchewan; and Calgary, Alberta.

The CNSC Compliance Program seeks to achieve a sensible balance between incentives that encourage compliance, and measures that compel compliance. This graduated approach includes promotional activities to encourage compliance, verification activities to assess the actual level of compliance and graduated enforcement actions in cases of non-compliance (up to and including revocation of licences and/or prosecution).

The Security of Nuclear Material

The events of September 11, 2001 forever changed our world view of nuclear security and the protection of nuclear facilities against terrorism. The CNSC has been a vigilant and responsive regulator both before and after those tragic events, with a series of initiatives based on improved regulations and standards, emergency preparedness training, and extensive cooperation with police and security organizations at the national and international levels.

Following September 11, the CNSC performed a comprehensive re-evaluation of security at nuclear facilities in Canada. Increased security measures put in place as a result of that re-evaluation are now maintained permanently as part of an improvement in security and safety for many nuclear operations. The CNSC also continues to monitor and assess the effectiveness of security measures for nuclear facilities and nuclear materials.

Emergency Preparedness

Being prepared in the event of an emergency is an essential part of being a responsible nuclear regulator. The CNSC has a comprehensive emergency preparedness program in place. The CNSC's emergency preparedness and response activities involve cooperation with nuclear operators, municipal, provincial and federal government agencies, first responders and international organizations. As a regulator, the CNSC's role during an emergency is to monitor and evaluate the actions of the nuclear operator involved, provide technical advice and regulatory directives when required, and inform the government and the public on its assessment of the situation.

To continually evaluate and improve its emergency response capabilities, the CNSC participates in simulated incidents in coordination with its licensees and government



Map of site and regional offices



agencies. In addition, the CNSC maintains a Duty Officer program, available on a 24-hour basis, which is the first point of contact in case of emergencies.

Getting the Public Involved

The Canadian Nuclear Safety Commission encourages Canadians to participate in licensing hearings. With citizen participation in the decision-making process, the CNSC can maintain a regulatory system that is transparent and takes into account the needs and concerns of Canadians. The Commission tribunal advises the public at least 60 days before the start of a public hearing, and hearings usually are open to the public. Members of the public, companies, or groups who have an interest in the matter being heard can make oral or written presentations. Public hearings and meetings are held throughout the year to establish regulatory policy and consider licence applications for major facilities. Submissions from CNSC staff, applicants, and the public are all taken into consideration by the Members of the Commission tribunal when making their decision. The decision is sent to participants, published on the Web site and communicated to the media.

Information on how to participate in public hearings can be found on our Web site at www.nuclearsafety.gc.ca.

INTERNATIONAL RESPONSIBILITIES

Canada was the first country with substantial nuclear capability to reject nuclear weapons, and has been actively involved in the international promotion of the peaceful use of nuclear energy. Fulfilling Canada's international commitments on the peaceful use of nuclear energy has been a CNSC responsibility since the *Atomic Energy Control Act* was passed in 1946.

Canada's Nuclear Non-Proliferation Policy

The two objectives of Canada's nuclear non-proliferation policy are to assure the Canadian public and the international community that Canada's nuclear exports are solely for peaceful, non-explosive purposes, and to promote a more effective and comprehensive international nuclear non-proliferation regime. The cornerstone of the international nuclear non-proliferation regime is the 1970 *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT). The NPT establishes commitments to prevent the spread of nuclear weapons, promote cooperation in the peaceful uses of nuclear energy and achieve nuclear disarmament. Canada is an original signatory to the NPT and has centered its nuclear non-proliferation policy on the treaty's provisions. The CNSC, through the *Nuclear Safety and Control Act* (NSCA) and corresponding regulations, implements Canada's NPT commitments not to receive, manufacture or acquire nuclear weapons or other nuclear explosive devices. The CNSC also implements Canada's NPT commitments to accept International Atomic Energy Agency (IAEA) safeguards on all nuclear material in peaceful uses in Canada, and to ensure that Canada's nuclear exports to non-nuclear-weapon States are subject to IAEA safeguards.

Canada is a founding and active member of both the Zangger Committee and the Nuclear Suppliers Group, two multilateral organizations which have agreed on conditions of supply for nuclear and nuclear-related exports. The CNSC licenses the import and export of nuclear and nuclear-related materials, equipment and technology identified by these organizations as presenting proliferation risks. Major nuclear exports are also made subject to bilateral nuclear cooperation agreements between Canada and the destination country. These agreements establish reciprocal obligations designed to further minimize the proliferation risk associated with these transactions.

The CNSC collaborates with Foreign Affairs Canada in implementing key aspects of Canada's nuclear non-proliferation policy. This includes:

- the provision of policy and technical advice in developing multilateral nuclear export control lists and guidelines;
- the negotiation of bilateral nuclear cooperation agreements; and,
- the implementation of administrative arrangements pursuant to bilateral agreements.

Under the NSCA and its regulations, Canadian importers and exporters are required to obtain and comply with CNSC licences controlling the international transfer of nuclear and nuclear-related items. Through the licensing process, the CNSC takes steps to ensure that nuclear imports and exports are consistent with Canada's nuclear non-proliferation policy.



Safeguards



The verification approaches and measures utilized by the IAEA to verify that nuclear material is not diverted from peaceful uses to nuclear weapons or other nuclear explosive devices, are commonly referred to as 'safeguards'. In 1972, Canada was the first country to bring into force a comprehensive safeguards agreement with the IAEA for such verification as required by the NPT. In 2000, as part of worldwide efforts to strengthen IAEA safeguards, Canada brought into force an Additional Protocol to its safeguards agreement with the IAEA. This new agreement provides the IAEA with enhanced rights of access to nuclear sites and other locations. It also provides the IAEA with access to information about nuclear-related activities in Canada above and beyond its rights under the safeguards agreement.

The CNSC is responsible for implementing the Canada/IAEA safeguards agreement and Additional Protocol. One of the cornerstones of safeguards implementation is nuclear material accountancy. The CNSC maintains a national system of accounting for and controlling nuclear materials in Canada under safeguards. Two further cornerstones of safeguards implementation are IAEA inspections and monitoring activities. The IAEA, using CNSC-supplied reports as a basis, inspects and monitors nuclear-related activities and verifies nuclear material flows and inventories as required under Canada's safeguards agreement and Additional Protocol. The CNSC cooperates with the IAEA to facilitate these activities in Canada.

The CNSC ensures through its regulatory process that all relevant licensees have in place policies and procedures that include the reporting and monitoring of nuclear material and nuclear activities and the provision of access to nuclear facilities for IAEA safeguards inspectors. The CNSC performs compliance and auditing activities to ensure that these policies and procedures remain sufficient to meet safeguards requirements.

The CNSC also cooperates with the IAEA in developing new safeguards approaches for Canadian facilities and contributes to efforts to strengthen safeguards internationally. As part of this effort, the CNSC, through its Safeguards Support Program, assists the IAEA in developing advanced safeguards equipment or techniques aimed at strengthening the effectiveness and efficiency of safeguards implementation. The Program also supports domestic needs in resolving specific safeguards issues related to Canadian nuclear facilities and the use of nuclear material.

Peaceful Uses of Nuclear Energy

The CNSC participates in a number of international Conventions, programs and activities designed to promote the safe and secure uses of nuclear materials and technology. These activities involve organizations such as the International Nuclear Regulators Association, the IAEA, the Nuclear Energy Agency of the Organization for Economic Co-operation and Development (OECD), the International Commission on Radiological Protection, and the United Nations Scientific Committee on the Effects of Atomic Radiation. The CNSC is also actively involved in the bilateral exchange of regulatory information and collaboration with foreign nuclear regulators. The CNSC's participation in these international activities contributes to the harmonization of international nuclear safety and security regulatory standards, and ensures that the CNSC's activities are consistent with international best practices.

OUR COMMITMENT TO CANADIANS

At the Canadian Nuclear Safety Commission, our business is regulation and our job is safety. The CNSC regulates the use of nuclear energy and materials to protect health, safety, security, and the environment and to respect Canada's international commitments on the peaceful use of nuclear energy.

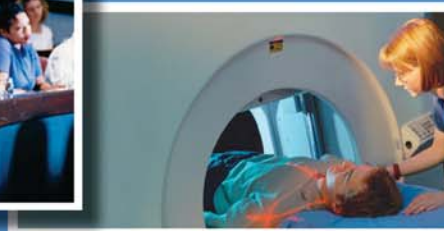
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