



Canadian Nuclear
Safety Commission

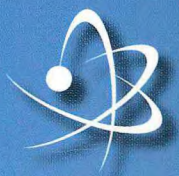
Commission canadienne
de sûreté nucléaire

Nuclear Safety

in Canada



ity Regulations
radioactivity power
depleted uranium
public hearing room
canister toxic
redness peaceful use of nuclear ene
ent reference man fume hood licensi
nt dosimeter security report threshol
ear substance environmental asses
onucleide dosimetry service nuclear security radiation dose limit
ARA principle millisievert heavy water safety system nuclear substan
posure limit fissile material gamma radiation monitor initiation system lic
compliance program nuclea
great risks environmental effect solid
the intake molecule nuclear security guard ore d
sie rock radiochemical analysis containment systems moni
recorded authorization transport container radioactive cell unc
limit leaching release mechanism radioactive ore accepta
licence stockpile control station fission product radioch
restricted area single unit station sub-atomic particle un
a mill thorium plutonium nuclear energy worker pub
nuclear technology export permit tritium environmer
activity storage facility surface drilling release rate turbine generator dousing syste



Canada

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.



Nuclear Safety in Canada

Published by the Canadian Nuclear Safety Commission (CNSC)
CNSC Cat. No. INFO-0749
Catalogue number CC172-25/2004E
ISBN 0-662-37660-9

© Minister of Public Works and Government Services Canada 2004

Extracts from this document may be reproduced for individual use without permission provided the source is fully acknowledged. However, reproduction in whole or in part for purposes of resale or redistribution requires prior written permission from the Canadian Nuclear Safety Commission.

Également publié en français sous le titre de *La sûreté nucléaire au Canada*.

Document availability

This document can be viewed on the CNSC Web site at www.nuclearsafety.gc.ca.
To order a print copy of the document in English or French, please contact:

Communications and Information Management Directorate
Canadian Nuclear Safety Commission
280 Slater Street
P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9
CANADA

Telephone: (613) 995-5894 or
1 (800) 668-5284 (in Canada)
Facsimile: (613) 992-2915
E-mail: info@cnsccsn.gc.ca

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



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.

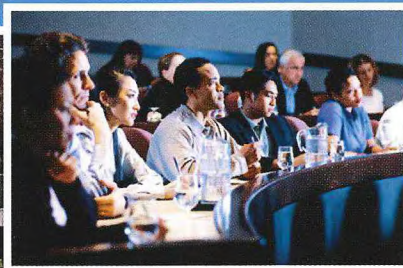
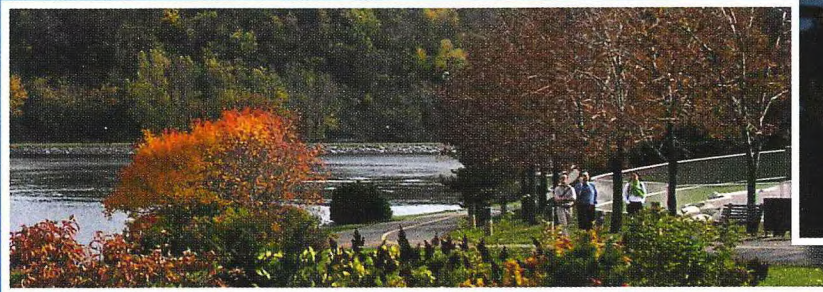
For more information contact us:

Canadian Nuclear Safety Commission
280 Slater Street
P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9
CANADA

Telephone: (613) 995-5894 or
1 (800) 668-5284 (in Canada)
Fax: (613) 995-5086
E-mail: info@cnsccsn.gc.ca

Please visit our Web site:
www.nuclearsafety.gc.ca





radioactive materials *Nuclear Safety and Control Regulations* cost recovery **guaranteed shutdown state certification licensee security monitoring room** Nuclear Security
 ear assembly *fission fusion isotope court of record prescribed equipment* CNSC effective dose *hazardous waste ore sample working level mSv acute radiation exposure*
 ting licence licence applicant atomic structure *availability test bioassay program code of practice* compliance inspection **contingency plan corporate plan** degree of irradi
 decay radioluminescence *reactivity response force revocation* sensing device *span of risks sub-criticality surface radiation* thermal shock test **thermoluminescent chip p**
ic particle trefoil symbol *test certificate* calibration distance *contaminant mining claim enriched fuel teletherapy machine* www.nuclearsafety.gc.ca **emergency prep**
ce inspector reactor containment uranium compound *critical group beam calibrator* coolant report card **oil exploration** becquerel *in vivo measurement* risk managen
 nge switch health standard **tailings** operation *removal site output factor* personal monitor **pool reactor** primary beam *radiation beam* radiation field **thermoluminesce**
 n system radiation protection **CANDU reactor** radioisotopes *uranium mines nuclear power plants nuclear energy Nuclear Safety and Control Act* non-proliferation health nuc
de source containment structure exposure device operators human factors public hearings regulatory standards *Slowpoke reactor radioactive waste management rad*
achine dosimeter action level exposure waste disposal **radiation units** food irradiator waste management area **emergency response plan** National Dose Registry A
 orized officer *beta particle* cessation licence commissioning **consolidated licence** cooling water *decay chain density* designated officer **detection limit** energy level ex