Regulation of the Complete Fuel Cycle

Current and Proposed Nuclear Legislation in Canada

F.C. Boyd

Atomic Energy Control Board

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REGULATION OF THE COMPLETE FUEL CYCLE

Introduction

Unlike the situation in many other countries with advanced nuclear programs the jurisdiction of the national nuclear regulatory agency in Canada extends to the entire nuclear industry. This has been the situation since 1946 when the Atomic Energy Control Act came into effect creating the Atomic Energy Control Board. A new Act respecting nuclear energy was introduced to Parliament late last year but this new Act will not change the concept of total control. Rather it is intended to clarify and strengthen the regulatory control over the health, safety and environmental aspects of the complete nuclear fuel cycle from uranium mining to ultimate waste disposal including radioisotopes, accelerators and even heavy water production plants.

Atomic Energy Control Act

The still existent Atomic Energy Control Act was proclaimed in 1946. Despite the fact that in the federal makeup of Canada, resources, health and labour are generally within the jurisdiction of the provinces, this Act gives control over all nuclear activities to the central or federal government. This was possible under the provisions of the British North America Act (the founding legislation of the country) which empowers the federal government to enact laws in the national interest for "the peace, order and good government of Canada".

The Atomic Energy Control Act created the Atomic Energy Control Board as the regulatory agency. Initially the Board also supervised the research and development program but in 1954 the Act was amended to transfer this activity to the crown company, Atomic Energy of Canada Limited, which had been created in 1952 to carry out research and development and promotional activities. Earlier, during World War II, the government had acquired Eldorado Mining and Refining, now called Eldorado Nuclear Limited, a uranium mining and refining company. Since 1954, therefore, regulatory and promotional matters have been separate, although both crown companies and the Board all report to Parliament through the same Minister (the Minister of Energy Mines and Resources).

The Act authorizes the Board to make regulations (with the approval of the governor in council) covering all aspects of nuclear activities including:

a) the development, control, supervision and licensing of the production, application and use of atomic energy

b) the prospecting for and mining of prescribed substances

c) the production, import, export, transportation, refining, possession, ownership use or sale of prescribed substances

d) the protection against unauthorized disclosure of information respecting the production, use and application of and research and investigation with respect to atomic energy.

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(The term 'prescribed substances' includes radioisotopes, uranium, thorium, and deuterium.) Partially because of the normal division of responsibilities between the provinces and the federal government no health and safety regulations were issued under the Act until 1960. When these were enacted, with the full support and agreement of the provinces, they were based upon the recommendations of the ICRP as is the case with most other countries.

The regulations were further amended in minor ways over the next decade and an extensive revision was issued in 1974. These have since been further amended, most significantly by recent regulations concerning exposure to radon and radon daughters in uranium mines.

Despite the apparent broad powers of the Act, the Board for many years remained relatively aloof from full regulatory control of uranium mines leaving the safety of these mines essentially with the provinces which have jurisdiction over worker safety in other mines. A provincial public enquiry in Ontario, the "Royal Commission on the Health and Safety of Workers in Mines", concluded in 1976 that there had been inadequate control over radiation levels in uranium mines, due, in part, to the unclear jurisdiction between federal and provincial agencies. It recommended stronger involvement by the Atomic Energy Control Board.

At about the same time as the above inquiry, radioactive contamination was uncovered in the town of Port Hope, the site of the Eldorado Nuclear Limited uranium refinery. This was determined to be primarily due to the misuse of refinery waste dating back twenty or thirty years. Other occurrences of contamination were discovered in various parts of the country due to early radium handling operations, mine tailings, and waste from other operations using materials containing thorium or uranium.

Although it is a somewhat unusual role for a regulatory organization, the Atomic Energy Control Board has been the lead agency in a federal-provincial effort to clean-up and correct these various areas of contamination. This was largely because the persons or organizations causing the contamination could not be determined or no longer existed.

Proposed Legislation

These events, together with the rapidly growing nuclear power program, created an environment propitious for an extensive revision to the Atomic Energy Control Act. Consequently, a new Act was drafted and was introduced to the federal parliament as Bill C-14, a proposed Nuclear Control and Administration Act, on November 24, 1977. For various reasons it has not at the time of writing been re-introduced for second reading, at which time it would receive detailed Committee review.

Under the new legislation the Atomic Energy Control Board would be renamed the Nuclear Control Board. Its separation from any perceived conflict of interest would be enhanced by having the Nuclear Control Board report to a different Minister than the Crown corporations Atomic Energy of Canada Limited and Eldorado Nuclear Limited which conduct promotional activities. The Bill is divided into three parts. Part I of the proposed legislation clearly designates the objects of the new Board as the regulation, control and supervision of all aspects of the development and use of atomic energy in order to: a) ensure the health and safety of persons and to protect the environment, b) maintain national security, c) ensure that nuclear energy is used only for peaceful purposes, and d) ensure compliance with measures of international control undertaken by Canada. In addition the Bill proposes that the Board act as a source of information for the public on health, safety and environmental matters related to nuclear energy.

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Beyond this restatement of its activities the new Act makes provisions for the Board to hold public hearings, to make available for public inspection all documents submitted by applicants and licensees and to have the power if and when necessary to assume responsibility for clean-up of contaminated areas. Public hearings would be mandatory at the Construction Licence stage of any major nuclear facility, and discretionary for other licensing actions, regulation making, or any other matter whithin the jurisdiction of the new Board. Such hearings would be conducted by one or more members of the Nuclear Control Board which would be expanded to up to nine members from the five (four part time) of the existing Atomic Energy Control Board.

The provision for public hearings and for public inspection of documents will mark a significant change in the operation of the Board since the present Act, being conceived in 1946 when security was the primary concern, limits considerably the public participation by the Board. To date all licensing action has been private and even the availability to the public of reports submitted by applicants or licensees has been limited.

Part II of the Bill continues the powers granted to the Minister in the existing Act to establish corporations and to order research into nuclear energy and prescribed substances. In addition, the Minister would be given powers to engage in and to regulate commercial and promotional activities.

In Part III penalties for offences covered by the Bill are spelled out and increased in severity. Penalties on conviction on indictment have been increased from a fine of less than $10,000 and/or imprisonment of up to five years to a proposed penalty of up to $250,000.00 and/or detention of up to five years.

Nuclear Liability Act

The other major legislation in the field of nuclear energy is the Nuclear Liability Act which was passed in 1970 and proclaimed in 1976 following the completion of protracted preparatory work on the development of acceptable insurance schemes. This Act places an absolute liability on the operator of a nuclear installation of up to $75,000,000 for nuclear damage and obligates him to carry insurance against this liability. The currently approved insurance pool privately underwrites up to $38 million, with the balance of the $75 million being re-insured by the federal government. In the case of claims resulting from a nuclear incident which exceed this statutory limit the Act provides for special measures including the creation of a Nuclear Damage Claims Commission to determine compensation. Canada has not joined either the Paris or Vienna conventions on nuclear liability. However it has incorporated in this legislation the principles of liability adopted in these conventions.

Licensing

As noted above, the existing Atomic Energy Control Act provides the Atomic Energy Control Board with the regulatory power to control the entire nuclear fuel cycle. The Board controls the use of prescribed substances and nuclear facilities through a comprehensive licensing system which involves steps of application, evaluation of applications, issuance of the licence and continuing compliance inspection. The term 'nuclear facility' includes reactors, particle accelerators, plants for the separation, processing, or reprocessing of prescribed substances, a plant for the production of deuterium or deuterium compounds, facilities for the disposal of prescribed substances, and uranium or thorium mines or mills. The last, uranium or thorium mines or mills, were added to the

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definition of nuclear facility only in January this year. This was done to include these facilities in the same licensing process as is applied to the other nuclear facilities mentioned.

The licensing system for nuclear power plants is similar, in a general way, to that in other countries with three licensing steps: site approval, construction permit, operating licence. This general approach is also applied to the licensing of all other nuclear facilities.

The requirements for Site Approval include submission of a general description of the proposed facility and a site evaluation report (which will include an environmental impact assessment). In addition, in the absence of a Board public hearing procedure, evidence of having conducted a public information program (including public meetings) is required.

An application for a Construction Permit must include a comprehensive Preliminary Safety Report including descriptions of facility, analyses of possible failures and provisions to protect the health and safety of workers and the public.

An application for an Operating Licence must include a Final Safety Report, conforming to the facility as built, a document containing the policies and principles governing the operation, and, evidence of satisfactory completion of tests. In addition, for nuclear power plants and research reactors, the key operating personnel must be certified.

At the site approval and construction permit stages there is considerable coordination with provincial agencies having an interest in environmental matters, health and worker safety.

Compliance

A major regulatory responsibility is ensuring compliance by licensees with regulations and licence conditions. Since the regulations are relatively general, most of the requirements placed on licensees are in the licence conditions.

Compliance is ensured through a combination of inspection and required reporting. The Board conducts inspections in three ways: through resident officers at the major facilities, inspection visits by Board officers, and inspection by provincial officers serving as designated AECB inspectors.

Radiation Safety Regulations

In the case of radiation safety the Atomic Energy Control Regulations are based upon the recommendations of the International Commission on Radiological Protection. As well as recommending specific acceptable dose limits the ICRP also recommends that doses should be kept as low as is reasonably achievable taking into account economic and social factors. The Atomic Energy Control Board has been guided by this definition. One example was the establishment, in cooperation with the nuclear power industry, of design and operating objectives to ensure that the radiation dose to members of the public resulting from radioactive effluents from nuclear power stations would not exceed one percent of the statutory limits. The actual operating results from nuclear power stations are within this objective.

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In the case of uranium mining and milling, the primary problem has been the potential hazard of exposure to radon and its radioactive daughters. Although there was no specific regulation in the 1950's and 1960's, a radon daughter concentration of 1 working level was generally accepted as the standard for Canadian uranium mines. In late 1975 the Board established an exposure guideline of 4 working level months per year. In January 1978 the Atomic Energy Control Regulations were amended to make this guideline a regulatory limit.

Heavy Water Plants

The production of heavy water, or deuterium oxide, does not present a radioactive hazard in itself but heavy water production plants are defined as nuclear facilities because deuterium is specifically mentioned in the Act. The process currently employed to extract deuterium compounds from fresh water involves the use of large amounts of hydrogen sulphide. Because of the potential of releasing this highly toxic gas the plants pose a risk to the health and safety of public and plant staff. Therefore the design, construction and operation of the plants is scrutinized and controlled by the Board in a manner similar to that for nuclear power plants.

Waste Management

Canada has not yet adopted any firm policy on the establishment of long-term disposal sites for radioactive waste. Nevertheless there exists today the problem of the management of radioactive waste originating from nuclear reactors, particle accelerators, mining, milling and processing of uranium ore, production and fabrication of nuclear fuels and the production and use of radioisotopes. These waste products must be isolated and stored in radioactive waste management areas which are licensed by the Board as nuclear facilities. A major radioactive waste management facility now licensed and operating is located at the Bruce Nuclear Power Development of the provincial utility Ontario Hydro. This facility will deal with waste from the Douglas Point and Bruce Generating stations and from other Ontario Hydro nuclear generating stations throughout the province.

Physical Security

In addition to the health, safety and environmental objectives, the Atomic Energy Control Regulations also require that the physical security of prescribed substances and nuclear facilities be maintained. Therefore licence applications must include a security plan which specifies measures to be implemented by the applicant to protect against theft, loss or unauthorized use of prescribed substances or nuclear facilities.

Safeguards

Canada was the first of countries with a major nuclear program to place its entire program under safeguards inspection by the International Atomic Energy Agency. There are now 22 operating nuclear facilities being safeguarded under the terms of the "Agreement Between Canada and the International Atomic Energy Agency for Application of Safeguards in Connection with the Treaty on Non-Proliferation of Nuclear Weapons", and subject to inspection by representatives of the IAEA. This is part of Canada's continued efforts to encourage major nations to commit themselves to more stringent control policies governing the export of nuclear materials and equipment.

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Canada's safeguards policy has undergone extensive development in the past few years, precipitated by the explosion by India in 1974 of a nuclear explosive device using nuclear material derived from a Canadian-supplied research reactor. The current and firmly established policy announced in December 1976, restricts export of nuclear material, equipment or technology to countries which meet the following requirements:

- are party to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) or place their entire nuclear program under the IAEA safeguards system;
- agree not to develop any nuclear explosive;
- agree that in the event IAEA safeguards were not applied, Canadian bilateral safeguards would apply for the lifetime of items and material supplied by Canada;
- agree to obtain prior Canadian consent before material, equipment or technology of Canadian origin was transferred outside the country's jurisdiction;
- agree to obtain prior Canadian consent before reprocessing spent fuel (of Canadian origin or from a reactor supplied by Canada or using Canadian technology) or enriching uranium of Canadian origin above 20 per cent.

The Atomic Energy Control Board serves as the technical advisor to the government on safeguards and effects the policy through its control of nuclear exports under the broad authority provided by the Atomic Energy Control Act. The proposed legislation before Parliament would continue the Board's role in safeguards.

Uranium Export Control

In addition to the safeguards requirements outlined above, uranium exports are also subject to additional policy restrictions relating to price, volume, relationship between contracting parties, reserves and domestic requirements. Under the uranium resource policy announced in September 1974, sufficient uranium must be reserved to fuel for 30 years all domestic nuclear power reactors operating, under construction, committed or planned. Uranium suppliers may only export uranium in excess of their prorated share of this domestic reserve.

Currently the Atomic Energy Control Board administers these policies in cooperation with other government departments. Export contract approvals are limited to ten years with actual export permits issued on an annual basis.

Under the provisions of Bill C-14 this control for essentially commercial or resource reasons would be transferred to the Minister of Energy, Mines, and Resources.

Summary

In recent years several factors such as the growth and increasing complexity of the Canadian nuclear program, the very visible problems of contamination and uranium mine safety, and the increasing national and international concern about proliferation, have all emphasized the need for a systematic, strong and comprehensive control over nuclear activities. Although the broadly worded Atomic Energy Control Act of 1946 provides the Canadian regulatory body, the Atomic Energy Control Board, with most of the powers necessary to achieve this, a new Act has been introduced to clarify jurisdiction and to strengthen the Board, renamed as the Nuclear Control Board, in its control of the health, safety, environment and security aspects of the complete nuclear fuel cycle.