THE ROLE OF THE

ATOMIC ENERGY CONTROL BOARD

IN

URANIUM EXPLORATION AND MINING

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The Atomic Energy Control Board has been regulating the nuclear industry in general and the uranium industry in particular since 1946 when the Atomic Energy Control Act was promulgated. The Act constituted the Board and, among other things, empowered it to make regulations respecting mining and prospecting for prescribed substances, which include uranium and thorium.

The initial emphasis of the Board's participation in this respect was on the strategic material aspects of uranium — in particular the security of the uranium and information regarding its reserves, production and disposition. Administrative arrangements were agreed with the appropriate provincial government agencies in Ontario and Saskatchewan that they would assume the responsibility for the safety of the mines and for the health of mine and mill workers. A condition was included in all AECB exploration and mining licences that required compliance with all laws respecting mine safety. With the inclusion of health and safety requirements in the 1960 amendment of the Atomic Energy Control Regulations, these administrative arrangements were extended with the appointment under the Atomic Energy Control Regulations of provincial Department of Mines inspectors.

The potential hazard in the mines of radon and its radioactive decay products was recognized when full-scale uranium mining started in the 1950's. Initially, a radon daughter concentration of one
working level (WL) was generally accepted as the target for Canadian uranium mines although most mines were operating at concentrations well above that level. In 1959, the International Commission on Radiological Protection (ICRP) recommended that for occupational exposure, the maximum permissible concentration of radon daughters in air should be 0.3 WLM. Although this new limit was apparently recognized as a desirable objective by the regulatory authorities and their advisers, little action was taken to achieve this objective.

Under the 1974 revision of the Atomic Energy Control Regulations, the Board is responsible for regulating the health, safety and security aspects of prescribed substances (including uranium and thorium) and nuclear facilities (including research and power reactors, nuclear fuel processing and fabrication plants, heavy water plants, particle accelerators and radioactive waste management facilities). This regulatory role is executed by means of a comprehensive licensing system which includes submission and evaluation of applications, issuance of licences and compliance inspection.

As a result of the 1974 revision to the Regulations, the Board took a new initiative by reviewing its procedures for the licensing of uranium mining and milling operations and by establishing the Mine Safety Advisory Committee.

The current Regulations require that, unless exempted in writing by the Board, no person shall produce, mine, prospect for, refine, use, sell or possess prescribed substances except in accordance with a licence issued by the Board. Specific exemptions to this requirement
are prospecting (if such prospecting does not involve the annual removal of more than 10 kilograms of uranium or thorium from each deposit), substances containing less than 0.05 weight per cent of uranium and thorium, and use, sale or possession involving not more than 10 kilograms of uranium or thorium per calendar year.

In practice, the licensing process derived to implement the Board's role in this area includes authorization for the stages of exploration, development, operation and abandonment.

Exploration can be divided into two phases: surface and underground. Currently, a simple Permit is issued to cover the whole exploration phase. However, underground exploration is of more significance when considering health and safety, and hence will, in the future, require formal authorization as the first step towards the licensing of an actual facility.

Prior to any authorization to proceed with the construction and development phase, it is necessary that a substantive assessment be made of the potential impact of the mine and its associated mill and waste management (tailings disposal) facilities on their surroundings, as well as a preliminary review of the occupational health and safety aspects of the proposed facility designs. Timewise, this is the most significant portion of the total licensing process, since environmental studies must be made to ensure sufficient information is available, for all seasons of the year, to enable the impact to be properly assessed and also to allow for a public information program to be initiated and the response then to be considered in the regulatory process.
Prior to commercial operation, an operating licence is required. A plan for abandonment must be actively considered and provided for at the time of the authorization for development, and must be approved by the Board.

The details of the licensing procedure have been laid down in draft form in the Board's "Guide to the Licensing of Uranium and Thorium Mine-Mill Facilities", copies of which are available upon request from the Board's Ottawa office.

At the present time, 80 exploration permits are in force. With reference to operating licences, six are currently active, of which three are long-standing "mining permits" (Denison Mines Limited and Rio Algom Mines Limited at Elliot Lake, Ontario and Eldorado Nuclear Limited at Beaverlodge, Saskatchewan), having been issued prior to 1976. Three new licences (now known as Mine, Mill and Waste Management Facility Operating Licences) have been issued during 1976 to Gulf Minerals Canada Limited at Rabbit Lake, Saskatchewan, Agnew Lake Mines Limited near Espanola, Ontario, and Madawaska Mines Limited at Bancroft, Ontario. The companies currently holding "mining permits" are in the process of being relicensed, consistent with current practice.

The Mine Safety Advisory Committee was established by the Board in November, 1974, to advise on radiological health and safety standards for uranium and thorium mining and milling operations licensed by the Board. The Committee is also expected to evaluate information contained in pre-licensing reports or post-licensing periodic reports and to recommend conditions to be imposed in the Board's licences, or remedial
actions to be taken. The Committee includes experts from federal government agencies (Departments of the Environment, Health and Welfare, and Energy, Mines and Resources, Indian and Northern Affairs, and Labour, Atomic Energy of Canada Limited, and the Atomic Energy Control Board), and from provincial agencies in Ontario (Ministries of Health, Environment and Natural Resources), and in Saskatchewan (Departments of Labour and Natural Resources).

The Board has also established a Radioactive Waste Safety Advisory Committee, part of the duties of which are to provide advice on the waste management aspects of uranium mining and milling, specifically the mill tailings.

In June, 1975, the Atomic Energy Control Board presented a brief to the Royal Commission on the Health and Safety of Workers in Mines in Ontario. This brief, in addition to summarizing the regulatory status of the health and safety of the uranium mines in Ontario, also provided an opportunity for the Board to make known its future objectives to protect the health and safety of uranium miners in Canada. These objectives are:

(1) On the advice of its Mine Safety Advisory Committee, to establish and make provisions for the enforcement of radiological protection and health safety standards in uranium mines pertaining to air quality and other matters pursuant to the Atomic Energy Control Regulations concerning radiological health safety in uranium mines.
(2) To clarify and amplify cooperative arrangements with federal and provincial departments and agencies regarding licensing compliance in uranium mines.

(3) In conjunction with the provincial governments, federal agencies and other interested authorities and institutions, to provide direct assistance in the training and certification of uranium mine radiation and dust inspectors.

(4) To establish a qualified medical/radiological safety coordinating group as a focal point for evaluating and auditing uranium miner health information (e.g., exposure data). This group will also be available for consultation and advice to industry and government agencies.

(5) In conjunction with the Department of Energy, Mines and Resources, and in consultation with other government departments and agencies, to implement a research and development program for improved techniques and associated equipment for protection of miners underground, for individual dose measurement and recording, for monitoring the contamination of the mine air, for mine inspection, and for the control of mine air quality (e.g., ventilation).

(6) In consultation with other government departments and agencies to initiate research and development programs,
to define mine air quality standards, to develop improved methods for the early diagnosis of health problems and to conduct epidemiological studies.

Significant progress has been made toward the achievement of these objectives.

With reference to the first objective, establishment and enforcement of radiological protection and health safety standards in uranium mines, the Board instituted in January, 1976, by letter from the President and on the advice of the Mine Safety Advisory Committee, the requirement that radon daughter exposure shall be kept as low as reasonably achievable and shall not exceed four working level months per annum. This requirement will be applied for at least one year as an interim guideline to provide time for further investigation of the appropriateness of this limit. The Board also agreed that miners who are approaching or who may have already exceeded a cumulative exposure of 120 working level months should be made aware, on a case-by-case basis, of the risks concerning lung cancer associated with continuing their present type of employment in order that they can make an informed decision concerning their future. The Board also supported the committee recommendation that workers at uranium mines be advised against smoking, both at work and at other times, because of the potential synergistic effect of radon daughter exposure and smoking.

At the same time, the Board indicated that it will be licensing uranium mines and mills in the same manner as other nuclear facilities, as provided for in the Atomic Energy Control Regulations. The Board
also indicated that uranium workers who may be exposed to radiation doses in excess of that permitted for the general public are considered to be Atomic Radiation Workers and subject to the regulatory provisions for that classification.

With respect to the second objective, progress is continuing toward better defining the cooperative arrangements between federal and provincial agencies re: licensing compliance in uranium mines.

The provinces consider that the management and exploitation of natural resources is a provincial responsibility, and the federal authority over uranium and thorium raw materials and their utilization, dating back to the late 1940's, is a perennial point of argument. Even though there is strong federal jurisdiction implicit in the field, the Atomic Energy Control Board has agreed that provincial rules for prospecting and staking of claims should apply, and the Board's authorizations and licences in the past have invoked applicable provincial mine safety statutes and regulations. Issuance of a Board licence regarding uranium mining is conditional upon the applicant obtaining from the province concerned, the necessary property rights and, subject to the Atomic Energy Control Regulations, compliance with all applicable provincial and territorial regulations.

In the matter of monitoring and compliance activities, in the past, the Board has been a passive partner, relying entirely on provincial agencies and the mine operators to be responsible. While the Board has no intention of taking over the compliance activities of other involved regulatory authorities, it does wish to be fully informed of
such compliance programs and their results to ensure that the appropriate standards are being met. The Board has also indicated that it will become involved as a participant in compliance programs and that it intends to audit existing radiation and dust measuring practices.

In this regard, meetings have been arranged by the Board with those provincial ministries and departments that are concerned, in provinces producing or likely to produce uranium, in order to confer on problems of regulation and to enable coordination of the many agencies involved.

With reference to the third objective, to assist in the training and certification of uranium mine radiation and dust inspectors, the Board has supported a uranium mine inspectors' training course, the first having been held during May, 1976, and attended by 25 persons (15 from provincial government agencies, 5 from the uranium industry and 5 from the United Steelworkers union, representing uranium miners); a second such course is currently in session at Elliot Lake.

Progress on the fourth objective, establishment of a qualified medical/radiological safety coordinating group to evaluate uranium miner health information includes the secondment to the Board from the federal Department of Health and Welfare, in April, 1976, of a senior medical adviser who is conducting discussions with other interested agencies towards the establishment of the proposed coordinating group.

With reference to the fifth and sixth objectives, the Board is becoming involved in various research and development projects in support of its licensing program. Included in this initiative is
an investigative program being conducted to determine the exposure conditions in various uranium mines. Other research and development efforts currently committed include a sputum cytology study (to identify early changes potentially leading to cancer) and field testing of a new alpha-dosimeter.

Recent events, other than the increased awareness of the hazards associated with the uranium mine atmosphere, have had a significant effect on the Board's role.

In early 1975, contaminated buildings were encountered in both Toronto and Montreal, resulting from previous radium processing and use. As work got underway to decontaminate the areas, a number of other locations came to light, and by early 1976, about fifty locations in Canada had been identified where radioactivity in excess of naturally occurring levels was known or suspected. These locations include uranium mine and mill tailings disposal areas, dumps from various metallurgical operations, and locations in public buildings, residential and commercial areas where radioactive fill and salvaged building material had been used in past years. The most widely known example is Port Hope, Ontario, where radioactive plant wastes and contaminated building materials have been identified in a number of widely dispersed sites. A second major site of radioactive material is at the abandoned metallurgical plant at Deloro, Ontario, where slags resulting from treatment of ores and waste products from several sources have been left exposed and close to habitation. In both locations, homes were vacated pending remedial action.
The problems of investigating the contaminated areas, of determining the corporations or agencies responsible, of cost sharing and of action to be taken, were complicated by the fact that at many locations throughout the country the companies are no longer in existence. To cope with this, a federal-provincial task force was organized early in 1976 to expedite clean-up in the Port Hope area, and to assist the Board in assessing the significance of radioactivity and the action needed elsewhere in Canada. Clean-up was straightforward and rapid in some locations, but in others large-scale and expensive operations are required; for instance, a complete survey of some 3,500 homes and buildings is to be completed in Port Hope, and contaminated soil and materials will have to be removed from an estimated 500 locations. The Board opened an office in Port Hope to coordinate efforts on site by the three levels of government and industry and to deal with requests for information from citizens.

The uranium mining areas of Canada - Elliot Lake, the Bancroft area, Uranium City - were immediately suspect, and preliminary information on environmental contamination and on hazardous use of mine wastes as building fill has been assembled. A temporary office was operated in Uranium City last summer as a coordination centre for the three levels of government and industry in first stage surveys and clean-up of contaminated sites. Early this month a survey of the Town of Elliot Lake was begun, in cooperation with the Ontario Ministry of Health, Health & Welfare Canada, the Department of National Defence, Energy, Mines & Resources and the mining companies, to delineate any
problem areas associated with radioactivity. Preliminary results indicate that a relatively unique situation exists in the town. There is a band of uranium-bearing quartzite close to the surface which is contributing to the levels of radioactivity found in the houses in the area, and is probably the sole source of radioactivity in the houses built right on the quartzite. Other areas show evidence of the use of mine waste for fill under and around buildings. This situation, of course, complicates the attempts being made to reduce the potential radiological hazard to the inhabitants, consideration having to be given to modifying building designs as well as removal of fill to reduce the ingress of radon and to minimize its concentration. Having identified the problem, it raises a number of interesting questions regarding the regulation of building in areas with such natural radioactive outcrops.

A major problem associated with the clean-up of radioactively contaminated material is to obtain local approval for a disposal site. In the case of Port Hope, the low grade radioactive soil has to be trucked 200 miles to Chalk River at high cost because of objections from the surrounding municipalities. Hopefully a local site can be found soon for the continuation of the clean-up.

Influenced by these events, major emphasis is being placed on the general question of low-level waste management, a significant portion of which has to do with uranium mine waste and mill tailings.

Looking at the current methods of disposing of mine waste and mill tailings, we must ask ourselves if these methods, thought to be
suitable in the past, should be allowed to be continued in the future. Modifications are constantly being made to improve retention of the radium in defined areas, but should not more effort be placed on removal of this and other contaminants, such as thorium and metal sulphides, as part of the milling process? No one wants to contemplate additional operational costs in the mill, but one wonders if current practice is not simply deferring the problem to future generations at vastly increased cost. The AECB and its associates on the Radioactivity Task Force are sensitive to this point since we are now engaged in a multi-million dollar clean-up resulting from actions taken a decade or two ago, which were thought at the time to be acceptable. It must be remembered that hundreds of millions of tons of tailings and mine waste are going to be around for a very long time, most of which contain significant quantities of radioactive and acid forming materials and are subject to all natural processes which could mobilize these contaminants and distribute them in the surroundings.

With these questions in mind, criteria for the handling, storage and disposal of wastes are currently being generated, for both the short-term and long-term considerations; groups have been established to consider various aspects of the problem, with the intent of factoring their input into the Board's regulatory process. Research and development projects by contract are also being formulated and initiated to support these activities, all in cooperation with other government agencies and the companies.
Future plans of the Atomic Energy Control Board in respect of its mode of operation in general and in relation to uranium and thorium mining and milling operations in particular include:

(1) Fulfill, on a national basis, the objectives outlined in the Brief to the Royal Commission on the Health and Safety of Workers in Mines in Ontario, and in the recommendations in the report of the Commission, including establishment and enforcement of radiological protection and health and safety standards, cooperative arrangements with federal and provincial government agencies re: compliance inspection, training and certification of uranium mine radiation and dust inspectors, establishment of the proposed medical/radiological safety coordinating group, and an appropriate research and development program in support of these objectives and the Board's licensing program.

(2) Review mine regulatory standards to confirm or amend the interim standards for radon daughter exposure published 14 January, 1976, in order to establish the acceptable standard for 1977.

(3) Amend the Atomic Energy Control Regulations to include new regulatory standards and requirements and to include uranium mine and mill complexes as nuclear facilities.

(4) Publish revised licensing guides to describe in greater detail the types of information, assessment, criteria
and procedures for effective licensing of uranium and thorium mines and mills.

(5) The Minister of Energy, Mines & Resources, through whom the Board reports to Parliament, recently announced that revisions to the Atomic Energy Control Act are to be made. Because of the increasing responsibilities of the Board in the licensing regulatory and compliance fields and the perceived conflict of interest with the promotional, commercial and developmental aspects of the Act, these two groups of functions are to be separated under a revised two-part Act and Regulations. The Board will continue to be responsible for the regulatory function and report through a Minister who is not responsible for commercial matters. The second part of the Act will be administered by another group responsible for developmental matters and report through another Minister.