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MANAGEMENT OF RADIOACTIVE WASTES – PROGRAMS OF THE INTERNATIONAL ATOMIC ENERGY AGENCY

RADIOACTIVE WASTE

KEYWORDS: IAEA, radioactive waste management, radiation protection, environment

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The International Atomic Energy Agency was established in 1957 to serve as the agency of the United Nations responsible for international activities concerned with the peaceful uses of atomic energy. The agency was established to promote the development of peaceful uses of atomic energy and dissemination of information from those member states having well-developed programs to those just embarking upon such programs.

The prevention of pollution of the seas from the discharge of radioactive waste was recognized early as a problem concerning international cooperation. From its inception the agency has devoted considerable effort toward this problem.

The recent worldwide interest in preservation of environmental quality has led the agency to broaden its waste management program to include consideration of all environmental impacts associated with nuclear power, regardless of whether they are unique to nuclear power. Also, an increasing amount of attention is being given currently to the problems associated with the management of high-level and alpha-bearing radioactive wastes; the combination of the high potential hazard and the long containment time required make this problem of international concern.

The international concern for these two problem areas has led to an increased scope of activities in the agency's waste management program.

agency be established under the aegis of the United Nations. Following a further recommendation from his address, the United Nations General Assembly resolved in Dec. 1954 to hold an international technical conference to explore means of developing peaceful uses of atomic energy through international cooperation. As a result of this resolution an International Conference on Peaceful Uses of Atomic Energy was held in Geneva, Switzerland, Aug. 8-20, 1955. President Eisenhower's proposal to establish an international atomic energy agency was also pursued by representatives from a small group of states and the Statutes of the International Atomic Energy Agency (IAEA) entered into force on July 29, 1957. The IAEA is an autonomous, intergovernmental organization headquartered in Vienna and related to the United Nations by an agreement in which it is recognized as the agency of the United Nations responsible for international activities concerned with the peaceful uses of atomic energy.

The objectives of the IAEA are "to seek to accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world." The IAEA is authorized to encourage and assist research and development of atomic energy for peaceful purposes, to foster the exchange of scientific and technical information, and to establish or adopt standards of safety for protection of health and minimization of danger to life and property.

The prevention of pollution of the seas from the discharge of radioactive wastes was recognized early as a problem requiring international cooperation. From its inception the IAEA has devoted considerable attention to this problem.

In Apr. 1958 the United Nations Conference on the Law of the Sea, which had originated in response to concern over releases of oil, adopted a Convention on the High Seas. Article 25 of this

On Dec. 8, 1953, President Eisenhower, in an address to the United Nations General Assembly, proposed that an international atomic energy

convention called for every state to "take measures to prevent pollution of the seas from dumping of radioactive wastes, taking into account any standards and regulations which may be formulated by the competent international organizations." The conference also adopted a resolution recognizing the IAEA as the competent international organization to assist states in this effort.

Beginning in 1958, the IAEA convened a series of panel meetings under the chairmanship of H. Brynielsson of Sweden to implement its program of formulation of regulations governing waste disposal into the sea. The deliberations of this panel led to the publication in 1961 of IAEA Safety Series 5, Radioactive-Waste Disposal into the Sea.

Following this series of panel meetings, the IAEA has continued to explore and review the problems associated with the discharge of radioactive wastes into the sea. In 1961 the IAEA, in cooperation with the Monagesque Government and French Institute of Oceanography, established the International Institute for Marine Radioactivity at Monaco. Its program, at present, is directed toward the standardization of research and measurement techniques used in determining the behavior and effects of radioactivity in the sea.

In addition to the activities of the Monaco Laboratory, the IAEA has periodically convened panel meetings and symposia on topics related to the behavior and effects of radioactive contaminants in the marine environment (Table I). During preparation for the United Nations Conference on the Human Environment, which was held in Stockholm in June 1972, the interest of several states in prevention of marine pollution was sufficient to initiate drafting of a Convention on Prevention of Marine Pollution from Dumping of Wastes and Other Matter. The final draft was completed at an Intergovernmental Conference convened for that purpose in London in Nov. 1972, and the convention opened for signature in Dec. 1972. The provisions of the convention, *inter alia*, prohibit the dumping at sea of high-level radioactive wastes, defined by the IAEA as unsuitable for dumping. Dumping of other radioactive wastes requires the issuance of a special permit by signators of the convention, and in issuing such a special permit the regulations and recommendations of the IAEA must be adhered to. The responsibilities entrusted to the IAEA under the terms of this convention made it necessary to convene a series of meetings in 1973 and 1974 to assure that these responsibilities were adequately covered.

The remainder of the early program of the IAEA in waste management centered on the collection of information on waste treatment and disposal processes from the more developed

TABLE I

IAEA Activities Conducted in the Period 1965-1974
in Relation to the Disposal of Radioactive
Wastes into the Seas

Symposia

Disposal of Radioactive Wastes into Seas, Oceans and Surface Waters, Vienna (May 1966).

Interaction of Radioactive Contaminants with Constituents of the Marine Environment, Seattle (July 1972).

Panels

Reference Methods for Marine Radioactivity, Vienna (Nov. 1968).

Procedures for Establishing Limits for Radionuclides in the Sea, Vienna (Nov. 1970).

The Agency's Responsibilities under the Convention on Prevention of Marine Pollution by Dumping of Wastes and Other Matter, Vienna (June 1973).

Reference Methods for Marine Radiobiological Studies, Monaco (June 1973).

Effects of Ionizing Radiation on Aquatic Organisms and Ecosystems, Vienna (1974).

Ocean Dumping Convention Criteria, Vienna (1974).

Publications

IAEA Safety Series 11, *Methods of Surveying and Monitoring Marine Radioactivity* (1965).

IAEA Safety Series 27, *Safety Considerations in the Use of Ports and Approaches by Nuclear Merchant Ships* (1968).

IAEA Safety Series 36, *Disposal of Radioactive Wastes into Rivers, Lakes and Estuaries* (1971).

IAEA Technical Reports Series 118, *Reference Methods for Marine Radioactivity Studies* (1970).

IAEA Proceedings Series—STI/PUB/126, *Disposal of Radioactive Wastes into Seas, Oceans and Surface Waters* (1966).

IAEA Proceedings Series—STI/PUB/313, *Radioactive Contamination of the Marine Environment* (1973).

countries and dissemination of the information to other member states. Efforts dealing directly with radiation protection of the public, especially those involving the formulation of standards and guidelines, have been conducted largely in cooperation with the World Health Organization (WHO). Those dealing with the technical aspects are often conducted in cooperation with the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (NEA/OECD).

The IAEA has also sponsored training of technical personnel from developing countries by

providing fellowships for study in the more advanced countries. Research contract funds are also made available to act as a stimulus for embryonic research programs in the developing countries. The objective is to permit the trained scientist or technologist sufficient funds to buy equipment and initiate a program with the intent that it will later be financed by his government. Most IAEA research contracts have a duration of three years. To promote exchange of ideas and information during the course of the research effort, a coordinated research program is often established on a topic of particular interest to the IAEA with research contracts awarded to several developing countries and research agreements with a number of the more developed countries. In this way the programs in the developing countries benefit from direct association with the more developed programs. Often in the initial stages of a research or development program, or at the time a development program is being made operational, technical experts may be provided by the IAEA to a member state upon request.

In the past few years there has been a broadening of the scope of the IAEA program in waste management. A number of reasons contribute to this. First, the dissemination of information in the field of atomic energy is not so restricted as in the early days of the IAEA. Furthermore, there has been increased public and governmental awareness of the need for protection of the human environment. The IAEA has sponsored a number of symposia on topics related to waste management (Table II). From the point of view of publications sales, one of the most successful was the symposium "Environmental Aspects of Nuclear Power Stations" convened by the IAEA in cooperation with the U.S. Atomic Energy Commission in New York, Aug. 10-14, 1970. To summarize the presentations at this symposium in a condensed and readily understandable form for those not engaged directly in this field of work, in 1972 the IAEA, in collaboration with WHO, prepared a booklet, "Nuclear Power and the Environment." The awareness of the public and governments concerning environmental protection was reflected also in the convening of the United Nations Conference on the Human Environment in Stockholm in June 1972. There is also a realization that resolution of some of the long-term problems of atomic energy programs related to protection of the public will require multilateral cooperation.

As a result of the focus of attention placed on environmental protection, the Director General of the IAEA recommended an expanded program of activities to the General Conference of the IAEA in Sep. 1972. The details of an expanded program were endorsed by a special consultants' meeting

TABLE II
IAEA Symposia on Waste Management and
Related Topics

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| <p><i>Disposal of Radioactive Wastes</i>, Monaco (Nov. 1959).</p> <p><i>Treatment and Storage of High-Level Radioactive Wastes</i>, Vienna (Oct. 1962).</p> <p><i>Radiological Health and Safety in Nuclear Materials Mining and Milling</i>, Vienna (Aug. 1963).</p> <p><i>Practices in the Treatment of Low- and Intermediate-Level Radioactive Wastes</i>, Vienna (Dec. 1965).</p> <p><i>Disposal of Radioactive Wastes into Seas, Oceans and Surface Waters</i>, Vienna (May 1966).</p> <p><i>Disposal of Radioactive Wastes into the Ground</i>, Vienna, May 29-June 2, 1967.</p> <p><i>Instruments and Techniques for Assessment of Airborne Radioactivity in Nuclear Operations</i>, Vienna (July 1967).</p> <p><i>Containment and Siting of Nuclear Power Plants</i>, Vienna (Apr. 1967).</p> <p><i>Operating and Developmental Experience in the Treatment of Airborne Radioactive Wastes</i>, New York (Aug. 1968).</p> <p><i>Agricultural and Public Health Aspects of Environmental Contamination by Radioactive Materials</i>, Vienna (Mar. 1969).</p> <p><i>Developments in the Management of Low- and Intermediate-Level Radioactive Wastes</i>, Aix-en-Provence (Sep. 1970).</p> <p><i>Environmental Aspects of Nuclear Power Stations</i>, New York (Aug. 1970).</p> <p><i>Rapid Methods for Measuring Radioactivity in the Environment</i>, Neuherberg, Germany (July 1971).</p> <p><i>Test Requirements for Packaging for Transport of Radioactive Material</i>, Vienna (Feb. 1971).</p> <p><i>Interaction of Radioactive Contaminants with Constituents of the Marine Environment</i>, Seattle (July 1972).</p> <p><i>Management of High-Level Radioactive Wastes</i>, Paris (Nov. 1972).</p> <p><i>Environmental Surveillance around Nuclear Installations</i>, Warsaw (Nov. 1973).</p> <p><i>Environmental Behaviour of Radionuclides Released in the Nuclear Industry</i>, Aix-en-Provence (May 1973).</p> <p><i>Physical Behaviour of Radioactive Contaminants in the Atmosphere</i>, Vienna (Nov. 1973).</p> <p><i>Physical and Biological Effects in Environment of Cooling Systems and Thermal Discharges from Nuclear Power Stations</i>, Oslo (Aug. 1974).</p> <p><i>Radiological Safety Evaluation of Population Doses and Application of Radiological Safety Standards to Man and the Environment</i> (Seminar), Portoroz, Yugoslavia (May 1974).</p> |
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in early Nov. 1972 and later by the Scientific Advisory Committee and the Board of Governors. Currently, a review is being made of other environmental impacts of nuclear power, such as effects of cooling systems, regardless of whether they are unique to nuclear power.

In the field of waste management it was believed previously that the problems of management of high-level wastes from fuel reprocessing were of concern only to the more advanced countries and that unilateral handling of the problem was sufficient. In Sep. 1970 the IAEA sponsored a three-day meeting of consultants at Aix-en-Provence, France, to discuss progress on the ultimate disposal of radioactive wastes and how the existing policies and technologies of disposal might apply to other countries entering into fuel reprocessing. At the conclusion of the session on radioactive waste management at the Fourth International Conference on Peaceful Uses of Atomic Energy held in Geneva, Sep. 1971, there was a spirited discussion on the various requisites of a waste management system and development of national policies. Some of the concern centered over the longer containment times required for decay of transuranic radionuclides. Similar discussions were held in the meetings convened by NEA/OECD in preparation of their document, "Waste Management Practices in Western Europe." Later at the Stockholm Conference, an action proposal directed member states to explore, through the IAEA and other competent international bodies, the problems of mining and milling tailings and of siting of fuel reprocessing plants in relation to waste disposal facilities and associated problems of transportation.

With this background of expressed interest, the IAEA took steps to intensify its program of activities related to management of high-level and alpha-bearing wastes. In Nov. 1972 a panel was convened in Vienna to explore the problems associated with establishment of international storage sites for high-level and alpha-bearing wastes. The panel concluded that it would be premature to consider establishment of international storage sites but recommended that the IAEA undertake a series of new activities related to the management of such wastes.

This panel was immediately followed by a Symposium on Management of Radioactive Wastes from Fuel Reprocessing, convened under the joint sponsorship of the NEA/OECD and the IAEA in Paris, from Nov. 27 through Dec. 1, 1972. Several participants expressed an interest in periodic international meeting to discuss progress in management of high-level and alpha-bearing radioactive wastes, especially the development of new concepts.

Shortly thereafter the Scientific Advisory Committee met and endorsed the expanded program of the IAEA for environmental protection and waste management that had been recommended in a consultants' meeting in early Nov. 1972. It was anticipated that supplementary funding would be available from the U.N. Environmental Program, which had been established on the basis of actions taken at the U.N. Conference on the Human Environment held in Stockholm in June 1972. To initiate the program as quickly as possible, the U.S. Government made a substantial voluntary contribution to the agency on Dec. 7, 1972; this contribution was designated for the expanded program, the Monaco Laboratory, and the IAEA fellowship program. The Federal Republic of Germany (FRG) also made a voluntary contribution and within a few weeks several other governments pledged financial support for the program.

Part of the additional financial support was used to obtain the services of Harry Parker, on a special services agreement, for the purpose of developing a detailed program of activities related to the management of high-level and alpha-bearing radioactive wastes. Implementing suggestions made at the IAEA/NEA Symposium, the IAEA established an International Working Group on High-Level and Alpha-Bearing Wastes. This group was established to provide an international forum for discussion of the problems encountered in developing national strategies for management of such wastes and of the merits of new concepts being suggested for development. Additionally, it was intended that the group would give advice to the Director General concerning the activities the IAEA should undertake in this field. The first meeting of the group was held in Mar. 1974 with representatives from France, FRG, India, Japan, the United Kingdom, the United States, and the U.S.S.R.

Another specific activity that the IAEA has undertaken as the result of recommendations of the panel in Nov. 1972 is the preparation of a technical report on the current status of management of high-level wastes from fuel reprocessing. This report had been suggested originally as a review of the high-level waste solidification processes being developed but was expanded in scope by the Nov. 1972 panel.

The Waste Management Section of IAEA plans to convene five panels during 1974 (Table III). Similar programs of activities are planned for succeeding years. In addition to the areas currently being given consideration, activities related to public acceptance of nuclear power and decommissioning of nuclear facilities will be included in the program.

TABLE III
Topics on Waste Management to be Discussed
at IAEA Panels Planned for 1974

1. Capacity of the environment to accept safely radioactive materials
2. Studies of the radiation doses to the population from the peaceful uses of atomic energy including the nuclear industry
3. Waste management in the uranium and thorium mining and milling industry
4. Solidification of low- and intermediate-level radioactive waste residues and criteria for their storage and disposal on land
5. Review of standardization of waste categories

The program of the Waste Management Section of the IAEA has changed drastically in the past few years. The interest of member states in both environmental protection and management of high-

level and alpha-bearing wastes has increased in this period and both of these "popular" areas have been addressed by the Waste Management Section. Unfortunately, the increased number of IAEA-sponsored meetings has not been matched by increased staffing. Also, the proposed activities represent a new direction by the IAEA and require much more intensive preparation than the former types of activities where experts from the member states had well-developed and well-documented information. It is my opinion that the international needs of atomic energy programs could be best served if the IAEA would select fewer topics for discussion and engage sufficient technical staff, perhaps in the form of special service agreements, to make detailed reviews prior to convening of panel meetings.

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