

CURRENT IAEA ACTIVITIES IN RADIOACTIVE WASTE MANAGEMENT

Rudolf Burel and Arnold Bonne
International Atomic Energy Agency
Waste Technology Section
Vienna, Austria

Abstract

The International Atomic Energy Agency's (IAEA) organizational structure and activities in the field of predisposal radioactive waste management are described. The present activities undertaken by the Agency's Waste Technology Section and Waste Safety Section are outlined, with the emphasis to the practical technical assistance to the Member States and the development of safe management practices. The three main types of documents produced by the Agency for disseminating safety requirements and rules and the technical information to the Member States are listed. The Agency's involvement in organising/sponsoring conferences, co-ordinating research programmes, providing assistance on technical projects and training of staff on waste management subjects is detailed. Attention is given to the direct advisory services and technical assistance offered to the Member States by the Agency.

Gaseous radioactive waste are the major source of potential direct environmental impact of nuclear facilities operation, therefore their proper and sound management represents a significant part of the Agency activities in the entire radioactive waste management programme. The main outputs are listed in the article.

Introduction

The International Atomic Energy Agency operates under a Statute signed on the 26 October 1956 by the initial group of Member States. The Statute in Article II states that the "**Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world.**"

Nuclear power plants contribute about 18 % of the total electricity generation world wide. Research and development in the field of nuclear science and technology have led to a wide scale of nuclear applications in research, industry and medicine. Such practices generate radioactive waste, that requires safe management to ensure the protection of human health and the environment now and in the future, without imposing undue burdens on future generations. This safe management is achieved by applying in an appropriate administrative and technical framework a series of waste management steps such as treatment, conditioning, storage, transportation and disposal in licensed facilities.

Assisting its Member States in the safe handling, predisposal and disposal of radioactive waste is a major concern of the Agency.

IAEA Organizational Structure in Waste Management

The activities of the Agency in the field of radioactive waste management are carried out by the Waste Technology Section, Department of Nuclear Energy, and the Waste Safety Section, Department of Nuclear Safety.

The Waste Technology Section's activities are organised into four subprogrammes covering:

- Handling, processing and storage of radioactive waste;
- Radioactive waste disposal;
- Technology and management aspects of decontamination, decommissioning and environmental restoration; and
- Waste management information and support services.

In the subprogramme Handling, Processing and Storage of Radioactive Waste, special emphasis is being placed on safe, sound and cost effective methods to minimise the generation of radioactive waste, and on the promotion of effective technologies to manage all types of radioactive waste, e.g. the waste generated from nuclear power plants, fuel cycle facilities and nuclear applications. Quality assurance of waste packages required for safe transportation, storage and disposal is also considered as an important project area within this subprogramme. The Radioactive Waste Disposal subprogramme is focused on planning, design, construction, closure and quality assurance of radioactive waste repositories for all types of radioactive wastes. In the Decontamination, Decommissioning and Environmental Restoration subprogramme, attention is mainly given to nuclear power plants and fuel cycle facilities, although, in recognition of the specific needs of many Member States, some work is oriented on the decommissioning and associated problems at research reactors and non-fuel cycle facilities. The fourth subprogramme is concerned with the provision of information and supporting services to facilitate the establishment of technical infrastructure in accordance with the specific needs of the Member States and to offer assistance in resolving special waste management problems.

The task of the Waste Safety Section is to promote the safe management of radioactive waste, the control of environmental releases of the radioactive materials and the restoration of sites contaminated by radioactive residues from past activities and events through the development of consensus safety standards. The Section's activities consist of three sub-programmes covering:

- Safety of disposable waste;
- Safety of released waste;
- Safety of residual waste.

The subprogramme Safety of Disposable Waste deals with the safety aspects of both the predisposal and disposal of radioactive waste. Its main objective, by means of the Radioactive Waste Safety Standards (RADWASS) programme, is to promote international consensus on the safe management of radioactive waste. The aim of the subprogramme Safety of Released Waste is to promote international consensus in the approach to the control of releases of radioactive materials to the environment. This is achieved through the fostering of information exchange and harmonization on the modeling of the environmental transport of radioactive material, the development of internationally agreed data on environmental transfer parameters, the development of guidance on criteria for limiting the releases of radioactive materials to the environment and for verification of compliance through environmental

25th DOE/NRC NUCLEAR AIR CLEANING AND TREATMENT CONFERENCE

monitoring programmes. The focus of the subprogramme Safety of Residual Waste is towards the development of internationally harmonized safety guidance for chronic situations involving restoring of contaminated areas, including harmonized approaches for environmental decontamination and for the release of previously contaminated environment for unrestricted or restricted use.

IAEA Activities in Technology Transfer and Assisting Member States

The IAEA as an international organization has the role of fostering co-operation and coordination of activities that can be best handled at the international level. Within the area of radioactive waste management, the role of the Agency has been well established and include the following:

- Collect, review and publish up-to date technical information on various aspects of radioactive waste management;
- Establish, reach consensus and publish Safety Standards for the safe management and disposal of radioactive waste ;
- Provide fora for dissemination and exchange of information;
- Sponsor and co-ordinate research and development in the waste management area;
- Provide technical assistance and staff training for developing Member States in specific waste management projects;
- Provide direct advisory services to the Member States;
- Provide technical support to the Member States in specific waste management problems. .

Publications

The Agency produces three main types of official documents for disseminating of safety requirements and rules and the technical information to Member States. These are:

- Safety Standards Documents
- Technical Reports Series
- Technical Documents

The Safety Standards (SS) documents are of regulatory nature, issued under the terms of Article III of the Agency's Statute, which authorizes the Agency to establish standards of safety for protection against ionizing radiation.

The Safety Standards comprise Safety Fundamentals, Safety Requirements (formerly Safety Standards) and Safety Guides and cover the subjects of radiation safety, transport safety, nuclear safety, waste safety and general safety.

Regarding radioactive waste safety, the Agency's Radioactive Waste Safety Standards (RADWASS) Programme is aimed at establishing a coherent and comprehensive set of principles and standards for the management of waste and formulating the guidelines necessary for their application.

Technical Report Series (TRS) and Technical Documents (TECDOC) are dedicated to publication of the latest state-of-the-art information on technical subjects. While TRSs cover more general subjects, with expected longer time validity, TECDOCs contain information or data of a preliminary nature.

25th DOE/NRC NUCLEAR AIR CLEANING AND TREATMENT CONFERENCE

Although TRS, TECDOC and SS documents on radioactive waste management have proved to be useful for over three decades, the need for a different type of document that focuses on "step-by-step" solutions to specific waste management problems facing developing Member States has become evident in recent IAEA technical assistance missions. Thus a new series of documents, called Technical Manuals, has been prepared to provide developing Member States with information on straightforward and low cost solutions to waste management.

Fora for exchange of information via international conferences, symposia and seminars

An effective way of disseminating up-to-date information is through the organization and sponsorship of international meetings on subjects of mutual interest to IAEA Member States. The major meetings on radioactive waste management organized or sponsored by the IAEA in recent years are listed in Table 1.

Table 1 Major meetings on radioactive waste management organized or sponsored by the IAEA

Type	Title	Year	Venue
Symposium	Management of Low and Intermediate Level Waste	1988	Stockholm
Seminar	Decontamination Policies	1991	Paris
Seminar	Storage and Disposal of Radioactive Waste	1991	Paris
Symposium	Geologic Disposal of Spent Fuel, High-Level and Alpha-Bearing Radioactive Waste	1992	Antwerp, Belgium
Conference	SAFEWASTE-93	1993	Avignon, France
Conference	Nuclear Waste Management and Environmental Remediation	1993	Prague
Symposium	Spectrum '94	1994	Berlin
	Spectrum '96	1994	Atlanta
Seminar	Radioactive Waste Management Issues and Practices in Developing Countries	1994	Seattle
Seminar	Requirements for the Safe Management of Radioactive Waste	1994	Beijing
Symposium	Waste Management '94	1994	Vienna
	Waste Management '95	1995	Tucson
	Waste Management '96	1996	Tucson
	Waste Management '97	1997	Tucson
	Waste Management '98	1998	Tucson
Symposium	Experience in the Planning and Operation of Low Level Waste Disposal Facilities	1996	Vienna
Conference	Radioactive Waste Management and Environmental Restoration (ICEM '97)	1997	Singapore

25th DOE/NRC NUCLEAR AIR CLEANING AND TREATMENT CONFERENCE

Co-ordinated Research Programmes

While the Agency does not conduct R & D activities in radioactive waste management, its Co-ordinated Research Programmes (CRPs) assist Member States' organizations to perform research and development on topics of wide interest and importance. Participation has ranged broadly, involving both developed and developing Member States, thus serving as an excellent forum for the transfer of technical information and data of common interest.

CRPs are based on research contracts or research agreements requiring that the information gained must be accessible to all Member States. CRPs have usually 5 to 12 participating institutes and are extended over a 4 to 5 year period. Every 18 months a co-ordination meeting of the principal investigators is called at the Agency's expense to discuss the programme achievements of each participant in terms of content and future direction. The results of CRP are published as IAEA technical documents (TRS or TECDOC) and provided to all interested Member States.

Technical assistance

IAEA technical assistance policy is based on requirement that the recipient Member States should have minimal satisfying radiation protection and administrative and technical waste management infrastructure. Technical assistance projects offer the opportunity to provide individual Member States with expertise, technology transfer, individual staff training and equipment for specific waste management problems faced. The final objective is to develop the expertise for self-sufficiency in the safe management of radioactive wastes. The number of technical assistance projects requested by the Member States is increasing every year as the linkage between use of nuclear techniques and the need to plan and manage the consequent waste management problems.

Training

A number of scientists and technicians from developing countries have been individually trained in developed countries in the area of radioactive waste management as a part of technical assistance projects.

In addition, national, regional and interregional training courses are regularly arranged for groups of participants. During the past four years, 9 regional and 3 interregional training courses have been organized on waste management subjects, with a total of 300 participants from 60 countries. In the last time "on-hands" training within demonstration projects is organized to improve the knowledge and practical skills of participants from developing Member States in radioactive waste management mostly from nuclear applications.

IAEA advisory services to the Member States

Direct advisory services are offered by the Agency to the Member States to assist in improvement of their waste management programme. The main Agency activities have been concentrated into the two advisory programmes:

- Waste Management Advisory Programme (WAMAP)
- Waste Management Assessment and Technical Review Programme (WATRP).

Waste Management Advisory Programme (WAMAP) was developed to provide (through international expertise) a direct assistance to developing Member States in planning and implementation of the national radioactive waste management programmes considering the country's specific conditions and common problems faced in the region. 42 developing countries were visited by WAMAP missions, 15

25th DOE/NRC NUCLEAR AIR CLEANING AND TREATMENT CONFERENCE

only generating radioactive waste from radioisotopes application in medicine and research, 18 having, in addition, waste from nuclear research reactors and 9 also having waste from nuclear power reactors.

Several Member States with established radioactive waste management programmes have requested international peer review services under Waste Management Assessment and Technical Review Programme (WATRP). Eight WATRP reviews (Table 2) have been carried out since 1989 focused mostly on waste disposal issues.

Table 2 WATRP reviews

Country	Year	Subject of review
United Kingdom	1989	NIREX R&D programme on deep geological repository post-closure safety and site assessment
Republic of Korea	1991	Siting criteria for a disposal site for low and intermediate level radioactive waste
Finland	1992	The Finnish nuclear waste management programme
Czech Rep.	1993	The deep geological disposal programme
Slovak Rep.	1993	The pre-operational safety assessment of the Mochovce near surface disposal facility
Norway	1995	Storage/disposal facility for LLW and ILW
France	1996	Short lived radioactive waste management at the Centre de l'Aube near surface disposal facility
USA	1997	Performance assessment of the Waste Isolation Pilot Plant (WIPP)

Technical support to the Member States

Various kinds of technical support has been established to assist in solution of specific problems concerning groups of the Member States or provide information and database service of general interest to all Member States.

Contact Expert Group (CEG) was established as a result of the seminar on "International Cooperation on Nuclear Waste Management in the Russian Federation" organized in 1995 at the request of the Nordic countries. The CEG, composed by a group of interested countries, oversees international co-operation on radioactive waste management and solution of connected ecological problems in the Russian Federation. At present the CEG consist of eleven "full" members and three observers. The Agency was asked to perform the CEG Secretariat's duties. Six meetings were held to date and the CEG activities resulted in a number of important, action oriented decisions and recommendations directed to strengthening co-operation in high priority areas.

Waste Management Data Base (WMDB) and Sealed Radiation Sources Registry (SRSR) were developed by the Agency to provide the Agency and the Member States with accessible information on respectively radioactive waste management data and effective record keeping system for management of sealed radiation sources. The WMDB provides a profile of waste management situation of Member States and contain information on the current inventory of waste volumes, national policy, strategy and regulatory developments, organizations responsible for waste management activities, waste management research

25th DOE/NRC NUCLEAR AIR CLEANING AND TREATMENT CONFERENCE

and development programmes, operational activities, and significant waste management milestones. The SRSR allows Member States to maintain records and information on any sealed radiation source, on a national, sub-national or local level, from the time that it is first used until it is properly disposed of or returned to supplier.

In recognition of the needs of many developing countries for assistance in the planning for the processing and storage of spent sealed sources and radioactive wastes generated in low volumes mostly from radioisotopes application, the Agency has developed and provided to the Member States reference design packages for Waste Processing and Storage Facilities and Spent Sealed Sources Facility, capable of handling, processing and storing low- and intermediate-level waste and spent sealed sources.

An action plan has been prepared by the Agency to provide direct and indirect assistance to developing Member States in their Management of the Spent Radiation Sources with special attention to spent radium (^{226}Ra) sources. Conditioning techniques have been proposed to ensure their safety during a long interim storage period (up to 40 years) until it is possible to dispose them in a deep geological repository. They have already been applied in severe countries.

IAEA Publications in Gaseous Radioactive Waste Management

Gaseous radioactive wastes represent a major source of potential direct environmental impact. Effective control and management of gaseous waste in normal and accidental conditions is therefore assumed in the Agency as one of the main corollary issues of nuclear fuel cycle facilities design and operation. Many IAEA Technical documents (about 20 % of all TRS concerning radioactive waste management) are dedicated to the particular problems of gaseous waste control and management (Table 3).

Some of the documents are of an old date, some of the are covering only specific problems. Therefore new task was initiated by the Agency in 1997 on "Retention, Conditioning and Storage of Gaseous Radionuclides from Nuclear Fuel Cycle Facilities" aimed to provide comprehensive information on present technologies of gaseous radioactive waste management at nuclear fuel cycle facilities, with special emphasis on the nuclear power plants and waste management facilities. The experts from developed Member States with wide scientific and technological background have been invited to participate in Technical Report preparation, which is intended to be completed in 2000.

Conclusions

The Agency continues to maintain a strong involvement in safe, sound and cost effective methods, procedures and techniques of predisposal radioactive waste management practices. This is evident through the development of consensus safety standards in the RADWASS programme, the preparation of wide spectrum of technical documents offering the Member States recent information and the best operational practice, the provision of a wide range of advisory services such as training, information dissemination and review missions as well as offering the technical guidance and direct technical support to the Member States.

Management of gaseous radioactive waste is considered as a significant part of entire radioactive waste management and therefore the Agency pays to gaseous radioactive waste management corresponding attention in its programmes.

Table 3 List of the Agency technical documents dedicated to gaseous radioactive waste management

<u>Technical Reports</u>	
TRS 199	Separation, storage and disposal of Krypton-85, 1980
TRS 201	Radioiodine removal in nuclear facilities, 1980
TRS 203	Handling of Tritium bearing waste, 1981
TRS 220	Control of semi-volatile radionuclides in gaseous effluents at nuclear facilities, 1982
TRS 234	Management of Tritium at nuclear facilities, 1984
TRS 243	Testing and monitoring of off-gas cleanup systems at nuclear facilities, 1984
TRS 274	Design of off-gas and air cleaning systems at nuclear power plants, 1987
TRS 276	Treatment, conditioning and disposal of Iodine-129, 1987
TRS 291	Design and operation of off-gas cleaning systems at high level liquid waste conditioning facilities, 1988
TRS 292	Design and operation of off-gas cleaning and ventilation systems in facilities handling low and intermediate level radioactive material, 1988
TRS 302	Treatment of off-gas from radioactive waste incinerators, 1989
TRS 324	Safe handling of Tritium; Review of data and experience, 1991
TRS 325	Particulate filtration in nuclear facilities, 1991
TRS 358	Off-gas and air cleaning systems for accident conditions in NPPs, 1993

<u>Safety Series and Nuclear Safety Standards (NUSS)</u>	
SS 49	Radiological surveillance of airborne contaminants in the working environment, 1979
SS 77	Principles for limiting releases of radioactive effluents into the environment, A Safety Guide, 1986
SS 108	Design and operation of radioactive waste incineration facilities, 1992
50-SG-011	Operational management for radioactive effluents and wastes arising in NPPs, A Safety Guide, 1986