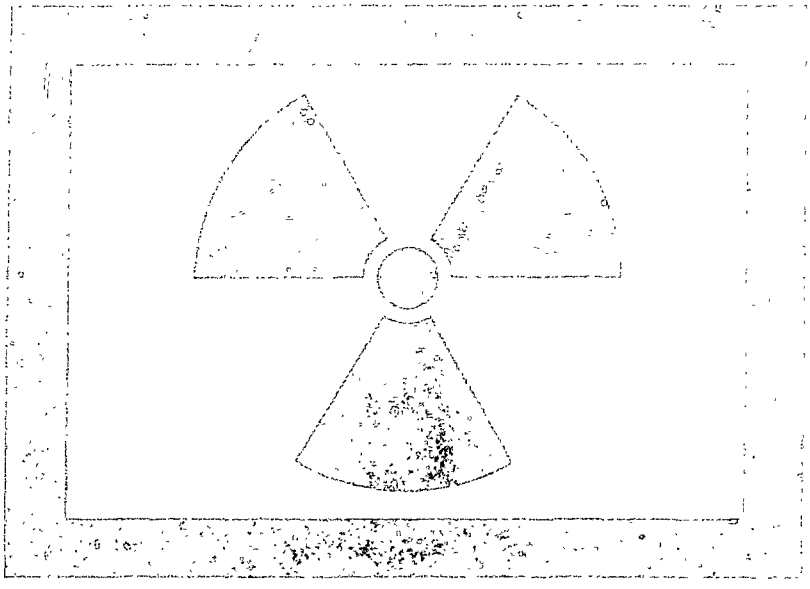
INTERNATIONAL CO-OPERATION IN SAFE RADIOACTIVE WASTE MANAGEMENT



INTERNATIONAL CO-OPERATION FOR SAFE RADIOACTIVE WASTE MANAGEMENT

NUCLEAR ENERGY AGENCY
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to article 1 of the Convention signed in Paris on 14th December, 1960, and which came into force on 30th September, 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The Signatories of the Convention on the OECD are Austria, Belgium, Canada, Denmark, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy. Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries acceded subsequently to this Convention (the dates are those on which the instruments of accession were deposited): Japan (28th April, 1964), Finland (28th January, 1969), Australia (7th June, 1971) and New Zealand (29th May, 1973).

The Socialist Federal Republic of Yugoslavia takes part in certain work of the OECD (agreement of 28th October, 1961).

The OECD Nuclear Energy Agency (NEA) was established on 20th April 1972, replacing OECD's European Nuclear Energy Agency (ENEA) on the adhesion of Japan as a full Member.

NEA now groups all the European Member countries of OECD and Australia, Canada, Japan, and the United States. The Commission of the European Communities takes part in the work of the Agency.

The primary objectives of NEA are to promote co-operation between its Member governments on the safety and regulatory aspects of nuclear development, and on assessing the future role of nuclear energy as a contributor to economic progress.

This is achieved by:

- *encouraging harmonisation of governements' regulatory policies and practices in the nuclear field, with particular reference to the safety of nuclear installations, protection of man against ionising radiation and preservation of the environment, radioactive waste management, and nuclear third party liability and insurance;*
- *keeping under review the technical and economic characteristics of nuclear power growth and of the nuclear fuel cycle, and assessing demand and supply for the different phases of the nuclear fuel cycle and the potential future contribution of nuclear power to overall energy demand;*
- *developing exchanges of scientific and technical information on nuclear energy, particularly through participation in common services;*
- *setting up international research and development programmes and undertakings jointly organised and operated by OECD countries.*

In these and related tasks, NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has concluded a Co-operation Agreement, as well as with other international organisations in the nuclear field.

INTRODUCTION

The nuclear industry, which provides a significant contribution to electricity generation in many OECD countries, produces increasing amounts of radioactive wastes, principally at nuclear power plants, but also in supporting nuclear fuel cycle facilities, such as uranium mining and milling, uranium enrichment, fuel fabrication and reprocessing plants. To safely manage these industrial by-products, substantial financial and manpower resources are required to develop or improve concepts, methods and technologies for treatment, conditioning, storage and disposal.

The Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA) supports national waste management efforts through a programme of international co-operation. The NEA promotes the transfer of experience between Member countries, assists in research and development, and contributes to the development of an international understanding and guidance on current issues.

Radioactive Waste Types

Nuclear wastes contain different radioactive isotopes and take many physical and chemical forms. Their common feature is their radioactivity, which ranges from high levels to the barely detectable. The time necessary for the waste to decay to innocuous levels may be a few weeks for some medical wastes, to thousands of years for waste containing long lived isotopes. Waste management strategies and techniques take into account these factors.

Different methods can be used for the treatment, storage and disposal of wastes, depending on their origin and characteristics. The principal characteristics being the composition in radioisotopes and radioactive concentration which fix the requirements for radiation shielding and possible transfer of the heat produced. In practice highly concentrated waste material such as the so-called "high level waste" occurs in relatively small volumes. On the other hand slightly contaminated waste can present much larger volumes, as is the case with the tailings resulting from uranium mining and milling operations.

WHY IS INTERNATIONAL CO-OPERATION DESIRABLE?

The management of radioactive waste, like any other activity involving nuclear materials, is undertaken within strict radiation protection regulations to protect both the public and the environment from potentially harmful effects of ionising radiations. These regulations, which are based on commonly agreed principles at international level, apply equally whether waste management programmes are limited to laboratory research activities alone, or include all industrial facilities of the nuclear fuel cycle. In fact, many of the questions to be resolved have a regional or worldwide dimension, from both the technical and the policy standpoint.

As a specialised inter-governmental body, NEA pursues three main objectives for its radioactive waste management programme:

- The promotion of studies to improve the data base available in support of national programmes.
- The support of Research and Development through co-ordination of national activities and promotion of international projects.
- An improvement in the general level of understanding of waste management issues and options, particularly in the field of waste disposal.

THE NEA PROGRAMME

To achieve these broad objectives, NEA's programme of work is defined and periodically reviewed by the NEA Radioactive Waste Management Committee (RWMC), which is an international body of senior governmental experts in this field. This Committee, which works in close co-operation with the NEA Committee on Radiation Protection and Public Health (CRPPH) and specialised sub-groups, draws on the best international technical expertise and oversees NEA's efforts at all levels.

The first level of activity in the programme is the sharing of information. This is carried out through the organisation of expert meetings, the preparation of technical reports, the analysis of data and the dissemination of this information.

The second level of activities, of an operational nature, includes the establishment of joint research and development projects designed to support national programme objectives. This may take various forms, depending on the subject and type of activity concerned.

Finally, the NEA's programme concerns the discussion of current issues and strategies in radioactive waste management. In this respect the RWMC fulfils the role of a specialised inter-governmental forum for discussion of waste management policies.

WHAT ARE NEA'S MAIN AREAS OF WORK?

The management of radioactive waste from nuclear activities covers several sequences of complex technical operations. However, as the ultimate objective of radioactive waste management is the disposal of the waste, the largest part of the work programme is directed towards the analysis of disposal options. In addition, NEA is active in various other areas of waste management, such as the treatment and conditioning of waste, the decommissioning of nuclear facilities and the institutional aspects of the long term management of radioactive waste.

Treatment and Conditioning of Waste

The management schemes for all types of radioactive waste must balance cost, risk and environmental detriment, bearing in mind available and proven disposal options. Treatment and conditioning of waste is an important element in the sequence of waste management options. Conditioning processes are designed to convert wastes to stable chemical forms, to solidify wastes, and where possible to reduce their volume. Their purpose is essentially to facilitate subsequent waste handling, storage and disposal.

Numerous industrially proven methods already exist for the treatment and conditioning of many waste types and international co-operation at government level is consequently limited to specific areas. Among the specialised subjects requiring further study, NEA has identified advanced treatment methods for certain waste types, the testing and characterisation of solidified and packaged waste products and the interaction between the waste and its disposal environment.

Disposal of Radioactive Waste

The choice between various disposal options again involves consideration of many aspects including safety, costs and availability of practical solutions. NEA promotes a number of general studies to provide a better assessment

of the alternatives available, particularly those involving the isolation of long lived waste from the biosphere, or those with international implications such as the release of gaseous and liquid effluents or the disposal of low level waste into the sea.

For the relatively large volume of radioactive waste which is only slightly contaminated with long lived isotopes, disposal solutions, such as the burial of waste at shallow depth in the ground, are already implemented in various countries and do not present major technical difficulties. NEA concentrates its efforts on the disposal of low level radioactive waste into the deep ocean, uranium mining and milling wastes, and the disposal of "high level" and other long lived wastes. These high level wastes are presently stored; they will ultimately require long term isolation in deep continental or sub-seabed geological formations.

Radiation Protection and Waste Disposal Safety

A key area of international concern, common to all forms of radioactive waste disposal, is that of the radiation protection objectives which should be addressed. As in all situations where radiation is involved there is concern that all exposures should be kept as low as reasonably achievable, and that waste disposal practices should not add significantly to the health risk of the population.

There is in fact little chance that any waste disposal practice could give rise to radiation exposures to either present or future generations with acute immediate damage to health. However assessment of the long term performance of waste disposal systems and safety studies involve a complex combination of many elements, including expert judgement and computer modelling, and is an area in which international contacts can be very valuable. The NEA plays an active role in promoting international agreement on long term objectives and in facilitating international understanding on how these are interpreted in the conception and design of disposal options.

The Management of Uranium Mining and Milling Wastes

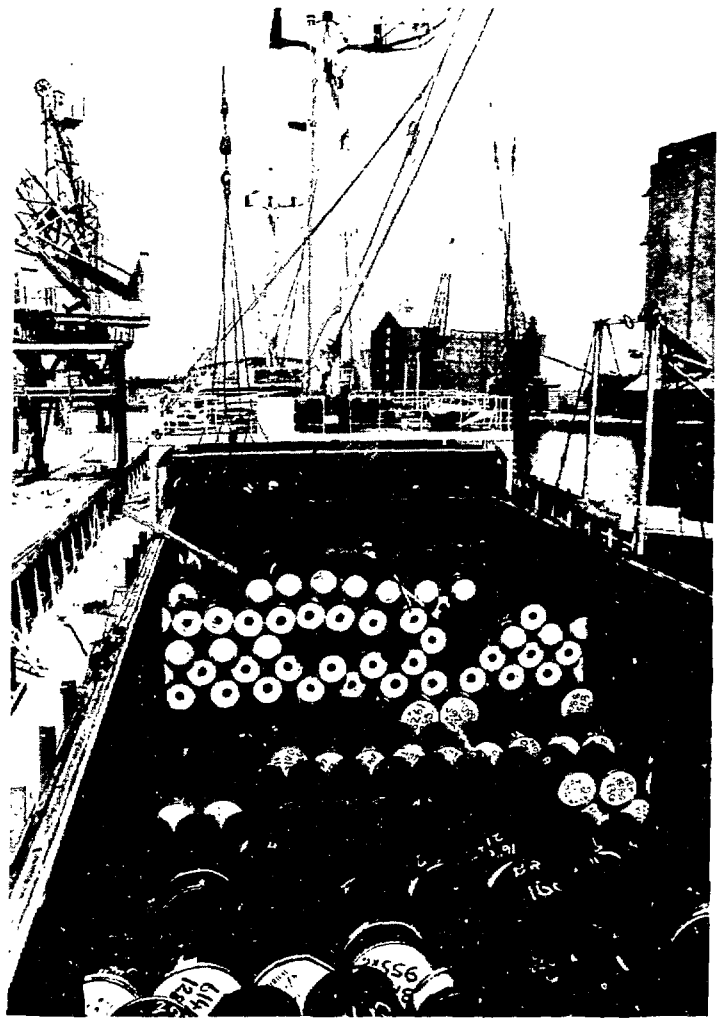
The mining and milling of uranium results in the production of large quantities of wastes containing low concentrations of natural radionuclides, such as uranium, thorium, radium, radon and their daughter products which can constitute a potential source of low level radiation.

At the international level, increased consideration is being given to the formulation of principles and guidelines for the proper management of uranium mill tailings considering both short term and long term factors. NEA has a major programme in this field covering radiation protection and engineering aspects of the disposal of uranium mill tailings. Under this programme the options available for the disposal of mill tailings are reviewed and the state of the art in this field assessed.

Underground mining of uranium, New Mexico, USA (US Atomic Industrial Forum Inc.)

Disposal of Low Level Radioactive Wastes into the Deep Ocean

This form of disposal has been practiced over the last 35 years and NEA itself has contributed towards the adoption of agreed operational procedures at the international level in this field. This method of disposal is now regulated by the



Packaged radioactive waste from nuclear establishments in the United Kingdom loaded for disposal at sea (UKAEA).

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the so-called "London Convention", adopted in 1972 and in force since 1975). To further the objectives of this Convention, the OECD Council adopted a Multilateral Consultation and Surveillance Mechanism for Sea Dumping of Radioactive Waste, under which participating countries undertaking sea disposal operations agree to submit their operations to international review and surveillance.

The NEA sponsors a number of activities related to the assessment and the suitability of the site used, the design and construction of appropriate waste containers, and the operational procedures. NEA has recently set up a Co-ordinated Research and Environmental Surveillance Programme for the North Atlantic disposal site currently used by some European countries. This programme is designed to collect additional data to improve specific knowledge about the area concerned, thereby allowing a more precise assessment of the safety of this practice.

Disposal of Radioactive Waste into Geological Formations

The most favoured concept for the long term isolation of high level and other long lived radioactive waste relies on the capability of geological formations to provide the extended containment required. Suitable characteristics have been

The Stripa Project

The International Stripa Project started in 1980 and is scheduled to continue until 1986 at a total cost of 108 million Swedish Kroner. The Project is supported by eight NEA Member countries: Canada, Finland, France, Japan, Sweden, Switzerland, the United Kingdom and the United States. Research is conducted in two phases, the first of which will draw to a close in 1984.

This has involved geochemical and hydrological studies, rock mechanics, and studies of engineering aspects of waste emplacement and isolation. The second phase covers the development of geophysical investigation techniques, radionuclide migration studies, fracture flow and radionuclide transport tests and development of techniques for sealing boreholes and shafts. The management of the Project is entrusted to the Division KBS of the Swedish Nuclear Fuel Supply Company.

The Stripa Mine is an abandoned iron mine in central Sweden. A granite formation is adjacent to the ore excavations and is accessible at a depth of 350 metres. Horizontal tunnels have been excavated into this granite where rock conditions are suitable for experimental investigations.

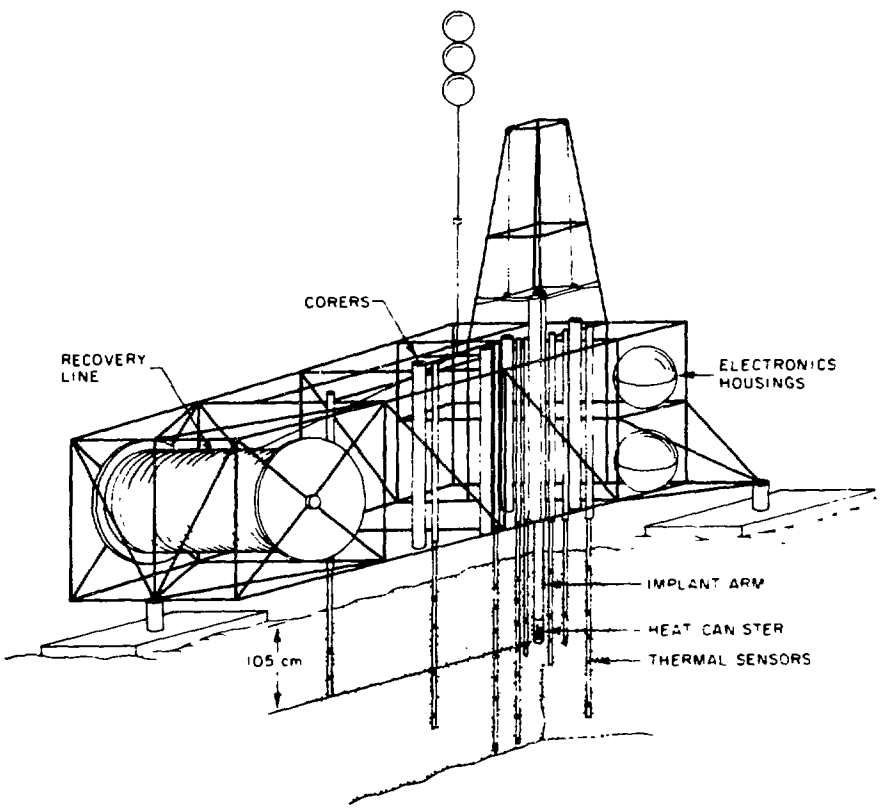
identified in various rock types such as salt, granite, basalt, volcanic tuffs or clays, on land or below the seabed. The NEA programme is designed to identify the main technical issues in deep underground disposal and to provide a framework to help Member countries improve the data available. This is done through specific studies or research and development projects and co-ordination of national activities.

One of the heater experiments in the International Stripa Project, Sweden.

NEA studies and workshops cover topics such as the migration of radionuclides in the geosphere, techniques for geophysical investigations, and safety assessments of potential repository sites, including the analysis of possible scenarios for the release of radioactivity. All these activities are intended to

contribute to a better assessment of the safety and feasibility of the disposal concepts. New developments in research on migration of radionuclides in the geosphere are reported in detail in a six-monthly Newsletter published by NEA.

The NEA provides a framework for several international co-operative projects. The Stripa Project, located in Sweden, investigates hard crystalline rock as a potential host medium for a nuclear waste repository. The International Sorption Information Retrieval System (ISIRS) is a data bank on radionuclide sorption information in geological media. Under the sponsorship of NEA, the Working Group on Seabed Disposal of Radioactive Waste exchanges information and co-ordinates R & D activities on the technical feasibility of using suitable sites under the seabed for the disposal of long lived radioactive wastes.



Platform for an In-Situ Heat Transfer Experiment (ISHTE) planned by the NEA Seabed Working Group to provide data on heat effects on sub-seabed sediments, and develop deep sea experimental technology (Sandia Laboratories, USA).

The International Sorption Information Retrieval System

A detailed understanding and reliable quantification of radionuclide sorption phenomena is widely recognised as essential to assessment of the extent of radionuclide migration in ground water from a repository. Confidence in the long term safety and acceptability of particular sites for waste disposal is linked to the ability to model such phenomena. The ISIRS Project has been set up within NEA to develop a computer based data storage system for the results of radionuclide sorption experiments. Eleven NEA countries support this project: Canada, Finland, France, the Federal Republic of Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.

The Project is directed by a technical committee of representatives from participating countries who met to inaugurate the project in June 1981. For the initial two year period the Project was based at the Battelle Pacific Northwest Laboratory in Richland, USA. During 1981, computer software systems were adapted to the needs of the international community, and specifications for a common reporting format were elaborated.

During 1982 the system became available for selective retrieval of data from laboratories throughout the participating countries, and in 1983 the System will be installed at the NEA Data Bank for a further two-year period of development.

Decommissioning of Nuclear Facilities

As nuclear installations reach the end of their useful lives, they will be decommissioned. These operations start with the removal of radioactivity from contaminated equipment and may be followed by actual dismantling, both of which result in additional waste products. Decontamination methods are therefore important and NEA has promoted a comparison of their effectiveness with reactor system components.

Information is also gathered on existing nuclear plants in NEA Member countries which are planned to be decommissioned in the next five years with a view to identifying specific decommissioning technology needs and to promote co-ordinated activities.

Institutional Aspects of Long Term Radioactive Waste Disposal

Since some types of waste produced from the nuclear fuel cycle remain radioactive over long periods, special considerations have to be taken into account when planning for their long term management and developing

appropriate regulations. In addition to purely technical questions, financing schemes, operational responsibilities, third party liabilities and administrative surveillance methods are therefore all parts of radioactive waste management policies. Legal, administrative and financial aspects of the long term management of radioactive waste re the subject of a comprehensive study undertaken by NEA with the assis ce of a group of technical and legal experts.

RADIOACTIVE WASTE MANAGEMENT

The OECD Nuclear Energy Agency's programme of work on nuclear waste management is directed by the Radioactive Waste Management Committee (RWMC) in consultation with the Committee on Radiation Protection and Public Health (CRPPH). The Committees bring together senior experts in radioactive waste management and radiation protection from the OECD/NEA Member countries.

The RWMC and CRPPH are assisted by a number of specialised groups and technical committees:

- Co-ordinating Group on Geological Disposal
- Co-ordinating Group on Uranium Mining and Milling Waste
- Seabed Working Group
- Executive Group for Research on Sea Disposal of Radioactive Waste
- Joint Technical Committee of the Stripa Project
- Technical Committee of the ISIRS Project

NEA PUBLICATIONS ON RADIOACTIVE WASTE MANAGEMENT

Objectives, Concepts and Strategies for the Management of Radioactive Waste Arising from Nuclear Power Programmes
(Report by an NEA Group of Experts, 1977)

Objectifs, concepts et stratégies en matière de gestion des déchets radioactifs résultant des programmes nucléaires de puissance
(Rapport établi par un Groupe d'experts de l'AEN, 1977)

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Decision of the OECD Council of the 22nd of July 1977 establishing a Multilateral Consultation and Surveillance Mechanism for Sea Dumping of Radioactive Waste

Décision du Conseil de l'OCDE en date du 22 juillet 1977 instituant un Mécanisme multilatéral de consultation et de surveillance pour l'immersion de déchets radioactifs en mer

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