

EUROPEAN COMMUNITIES



Information

R + D

RESEARCH AND DEVELOPMENT

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COMMUNITY ACTION IN RADIOACTIVE WASTE MANAGEMENT

The Nuclear Option

There is a necessity for the European Community (E.C.) - i.e. 10 industrialized countries with 270 M inhabitants - to move away from its actual reliance upon imported oil and gas. Nuclear energy, among others ways like energy conservation, coal and its new uses, solar and geothermal energies, etc, has to be developed to achieve an energy balance.

Community objectives for 1990 are to increase the use of coal and nuclear power so that together they cover 70-75% of electricity generation, compared with 52% in 1977. This will mean an installed nuclear capacity of 130 GWe by 1990 versus 38 GWe today.

The Nuclear Waste

The nuclear industry, like many other industries, generates waste. This waste has two essential characteristics:

- in certain cases, its radioactivity can persist at potentially harmful levels far beyond the period of human life before it decays naturally to a harmless level; in such cases it falls in the category of long lived dangerous substances, with non radioactive substances like lead and mercury.
- it forms part of a large group of substances called carcinogens, which can cause cancer (like asbestos dust, tobacco tars, etc.)

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The radioactive waste can be labelled (*) in relation to its radionuclide content, heat generation rate and methods of management as :

- High level radioactive and long lived waste
- Low and medium level radioactive waste.

Fission products and/or those transuranic elements included in high level and/or long lived waste are by products produced during nuclear power generation; they remain contained in the spent nuclear fuel elements unloaded from the nuclear power plants. Spent fuel elements may be reprocessed to extract useable fuels, mainly uranium and plutonium, recycling of which in power plants may considerably improve the future efficiency of nuclear power generation. The residues of the reprocessing operation are the high level and long lived waste. If no reprocessing takes place, spent fuel elements themselves would constitute high level long lived waste. Low and medium level waste which are more voluminous than high level waste are produced during the operation of nuclear power plants and all along the nuclear fuel cycle. Therefore a significant quantity of these wastes - and of those coming from medical care in hospitals and specific uses in non-nuclear industries - has been generated in the E.C. during the last 30 years.

The objective of radioactive waste management

The fundamental objective of radioactive waste management is to ensure the protection of present and future generations and their environment against the possible radiological hazards due to these materials. This objective can be achieved with suitable controls which may be institutional (i.e. legislation) or technical, like :

- Immobilizing whenever necessary, liquid and gaseous wastes which are easily dispersible into solid matrices capable of retaining their integrity over very long periods.
- Minimizing the production of long-lived radioactive waste, or at least the radioactivity and/or volume of the waste for final disposal.
- Developing methods for isolating solidified waste that are suitable for very long time scales, like disposal in deep geological formations.

To meet such an objective is of interest for all, and is also a public service.

(*) This is not an absolute classification.

Technology and experience available for the management of radioactive waste

The necessary technology has been developed within the various Member States of the European Community to meet existing radioactive waste management requirements. The record in managing these waste over the past 20/30 years shows no discernible health or safety effect on the public.

The technical alternatives to achieve each step of radioactive waste management including future reprocessing waste with optimal safety are under extensive development work within the European Community.

Reprocessed liquid waste can be solidified to a stable solid form such as glass. This capability has already been demonstrated at the industrial level with real waste in France.

There are a variety of geologic formations potentially suitable for storing underground solidified, containerized waste for the very long periods of time required.

The role and activities of the Commission of the European Communities (CEC)

Since most of the Member countries of the European Community have a high population density, a large degree of industrialization and nuclear power programmes, they have similar problems to solve and a common objective of achieving safe waste management. The European Community is therefore naturally involved in optimizing the necessary technical solutions and preparing waste management policies.

A coordinated action at Community level is a better guarantee for optimal choices than isolated approaches. This action is the task of the Commission of the European Communities (CEC). The basis, time table and summary of its activity in the field of radioactive waste management is given below:

1958

The CEC is empowered by the Treaty establishing the European Atomic Energy Community (Euratom), to lay down within the Community basic standards for the protection of the health of the general public and workers against the dangers arising from ionizing radiation. It has also the task to promote nuclear R and D within the Community.

1973

The E.C. Council of ministers laid down the principle of the E.C. competence in the field of environmental protection including waste (nuclear and non nuclear) questions.

The Laboratories of the Joint Research Center of the CEC start an R & D programme on radioactive waste management.

1975

Community R & D work is extended to national laboratories of the Member States, with financial support and coordination of the CEC.

1980

The R & D programme in national as well as Community's laboratories is renewed for a period of five years. The budget has been doubled and yearly spending will for the first time be more than 20 Millions of european units of account *.

A Community plan of action of 12 years (1980-1992) in the field of radioactive waste management is approved by the E.C. Council of Ministers. The plan deals with technical and non technical aspects, like informing the public, an extensive cooperation between Member States, and a sustained R & D effort.

* 1 european unit of account is approximately equal to 0,54 Pound or 1,3 US \$.

The implementation of the radioactive waste management R & D programme of the Community.

The CEC programme is implemented in the laboratories of the Community's Joint Research Center and research bodies in the Member States, working under shared expense contracts with the CEC.

The specific tasks are defined in close cooperation with national experts, who advise also the CEC in the selection of the contractors. They are aiming to fulfil the objective of a safe waste management (see above).

The work carried out under the programme ranges from exploratory laboratory tests to active demonstration of full-scale pilot plants and covers almost the entire scope of scientific-technical activities associated with the management of radioactive waste and final disposal in multi-barrier repositories.

Typical projects are :

- Construction and operation of waste conditioning pilot plants for power reactors.
- Development of techniques to trap and immobilize gaseous radionuclides
- Survey and testing of technologies for decontamination of medium active liquid wastes by advanced membrane and electrochemical techniques.
- Volume reduction of solid waste by incineration, melting or compaction, decontamination of long-lived waste and subsequent immobilization in high integrity matrices.
- Testing of solid waste forms as glass, bitumen, resins, ceramics and evaluation of their resistance under storage, transport and disposal conditions.
- Development of the concept of multi-barrier repositories located in deep geological formations.
- Investigations into the hydrogeological, geochemical and thermal effects of radioactive disposal into deep geologic formations and design studies of repositories.
- Development of other man made barriers (containers and borehole backfill) which provide added safety in case of all conceivable accidents during the first centuries after disposal.
- Analysis of the performance of the natural barriers which will have the role of confining the long-lived radioactivity for hundred thousands of years.

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