

PARTICIPATION OF ENRESA IN THE EC RADIOACTIVE WASTE RELATED PROGRAMMES

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The fifteen EU Member States generates radioactive waste, although most of then comes from the eight countries with nuclear power plants and associated facilities currently in operation. The European Commission as well as all Member States have long been active in the field of radioactive waste management in order to protect current and future generations from unacceptable exposure to radiation. ENRESA, as the Spanish agency responsible of the management of radioactive waste, has been deeply involved in the different programmes established and developed by the European Commission in this area.

INTRODUCTION

Most of the radioactive waste in the European Union, where nuclear power currently provides one-third of total electricity needs, comes from the operation of nuclear power plants and associated facilities in eight Member States. Countries without nuclear power stations also produce small quantities of radioactive waste, from the use of radiation and radioactive materials in medicine, industry and research.

The quantities of radioactive waste generated by nuclear power plants are small compared with the quantities of toxic industrial waste and very small compared with the total amount of waste produced each year in the EU. The annual production of all conditioned radioactive waste in the EU is around 50,000 m³, of which about two-thirds are short-lived LILW and one-third long-lived LILW, and 500 m³ of HLW and spent fuel for direct disposal.

However, some radioactive waste remains hazardous for many thousands of years, as the HLW and spent fuel, and stringent regulations and management methods are needed to ensure safety. All Member States have their own nuclear laws, regulations and standards on radiation protection and to some extent on radioactive waste management. Those with nuclear power programmes have set up agencies responsible for all or part of the management of radioactive waste. Control of the activities of these agencies is entrusted to national safety authorities. The main objective of radioactive waste management is to protect current and future generations from unacceptable exposure to radiation.

EU Directives, which Member States are required to implement, cover basic standards of radiation protection, controls on the shipment of radioactive material, and environmental impact assessments (EIA) for new facilities, which must include public information activities. The European Commission has long been active in the field of radioactive waste management: a Community Plan of Action was first approved in 1980 and has been extended to the end of 1999, research and development programmes have been carried out since the early 1970s.

EUROPEAN COMMISSION PROGRAMMES

The EURATOM Treaty was approved in 1957 with the main goal of promoting the use of civilian nuclear power. The Treaty itself only contains one specific reference to radioactive waste management; this is in Article 37, which requires that "Each Member State shall provide the Commission with such general data relating to any plan for the disposal of radioactive waste in whatever form as will make it possible to determine whether the implementation of such a plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State".

However, in November 1973 the Council approved the Community Environmental Programme which underlined the need for Community measures covering the "particular case of handling and storage of radioactive waste" and specified the content of the procedures for implementing such

measures. Furthermore, by a Council Decision (June 1975) a programme on the management and storage of radioactive waste was adopted as part of the Community's research activities involving the laboratories of the Member States through "shared cost" actions. In 1980, the Council adopted a Resolution on the implementation of a Community plan of action in the field of radioactive waste.

Research and development (R&D) activities

The R&D work on radioactive waste management and disposal supported by the European Commission over more than 25 years has contributed to establishing a common understanding and consensus within the European Union on the key issues. It has also improved the transnational co-operation between the research institutions in the Member States, and provided a forum for exchange of information and expertise. The many consortiums formed for the research shows the importance of this factor.

In the area of radioactive waste management and disposal substantial efforts were in the early programmes directed towards the treatment and conditioning of different types of waste, in particular low- and intermediate level waste, and also on disposal of these wastes. As these techniques have been commercially established and put in practical use in many EU Member States, the Community support to R&D in this area has practically ceased. The work still going on has the objective of characterising the waste

products (incl. QA and QC), primarily in view of their subsequent disposal.

For long-lived radioactive waste the disposal in deep geological formations has been the main management alternative for a long time. In the first EC programme (1975–79), a catalogue of possible geological formations in the Member States was prepared by the National Geological Institutes. In the subsequent programmes the different technical and scientific issues connected to geological disposal have been dealt with in greater detail. Important development has taken place both with regard to the practical demonstration of repository construction and operation in underground research facilities, and with regard to the capability of assessing the performance and safety of repositories and the basic understanding of the processes of importance for the containment function of the repository.

In parallel to the repository development, a growing interest has been shown for the possible use of partitioning and transmutation to reduce the amount of long-lived radionuclides in the waste that must be disposed of.

In the current fifth EURATOM framework programme for research and training in the field of nuclear energy (1998–2002), the main objectives of the key action on nuclear fission are to enhance the safety of Europe's nuclear installations and improve the competitiveness of Europe's industry. The research supported under this key action has four components, one of them "Safety of the fuel cycle" includes the following three lines:

- Waste and spent fuel management and disposal, mainly devoted to the disposal of HLW and long-lived radioactive waste and spent nuclear fuel and characterised a move from fundamental research to the stage of demonstration and implementation of the concept of deep disposal of radioactive waste.

- Partitioning and transmutation (P&T), devoted to provide a basis for evaluating the practicability, on an industrial scale, of P&T for reducing the amount of long-lived radionuclides to be disposed of.

- Decommissioning of nuclear installations, mainly oriented to dissemination of results from former research activities, exchange of experience and provision of training, collection of relevant data from decommissioning projects, development of decision-supporting and management tools and, integration of the needs of the candidate countries.

The next EURATOM Framework Programme (6th FP 2002–2006) nowadays in negotiation process, will include a waste treatment and storage area, addressing the following aspects:

- Research into processes for long term storage in deep geological strata, with the networking of the activities carried out on various sites in the three main types of geological formations envisaged.

- Research aimed at reducing the impact of waste, more particularly as a result of the development of new concepts for reactors producing less waste and the development of technologies to reduce the hazards associated with waste by means of partitioning and transmutation techniques.

Community Plan of Action

The Plans of Action in the field of radioactive waste were approved in order to define the orientation and to complement the R&D framework programmes. The Council approved the first plan of action in the field of radioactive waste in 1980 for a period of twelve years. This Plan referred to the problems associated to radioactive waste arising from nuclear installations and especially to the management and disposal of high level and long-lived radioactive waste. The Plan was divided in five points: continuous analysis of the situation, concerted action and technical co-operation among Member States regarding disposal, approximation and harmonisation of approaches on waste management, quality and properties of conditioned waste and conditions for waste disposal, continuity of research activities and public information.

This Plan was renewed in 1992 until 1999 (by Council Resolution of 15 June 1992) considering the Commission the success of it, in particular by enabling technical, legal, administrative and social issues, and particularly those relating to information of the public, to be considered within one and the same framework. The Council considered that "the activities relating to radioactive waste management shall be continued and expanded in the light of the results of research programmes, the more comprehensive approach to safety and environmental protection that is now required and the new context created by the technical and practical issues resulting from the abolition of frontier controls within the Community and the gradual enlargement of the Community".

This renewed Plan referred to the problems posed by wastes arising from nuclear power production, from the use of radioisotopes for medical, industrial and research purposes and from possible concentration of natural radioisotopes resulting from industrial activities. It was divided in seven points: continuous analysis of the situation, development of technical co-operation in the Community in relation to the long-term or final storage of radioactive waste, concerted action on the safe management and storage of radioactive waste, consultation on management practices and strategies in the context of the abolition for frontier controls within the Community, continuity of interaction between research programmes and administrative, legal and regulatory issues, information for the public, and development of international consensus.

The last Plan emphasised the importance of developing the co-operation between the Community and third countries, in particular those of central and eastern Europe including the republics of the former Soviet Union.

Technical assistance programmes for central and eastern European countries.

Following the Chernobyl disaster the international community started to take actions to avoid a repetition of such a dramatic event. In fact, it responded by putting into place in the early 1990s a nuclear safety strategy for central and eastern Europe and the New Independent States.

This strategy has been further set out and developed in several Commission documents, all of them emphasising the priority of activities addressed to enhance the reactors' nuclear safety, but also defining complementary action mainly for nuclear fuel cycle facilities and nuclear waste. The availability of an appropriate radioactive waste management infrastructure, both from the technical and regulatory standpoints is a required condition either during the operation of the nuclear power plants and to undertake the decommissioning phase.

The principal instruments of the EU to implement this strategy are the PHARE assistance programme in the case of the central and eastern European countries (CEEC) and the TACIS assistance programme in the case of the new Independent States (NIS), both of which managed by the Commission. In addition, the EU has Euratom loans and a number of small

grant programmes at its disposal. The EU has also helped to set up and operate several multilateral programmes in the field of nuclear safety, namely the International Science and Technology Centre (ISTC) in Moscow and the Nuclear Safety Account (NSA) administered by the EBRD.

Additionally, the Directorate General Environment, formerly DG-XI, of the European Commission was also devoting smaller budgets, mainly through co-operation projects in the framework of the Community Plan of Action in the field of radioactive waste.

Following the organisational changes of the Commission services during 2000, these co-operation and technical assistance programmes have been affected. As the CEEC will become member states in the next future a DG Enlargement has been created, and a Task Force for Nuclear Issues (TFNI) co-ordinates all nuclear issues in candidate countries. In the case of the NIS, DG External Relations and AIDCO have the responsibility to run the TACIS nuclear safety programme.

The PHARE nuclear safety programme, from 1992 to 1999, has allocated some 17 million € in regional and country specific radioactive waste studies. From 2001 the programme will be defined and country specific projects will be specified by the TFNI while the projects will be launched and managed by the EU Delegations in the individual countries. These projects will be co-funded from 2003 and this programme has only limited remaining lifetime in most countries.

Regarding the former co-operation programme of DG Environment, the fund made available during the period 1995-2000 was 7 million € in NIS and 3 million € in CEEC. The programme was two general objectives: to transfer environmental awareness and safety culture to CEEC/NIS, and to help establish the infrastructure necessary to achieve and maintain acceptable levels of safety and environmental protection. After the changes, the competences on fuel cycle and RW policy in EU (plan of action) have been moved to DG Energy and Transport.

PARTICIPATION OF ENRESA IN THE EC PROGRAMMES

Participation in R&D Framework Programmes

Due to the nature of its projects ENRESA, as the Spanish agency responsible of the management of radioactive waste, was fully conscious from the

very beginning of the importance that research and development activities should play in providing a sound support to the solutions adopted. Being a management company, ENRESA does not carry out its own research but promotes, co-ordinates, controls and finances research activities via contracts by means of which the research efforts to be included in the R&D plans are developed. The R&D Plans have been guided by the following principles:

- The resources to be used should be in proportion with the magnitude of the Spanish nuclear programme
- The Plans should be implemented in co-ordination with the R&D programmes of the EC, NEA/OECD and IAEA.
- Maximum use should be made of the research potential of the country (public organisations, universities, as well as public and private companies)

The first (1987-1991) and second (1991-1995) R&D Plans for the management of radioactive wastes in Spain were mainly oriented to the establishment and consolidation of the research groups and the corresponding infrastructure. The third Plan from 1995 to 1999 was focus on the co-ordination of the participation of the different groups in international projects and the integration of the project results in the design and the performance assessment of deep geological repository. The Fourth Plan, which is nowadays in force (1999-2003), covers all the internationally considered radioactive waste management options and alternatives. This new approach implies a wider view of SF management options, including separation and transmutation, along with modulation in budgeting, in order to adapt to a longer timeframe for implementation of the possible solutions.

Since the establishment of the first R&D plan, ENRESA has been participating in the R&D framework programmes. The main objectives for this participation are: to

develop our knowledge being involved in the evolution of other national programmes, to take advantage of the European infrastructure and of the financial sources, and to consolidate the Spanish R&D groups. Currently, ENRESA is participating very actively in the European Union's 5th framework programme with ENRESA's direct or indirect involvement in some 37 projects co-ordinating 4 of them. These projects are the following:

- BENIPA will assess the treatment of bentonite barriers in integrated performance assessments of repositories in granite and clay rocks. Current repository concepts will be reviewed and reference cases will be selected for the project. Available information on features, events and processes (FEP) will be assessed and processed. Assessment codes at process and integrated level will be analysed and upgraded where necessary.
- EB is testing a new concept for repositories in horizontal drifts in clays. A one to one scale dummy canister is emplaced on a bed of bentonite blocks and various techniques are tested to backfill the drift with bentonite pellets. Then following artificial hydration the Hydro-Mechanical processes within the EBS and EDZ will be modelled.
- VE aims at evaluating the consequences for repository design and performance of an in-situ de-saturation experiment by ventilation of the host rock. Both EB and VE will be performed at Mont Terri underground laboratory -clay formation- (Switzerland).
- FEBEX has the following objectives: to demonstrate the technical feasibility of constructing and handling of

II FP (M€)		III FP (M€)		IV FP (M€)		V FP (M€)		Total (€)	
Cost	EC Funding	Cost	EC Funding	Cost	EC Funding	Cost	EC Funding	Cost	EC Funding
1,80	0,90	4,51	2,19	13,22	5,26	10,71	4,97	30,24	13,32

Evolution of ENRESA's participation in EU R&D programmes

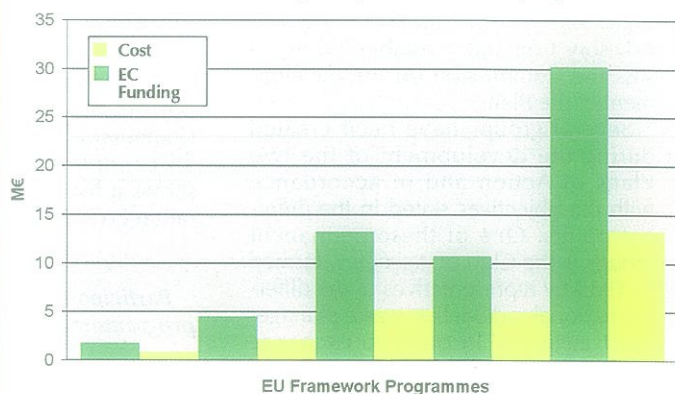


Table 1: Participation in EUR studies

EUR number	Title
EUR-12570	Objectives, standards and criteria for radioactive waste disposal in the European Community
EUR-12879	Radioactive waste equivalence
EUR-13069	Quality assurance on the management of radioactive waste in the European Community
EUR-14520	An approach on the exemption of regulatory control of radioactive waste arising from outside the nuclear fuel cycle in the European Community
EUR-14598	Evacuation of radioactive waste: recommended criteria on site selection
EUR-18041	Recycling and reuse of radioactive material in the controlled nuclear sector
EUR-18185	Schemes for financing radioactive waste storage and disposal
EUR-18187	Safety case for geological disposal of HLW – follow-up to the “desk simulation” license application studies
EUR-18324	Radioactive waste categories. Current position (98) in the EU member States and in the Baltic and central European countries
EUR-18860	Supporting document for the preparation of an EC communication on the subject of decommissioning nuclear installations in the EU
EUR-19151	Evaluation of the radiological and economic consequences of decommissioning particle accelerators
EUR-19152	Environmental Impact Assessments and geological repositories for radioactive waste
CD-ROM	Radioactive Waste Management in the European Union

the engineered barrier components for the Spanish disposal concept in crystalline rock; to improve the understanding of the long-term behaviour of the engineered barrier system; and to acquire experience on a potential retrievability operation during the dismantling phase of one section of the in-situ experiment and to provide data on the behaviour of the engineered barrier system (bentonite) and instrumentation.

Participation in the Plan of Action

ENRESA has been involved in the activities carried out by the Commission under the Community Plan of Action in the field of radioactive waste management. Furthermore, ENRESA is one member of the Advisory Committee established to assess the Commission on the development of the Plan.

Several groups have been created during the development of the two Plans of Action and in accordance with the objectives stated in the different points. One of these permanent groups is the Club of Agencies, formed in 1985 by representatives of the different national radioactive waste management agencies, in order to exchange information on national practices and have open discussions about common

problems. ENRESA is one of its members. Later on another similar permanent group was established with representatives of the regulators, the so-called Forum of Regulators (1997).

Other group, in which ENRESA is participating, is the Laboratory Network created in order to exchange information regarding the different methods of quality control and quality assurance of waste packages.

Some other ad-hoc groups have been established and disbanded after a report was elaborated and published by the European Commission as an EURADWASTE publication. This serie has been created in order to provide information to the general public on radioactive waste issues as well as on the results of the R&D projects. Some of these reports were the basis for a communication from the Commission to the Council. Other EUR reports published studies that have been carried out via a service contract with the Commission, mainly covering some or all candidate countries. The table 1 shows a list of reports in which elaboration ENRESA has participated.

Participation in technical assistance programmes

The participation of ENRESA in the technical assistance and co-operation

projects has mainly been developed under the Consortium Cassiopee (an acronym for Consortium d'Assistance Operationnelle aux Pays de l'Europe de l'Est), formed by ANDRA (France), COVRA (the Netherlands), DBE (Germany), ENRESA (Spain), NIREX (United Kingdom), and ONDRAF/NIRAS (Belgium). Encouraged by the Commission, Cassiopee was established in February 1993, as a European Economic Interest Group (E.E.I.G.) with the aim of assisting the European Commission in radioactive waste management issues under the PHARE and TACIS Programmes.

ENRESA within the Consortium has since then played a very active role in all its activities. From the very beginning ENRESA has pursued an approach for the Consortium that could be compatible with the role played by its partners in the national programmes. In this approach, the Consortium mainly assists the European Commission in defining and preparing the technical assistance programmes as well as in developing those projects of an organisational or strategic nature, thus leaving the implementation of the remain projects to industrial groups.

In this context, ENRESA plays, within the Consortium, a leading role in the whole Phare programme, and is responsible of all assistance contracts signed with the European Commission since 1995 in the framework of this programme. Expert mission aiming at evaluating the situation, identifying the main problem areas and defining the priorities have been carried out to Hungary and Lithuania (1993-94) to Slovenia (1997-98) and to Latvia (1998-99). Besides two other missions have been conducted to Hungary in order to provide support and advice to the Hungarian authorities in the site selection process for the low and intermediate level waste repository. Furthermore, the Terms of Reference for projects have also been prepared within the abovementioned assistance contacts.

The Consortium is particularly experienced in addressing the issues regarding creation and functioning of radioactive waste management organisation. One example is the project carried out in 1996-1998 providing technical support to the Czech authorities in establishing the national radioactive waste management agency. This experience is valuable to the eastern countries, which originally had no dedicated radioactive waste management organisations, the responsibilities being

Table 2: Participation in co-operation and technical assistance programmes

EC programme	Project	Duration
Technical co-operation programme	Safety Study and Assessment of a geological disposal facility in granite and clay media	1994-1996
	Environmental Impact Assessment of a Deep Geological Disposal Facility	1998-1999
	Comparative analysis of the financing schemes for radioactive waste management in various Western and CEEC countries	1997
	Preparation of a CD-ROM on waste management in the countries of the European Union	1998
	EIA and decommissioning of nuclear installations	2000
	Long-term safety analysis of the Baldone radioactive repository and updating of waste acceptance criteria	2000
	Drawing up and evaluation of strategies for radioactive waste in Estonia	2000-01
PHARE programme	Detailed Regional Study of Management Schemes for the Back End of the Nuclear Fuel Cycle, Radioactive Waste Management and The Decommissioning of Obsolete Nuclear Installations (Czech Republic, Slovakia, Poland, Hungary, Lithuania, And Romania)	1993-1994
	Fact-Finding Mission to Bulgaria for Assessing the Radioactive Waste Management Situation	1993
	Expert Support to Site Selection for Low- and Intermediate-Level Wastes in Hungary	1995
	Expert Advice to Hungary on Disposal	1996
	Assistance for Waste Management meeting with the PHARE countries	1996 1997 1998
	Assistance to the European Commission in Preparing TOR for the Phare Programme	1996 1998
	Radioactive Waste Management in Bulgaria	1996-1997
	Technical Support to the Czech Republic in Establishing the National Radioactive Waste Management Agency	1996-1998
	Study on Waste management schemes in Slovenia	1997-1998
	Extension to the Slovenian Uranium Mines	1998
	Study on Waste Management Scheme in Latvia	1998-1999
	Co-operation agreement with the European Commission for the preparation of TOR – decommissioning unit at Ignalina NPP, Lithuania	2000
	Support to the establishment of a State body for Radioactive Waste Management and to the activities of the RWM fund in Bulgaria	2001
TACIS Programme	Inventory of radioactive waste and spent fuel at the Kola Peninsula region of North-West Russia	1995
	Management of Radioactive Waste in the Moscow Region	1995-1996
	Radioactive Waste Management Schemes In Ukraine	1996

traditionally concentrated in the individual waste producers.

ENRESA has participated in the following projects undertaken under the PHARE and TACIS programmes as well as the co-operative programme of the DG Environment. (Table 2)



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