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Proposal for a
COUNCIL DECISION

adopting a specific research and technical development programme
for the European Atomic Energy Community
in the field of management and storage of radioactive waste
(1990-94)

(presented by the Commission)

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ABSTRACT

The present proposal concerns one of the specific programmes through which the "framework programme for Community activities in the field of research and technological development (1987-1991)" is to be implemented.

The proposed programme, the fourth five year programme on Management and Storage of Radioactive Waste, is composed of two parts :

Part A : Waste management and associated R&D actions

Part B : Construction and/or operation of underground facilities open to Community joint activities.

It resumes the broad lines of the previous programme with some modifications for taking into account the results obtained so far and future needs. The main objective is to contribute to the demonstration and to bring to maturity a complete system for radioactive waste management, which ensures the safety of the population and the protection of the environment during all the handling phases, and in particular during the final disposal phase. International cooperation is in particular promoted in the projects under Part B.

The proposed programme would require a budget of 79.6 million ECU and a staff of fourteen. The programme would be implemented mainly through cost-sharing contracts with competent public organisations or private firms in the Member States. In the carrying out of the programme, the Commission would again have the assistance of the Management and coordination advisory committee "Nuclear fission energy - Fuel cycle/processing and storage of waste."

1. INTRODUCTION

Nuclear energy provides today 32% (1987) of the electricity production in the European Community and contributes to its policy of diversification of energy sources. In parallel, the safety of the population and the protection of the environment must be ensured; the necessary efforts thereto must be pursued as foreseen in the policy and in the action programme of the Community in the field of the environment (1) and in the framework programme 1987-1991 for Community activities in the field of research and technological development (2). The framework programme foresees therefore under the activity "Energy" an item "Fission : nuclear safety", aiming at reinforcing the scientific and technical basis necessary to strengthen the safety aspects of nuclear power plants and of other nuclear activities. The framework programme precises that radioactive waste management is one of the areas of highest relevance. It indicates that the R&D activities include waste treatment and conditioning, quality assurance of waste packages, demonstration of safe long-term waste disposal options in geological formations, accompanied by attempts to reach an european consensus on a common approach on waste management.

Moreover, the broad lines defined by the Community twelve year Plan of Action in the field of radioactive waste (1980-1992), which was approved by the Council in 1980 (3), and revised in 1983, 1985 and 1989, emphasize, inter alia, that "the Council is resolved to ensure the continuity of the R&D programmes (in the field of radioactive waste) during the plan". This guide line has therefore been adopted and materialized in the framework programme.

The present proposal for a new programme 1990-1994 on management and storage of radioactive waste complies with the requests above concerning the continuation of shared-cost R&D actions, coordinated at Community level. It resumes the broad lines of the current programme (1985-1989) with some modifications for taking into account the results obtained and the future needs, in particular the feasibility and safety of disposal, the management of waste resulting from the decommissioning of nuclear installations, (in coordination with the R&D programme on decommissioning of nuclear installations), and the quality of processes and products. The new programme also takes account of the activities performed in the framework of the programme of the Joint Research Centre.

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- 1) Resolution of the Council of the European Communities concerning the continuation and the realisation of a policy and an action programme of the European Communities in the field of the environment (1987-1992).
 - 2) Council decision of 28.09.1987, O.J. No L 302, 24.10.1987
 - 3) O.J. No C 51, 18.2.1980.

2. THE PREVIOUS PROGRAMME 1985-1989

2.1. Contents, progress and results

Through its Decision of 12 March 1985 (1), the Council adopted a five-year programme covering the following fields :

A. Waste management studies and associated R&D actions

- Task 1 : Systems studies
- Task 2 : Improvement of radioactive waste treatment and conditioning technologies
- Task 3 : Evaluation of conditioned waste and qualification of engineered barriers
- Task 4 : Research in support of the development of disposal facilities; shallow burial and geological disposal studies
- Task 5 : Safety of geological disposal
- Task 6 : Joint elaboration of radioactive waste management policies

B. Construction and/or operation of underground facilities open to Community joint activities (initially for the three projects listed below, but taking into account that additional proposals are likely)

- Project 1 : Pilot facility in the Asse mine (Federal Republic of Germany)
- Project 2 : Pilot underground facility in the argillaceous layer located under the Mol nuclear site (Belgium)
- Project 3 : Experimental underground facility in France in a geological medium of complementary nature (2)

This programme differed substantially from its predecessors in that it comprised activities related to underground facilities (Part B). Like its predecessors, it was executed through share-cost contracts, concluded with public and privately owned bodies in the Member States under the overall supervision of the Commission. In the discharge of this task the Commission was assisted by a management and co-ordination advisory committee (CGC 6). The budget of the programme was 62 MECU.

(1) O.J. No L 83, 25.03.1985, p.20

(2) The start of this project was delayed to 1991 due to a Decision of the French Government in 1987

Important progress and results have been obtained during the programme. They concern mainly improvements in reducing waste volume and radioactivity, waste package behaviour in repository conditions, feasibility and safety of deep geological disposal in salt, granite and clay.

Some highlights are given hereafter; a detailed summary of progress and results is given in annex I.

With regard to waste treatment and conditioning, the application of advanced processes for the treatment of liquid waste, namely those arising at nuclear power plants and reprocessing plants, should enable to reduce by several tenths the release of radioactive effluents in rivers or seas. Volume reduction factors up to five seem also feasible for waste concentrates.

With respect to the behaviour of conditioned waste, studies on the retention of radionuclides in the embedding matrices have shown that long lived radionuclides remain immobilized in cemented waste for several hundred years, even after mechanical degradation of the cement; a testing campaign with 15 laboratories participating has confirmed the protecting role played by the corrosion layer formed on the surface of the vitrified waste forms under disposal conditions.

With regard to the feasibility of deep repositories, works performed on deep rock formations permit to understand and predict their behaviour and to realize excavations adapted as needed : drilling of large diameter holes in granite, excavation and backfilling of large caverns in salt and excavation and support, at reasonable costs, of representative galleries in plastic clay. The underground test drift realised at Mol (Belgium) at 220 m depth is the first of its kind in the world.

With regard to safety of deep disposal the MIRAGE (1) project has provided valuable experimental data on the migration of radionuclides through the geosphere. In parallel scientists from different Member States, who have worked together during the last two programmes in the Community project PAGIS (2), have shown that during thousands of years no radioactivity would escape from underground repositories for vitrified high level waste, if these installations are well designed and the sites well chosen. This conclusion, drawn on the basis of existing technology and scientific knowledge in Europe, confirms the ones obtained previously outside the Community on different bases, namely in Sweden and Switzerland.

Finally, in the framework of a study on waste management practices and policies, a certain number of areas have been identified, in which a common approach and/or harmonization should be developed.

(1) MIRAGE : Migration of Radionuclides through the Geosphere

(2) PAGIS : Performance Assessment of Geological Isolation Systems

2.2 Exchange of information

The exchange of fresh scientific information on the progress and results of the work carried out in the framework of the programme was assured at the operational level by periodical progress meetings of working groups, for the various tasks and projects. Some 70 bodies within the Community were involved (43% national bodies and research centres, 36% private industries, 21% universities and institutes). Exchange of information and experience has also been achieved in depth by means of participation of one EC country research team to a project of another EC country, notably in the framework of part B of the programme (see paragr. 2.3).

The results of the research contracts are published in final reports and frequently presented at international seminars and conferences. The Commission itself organizes or cosponsors several of them.

The overall results of the programme, the third of its kind, will be presented, as usual, to the worldwide scientific community, at the third European Conference on Radioactive Waste Management to be held in September 1990.

Exchange of information with non EC-countries has been assured by means of the co-operative agreements (see paragr. 2.4).

In addition, the Commission has been issuing since 1983 a six monthly news letter, EC FOCUS, which reports the main events, the salient scientific results, the publications made during the period under consideration, and the meetings to come.

2.3 Intra Community co-operation

The launching of specific coordinated research projects within Part A of the programme has promoted the co-operation between various teams within the Member States. Half of the contracts concluded were dedicated to such projects as MIRAGE and PAGIS and Round Robin Tests (see par. 2.1).

The cooperation within the projects of Part B of the programme, regarding the construction and/or operation of underground facilities declared open for joint Community activities, was very successful. The bilateral co-operation between Gesellschaft für Strahlen und Umweltforschung mbH (GSF-FRG) and the Energieonderzoek Centrum Nederland (ECN-NL) in the HAW project at Asse (FRG) has been enlarged by the participation of the Agence Nationale pour la Gestion des Déchets Radioactifs (ANDRA-F) and the Empresa Nacional de Residuos Radioactivos S.A. (ENRESA-E) in the project. In the second project of Part B, the HADES underground facility at Mol (B), international co-operation has been established between the Studie Centrum voor Kernenergie (SCK/CEN-B), ANDRA (F) and the Geotechnical Consulting Group (UK).

2.4 Extra Community co-operation

Five year agreements for specific co-operation were reached with Atomic Energy of Canada Ltd (AECL) in October 1980 and renewed in 1985, with the United States Department of Energy (US-DOE) in October 1982 and renewed in 1987, with the Swiss National Co-operation for the Storage of Radioactive Waste (NAGRA) in June 1984 and with the Swedish Nuclear Fuel and Waste Management Company (SKB) in February 1986. Moreover a cooperation agreement in the form of an exchange of letters has been concluded in 1989 with the Republic of Finland. These co-operations result in fruitful exchanges of information in the fields of common concern, in particular where the disposal of waste is concerned. Moreover some organisations from these countries are participating in some of the specific coordinated research projects launched by the Commission and mentioned above.

Cooperation with international nuclear bodies, particularly with the Nuclear Energy Agency (OECD/NEA) and the International Atomic Energy Agency (IAEA) have continued very satisfactorily. In particular several international conferences, seminars and workshops were jointly organised with IAEA and/or NEA and some reports jointly published with NEA.

2.5 Evaluation

The programme is evaluated by a panel of independent experts in accordance with the Community research and development activities (1). In the summary conclusions, the panel judged that the programme 1985-1989 is a logical and fruitful follow-up of previous Community activities in the field of radioactive waste R&D. Those activities resulted in a significant increase in scientific and technical knowledge which will contribute to future decision-making. The panel also noted that the programme created an appropriate European context where most of the problems relevant for waste management have been dealt with in common. Finally, the panel welcomed the structure of the programme in two parts A and B.

The panel supports therefore the extension of the Community programme, stressing that the nature of the research involved requires an effort spread over long periods of time, including in situ research, inter-comparisons, reviews and public information. This programme should have spin-off in other sectors. The panel stresses the importance of maintaining the expertise in the teams engaged in the programme and the consequent need for continuity of funding.

(1) COM (86) 660 final

3. THE PROPOSED PROGRAMME 1990-1994

3.1. Justification

It no longer seems necessary nowadays to justify the interest of Community research on radioactive waste management, as underlined by the obtained results and the adoptions since 1973 by the Council and the Parliament of successive five yearly Community programmes. Moreover such a research area is part of the framework programme 1987-1991 as mentioned above.

As far as the necessity to pursue the research on Community level by means of the new proposed programme, this is based on the remarks hereafter :

- Nuclear energy provides today for 32% (1987) of the electricity needs in the Community; the production at present of all categories of waste from all sectors (nuclear, industrial, medical, research) is in the order of 70.000 m³/year. The accident which occurred at Goiania (Brazil) in 1987, due to abandonment of a source for medical radiotherapy, has recalled that the problem of radioactive waste has to be dealt with by all countries, whether they have nuclear programmes or not.
- Treatment and conditioning of radioactive waste have been practised for a number of years for most of the wastes; it is however advisable to complement the range of available processes in the Community and to benefit from the technological progress in general, in order to further reduce radioactive releases in the environment, releases which do not recognise borders.
- Only disposal of low and medium level short lived waste has been practised up to now; long lived waste and high level waste (vitrified waste resulting from reprocessing of spent nuclear fuel of those fuels themselves if not reprocessed) are stored awaiting the development of disposal options. The ongoing works in the Member States, to a large extent integrated in the Community programme, show that the deep geological disposal concept is feasible and safe in its various options (saliferous argillaceous, crystalline formation, etc) if the site is well chosen and if the design and the construction of the underground repository are based on sound practises. It is thus advisable to develop and to verify the concept in a concrete manner, namely by means of the experimental facilities which take profit of the different geological formations available in the Community.

The Community programme 1985-1989, of which the main results are presented in par. 2.1 and in Annex 1, has contributed up to now in a major manner to advancing in this work. The Community effort however has to be pursued, if not enlarged, as it regards a long and exacting task.

It is in fact necessary to operate the underground experimental facilities over a reasonable period of time, which is the only way to validate and confirm results obtained by other means. The Community programme makes it possible to integrate these facilities, existing or projected, in the framework of the european cooperation and to have them open to

all countries and scientists from the Community.

Besides these technological, safety and environmental protection aspects, the influence of the Community programme on the promotion of a consensus on waste management practises and on the development of an appropriate regulatory framework should be taken into account.

The positive impact of such a programme on the promotion of contacts between universities and industries and on small and medium enterprises (notably in the field of instrumentation) should be taken into consideration as well, even if an important part accounts for the public sector and has to be granted to large national public organisations.

Finally in the past it has been shown that the Community programme on radioactive waste management is a privileged framework for an intensive exchange of information between scientists from the Community, to fertilize individual efforts, and to make a certain integration of research possible. It is therefore very desirable to maintain this framework.

3.2. General objectives

The first objective of the programme is to contribute to the demonstration and to bring to maturity a complete system for radioactive waste management, which ensures the safety of the population and the protection of the environment during all the management phases, and, in particular, during the final phase, the disposal. That objective had already been set in the previous programme; it is however clear that such an objective cannot be reached in some years, in particular with regard to final disposal of high level and/or long lived waste. The priorities of the present programme are :

- with regard to the waste :
 - . the reduction of quantities and the releases into the environment
 - . the development of waste containment with a view to disposal
- with regard to disposal :
 - . the demonstration of the feasibility of deep geological disposal, thanks to the pilot facilities
 - . the confirmation of the safety, thanks to the continuation of community projects related to the study of migration of radionuclides through the geosphere and to the development of engineering and safety studies
- with regard to the whole system :
 - . the promotion of quality assurance and its control, concerning processes, waste packages, facilities and software (calculation codes).

Moreover, similar to the previous programmes, the proposed programme must pursue the objective to be a framework for exchange of information and reflections between the different researchers in the Community, permitting, among other things, the search for a European consensus on common approaches and to harmonize practices if needed. The programme has also to promote the scientific and technological co-operation between Member States, a source of efficiency and economy in time and money.

3.3 Contents

The proposed programme is composed of two parts A and B with mainly the same subjects as the current (1985-1989) programme. Part A deals with waste management studies and associated research and development actions, whereas in Part B the construction and operation of underground pilot and/or site validation facilities for deep geological disposal of radioactive waste are covered.

The proposed content is the following (1) :

Part A : Waste management and associated R&D actions

- Task 1 - System studies and harmonization of waste management practices and policies
- Task 2 - Treatment of radioactive waste
- Task 3 - Characterization and qualification of waste forms, packages and their environment
- Task 4 - Radioactive waste disposal, research in support of the development of underground repositories
- Task 5 - Safety assessment

Part B : Construction and/or operation of underground facilities open to Community joint activities

- Project 1 - Pilot underground facility in the Asse salt mine in the F.R. of Germany
- Project 2 - Pilot underground facility in the argillaceous layer under the Mol nuclear site in Belgium
- Project 3 - Underground validation facility in France
- Project 4 - Underground validation facility in the United Kingdom

It resumes the broad lines of the previous programme 1985-1989 with some modifications for taking into account the results obtained, the future needs, and the priorities mentioned above (parag. 3.2.).

(1) See for detailed description Annex 2

A first modification is the enlargement of the programme to other waste types than those studied in the previous programmes (waste resulting from operation of reactors and installations associated with the fuel cycle), in order to include, notably, the waste resulting from dismantling operations of nuclear installations and the spent fuel when it is not possible or not desirable to reprocess them. This enlargement is in particular necessary with regard to the dismantling waste, because they form, during the next century, an important part of the waste production; moreover this enlargement forms an indispensable addition to the Community research programme on "Decommissioning of nuclear installations", which covers the dismantling operations themselves and the evaluation of the arising waste but doesn't include management and disposal aspects. That modification concerns the whole of the programme and in particular Task 1, 3, 4 and 5 and may be Project 1 of Part B.

A second modification concerns the important development which is foreseen to allocate to Quality assurance of processes (Task 2) and of software (calculation tools ; Task 4 and 5) and to quality control of waste packages proposed for disposal (which would form a significant part of Task 3). This last point regards the development, up to industrial level, of methods and techniques permitting to verify whether the radionuclide contents and characteristics of waste packages meet with the safety requirements formulated by the authorities responsible for disposal.

One notes as well the priority allocated to the study of deep geological disposal conducted in order to open to a larger extent Part B to other projects and to allocate to Part B a slightly increased budgetary weight. The experimental and safety studies (PAGIS project) conducted in the previous programme have indeed shown the determining influence of the site selected for the disposal and the characteristics of the deep surroundings around the underground repository on the safety. It appears also necessary, judging from the knowledge already gathered on crystalline formations (granite), clays and salt, to know more on the varieties present in each of the rock types and liable for hosting a final repository. As a consequence, new projects (3 and 4) have been added to projects 1 and 2, already started successfully during the previous programme.

Furtheron, one remarks that Task 1 (merger of Tasks 1 and 6 of the previous programme) should permit to ensure a close liaison between management strategy studies and harmonization of practises and policies. Task 1 should also permit to place from a technico-regulatory point of view, the management of radioactive waste with respect to industrial toxic waste and to obtain interesting observations concerning these two sectors.

Finally, it has to be pointed out that the programme takes also into account the complementary activities of the JRC in the field, notably the operation of the PETRA facility at Ispra (in relation with Task 2), the characterisation work on waste at Ispra and Karlsruhe and on spent fuel at Karlsruhe, the actinide monitoring activities at Ispra (in relation with Task 3). The work on the radionuclide migration done at Ispra (in relation with Task 4) and the development of performance evaluations at Ispra (in relation with Task 5).

3.4 Implementation and management

The proposed programme will be carried out on the Commission's responsibility mainly through shared-cost contracts with competent public organisations or private firms, including small and medium enterprises, within the Member States. The Community's contribution will not normally exceed 50% of the total allowable cost of the project. Alternatively, in respect of universities and similar organizations, the Community may bear up to 100% of the marginal costs which are additional to the normal recurrent costs without the execution of the project.

The Commission will, like in previous programmes, promote cooperation within the framework of specific research projects. In the selection of research proposals, the Commission will therefore give priority to proposals which can be inserted in such specific projects. In particular international cooperation within the projects of Part B will be promoted.

The progress of the research will be periodically presented and discussed in various working parties for each specific research area and/or project. These working parties consist of representatives of the contractors and of experts from the Member States. In addition for each project of part B of the programme, a project Committee will be established made up of the project leader and a representative of each of the organizations participating financially or in kind in the project.

In carrying out the programme, the Commission will again have the assistance of the Management and coordination advisory committee "Nuclear fission energy - Fuel cycle/processing and storage of waste" (CGC-6)(1).

1) O.J. No L 177, 4.7.1984, P.25.

3.5 Budget and staff

The proposed programme would require a Community funding of 79.6 Mio ECU and a staff of fourteen. Table 1 gives a breakdown of the costs.

TABLE 1 BREAKDOWN OF COSTS

(Over five years)

Item	Mio ECU
A. Waste management and associated R&D actions	
- Task 1	3.8
- Task 2	6.8
- Task 3	16.8
- Task 4	16.8
- Task 5	2.0
Total Part A	46.2
B. Construction and/or operation of underground facilities open to Community joint activities	
- Project 1	15.0
- Project 2	5.0
- Project 3	3.0
- Project 4	2.0
Total Part B	25.0
Commission staff (7A + 4B + 3C)	6.7
Administrative expenses	1.7
Total	79.6

3.6 Intra Community co-operation

The bi- and multilateral co-operation between bodies in the Member States established and intensified in the previous programme (see par. 2.3), will be continued. In particular the co-operation in the projects under Part B will be further promoted, as these projects have been declared open to Community co-operation by the responsible bodies in the Member States on whose territory the facilities are built.

3.7 Extra Community co-operation

The co-operation agreements mentioned in paragraph 2.4 (Canada, USA, Switzerland, Sweden and Finland) which have been concluded for a five year period, partially cover the new proposed programme. This will assure, as in the past, the necessary scientific and technical exchanges with other countries outside the Community carrying out important R&D programmes in the field of radioactive waste.

The relations with the international nuclear agencies (OECD/NEA and IAEA) will be continued. This will further open up the proposed programme to the international co-operation.

ANNEX 1THE PREVIOUS PROGRAMME 1985-1989CONTENTS, PROGRESS AND RESULTS

The programme was divided into two parts :

Part A : Waste management studies and associated R&D actions,

aiming at :

- developing efficient waste treatment and conditioning processes
- developing the concept of deep geological storage and evaluating its safety
- optimizing waste management systems.
- continuing the study of the administrative, legal and financial framework which must encompass waste management

Part B : Construction and/or operation of underground facilities open to Community joint activities,

aiming at validating the basic results obtained so far on the subject of disposal, thanks to the construction and operation of experimental underground facilities.

With regard to waste treatment and conditioning, most activities were focussed on testing and demonstrating processes and techniques in pilot facilities. Advanced processes are being developed and tested aiming in general at reducing the volumes of waste, decreasing the discharge of radioactive effluents in the environment and transformation of the waste in a form increasing the possibility of ulterior safe disposal.

Good results were e.g. obtained with the flocculation centrifugation process for the treatment of liquid effluents arising during operation of LWR's and with thermal denitration of reprocessing concentrate which last process should lead to a volume reduction factor between 4 and 5 in comparison with the conventional bituminisation process.

Reduction of the volume of arising waste has also been obtained in the fabrication process of plutonium fuels. By installing a fourth containment barrier in the glove-boxes line of fuel fabrication it was possible to reduce the volume of Pu-contaminated waste by 10-15 % while decreasing the Pu-content of waste with 80 %.

In addition, and with a view to compare various existing processes, mainly treatment processes for liquid waste, an intercomparison exercise was set-up early in 1989. Tests and experiments at several laboratories in the Member States were carried out on genuine samples of radioactive waste and as far as possible on the sites where these wastes were available, in order to avoid transport operations.

With respect to the evaluation of the properties of the conditioned waste forms and waste packages, the list of reference waste forms for low and medium level waste investigated during the previous programme has been updated and extended. The nuclide releases of most reference materials have been measured by leach testing of fully active samples. For the measurement of leach rates under disposal conditions lysimeter tests have begun. With respect to solidified high level waste forms an international joint project was organized by the CEC in which 15 laboratories were participating. The project was focused on the experimental examination, analysis and modelling of waste glass reactions with the surrounding repository materials and leachants under conditions representative of performance analysis scenarios. The results showed the close agreement of measured data and a wide consensus on corrosion and release models.

A new action was launched on quality assurance of waste packages in which significant progress was achieved in the field of non-destructive testing e.g. a prototype high resolution CT scanner was developed and applied in detecting voids, cracks and inhomogeneities in drums of LLW and in full size simulated waste glass blocks. Moreover an interlaboratory test on non-destructive assaying of actinide concentration in waste drums was set up which led to improvements of the data interpretation methods and allowed to define the limitation of the various systems.

Regarding research on the development of geological repositories activities have been concentrated on the characterization of potential sites and host rocks and on the study of migration phenomena of radionuclides through the geosphere. The European Catalogue of suitable formations for waste disposal, established in previous programmes, has been completed with an inventory of the relevant formations on the Spanish territory.

For the characterization of potential sites on-land, measurement techniques have been improved, e.g. electromagnetic borehole probes for the detection of fractures in granite and gas emanation measurement techniques for the detection and characterization of fractures and faults in clays. The understanding of large-scale rock mass behaviour under the influence of excavation-induced and/or thermal stresses has been improved by large in situ investigations in granite (Fanay-Augères - F), in clay (Mol - B) and in salt (Asse - D). The in situ data about the rheology of salt was used for the project COSA (Comparison of Rock-Mechanics Computer Codes for Salt). In this four year project, twelve specialized teams throughout the EC could verify and validate their codes and models on geomechanical behaviour of rock salt. In this intercomparison exercise very satisfactory results were obtained and a first step set towards quality assurance of software in this field.

The MIRAGE project (Migration of Radionuclides in the Geosphere), co-ordinated and launched in 1983 by the Commission with the aim of providing experimental data and of supporting safety analyses has been continued. The main thrust of the project is on in-situ investigations and on the benchmarking of measurement techniques, concepts and computer codes.

Within the COCO-club (Colloids and Complexes) over twenty laboratories put together their research efforts on complexation of radionuclides with natural and man-made organic substances, colloid generation in groundwaters and basic retention mechanisms in aquifer systems. Intercomparison exercises were performed about characterization of natural humic acids and natural colloids, which resulted in a substantial improvement of knowledge about these sensitive questions. In situ migration experiments (tracer tests) are performed in the underground laboratory in the clay at Mol (B) and in the sandy aquifer in Drigg (UK).

For the long term prediction of migration processes, advanced groundwater flow and geochemical codes have been developed and improved. In order to ascertain the EC capabilities for geochemical modelling, an international exercise called CHEMVAL was implemented in which fourteen teams were participating. This exercise permitted the development of a geochemical data base for modelling purpose and the verification and validation of geochemical codes.

Much emphasis was put on the study of naturally occurring analogues of processes which are significant in predicting the long-term behaviour of repositories. In particular, the CEC took the initiative of establishing, in 1985, an international "Natural Analogue Working Group", which held regular plenary meetings and a major symposium in Brussels in 1987. This informal alliance of experimentalists and modellers, drawn from research and assessment teams in all the major international programmes, has progressed a considerable way towards clarifying the needs for natural analogues, their realistic potentials to support performance assessment modelling and the principles involved in applying them sensibly.

The PAGIS project for evaluating the safety of the disposal systems (Performance Assessment of Geological Isolation Systems) initiated in 1982, was terminated. The essential aim of the project has been to assess the general capability of possible waste disposal systems to confine or restrict to acceptable levels, the release of radionuclides incorporated in conditioned high level radioactive waste after the closure of the underground repositories.

Scientists from different Member States worked together on a common methodological basis and used realistic design and data assumptions based, as far as possible, on real site characteristics. Three host rock formations were considered which are commonly found in the Member States : clay, granite and salt ; deep sea sediments have been added as alternative to land based disposal.

Normal evolution and altered evolution scenarios, considering possible perturbative events, were defined. Deterministic approach- and stochastic calculations were performed, the last ones for uncertainty and global sensitivity analyses. None of the results obtained give rise to doubts about the feasibility of safely disposing high level radioactive waste in any of the analysed options if appropriate sites are selected and the repositories are designed according to sound engineering principles. This is so even taking into account the many uncertainties still affecting the present data and models.

In 1986, as a complement to the PAGIS project, the PACOMA project (Performance Assessment of confinements for MLW and Alpha waste) was launched. The study applies the same methodology as set up in the PAGIS project. Data on the waste inventory and on the repository design were collected and near field models set up. Calculations are under way and results are expected in the middle of 1989.

Considering the several partial and specific results obtained during the previous programmes and becoming available in the present programme it appeared necessary to evaluate and optimise the various overall management schemes of radioactive waste. Two categories of waste have in particular been considered namely reactor waste and hulls. Moreover a comparison has been made between waste management aspects of direct disposal of spent fuel and reprocessing. Flow sheets of waste streams and management routes were defined, based on current practices in Member States and hence as close as possible to reality. In the further evaluation various aspects are considered such as feasibility, availability and radiological and economic features. In order to allow comparison of management options with large differences in cost and radiation exposure procedures have been developed to provide a rational base for comparative evaluations.

In parallel to these system studies also a start was made with the joint elaboration of criteria for waste management and disposal and with the evaluation of possible approaches at Community scale for waste disposal. A report was elaborated giving an overview of principles, standards and technical criteria etc. applicable to radioactive waste disposal in the European Community. Areas for possible common approaches have been identified.

Moreover preliminary inventories are being made on the quantities of waste produced by Industry, Research and Medical activities and on the current management practises in the main countries.

The underground facilities involved under part B of the programme are being declared open to Community co-operation by the responsible bodies in the Member States on whose territory the facilities are being built. At the beginning of the programme in 1985, three projects were defined, respectively the HAW project in the Asse salt mine (FRG), the HADES project in the Boom clay at Mol (B) and the ATLAS project in France. During the programme period 1985-1989 only the first two projects could be implemented, the third one being delayed due to a decision of the french government in 1987.

The HAW-project concerns the emplacement of thirty high radioactive canisters, borosilicate glass blocs spiked with Cs-137 and Sr-90, in six boreholes located in two test galleries at the 800 m level in the Asse salt mine in the Federal Republic of Germany. They are scheduled to be emplaced in the Asse mine in the beginning of 1989 and would remain there for a period of five years. For the handling of the radioactive canisters and their emplacement, the complete technical system consisting of transportation casks, transport vehicle, disposal machine and borehole slider has been developed and tested, therefore the first of the objectives has been achieved. The project is being carried out by the "Institut für Tief Lagerung of the Gesellschaft für Strahlen- und Umweltforschung mbH".

From the beginning of the project there was already a close co-operation between GSF and the Netherlands Energy research Foundation (ECN). This international co-operation has been enlarged with the participation of the "Agence National pour la Gestion des Déchets Radioactifs" (ANDRA) (F) and the "Empresa Nacional de Residuos Radioactivos S.A." (ENRESA) (E). This project, which is a first of its kind, has developed to an international project in which a number of organisations from Member States are participating.

The second project concerns the HADES project, where in the Boom clay layer under the nuclear site at Mol (B), a Test drift was successfully excavated between April and December 1987. The drift is 63 m long and has a 3.5 m inner diameter, and was realized in close co-operation between SCK/CEN (B) and ANDRA (F). The first section, about 45 m long, was made on behalf of SCK/CEN and is lined with concrete segments ; the second section is lined with sliding steel ribs and was realized for ANDRA. This co-operation has still been enlarged by the participation of the Geotechnical Consulting Group (UK).

Building the test drift has been the direct and successful demonstration of mining capabilities in a plastic clay with properties and conditions representative of an argillaceous host formation for disposal of radioactive waste. The two different lining techniques were successfully applied and the results of tests show that the facility and the host rock behaved as predicted.

ANNEX 2DESCRIPTION OF THE PROPOSED PROGRAMMEPART ATASK 1System Studies and Harmonization
of Waste Management Practices and Policies

- OBJECTIVES :
- * TO ASSESS THE FEASIBILITY, AVAILABILITY, ECONOMICS, AND RADIOLOGICAL IMPACT OF VARIOUS OVERALL MANAGEMENT SCHEMES FOR DIFFERENT TYPES OF RADIOACTIVE WASTE
 - * TO ELABORATE IN COMMON RADIOACTIVE WASTE MANAGEMENT AND DISPOSAL CRITERIA
 - * TO ASSESS VARIOUS APPROACHES TO DISPOSAL AT COMMUNITY SCALE
 - * TO EVALUATE THE POSSIBLE APPLICABILITY OF RADIOACTIVE WASTE RESEARCH ON INDUSTRIAL TOXIC WASTE MANAGEMENT AND DISPOSAL PROBLEMS

System studies on nuclear reactor and fuel cycle waste have been performed during the previous programme; common features and disparities in national regulatory frameworks and radioactive waste management practices have been reviewed as well. The work should be extended to other radioactive waste types, to a comparative assessment of toxic waste disposal practices, to harmonization studies when a need has been identified and to aspects of radioactive waste management of community concern.

1. System studies

- System 1 : Radioactive waste resulting from the decommissioning of nuclear installations

The information gained during the implementation of the community programme on "Decommissioning of nuclear installations" will be used as an input.

The adequacy of the disposal schemes currently under study to accommodate decommissioning waste will be examined; the specific requirements of this waste category will be identified as well.

- System 2 : Spent fuel, when declared as a waste

Besides the case of the spent fuel coming from commercial nuclear power plants, special consideration will be given to the various types of spent fuel which are not reprocessed for technical or non technical reasons (Research reactor fuel, experimental fuel, special MOX fuel etc...).

TASK 3Characterization and Qualification of
Waste Forms, Packages and their Environment

- OBJECTIVES :
- * TESTING AND VALIDATION OF MODELS AND DATA BASE DESCRIBING THE LONG-TERM EVOLUTION OF DISPOSED WASTE PACKAGES
 - * DETERMINATION OF THE RELEVANT PROPERTIES + PERFORMANCES OF THE WASTE FORMS AND THEIR ENVIRONMENT
 - * IMPROVEMENT OF PRODUCT QUALITY CONTROL

During the past programmes, a number of candidate waste forms and barrier materials were investigated. Many of the materials tested were found satisfactory in short-term testing but results of longer-term experiments are still needed. In addition to the existing waste forms, new products will be studied to comply with recent regulatory developments, as well as packages resulting from decommissioning operations.

A major effort will be devoted to the validation of source term models and data bases required for risk assessment of disposal. Confirmation of the validity of long-term predictions will be sought by testing the models against natural analogues representative of vitreous waste forms. In addition, the development of quality control procedures and test equipment initiated in the preceding programme will be conducted as a co-ordinated research action which unites the interests of waste processors, waste disposal agencies and regulatory authorities.

1. Quality and performance of low- and intermediate level waste forms

- Characterization of heterogeneous waste forms
- Influence of waste loading and package size on product quality
- Effects of radiation, corrosion, biodegradation, etc. on waste for stability
- Gas generation by corrosion radiolysis + biological decomposition
- Solubility of nuclides in conditioned waste, mobility of colloids and the effects of complexing agents
- Modelling of the source term for low- and intermediate waste disposal

2. Characterization of solidified high level and actinide waste

- Structural damage by alpha and neutron radiation
- Homogeneity of full scale waste products
- Mechanisms of nuclide release under repository conditions
- Study of natural analogues for vitreous and ceramic waste forms
- Application of source term models to natural analogues

3. Properties and performance of containers, and surrounding materials
 - Corrosion resistance of waste containers
 - Safety of container handling-integrity under accident conditions
 - Performance of containers under conditions of prolonged intermediate storage
 - Chemical and physical interactions of backfill/buffer materials with waste packages - Modelling of migration phenomena
 - Permeability of materials to gases and liquids

4. Radionuclide assay : development of standard methods and equipment for specific applications
 - On-line monitoring of waste treatment and conditioning processes
 - Destructive and non-destructive measurements of the nuclide inventories
 - Active and passive methods of alpha and neutron assaying
 - Mobile assaying equipment

5. Quality control of waste products and development of test methods (other than 4.)
 - Establishment of sampling procedures and techniques
 - Verification of chemical composition
 - Detection of unwanted or undeclared substances
 - Detection/measurement of waste/matrix interaction, gas generation, container corrosion, and swelling
 - Measurement of physical properties of waste products and packaging - homogeneity, setting, mechanical strength, etc.

Where applicable, preference will be given to the development of non-destructive testing.

Community contribution : 16.8 MECU over five years

- System 3 : Waste exempted of regulatory control

A parametric investigation of the consequences on waste management systems of various levels of exemption will be performed, notably where concrete rubble resulting from dismantling operations is concerned.

2. Harmonization of radioactive waste management practices and policies

- Development of common criteria for exemption of particular waste streams from regulatory control (re-inforced concrete, contaminated soil, etc.)
- Elaboration of harmonized classification schemes for typical disposal options and geological formations
- Multinational dimensions of radioactive waste management; inter-community handling of waste components; regional disposal systems.

3. Comparative assessment of disposal practices for various toxic and radioactive waste management schemes

- To compare and contrast the management practices of the two types of waste
- To identify sectors where the R&D activities and results related to radioactive waste may be of interest for toxic waste management and disposal.

Community contribution : 3.8 MECU over five years

TASK 2Treatment of Radioactive Waste

- OBJECTIVES :
- * MINIMISATION OF THE RADIOACTIVE DISCHARGES INTO THE ENVIRONMENT
 - * VOLUME REDUCTION OF WASTES FOR DISPOSAL
 - * ACTIONS AT SOURCE TO PREVENT GENERATION OF RADIOACTIVE WASTE
 - * APPLICATION OF IMPROVED CONTROL

The need to further reduce both the radioactive discharges into the environment and the cost of radioactive waste management require the continuation of research efforts in the treatment of radioactive waste. In addition, comprehensive process control schemes for waste treatment and conditioning have to be developed to make sure that waste products meet the technical specifications and regulatory requirements. It is intended to pursue investigations on the following items, taking into account the results of the system studies performed during the preceeding programme :

1. - Minimisation of radioactive/toxic discharges from nuclear facilities
 - . Improvement of the decontamination performances of conventional treatment processes for low and medium level liquid waste
 - . Removal of toxic species from low level liquid effluents
2. - Reduction of waste volumes and arisings
 - . Volume reduction of wastes by melting, thermal denitration, dewatering.
 - . By application of high performance decontamination processes, use of very selective extractants, oxidative or reducing agents, to achieve changes of waste category where possible to levels below regulatory concern.
 - . By actions at source to prevent generation of radioactive wastes.

Priority will be given to the research actions involving treatment of genuine samples of radioactive waste at a representative scale.
3. Advanced process control and monitoring
 - . Development of reliable and sensitive monitoring and control systems : in particular for on-line application.

Community Contribution : 6.8 MECU over five years

TASK 4

Radioactive waste disposal; research in support of the development of underground repositories

OBJECTIVES: * DEVELOPMENT OF DISPOSAL FACILITIES AND ASSESSMENT OF THE LONG-TERM BEHAVIOUR OF THE GEOLOGICAL BARRIER FOR PREDICTIVE MODELLING.

Previous research has significantly improved knowledge about the potential geological horizons for waste disposal, the candidate materials and techniques for backfilling of repositories, and the phenomena governing the possible migration of disposed radionuclides through the geological barrier. The implementation of the concept of geological disposal however requires further research and development work on the geological media under consideration (such as granite, clays, salt domes or layers), on the construction and operation of repositories, and on the actual isolation properties of the whole system. To this end, studies will deal with:

1. Research related to sites and their characterization

- . Data acquisition and modelling of the geological systems by means of laboratory and in-situ tests ; improvement of the knowledge about geodynamic factors (geoprospective).
- . Development and improvement of adequate techniques for measuring relevant properties of geological formations e.g. borehole probes for measuring groundwater geochemistry, detection and characterization of fractures, investigation on groundwater flow and gas permeability.

2. Design, construction and operation of underground repositories

- . Technology of disposal; assessment of emplacement schemes and methodologies.
- . Development and testing of suitable materials, technologies, and engineering procedures for the backfilling and sealing of the various disposal boreholes, galleries and shafts in underground repositories.

3. Radionuclide migration in the geosphere (MIRAGE project)

- . Geochemistry of actinides and fission products in natural aquifer systems; role of organics and complexes on radionuclides transport; basic retention mechanisms.
- . In situ migration experiments and development of adequate techniques for the acquisition of large scale data for use in radionuclide transport modelling.

- . Natural evidences of geological migration processes (natural analogues) for the understanding of long term behaviour of geological isolation systems.
- . Development, improvement and intercomparison of concepts, computer codes and data bases for use in predictive radionuclide migration models.

Community contribution : 16,8 M ECU over five years.

TASK 5**Safety Assessment**

OBJECTIVE : * EVALUATION OF THE SAFETY OF DISPOSAL SYSTEMS

The projects PAGIS (Performance Assessment of Geological Isolation Systems, for vitrified waste) and PACOMA (Performance Assessment on the Confinement of Medium-level and Alpha waste) have been completed during the preceding programme. They have shown that the radiological impact of radioactive waste disposal facilities may remain within the regulatory limits, provided that some parameters and factors are well chosen. In addition, a European methodology for safety assessment has been established. In the light of what has been learnt during the implementation of these two pluriannual projects, it is necessary :

- to review, improve and structure the methodology to make it fit as well as possible with realistic situations;
- to investigate the sensitivity of the results of a performance assessment to various parameters and factors (e.g. relative importance of near- and far-field, and in particular of the engineered barriers);
- to perform complementary assessments with additional radioactive packages, like spent fuel casks;
- to harmonize approaches in performance evaluation.

Community contribution : 2.0 MECU over five years

PART B

CONSTRUCTION AND/OR OPERATION OF
UNDERGROUND FACILITIES
OPEN TO COMMUNITY JOINT ACTIVITIES

The specific projects involved in this part of the programme are, by nature, projects of long duration. Projects 1 and 2 have already been started during the previous programme and will be continued. All these projects have been declared open to Community co-operation by the responsible bodies in the Member States on whose territory the facilities are built. They deal with experimental and pilot facilities without industrial purposes. These facilities make it possible to confirm on site the design criteria to be taken into consideration for building industrial disposal facilities, to develop radioactive waste emplacement techniques or to validate the site as being convenient for waste disposal.

Radioactive waste or materials, which will be used in some projects for studying operating conditions similar to those envisaged for an industrial facility, will be retrievable.

As in the previous programme, the co-operation includes, inter alia, participation of scientists from other Member States to the projects, especially by means of temporary secondment of personnel, and the possibility of complementing the projects by specific activities; in the latter case modalities are specified on a case-by-case basis and a project committee will be set up for each project.

The control of, and the responsibility for the projects will be ensured by the hosting bodies.

In addition to the projects described below, others could be added in the course of the programme.

PROJECT No 1 : PILOT UNDERGROUND FACILITY IN THE ASSE SALT MINE *

Within the previous programme, the project dealing with the test disposal of high level waste has been started, including the emplacement of thirty radioactive high level waste sources at the -800 m level of the Asse salt mine. Dutch, French and Spanish organizations are participating in complementary research activities. Besides this project, new activities will start in the Asse salt mine dealing with the test disposal of other waste types and the demonstration of gallery sealing.

The work covered by the Community programme for 1990-1994 will be the following:

* Presented by the Authorities of the Federal Republic of Germany

- Test disposal for high level waste. This test will be pursued further; the behaviour of the irradiated and heated salt mass will be continuously monitored and studied. Periodical testing of the technical emplacement system and components will be performed. All waste sources will be retrieved at the end of the test period.
- Test disposal aiming at developing and testing suitable methods for the disposal in salt of heat generating intermediate level radioactive waste (hulls from spent fuel elements, fuel element structural components, fuel clarification sludges) and irradiated fuel elements from high temperature reactors. The waste drums will be emplaced in four large diameter boreholes. Real waste will be used and retrieved after a three year emplacement period.
- Test disposal dealing with the demonstration of the technical feasibility of the direct disposal of spent fuel elements from light water reactors and the observation of the containment, the back-filling as well as the surrounding rock salt along the emplacement drifts. Six POLLUX containers will be emplaced in two parallel galleries and the spent fuel will be simulated by electrical heaters. The testing phase will last 5 years.
- Large scale test on the sealing of access drifts to the disposal area aiming at demonstrating that it is possible to efficiently seal those parts of an industrial repository filled with radioactive wastes from the parts which are still in operation. A multi-component dam will be constructed in a full size gallery and is designed for two-sided loading in case of possible intrusion or occurrence of brine or gas. The test period is planned to last 4 years.

Community contribution, including complementary studies : 15.0 M ECU over 5 years.

PROJECT No 2 : PILOT UNDERGROUND FACILITY IN THE ARGILLACEOUS LAYER UNDER THE MOL NUCLEAR SITE (*)

In the previous programme, a test drift was excavated in the Boom clay layer at 220 m beneath the Mol nuclear site, demonstrating the feasibility of constructing full size galleries in deep plastic clay. In addition, a French organization tested successfully an alternative gallery lining system. French and British organizations are also participating in the experimental programme performed in these galleries.

The work covered by the Community programme in 1990-1994 will be the following :

- . monitoring of the running experiments such as mine-by test, gallery heating test and a combined heating irradiation test.

* Presented by the Belgian Authorities

- . demonstration of the in-gallery waste disposal concept, by excavating an additional gallery from the existing one, emplacement of an electrically heated, full size dummy container string, back-filling of the gallery and monitoring;
- . design studies of a large scale pilot facility.

Community contribution, including complementary studies: 5.0 M ECU over 5 years.

PROJECT NO 3 : UNDERGROUND VALIDATION FACILITY IN FRANCE *

The French programme foresees the selection of one potential site for deep disposal of radioactive waste in 1991. At present, four sites have been pre-selected, respectively in clay, granite, salt and schists. The suitability of the selected site will be investigated by means of an underground validation facility scheduled to be in operation in 1994.

The work covered by the Community programme 1990-1994 will be the following :

- . mine-by test and characterization of the formation during the construction of the access shaft;
- . design of the underground validation facility and definition of the experimental programme.

Community contribution, including expected complementary studies : 3.0 M ECU over 5 years.

PROJECT No 4: UNDERGROUND VALIDATION FACILITY IN THE UNITED KINGDOM**

The British plan for deep disposal of intermediate and low level waste foresees the naming of some potential sites in 1989. After exploratory investigations on these sites, one site will be selected around 1993. The suitability of the site will then be investigated by means of an underground validation facility scheduled to be in operation after 1994.

The work covered by the Community programme 1990-1994 will be the following :

- . characterisation of the selected disposal site from the ground surface;
- . study of the formation during the construction of an access shaft;
- . preliminary design of the underground validation facility.

Community contribution, including expected complementary studies : 2.0 M ECU over 5 years.

(*) Presented by the French Authorities

(**) Presented by the United Kingdom Authorities

ANNEX 3FINANCIAL RECORD SHEET1. Budget heading

- Code No 7351
- Title: Radioactive Waste management.
- Programme included in the framework programme 1987-1991 under action line No 5.1

2. Legal basis

Article 7 of the Treaty establishing the EAEC.

3. Description and objective of the action

This action concerns a five-year (1990-1994) shared-cost research programme, which is a follow-up of the programme ending in 1989 that was adopted by Council Decision 85/199/Euratom of March 12 1985 (OJ No L83,25.03.1985, p.20). The present programme is one of the components of the "Framework programme for Community activities in the field of research and technological development (1987 to 1991)" concerned by Council Decision 87/516/Euratom, EEC of 28 September 1987 (OJ No L 302, 24.10.1987, p.1).

The programme covers the following two parts :

Part A : Waste Management and associated R&D actions

- Task 1 - System studies and harmonization of waste management practices and policies
- Task 2 - Treatment of radioactive waste
- Task 3 - Characterization and qualification of waste forms, packages and their environment
- Task 4 - Radioactive waste disposal; research in support of the development of underground repositories
- Task 5 - Safety assessment

Part B : Construction and/or operation of underground facilities open to Community joint activities

- Project 1 - Pilot underground facility in the Asse salt mine in the FR Germany
- Project 2 - Pilot underground facility in the argillaceous layer under the Mol nuclear site in Belgium
- Project 3 - Underground validation facility in France
- Project 4 - Underground validation facility in the United Kingdom

The objective of the programme is to ensure the best protection of the population and environment and to continue the joint development and perfecting of radioactive waste management.

The action concerns in particular :

- authorities responsible for nuclear safety and radiation protection;
- operators of nuclear installations;
- public organisations and private firms with competence in nuclear research, concerned as potential contractors.

4. Justification of the action

The action is necessary to attain the objective given under item 3 above.

The need for Community action in this field was repeatedly recognised by the Council, namely in the two Decisions mentioned under item 3 above.

5. Financial implications of the action in respect of expenditures

5.1 Total cost over the whole duration :

Amount deemed necessary = 79.6 MioEcu

5.2 Breakdown of financing :

Expected total expenses in the frame of the action are about 150 MioECU, and 53% of this amount (i.e. 79.6 MioECU) is to be covered by the Community budget.

5.3 Multiannual timetable of appropriations

The timetable of appropriations for commitment and for payment is given expecting an adoption of the action before the end of 1989. Nevertheless, in order to cover the possibility of a delayed adoption during the year 1990, the draft budget for 1990 has been set up earmarking 1 MioECU of appropriations for commitment and payment in the previous (1985-1989) action. This amount will cover expenses for the present staff (6A, 3B, 3C) up to 0.913 MioECU and the administrative expenses up to 0.087 MioECU even in the absence of a programme decision. Correspondingly the 1990 appropriations for the 1990-1994 action in the draft budget have been reduced from 30 to 29 MioECU for commitment and from 9 to 8 MioECU for payment. Any expenses in the new action performed on appropriations of the previous programme will be transferred to the new action as soon as the programme decision is taken.

It is worthwhile noting that the draft budget for 1990 includes 8.5 MioECU of appropriations for payment for the 1985-1989 action in order to allow payment of work committed but not yet completed.

Appropriations for commitment (MioECU)

	1990	1991	1992	1993	1994	1995	1990-1994
Staff	1.212	1.300	1.370	1.373	1.408	-	6.663
Administration	0.390	0.335	0.330	0.325	0.315	-	1.695
Contracts	28.398	22.265	14.300	6.002	0.277	-	71.242
Total	30.000	23.900	16.000	7.700	2.000	-	79.600

Appropriations for payment (Mio ECU)

	1990	1991	1992	1993	1994	1995	1990-1994
Staff	1.212	1.300	1.370	1.373	1.408	-	6.663
Administration	0.390	0.335	0.330	0.325	0.315	-	1.695
Contracts	7.398	15.016	16.287	13.319	8.594	10.628	71.242
Total	9.000	16.651	17.987	15.017	10.317	10.628	79.600

5.4 Method of calculation5.4.1. Staff expenditure

The appropriations were evaluated on the basis of the following staff :

- 6 category A officials in 1990, 7 A officials from 1991 on
- 4 category B officials
- 3 category C officials.

The calculations are based on the data established for the Provisional Draft Budget for 1990 (i.e. : A: 93,000 ECU ; B: 58,000 ECU ; C: 37,000 ECU) and on an annual increase rate of 4% taking into account the trend in the general level of prices in the Community.

Staff attached to the previous 1985-1989 programme consists of 6A, 3B and 3C officials; this number is to be increased by 1B official in 1990 (calculated in 50% of the annual expense for a B official during the year of appointment) and 1A official in 1991 (again calculated in 50% of the annual expense for an A official during the year of appointment).

Appropriations for staff also cover expenses for missions and auxiliary staff.

5.4.2 Administrative expenditure

Administrative expenditure covers :

- organisation of working group meetings;
- use of data processing and telecommunication facilities;
- supporting coordination activities;

The calculations are based on average requirements and experience made with the 1985-1989 programme.

5.4.3. Contract expenditure

The appropriations cover the financial contribution of the Community (typically 50%) to the expenditures incurred by contractors in performing research and development work under the programme. Provisions are made for programme evaluation and contract audits.

6. Financing of expenditures

The appropriations required to cover the financial participation of the Community in this action will be entered into the future Community budgets.

7. Control system to be applied

Administrative control by the Directorate General for Financial Control and by the Contract Division of the Directorate General for Science, Research and Development, as regards the implementation of the budget and regularity of expenditures.

Scientific Control by the competent Management and Coordination Advisory Committee (CGC) and by responsible officials in the Directorate General for Science, Research and Development.

Evaluation in accordance with the "Community plan of action relating to the evaluation of Community research and development activities for the years 1987 to 1991" (COM(86) 660 final).

ANNEX 4OPINION OF THE MANAGEMENT AND COORDINATION ADVISORY COMMITTEE CGC6
"NUCLEAR FISSION ENERGY- FUEL CYCLE/PROCESSING AND STORAGE OF WASTE"

The Management and Coordination Advisory Committee "Nuclear fission energy - Fuel cycle/processing and storage of waste" (CGC 6), at its meeting of 16 February 1989, examined a proposal for a 1990-1994 research and development shared-cost programme on the management and storage of radioactive waste (document CGC6/88-22 Rev. 1).

The proposed programme is a follow-up of the current programme 1985-1989 and is based on the positive and encouraging results obtained so far. As previously, the new programme will be composed of two main parts : Part A will deal with waste management and associated R&D actions and Part B with the construction and/or operation of underground facilities open to community joint activities.

The proposed programme would be implemented through cost-sharing contracts with competent private firms and public organisations in the Member States, with a budget of 79.6 million ECU and a staff of 14.

The Committee considered that the programme provides a suitable basis for well balanced activities comprising : (a) system studies and harmonization of waste management practices and strategies, (b) activities in the field of waste treatment, conditioning and disposal, (c) safety assessment of waste disposal and (d) underground pilot installations.

The Committee considered that the construction and/or operation of underground pilot facilities in several Member States is of paramount importance at this stage of the development of waste disposal systems. It recommended nevertheless to carefully monitor, during the course of the programme, the balance of the budget allocated to both parts of the programme in order to ensure the transfer of funds from Part B to Part A if it is justified by the rate of progress on underground pilot facilities and considerations of expenditure and relative priorities of projects at that time.

The Committee noted with satisfaction that the new programme will also take into consideration the management of other types of waste such as decommissioning waste and spent fuels when considered as waste.

As a conclusion, the Committee supports unanimously the programme proposed by the Commission services, both for its technical content and the amount of funding.

J. LEFEVRE
Chairman of CGC 6

Brussels, 16 February 1989

ANNEX 5OPINION OF THE SCIENTIFIC AND TECHNICAL COMMITTEE

1. The Scientific and Technical Committee, at its meeting on the 13th of March 1989, examined the proposal for the shared-cost R&D Programme on Management and Storage of Radioactive Waste, 1990-1994, for which 79.6 MioECU and a staff of 14 is sought.
2. The Committee considers the Radioactive Waste Management and Storage Programme to be very important for the continued use of nuclear energy in the Community. The Committee believes that international co-operation, particularly between Member States of the Community, is of great advantage in this work.
3. The Committee stresses that many technologies for waste management are already available and seem likely to be satisfactory from previous scientific research. It is nevertheless necessary to optimize the use of these methods and to provide convincing evidence that they can be used safely, to ensure that the public has confidence in the safety of disposal for the long-term.
4. The Committee noted with satisfaction that the third programme (1985-1989) gave very valuable results which should be made available, as fully and quickly as possible, both to waste managers and to the public. The proposed fourth programme is a sensible continuation of this.
5. The Committee emphasizes the importance of moving forward quickly with demonstration projects but, given the uncertainties in the time scales for these, a degree of flexibility should be maintained between Parts A and B.
6. The Committee welcomes the following specific points :
 - the broadening of the scope of the programme, to include decommissioning waste and spent fuels considered as waste; in this context it is desirable to establish maximum contact with the programme on decommissioning;
 - the emphasis put on quality assurance and control in waste management;
 - the emphasis on using natural analogues to the maximum possible extent, since only in this way can information be obtained about actual radionuclide migration rates over many centuries in real geological structures.
7. The STC wishes to emphasize the importance, particularly in enabling the public to set nuclear waste management in proper perspective, of considering nuclear and non-nuclear toxic waste in a comparable way : nor should the programme neglect possible alternative methods for handling nuclear waste in the longer term.
8. The Committee therefore supports unanimously the programme proposed, both in its technical content and in terms of the funding required.

ANNEX 6

PROPOSAL FOR A COUNCIL DECISION
ADOPTING A SPECIFIC RESEARCH AND TECHNICAL DEVELOPMENT PROGRAMME
FOR THE EUROPEAN ATOMIC ENERGY COMMUNITY
IN THE FIELD OF MANAGEMENT AND STORAGE OF RADIOACTIVE WASTE
(1990-94)

THE COUNCIL OF THE EUROPEAN COMMUNITIES

Having regard to the Treaty establishing the European Atomic Energy Community, and in particular Article 7 thereof,

Having regard to the proposal from the Commission, presented after consulting the Scientific and Technical Committee (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas the use of nuclear energy inevitably involves the production of radioactive waste; whereas it is therefore essential to implement effective solutions to guarantee the safety and protection of man and the environment against the potential risks associated with the management of such waste;

Whereas the fourth European Communities' action programme on the environment, which was the subject of the resolution of 19 October 1987 (4) of the Council and the Representatives of the Governments of the Member States meeting in the Council, underlines the need to pursue Community action on the handling and storage of radioactive waste;

Whereas, by its resolution of 18 February 1980 (5) on the implementation of a Community plan of action (1980 to 1992) in the field of radioactive waste, the Council resolved to ensure the continuity of the R&D programmes in this sphere during the plan;

Whereas the Council, by adopting the Framework Programme of Community research and technological development (1987-1991) (6), acknowledges the interest of an activity "Fission : Nuclear Safety" which includes an R&TD area "radioactive waste management";

Whereas the programme on the management and storage of radioactive waste adopted by Decision 85/199 Euratom (7) has yielded positive results and opened up encouraging prospects which it is advisable to complete and confirm by the implementation of research, development and demonstration actions representing the real waste management and storage conditions which can be expected in the future;

- (1) OJ No C...
- (2) OJ No C...
- (3) OJ No C...
- (4) OJ No C 328, 7.12.1987
- (5) OJ No C 51, 29.2.1980, p.1
- (6) OJ No L 302, 24.10.1987, p.1.
- (7) OJ No L 83, 25.3.1985, p.20

HAS ADOPTED THIS DECISION

Article 1

A research and technological development programme for the European Atomic Energy Community in the field of management and storage of radioactive waste as defined in the Annex, is hereby adopted for a period of five years, from 1 January 1990.

Article 2

The funds estimated necessary for the execution of the programme amount to 79.6 Million ECU (=MECU) including expenditure on a staff of fourteen.

Article 3

Detailed rules for the implementation of the programme and the rate of the Community's financial participation are set out in the Annex.

Article 4

1. During the third year of implementation, the Commission shall review the programme and send a report on the results of its review to the Council, the European Parliament and the Economic and Social Committee. This report shall be accompanied where necessary by proposals for the amendment or extension of the programme.
2. At the end of the programme, an evaluation of the results achieved shall be conducted by the Commission which shall report thereon to the Council, the European Parliament and the Economic and Social Committee.
3. The above mentioned reports shall be established having regard to the objectives set out in the Annex to this decision and in accordance with the provisions of Art.2, par. 2 of the framework programme set out in the decision 87/516/Euratom, EEC.

Article 5

For the implementation of the programme, the Commission shall be assisted by the Management and Coordination Advisory Committee CGC6 "Nuclear fission energy - Fuel cycle/processing and storage of waste" set up by Council Decision 84/338/Euratom/ECSC/EEC(1).

Article 6

This decision is addressed to the Member States.

Done at.....,....

For the Council,
The President

ANNEX

to the proposal for a Council Decision

1. Programme contents and allocation of funding

The programme is aimed at perfecting and demonstrating a system for managing the radioactive waste produced by the nuclear industry ensuring, at the various stages, the best possible protection of man and environment.

The programme will cover :

Part A : Waste management and associated R&D actions

- Task 1 - System studies and harmonization of waste management practices and policies
- Task 2 - Treatment of radioactive waste
- Task 3 - Characterization and qualification of waste forms, packages and their environment
- Task 4 - Radioactive waste disposal; research in support of the development of underground repositories
- Task 5 - Safety assessment

Part B : Construction and/or operation of underground facilities open to Community joint activities

- Project 1 - Pilot underground facility in the Asse salt mine in FR Germany
- Project 2 - Pilot underground facility in the argillaceous layer under the Mol nuclear site in Belgium
- Project 3 - Underground validation facility in France
- Project 4 - Underground validation facility in the United Kingdom

In addition to the above projects, others could be added in the course of the programme.

From the total budget about 70 % is intended to be allocated to part A and the remaining 30 % to part B.

2. Implementation of the programme

The implementation of the programme shall be done mainly through shared-cost contracts with competent public organisations or private firms, including small and medium enterprises, within the Member States.

In addition to shared-cost research contracts, the programme may also be carried out by means of study contracts, co-ordination projects and awards of training and mobility grants. Such contracts and grants shall, where appropriate, be awarded following a selection procedure based on calls for proposals published in the Official Journal of the European Communities.

The Community's contribution will not normally exceed 50% of the total allowable costs of the project. Alternatively, in respect of universities and similar organisations, the Community may bear up to 100% of the marginal costs which are additional to the normal recurrent costs without the execution of the project.

Specific coordinated research projects already launched in the previous programme will be continued in order to promote and intensify cooperation between teams in the various Member States. In particular international cooperation within the projects in Part B (underground facilities) will be promoted.

The information resulting from the implementation of the shared-cost activities shall be made accessible on an equal basis to all Member States. Licences and/or other rights developed in the framework of the programme will be subject to the normal contractual conditions of the Community.

3. Evaluation criteria

The programme is to be evaluated by independent experts in accordance with the Community plan of action relating to the evaluation of Community research and development activities (1). The following criteria are to be considered in the evaluation :

- the extent to which research proposals were selected against relevant criteria;
- the extent to which substantial development of knowledge, techniques and equipment has resulted from the work supported, taking into account the original objectives;
- the potential relevance of the results with regard to safety and protection aspects and in particular with regard to radioactive waste disposal;
- the potential relevance of the results with regard to radioactive waste management and disposal at industrial scale;
- the extent to which information exchange and co-operation across the borders of Member States have been promoted;
- The programmes' contribution to the development of Community policies in the field.

(1) COM (86) 660 final

Commission of the European Communities

COM(89) 226 final

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