COUNCIL DECISION

of 15 December 1994

adopting a specific programme of research and training in the field of nuclear fission safety (reactor safety, waste management and radiation protection) (1994 to 1998)

(94/920/Euratom)

THE COUNCIL OF THE EUROPEAN UNION,

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 [1], which has consulted the Scientific and Technical Committee,

Having regard to the opinion of the European Parliament [2],

Having regard to the opinion of the Economic and Social Committee [3],

Whereas, by Decision 94/268/Euratom [4], the Council adopted a framework programme of Community activities in the field of research and training for the European Atomic Energy Community (1994 to 1998) specifying *inter alia* the activities to be carried out in the field of nuclear fission safety; whereas this Decision takes account of the grounds set out in the preamble to that Decision;

Whereas Article 2 of Decision 94/268/Euratom specifies that the framework programme is to be implemented through specific programmes adopted in accordance with Article 7 of the Treaty; whereas each specific programme is to specify its precise objectives in accordance with the scientific and technical objectives referred to in Annex III to the Decision, define the detailed rules for implementing it, fix its duration and provide for the means deemed necessary;

Whereas the amount deemed necessary for carrying out this programme is ECU 160 million; whereas the appropriations for each financial year shall be laid down by the budgetary authority subject to the availability of resources within the financial perspectives and to the conditions set out in Article 1 (3) of Decision 94/268/Euratom;

Whereas the content of the framework programme of Community activities in the field of research and training was established in accordance with the principle of subsidiarity; whereas this specific programme specifies the content of the activities to be carried out in accordance with this principle in the field of nuclear fission safety;

Whereas, as is laid down in Annex III to Decision 94/268/Euratom, the Community needs a 'Nuclear fission safety' programme with the objective of arriving at a better understanding of nuclear safety issues and of stimulating broad collaboration between the Member States in this field;

Whereas Decision 94/268/Euratom (framework programme 1994 to 1998) lays down that Community action is justified if, *inter alia*, the research contributes to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development while being consistent with the pursuit of scientific and technical quality; whereas this programme is intended to help meet these objectives;

Whereas the abovementioned Decision 94/268/Euratom provides that the Community's research actions should strengthen the technological base of Community industry and provide it with the knowledge and know-how required to make it more competitive at international level, while ensuring the safety of all nuclear activities;

Whereas the Community should only support RTD activities of high quality;

Whereas basic research in the field of nuclear fission safety must be encouraged within the Community so as to enable innovative approaches to be developed;

Whereas the rules for the participation of undertakings, research centres (including the JRC) and universities, specified in Decision 94/761/Euratom [5], apply to this specific programme;

Whereas this programme will help to strengthen synergy between the research and training activities carried out in the field of nuclear fission safety by research centres, universities and undertakings established in the Member States and between these and the corresponding Community research and training activities;

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(1) OJ No C 113, 23. 4. 1994, p. 4.
(2) OJ No C 344, 5. 12. 1994.
(3) Opinion delivered on 14 September 1994 (not yet published in the Official Journal).
(4) OJ No L 115, 6. 5. 1994, p. 31.
(5) OJ No L 306, 30. 11. 1994, p. 1.

Whereas it may be appropriate to engage in international cooperation activities with international organizations and third countries for the purpose of implementing this programme;

Whereas this programme should compromise also activities for the dissemination and exploitation of research results, in particular *vis-à-vis* small and medium-sized enterprises, as well as activities promoting the mobility and training of researchers within this programme to the extent necessary for the proper implementation of the programme;

Whereas an analysis should be made of possible socio-economic consequences and technological risks associated with the programme;

Whereas progress with this programme should be continuously and systematically monitored with a view to adapting it, where appropriate, to scientific and technological developments in this area; whereas in due course there should be an independent evaluation of progress with the programme so as to provide all the background information needed in order to determine the objectives of the next framework programme of research and training for the European Atomic Energy Community; whereas at the end of this programme there should be a final evaluation of the results obtained compared with the objectives set out in this Decision; and whereas the conclusions of these evaluations should be submitted to the European Parliament, the Council and the Economic and Social Committee;

Whereas the JRC may participate in indirect actions covered by this programme;

Whereas the JRC will also contribute, through its own programme, to the attainment of the Community research and training objectives in the areas covered by this programme,

HAS ADOPTED THIS DECISION:

Article 1

A specific programme of research and training for the European Atomic Energy Community in the field of nuclear fission safety, as set out in Annex I, is hereby adopted for the period from the date of adoption of this Decision to 31 December 1998.

Article 2

1. The amount deemed necessary for carrying out the programme is ECU 160 million, including a maximum of 12,5 % for staff and administrative expenditure.

2. An indicative breakdown of this amount is given in Annex II.

3. The budgetary authority shall lay down the appropriations for each financial year, subject to the availability of resources within the financial perspectives and in accordance with the conditions set out in Article 1 (3) of Decision 94/268/Euratom concerning the framework programme, taking into account the principles of sound management referred to in Article 2 of the Financial Regulation applicable to the general budget of the European Communities.

Article 3

1. The general rules for the Community's financial contribution are laid down in Annex IV to Decision 94/268/Euratom concerning the framework programme.

2. The rules for the participation of undertakings, research centres and universities are specified in Decision 94/761/Euratom.

3. Annex III sets out the specific rules for implementing this programme, supplementary to those referred to in paragraphs 1 and 2.

Article 4

1. In order to help ensure, *inter alia*, the cost-effective implementation of this programme, the Commission shall continually and systematically monitor, with appropriate assistance from independent, external experts, the progress within the programme in relation to the objectives set out in Annex I. It shall in particular examine whether the objectives, priorities and financial resources are still appropriate to the changing situation. It shall, if necessary, in the light of the results of this monitoring process, submit proposals to adapt or supplement this programme.

2. In order to contribute towards the evaluation of Community activities, as required by Article 4 (2) of Decision 94/268/Euratom concerning the framework programme and in compliance with the timetable laid down in that paragraph, the Commission shall have an external assessment conducted by independent experts of the activities carried out within the areas covered by this programme and their management during the five years preceding this assessment.

3. At the end of this programme, the Commission shall have an independent final evaluation carried out of the results achieved compared with the objectives set out in Annex III to the framework programme and Annex I to this Decision. The final evaluation report shall be forwarded to the European Parliament, the Council and the Economic and Social Committee.

Article 5

1. The Commission shall be responsible for the implementation of the programme. In this context, it will ensure arrangements for coordination with other RTD activities carried out in this field, in particular under the JRC programme.

2. The Commission shall be assisted in the implementation of the programme by a consultative Committee for the Nuclear Fission Safety programme, which is established hereby in replacement of the existing Coordinating Committees (CGCs) (No 5 on Safety of Reactor and Fission Material; No 6 on Radioactive Waste Management and Disposal; and No 10 on Radiation Protection Research) set up by Decision 84/338/Euratom, ECSC, EEC [1]. The procedures and operational modalities defined in that Council Decision apply to the new Committee.

Article 6

Participation in the areas of radiological impact on man and the environment and of mastering events of the past may be open on a project-by-project basis, without financial support from the Community, to legal entities established in third countries, where such participation contributes effectively to the implementation of the programme taking into account the principle of mutual benefit.

Article 7

This Decision is addressed to the Member States.

Done at Brussels, 15 December 1994.

For the Council

The President

A. MERKEL

[1] OJ No L 177, 4. 7. 1984, p. 25.

ANNEX I

SCIENTIFIC AND TECHNOLOGICAL OBJECTIVES AND CONTENT

The present specific programme fully reflects the orientations of the framework programme for the European Atomic Energy Community, in applying the selection criteria and in specifying its scientific and technological objectives.

Section 1 of Annex III of the framework programme is an integral part of the present specific programme.

1. THE CONTEXT

Although nuclear energy has reached considerable maturity in the Community and elsewhere in the western world — the safety record of its nuclear plants is excellent — it is not universally accepted by our society. The Community action therefore aims at stimulating collaboration with the objective to improve knowledge in specific areas and to develop a new global and dynamic approach to nuclear safety in the broadest sense. The joint setting of priorities should bring all interested parties closer in a better understanding that nuclear energy, like other mature technologies, can benefit from further development. The potential of some new developments to improve nuclear safety is to be assessed taking into consideration their effect on public perception. Of course, it must be understood that new technology will not necessarily be applied simply because it exists, just as we cannot afford to make a definite judgement about its use by future generations on the basis of today's knowledge.

In that sense, a global dynamic approach means that there must be an improvement of the understanding and quantification of the overall risk associated with the use of nuclear energy: considering the whole cycle, considering all exposure to ionizing radiation, not only from nuclear but also from medical and other applications as well as from natural radioactivity; considering normal and accidental conditions; considering the usefulness of mastering events of the past associated with its use elsewhere — e.g. the New Independent States (NIS); and considering the possibility of technological evolution just as in other high-technology areas.

To support that approach, the various activities are set out and managed accordingly in one single programme. Consequently, they are deliberately not grouped as a set of individual actions (as in the previous framework programme), although they are assembled according to the main emphasis of the respective activity as related to the use of nuclear energy in the global sense. The technical maturity reached in some areas of the nuclear cycle implies a reorientation of priorities, concentrating on aspects dealing with exposure of man and environmental impacts. A number of concerted actions will be launched to safeguard adequate exchange of information and data collection.

Close interaction with national and international organizations competent in the fields of nuclear fission safety will enable the Community to contribute worldwide to an improvement of nuclear safety, including protection of man and his environment against the effects of ionizing irradiation. It will enhance the integration of national efforts to further improve the performance of the European nuclear industry and will give essential input to the relevant regulatory responsibilities of the Community and the Member States.

Cooperation in research on nuclear fission safety has been well established with third countries such as the United States of America, Canada, Japan and with some EFTA countries. Together with the collaboration with central and eastern European countries (PECO), including the New Independent States which is of particular importance, this may lead to the further convergence of national activities in this field. Synergy with other Community instruments (e.g. Phare, Tacis) should be sought.

Close interaction has also been achieved and will continue with the International Atomic Energy Agency (IAEA), the Nuclear Energy Agency of the Organization for Economic Cooperation and Development (OECD/NEA) and the World Health Organization (WHO), as well as with non-governmental international organizations involved in standardization and recommendations, such as the International Commission on Radiological Protection (ICRP), the International Commission on Radiation Units and Measurements (ICRU) and the International Standards Organization (ISO). This international cooperation is the main instrument for achieving worldwide consensus on the fundamental issues of nuclear fission safety.

Opportunities for training and mobility of scientific and technical staff will be assured by activities such as the 'European Radiation Protection Education and Training' scheme (Erpet) and the Eurocourses organized together with JRC Ispra.

As indicated in the different activities proposed, the JRC is closely associated with them (1).

2. PROPOSED ACTIVITIES

A. Exploring innovative approaches

The proposed activities will illustrate a new approach which aims at exploring ways to improve the acceptance of nuclear energy through an integrated initiative addressing the three main issues of common concern:

— reactor safety, especially with regard to severe accidents,

— the management of long-lived radionuclides (including plutonium),

— the risk of fissile material diversion.

These activities will be carried out in close cooperation with authorities, industry and the scientific community.

It is proposed to pursue two main lines of approach: in continuity with R&D work performed hitherto, on the one hand, innovative approaches will be reviewed as to their potential to enhance the safety of reactors and of their fuel cycle and, on the other hand, the potential of alternative waste management options will be explored.

A.1. *Conceptual safety features*

Besides a continuous improvement of the safety of reactors which takes account of the experience from operating plants and new results from research, industry is offering reactors with improved safety, e.g. by an increased use of passive features. Prospective theoretical and some experimental investigations are foreseen to assess these designs with regard to their benefit to overall safety. These investigations will be of generic nature and the results should provide supporting data for the licensing of these reactors.

Approaches to reduce the amount of long-lived radioactivity in spent fuel by changing the composition of the fissile material could be included in an overall analysis of the fuel cycle which could also cover the aspect of safeguards.

The investigation of advanced fuel cycle strategies will require some experimental research which will be performed in concertation with the JRC.

A.2. *Partitioning and transmutation*

Methods other than plutonium (Pu)-burning, aiming at reducing the long-lived (half-life › 30 years) nuclide inventory of nuclear waste, including minor actinides should be investigated although the final disposal of nuclear waste in deep repositories cannot currently be avoided. As numerous partitioning and transmutation (P&T) studies are being conducted worldwide, this part of the programme should mainly concentrate on providing a synthetic evaluation of the research and developments going on.

Some work in this area will be pursued in concertation with the JRC.

(1) A description of the activities envisaged for the JRC in these areas is contained in the proposal for a decision of the Council relating to the activities of the JRC (COM(94) 70 final, 30 March 1994, 90/0074 (CNS)). An extract from this proposal is attached to this Decision.

B. **Reactor safety**

Although accident prevention is essential in nuclear use, it is nevertheless of vital importance to improve the understanding of severe accidents in order to prevent possible radioactivity release under these extreme conditions. Thus, severe accident phenomena and mechanisms will be the main items of research.

Furthermore, different measures to mitigate the consequences of a severe accident will be studied.

Besides the activities in a severe accident, attention should be given to other matters of great importance to maintaining and improving the safe operation of existing installations while advancing knowledge applicable to future reactors.

B.1. *Severe accidents*

Investigations of the various phenomena involved e.g. core degradation and the release and behaviour of fission products will be carried out. These results of the experimental Phebus Fission Product project, previously organized jointly by CEA-Cadarache and JRC Ispra, will provide essential data in this respect. Molten fuel-coolant interaction and molten core-concrete interaction as well as hydrogen generation and combustion are the main concerns with regard to the primary system and containment integrity.

The Commission should promote the coordination of the activities performed by the Member States and by the JRC under its institutional activities, taking into account the existence of the large facilities, with the aim of producing the data needed by the designers and the licensing authorities.

Besides the study of accident progression mechanisms, major attention will be devoted to the integrity of the containment system and the material characterization of the various safety-relevant components under severe accident conditions in order to evaluate the safety margins.

The proposed activities include theoretical and experimental investigations, code developments and validation as well as benchmark exercises. The joint use of large test facilities is foreseen.

B.2. *Supplementary safety related activities*

Taking into account research work undertaken in the Member States and/or under other specific research programmes, some activities may be conducted in relation to human factors, probabilistic safety assessment, ageing and, if necessary in the light of significant and rapid changes occurring in this field, in relation to control and instrumentation.

C. **Radioactive waste management and disposal and decommissioning**

One of the main objectives of this activity is to contribute to a further integration of the efforts undertaken by the Community and the Member States to develop the technical basis for a common understanding of the scientific issues of the disposal of long-lived radioactive waste, specifically spent fuel and vitrified High Level Waste (HLW). The strategic issues involved are the time horizon to be considered for the analysis of disposal concepts and the possibility of retrievability of waste.

In this respect the Commission should promote research initiatives by which countries with large nuclear programmes could assist other countries in exploring possibilities for the disposal of long-lived wastes on a smaller scale, e.g. from research reactors, medical or industrial establishments. The need to establish the scientific basis for guidelines, e.g. on 'Waste equivalence' and on 'exemption levels, is recognized.

C.1. *Safety aspects of geological disposal*

Disposal in deep geological strata is at present the only known method of long-term isolation of radioactive substances from the biosphere. The Community's analysis of the long-term safety of disposing of HLW, the Pagis (Performance Assessment of Geological Isolation Systems) study, concluded that — assuming predictable natural evolution — such deep geological disposal can assure adequate protection even tens of thousands of years after the emplacement of the waste if appropriate sites are selected. In these circumstances and in view of the repository-siting concepts hitherto adopted, attention must be given to the development of siting methodologies and criteria for the evaluation of the suitability of potential sites. There are basic questions, however, on which a European consensus could be sought through appropriate research, e.g., the long-term time horizon up to which the safety analysis of disposal concepts has to be elaborated, the possibility of retrieval of the disposed material and the accidental intrusion. It is considered that the possibility of retrieval and the accidental intrusion are not issues of the same level of concern as an agreed long-term time horizon.

The Community's Plan of Action in the Field of Radioactive Waste [1] should play an important role in stimulating the participation of the Member States in the relevant investigations and exploring the possibility of developing a common approach on these questions.

C.2. *Underground laboratories for waste disposal*

Underground laboratories are a necessary prerequisite for meaningful research on crucial phenomena related to geological disposal. As in the previous programmes tests and investigations on geological disposal in the underground laboratories in Asse (Germany) and Mol (Belgium) should be continued. The efforts should be focused on the best utilization of the existing underground laboratories in Europe. Possible new laboratories could also become part of the Community programme. These facilities should offer important opportunities for participation from all EC countries for performing research projects under representative conditions. The projects shall provide qualitative and quantitative elements for characterizing possible disposal sites, for designing optimized repository concepts and for evaluating the long-term protective performance of disposal strategies.

Research on geological and engineered barriers, development of special mining and waste emplacement techniques and radiological investigations should be carried out in the underground laboratories and in associated research facilities, thus contributing also to demonstrate the feasibility and safety of underground repositories.

C.3. *Supporting research*

The assessments of waste disposal schemes will require further analysis and modelling of the performance of natural and engineered barriers, transfer of radioactivity from the waste packages in the repository through the geosphere into the biosphere as well as the verification and validation of long-term predictive assessment models of the geological environment of repositories. Useful information on the evolution of disposal systems is also gained from natural analogue and geoprospective studies.

Development of effectively controlled advanced waste volume minimization is envisaged with a view to introducing safe and effective standard practices.

Another object of R&D is the provision of scientific data to support EC policies in the field of nuclear safety standards, and of reliable methods to implement such policies.

Actions to enhance the safety culture of nuclear energy and confidence in safety should include the technical application of radiological optimization principles and the further development of quality assurance methodology in conjunction with the EC 'Network of testing facilities'.

[1] OJ No C 158, 25. 6. 1992, p. 4.

Results from the previous telemanipulation programme should be gathered and evaluated to enable interested parties in the Union to benefit from the accumulated experience and conclusions of that programme.

C.4. *Decommissioning*

The dismantling of nuclear installations is part of closing the nuclear cycle. It particularly concerns the solution to issues of environmentally compatible disposal of radioactive wastes, of the minimization of radiological impact and the reduction of costs.

Activities in this area comprise:

— the support of relevant decommissioning projects, in particular with a view to testing of decommissioning strategies as well as to the systematic collection and processing of data,

— the establishment of databases on experience with specific techniques, the arising of radioactive waste, the occupational exposure and the associated costs.

D. **Radiological impact on man and the environment**

The Euratom Treaty defines the Community responsibility for 'establishing uniform safety standards to protect the health of workers and the general public and ensure that they are applied' and for 'studying the harmful effects of radiation on living organisms'. Although the present radiation protection standards and the underlying scientific information are of high quality, it remains imperative to reduce the remaining uncertainties in the quantification of radiation risks arising from the use of ionizing radiation in energy production, industry and medicine, as well as from exposure to natural radiation, that is to low radiation doses. This concerns all phases of the nuclear cycle where (potential) exposure situations may exist and also considers the consequences of nuclear accidents, the limitation of the extent of possible health effects, the mitigation of environmental consequences and the development of methods for the management of nuclear emergencies. The range of issues concerned and the many underlying scientific disciplines require a truly interdisciplinary approach to radiation protection research and the intensive involvement of university based research.

The priorities set forward here are closely linked with the validation work proposed in the area of mastering events of the past, which mainly deals with the health and environmental consequences of the Chernobyl and other radiation accidents and of past uncontrolled releases of radioactive materials.

D.1. *Understanding the mechanisms of radiation action*

The mechanisms of radiation action need to be known in order to be able to extrapolate the radiation effects determined experimentally to predict, with confidence, the effects at low doses. Continuation of the studies of radiation induced hereditary effects and effects after *in-utero* irradiations will contribute to a deeper understanding of the mechanisms at the cell level. This understanding will be gained by mobilizing the most up-to-date techniques from molecular and cellular biology, by studying mutation and chromosomal aberration formation and the role of DNA repair and by combining this work with recent developments in radiation energy deposition modelling to elucidate a comprehensive biophysical model of cellular radiation action. The extension of this understanding to the radiation induced cancer process will take advantage of new knowledge of oncogenesis, in general, coupled with continuing studies of the early molecular and cellular events in radiation induced cancer. The development of models of the radiation induced cancer process founded on sound biological principles will further contribute to more accurate assessments of radiation risk.

D.2. *Evaluation of radiation risks*

Risk evaluation depends on reliable assessment of the level of exposure, which in turn depends on an accurate determination of internal and external doses. This necessitates research on environmental pathways of radioactive substances to man and on the age dependent metabolism and biokinetics of incorporated radionuclides. Targeted research will include work to develop more sensitive and delicate instrumentation for measurement of external and internal irradiation

and the further extension and application of risk assessment models for the health and environmental impact of discharges of radioactive materials to the environment and of nuclear accidents. Risk estimates converting radiation dose to the probability of induction of health effects will be derived from epidemiological studies of exposed populations, using the knowledge on radiobiological mechanisms and a dosimetric approach.

D.3. *Reduction of exposure levels*

Criteria, methods and strategies for reducing exposure to ionizing radiation from all sources (natural, medical and industrial) have to be developed further with a view to reducing or preventing the induction of health effects. These include aspects of exposure monitoring, techniques for environmental restoration including site restoration, treatment of health consequences including acute radiation damage, risk management for normal and emergency situations and the implementation of the Alara philosophy (as low as reasonably achievable). The approach is based on justification of the practical benefits, their optimization taking account of economic and social factors and the limitation of any individual risks which might occur as a result of the adoption of such measures. These principles will be applied to problems of practical relevance, such as the development of criteria for the recycling of material from decommissioned nuclear facilities; occupational exposure arising from waste management, decommissioning and environmental mitigation, including radon mitigation strategies; and optimization strategies and techniques in medical radiological diagnostic procedures.

E. **Mastering events of the past**

The situation in eastern and central Europe and in the New Independent States (NIS) presents liabilities in nuclear safety, which the international community must share not only for altruistic reasons. In addition to humanitarian considerations, the European Union has an interest in the establishment of safe conditions in neighbouring countries. The accident of Chernobyl was a reminder that radioactive material released in an accident is no respecter of international borders.

The consequences of the Chernobyl accident, of other radiation accidents and of uncontrolled releases of radioactive materials in the NIS have led to environmental contamination and health hazards which represent unique opportunities for initiating collaborative projects, including scientific and technical research schemes as well as training schemes.

The objective of this part of the specific programme is to establish an operational platform to work out long-term mitigation strategies, to monitor the continuously changing circumstances and to initiate targeted research projects and to provide catalytic links and appropriate coordination between the R&D programme and the technical assistance programmes.

E.1. *Consequences of Chernobyl and other radiation accidents*

Environmental research in the more heavily contaminated terrestrial and aquatic areas will include the analysis of exposure pathways and the evaluation and validation of existing radioecological databases. A special aim of the work will be to use the results from the radioecological studies for predictive assessments and to develop improved emergency management systems not only to provide guidance on the mitigation of the consequences of the accident but to provide an effective framework for response to future accidents. They will deal especially with the environmental consequences and applicability of countermeasures in highly contaminated zones, the development of intervention criteria, waste management procedures and environmental restoration.

Health effects studies will concentrate on the development of methods of biological and retrospective dosimetry in close cooperation with epidemiological studies of cancer induction in the more exposed groups of the population. A study of the treatment strategies used for the over-exposed accident victims aims at deriving improved treatment protocols using newly developing methodologies. The occurrence of increased rates of childhood thyroid cancer reported in Belarus and the Ukraine demands systematic research to provide important information on radiation-induced thyroid cancer and an estimate of the extent of this health problem in the future. At the same time the treatment of the thyroid cancer patients will be optimized by the development of therapy protocols.

E.2. *Cooperative networks*

In the field of radiation protection, a collaboration with institutes of Belarus, the Russian Federation and the Ukraine was initiated in late 1991 which involves some 100 EC institutions and 100 CIS institutions and has led to the establishment of a central laboratory in the Ukraine. The establishment of such a network will reinforce the collaborative research programme between the European Union and the CIS in the whole area of nuclear fission safety. In addition it can be used as a platform for coordination of the many international and bilateral initiatives in these areas.

In the area of waste management and site restoration, similar networks with the central and eastern European countries will assist these countries in developing safe solutions for their particular problems. In addition, networks of information exchange would be useful to learn from the Russian experience of waste management. Cooperation in the field of reactor safety will address some problems typical of existing Russian reactor designs as well as research in areas of interest for future plants. The progressive inclusion of these Eastern countries in Community nuclear safety programmes is to be seen as an efficient way to develop a wide ranging safety culture.

ANNEX II

INDICATIVE BREAKDOWN OF THE AMOUNT DEEMED NECESSARY

(ECU million)

Area A:	Exploring innovative approaches	7
Area B:	Reactor safety	48
Area C:	Radioactive waste management and disposal and decommissioning	43 (1)
Area D:	Radiological impact on man and the environment	50
Area E:	Mastering events of the past	12
	Total	160 (2) (3)

(1) Of which up to ECU 4 million for decommissioning-related R&D activities.

(2) Of which:
- a maximum of 8,5 % for staff expenditure and 4,0 % for administrative expenditure,
- 1,25 % for the dissemination and optimization of results,
- at least 30 % for basic research,
- approximately 2 % for training.

(3) An amount of ECU 254 million, the difference between the amount deemed necessary for this programme and the amount foreseen in the framework programme for research and training activities in the nuclear field (1994 to 1998) for 'Nuclear Fission Safety', is earmarked for the specific research and technological development programme to be implemented by the Joint Research Centre for the European Atomic Energy Community (1995 to 1998).

The breakdown between different areas does not exclude the possibility that projects could cover several areas.

ANNEX III

SPECIFIC RULES FOR IMPLEMENTING THE PROGRAMME

This programme will be carried out through indirect action, whereby the Community makes a financial contribution to research and training activities carried out by third parties or by the JRC in association with third parties:

(a) Shared-cost actions:

— Research and training projects carried out by undertakings, research centres and universities; creation of large integrated projects with a common objective will be stimulated.

— Support for financing the infrastructure or installations necessary for coordinated action (reinforced coordinated activity).

Community funding will normally not exceed 50 % of the cost of the project, with progressively lower participation the nearer the project is to the market place. Those universities and other institutions which do not have analytical budget accountancy will be reimbursed on the basis of 100 % of the additional costs.

(b) Preparatory, accompanying and support measures, such as:

— studies in support of this programme and in preparation for future activities,

— support for exchanges of information, conferences, seminars, workshops or other scientific or technical meetings, including meetings on intersectoral or multidisciplinary coordination,

— use of external expertise, including access to scientific databases,

— scientific publications and activities for the dissemination, promotion and exploitation of results, in coordination with the activities conducted under the third action of the fourth framework programme of the European Community activities in the field of RTD,

— analysis of the socio-economic consequences and technological risks associated with the programme,

— training actions related to research covered by this programme and which may facilitate technology transfer,

— independent evaluation of the programme and of the implementation of the activities.

Community funding may cover up to 100 % of the costs of these measures.

(c) Concerted actions, consisting in coordinating, particularly with the aid of concertation networks, research and training projects already being financed by public authorities or private bodies. A concerted action may also provide the coordination necessary for the operation of thematic networks which, through shared-cost actions, bring together manufacturers, users, universities and research centres around a single technological or industrial objective.

The Community participation may cover up to 100 % of the costs of the concertation.

Extract from the proposal for a Council Decision for the JRC programme (COM(94) 70 FINAL (CNS)) concerning the activities envisaged for the Joint Research Centre (JRC) in the areas covered by the specific programme of research and training in the field of nuclear fission safety

The objective is to increase scientific and technical knowledge and to contribute to the development of technologies aimed at improving the safety of the whole of the nuclear cycle and reducing the environmental impact of the use of nuclear energy, and to respond to the need to assume the responsibilities of the Community arising from implementation of the Treaty.

The JRC contribution will be in the following fields:

— reactor safety,

— fuel cycle safety,

— safeguards and fissile materials management.

Reactor safety

JRC research will be focused mainly on the following areas

— a contribution to accident prevention: the development of non-destructive analytical techniques (NDA) for the improvement and refinement of inspection procedures and the development of qualification methodologies to facilitate their harmonization,

— probabilistic safety studies: the JRC will contribute to the improvement of methodologies and to the emergence of a consensus on their implementation in safety studies,

— studies conducted through European networks into the mechanisms of component ageing, a method of attenuation, evaluation of the integrity of structures and inspection possibilities,

— studies of serious accidents: these studies will be conducted, on the one hand, through studies of the internal and external phenomena in the containment in experiments with degradation of the reactor core using real materials and operating at a real temperature; these operations will be carried out on a small and a large scale at the JRC and, on the other hand, through a contribution to the study of the release of fission products and the transfer of phenomena by participation in the releases conducted in other laboratories, in particular the CEA (study of the source-term) and by carrying out aerosol resuspension tests at the JRC. They will be carried out in conjunction with the activities in this field foreseen under indirect actions.

This research will continue to be the subject of a major cooperation effort within the framework of networks involving European and non-European partners. It is aimed in particular at the development of common design tools intended for industry and the authorities responsible for safeguards.

It will make extensive use of the JRC's ability to set up cooperation networks between the European partners concerned and thus to participate in the implementation of the Community policy provided for in the Treaty.

Fuel cycle safety

The main objective of the studies conducted by the JRC is to reduce the environmental impact of using nuclear energy by means of research into the fuel cycle permitting optimized management of the end of the cycle. They will be conducted in close cooperation with the activities in this field foreseen under indirect actions.

This research will be aimed at improving the understanding of actinides and the plutonium cycle and drawing up the best possible waste management strategy, in particular by minimizing the production of high-level waste. It will take account of changes in reactor design.

It will also be aimed at supporting the Member States' current strategy of deep burial of radioactive waste and exploring management strategies which would make it possible to reduce the amount of waste produced by future fuel cycle installations. This research will be conducted in close cooperation with national laboratories.

The subjects covered will include:

— studies of the safety of the behaviour of nuclear fuels (UO_2 and mixed oxide),

— study of fundamental and solid-state physico-chemical analysis of actinides,

— study of nuclear aerosols,

— minimization of secondary actinides and other radionuclides with long half-lives in the nuclear fuel cycle,

— plutonium fuel technology,

— characterization of spent fuel with a view to its elimination,

— radionuclides for medical applications.

Safeguards and fissile materials management

The research conducted at the JRC is aimed at obtaining, in good time, results of new techniques implementation of which is necessary for compliance with obligations arising from safeguards provided for in the Treaty and the Non-Proliferation Treaty.

It is necessary in particular to develop new techniques to meet the new challenges related to the development of the fuel cycle and the strengthening of the control systems.

These activities are aimed at the development and improvement of techniques, including:

— non-destructive test techniques using gamma and neutron radiation for the analysis of waste, production waste and irradiated fuel,

— measurements relating to volume and weight in large tanks in fuel production and reprocessing plants;

— sealing techniques and new marking systems for objects containing nuclear materials and for containers,

— surveillance systems using the storage and procession of digital images for automatic surveillance and examination and for improvement of recordings in the long-term without inspectors.

A particular effort will be devoted to research on the design of multisensoral integrated systems able to function in the absence of inspectors by using mobile robotic technology. These systems will use intelligent software for the production of data and the compatibility of materials.

These activities will be conducted in particular using the experimental installation Perla ('Performance and training laboratory'), Tame ('Tank measurement') and Lasco ('Surveillance and containment') of the JRC which offer experimental conditions which are representative of reality in an installation.

Lastly, the JRC research in the field of safeguards also forms part of a process of European cooperation as illustrated by the Esarda network ('European Safeguards Research and Development Association') and international cooperation with the United States of America, Canada, Japan and Russia.