

COMMISSION OF THE EUROPEAN COMMUNITIES

COM(79) 87 final

Brussels, 8th March 1979

PROPOSAL FOR A COUNCIL DECISION FOR A
RESEARCH AND TRAINING PROGRAMME FOR THE
EUROPEAN ATOMIC ENERGY COMMUNITY ON THE
PLUTONIUM CYCLE AND ITS SAFETY

(submitted to the Council by the Commission)

1. Introduction

On 17 December 1974 the Council adopted a research and training programme on plutonium recycling in light-water reactors. This four-year (1975-79) programme (OJ N°349 of 28 December 1974, p.61) was extended for a year by the Council Decision of 10 October 1978 (OJ L 291/17 of 17 October 1978).

In order to ensure that this programme has the best possible chances of success, the Commission has been guided by the opinions of the Advisory Committee on Programme Management, set by the Council, and of many groups of experts. The programme has given rise to useful consultations and has enabled high-quality work to be carried out at minimum cost as a result of the frequent use of the Community invitation-to-tender system.

A number of information meetings for the contractors under the programme, intended to ensure effective dissemination of the results obtained, have been held, and will again be held in 1979, under Commission auspices.

In view of the very significant results obtained in the 1975-79 programme, the Commission feels that the knowledge already acquired at Community level should be increased by a more extensive programme concentrating on the safety of the plutonium fuel cycle and covering the period 1980-84.

2. Results obtained and anticipated from the 1975-79 programme *

Under this programme it has been possible to perform the following work:

a) In the context of general studies relating to the use of plutonium

- On the basis of a forward analysis of the use of plutonium in the Community (published in 1976 and updated in 1977) it has been possible to prepare a reference scenario in which some 15 tonnes of plutonium would be recycled annually in about 40 LWR power stations in the Community towards the end of the twentieth century.
- An analysis of the environmental impact of plutonium recycling was made in the context of an industrial development hypothesis in line with the reference scenario; this study covers each stage of the plutonium cycle: transport, fuel fabrication, plutonium-fuelled LWR power stations and reprocessing of plutonium fuels; it also included an assessment of the radiological impact on workers and the general public. It thus forms the first overall forward analysis on a Community scale of the environmental impact of the use of plutonium. The study was carried out under about fifteen contracts and the Commission departments are to prepare a summary review; the preliminary results show that in the relevant industrial development context the radiological impact on both workers and the general public remains within the limits set by current radiation protection standards. The study also made it possible to pinpoint research and development fields that will help to reduce still further the radiological impact of plutonium recycling.
- Various research projects have been launched with the aim of improving plutonium transport or storage conditions. The knowledge acquired in the course of this research should enable more reliable transport containers to be developed. The results of these projects will be reported or published in 1979.

* A detailed account of the results obtained is given in the annual progress reports for 1976 (EUR 5780), 1977 (EUR 6002) and 1978 (to be published).

b) In the context of the improvement of scientific and technical data on plutonium recycling in light water reactors

- Knowledge of the neutron physics of the higher isotopes of plutonium and transplutonium elements is being increased by means of:

An experimental programme to measure the cross sections of the isotopes selected following critical studies of specific requirements in LWR power stations. The results will be available in 1979;

A series of isotopic analyses of fuels irradiated in power stations, the results of which will be reported in 1979;

The basic experimental data that will be obtained are essential to the correct prediction of the plutonium balance in LWR power stations. However, this series will not provide a sufficient number of isotopic analyses of fuels irradiated to high burn-ups of the order of 300 000 MWD/t.

- A comparison of neutron computation codes geared to plutonium-fuelled LWR power stations has been carried out free of charge and on their own initiative by the main Community code holders. This was reported in a summary review in 1978. This Commission activity has established fruitful contacts between the main Community code holders.
- The studies on the control and safety of LWR power stations using plutonium fuels consist of:
 - . A theoretical part covering the control and safety of plutonium-fuelled power stations (static and dynamic aspects of the stations, fuel-handling and storage problems, major accident analysis).
 - . An experimental part intending to improve knowledge of the neutron physics of plutonium fuel assemblies (power distribution, reactivity coefficients).

This work started in 1977 and will be completed in 1979.

The results available to date indicate that on the whole there is a good knowledge and mastery of the specific problems involved in the control and safety of LWR power stations recycling the plutonium they produce (self-recycling).

- Plutonium fuel post-irradiation examinations have been conducted in two stages:

- An initial set of projects was launched in 1975 and 1976; these cover examinations of plutonium fuel assemblies irradiated in the power stations at Mol in Belgium (BR-3), Garigliano in Italy, Lingen in Germany and Dodewaard in the Netherlands and of fuel pins fabricated by the Vibrasol technique irradiated in the HFR at Petten in the Netherlands.

The results of this work will be available in 1979; they already indicate that plutonium fuels have a similar behaviour to uranium fuels.

- A second set of projects was launched in 1978 on fuels either irradiated to high burn-ups or representative of a more recent technology. These projects cover post-irradiation examinations of fuels irradiated in the Garigliano, BR-3, Dodewaard and Sena power stations.

The results of the second part will not be available before the end of 1979 or the beginning of 1980.

Summarizing, this programme:

- has encouraged the exchange of information and dissemination of results in the Community. This has come about either during the preparation of the studies and projects to be undertaken, carried out in close collaboration with ad hoc groups of experts, or during the evaluation of results at briefing meetings organized by the Commission for the contract holders, the ad hoc groups of experts and the members of the ACPM;
- has prevented duplication of effort by defining precise projects in close collaboration with the members of the ACPM or ad hoc groups of experts. Frequent use of the Community invitation-to-tender procedure has enabled the programme to be carried out at minimum cost while at the same time ensuring coordinated distribution of the work amongst Community laboratories;

- has effectively improved knowledge of the behaviour of plutonium fuels in LWR power stations and will provide the European Community with an assessment of the impact on the environment and on man of plutonium recycling in LWR power stations (likely industrial development situation at the end of this century). From those two aspects, the current programme has not identified any obstacles to industrial development in this field.

3. Objectives for an indirect action programme covering the years 1980-84: Safety of the plutonium fuel cycle

Reprocessing of fuels irradiated in power stations equipped with gas/graphite reactors (United Kingdom, France and Italy) has been in operation for some years; those fuels are and will be for several years the main source of plutonium.

The decision already taken in several Community Member States to reprocess irradiated fuels from LWR power stations (The Hague, plant in operation; Windscale (Thorp project); WAK, plant in operation; indicate that the quantities of plutonium thus recovered in the Community will be appreciable, of the order of 20 tonnes per year in 1990.

The radiological characteristics of the plutonium to be processed in the near future will be less favourable than at present, since the quantity of plutonium from metal fuels irradiated to low levels of burn-up in gas/graphite reactors will gradually fall in comparison to the plutonium from oxide fuels irradiated to high levels of burn-ups in light-water reactors.

The main objective of the programme is to ensure safety in the use of plutonium as a nuclear fuel so as to enable all those involved (parliamentarians, governments and industry) to determine their attitude to the use of plutonium fuels with a full knowledge of the facts.

The Commission for its part felt that this aim should be supported by a greater commitment to the use of plutonium, a subject already covered in document COM(77) 331 final "Points for a Community strategy on the reprocessing of irradiated nuclear fuels".

Apart from the main purpose fo the programme set out above, there are other specific aims:

- to conduct studies and research on alternative technologies which may offer a greater inherent safety than the conventional technologies,
- to help demonstrate that the fissile and fertile materials in UO_2 - PuO_2 fuels irradiated in LWR power stations can be recovered and recycled in power stations equipped with fast-breeder and thermal reactors;
- to complement the work carried out under the first programme on the behaviour of LWR power stations using mixed oxide fuels.

4. Outline of the 1980-84 programme

In order to achieve these objectives, the Commission proposes that the following programme, divided into five main projects chosen in consultation with the Advisory Committee on programme Management in accordance with the Council Resolution of 18 July 1977 (OJ c 192 of 11 August 1977), be carried out within a Community framework.

Project N°1 General Studies

These studies will provide a theoretical framework for assessing all the work carried out under the programme. They cover:

(a) Analyses of strategies for the use of plutonium in thermal and fast-breeder reactors

These studies will involve the periodic updating of the plutonium availability forecasts published in 1976 and 1977, examination of the various possible strategies in the Community for using the plutonium available (FBR and LWR power stations) and analysis of the difficulties involved.

(b) Assessments of the impact on the environment of plutonium recycling

The assessment of the environmental impact of plutonium recycling in LWR power stations carried out during the 1975-79 programme should be supplemented, especially in order to evaluate the progress achieved in improving the safety of the plutonium fuel cycle. These studies will include an examination of the ways and means of compiling within the Community comparable statistics on the health of workers in the plutonium industry and on the extent of the radiological pollution of the environment by that industry in general. (in collaboration with the research programme on radiation protection).

(c) Other general studies

Some other general studies could prove useful for effective management of the programme, for example, a summary or assessment of work done outside the Community programme, an analysis of which would be valuable as regards the general lines of the programme.

The Commission's financial contribution to the general studies is estimated at: 800 000 EUA.

Project N° 2. Research and development work relating to the safety
in the field of mixed-oxide fuel fabrication

This work should help solve the problems resulting from the increase in the production capacity of the fabrication units and the foreseeable evolution of the radiological characteristics of the plutonium to be processed, while ensuring that these operations have the highest level of safety.

These projects will include :

(a) Work of general relevance on :

The improvement of radiation protection for personnel and the environment in mixed-oxide fuel fabrication units; this will involve, among other things :

- development of fire-resistant filters and neutron shields;
- comparison of methods of evaluating accidents applied during the safety analyses of fuel fabrication plants and acquisition of reference data to back up these evaluations;
- improvement of neutron dosimetry and the monitoring of the atmosphere in fabrication plants ;
- development of systems to reduce glovebox contamination ;
- development of techniques for detecting residual fissile materials in order to forestall incidents and accidents and developemnt of automated techniques for measuring the fissile materials present in production lines in order to improve accounting and safeguards procedures.

(b) Work to assess the potential of alternative techniques

The value in developing these alternative techniques lies in their potential ability to reduce radioactive pollution (elimination from the fabrication process of any plutonium oxide powder stage - a particularly intricate stage) and the fact that they avoid separation of plutonium from uranium during fuel fabrication. This work will consist in :

- (i) assessment of the advantages and disadvantages of alternative techniques (based on sol-gel or other processes) in relation to existing techniques based on the powder-pelletization process. These studies will be continued throughout the programme in order to incorporate all the technological data obtained and will include a general comparative analysis of these techniques on the assumption that they are used in a reference plant on an industrial scale.

- (ii) Laboratory development tests to acquire the further data still needed to master these technologies so as to weigh them up against existing techniques on a comparable technical basis. In particular work on the sol-gel processes will be designed to master the techniques for the preparation of uranium and plutonium oxide granules or microspheres from a mixture of plutonium and uranium nitrates, the recycling of recoverable materials (minimization of the quantities of plutonium-contaminated waste for later processing and the conversion of the granules into fuel pellets with a view to assessing their characteristics. (Irradiation tests on these samples under representative power-reactor conditions are not included in this programme). These laboratory tests must, in addition, provide all the information still required for the design and operation of equipment on the assumption that it is incorporated in the reference plant on an industrial scale referred to above.

The total financial contribution by the Community to this project is estimated at:

| | | | |
|-----------------------------------|-------|---|-----|
| (a) Work of general relevance | 2.5 | m | EUA |
| (b) Work on alternative processes | 4.5 | m | EUA |
| | <hr/> | | |
| Total | 7 | m | EUA |

Project N° 3 Research and development work on plutonium transport
(unwrought plutonium and plutonium fuels.)

The aim of these projects is to ensure better safety and improve conditions for the transport and handling of plutonium (unwrought plutonium and plutonium fuels). This aim will be achieved by preparing at Community level test specifications for the design of air-transport containers and by designing and producing containers suitable for the shipment of substantial quantities of plutonium or plutonium fuels. These projects form a logical sequel to the work carried out during the first programme and will enable it to be continued in depth.

The R & D studies and work will include :

(a) Basic research on container design

This work will comprise some studies and basic experiments necessary for the design of containers :

- Execution of a criticality bench mark experiment with a view to validating the criticality codes used for the safety assessment of containers for transporting plutonium fuels for power stations equipped with thermal or fast-breeder reactors;
- an experimental programme to support and harmonize at Community level the specifications for the tests (studied during the first programme) to which air-transport containers will have to be subjected.

This harmonization will be carried out in agreement with the competent authorities of the Member States;

- compilation of a reference manual containing the principal data (contamination potential, residual heat, activity) of the unirradiated and irradiated fuels for thermal and fast-breeder reactors taken into account for the container project.

Project n°4 Research and development work on the balanced recycling in FBR and LWR power stations of UO₂-PuO₂ fuels irradiated in LWR power stations

It is estimated that by the end of 1979 there will be some 15 tonnes of plutonium fuels irradiated in LWR stations and held in power station cooling ponds awaiting reprocessing.

The aim of the proposed work is to demonstrate, on a significant scale, that these fuels do not represent unusable waste but that the fissile and fertile materials which they contain can be recovered and re-used and that the radioactive waste extracted can be conditioned and disposed of in the same way as conventional radioactive waste.

These demonstration projects should enable electricity producers to assess the technological and industrial practicability of plutonium recycling in the context of the two reactor concepts, fast-breeder and thermal.

The recovery and re-use of plutonium from irradiated mixed UO₂-PuO₂ fuels differ from the recovery and re-use of plutonium from uranium-oxide fuels irradiated in LWR power stations. Among the reasons for this, mention may be made of the following :

- the considerable total plutonium content, particularly rich in higher plutonium isotopes, and the considerable content of trans-plutonium elements (Am and Cm) affect the transport and reprocessing of these irradiated fuels, the transport of the plutonium recovered, refabrication of the fuels and, lastly, their re-use;
- the structure of the mixed UO₂-PuO₂ fuels, which differs from that of the uranium-oxide fuels, has an effect on the solubility of the plutonium-oxide particles during the reprocessing of these fuels.

In order to study the problems of second-generation plutonium recycling in their various operational aspects, the Commission intends to take part in a number of concerted demonstration exercises involving the recycling of plutonium contained in UO_2 - PuO_2 fuels which have undergone prior irradiation in light-water reactors. This recycling will have to be carried out, in a balanced manner, in the context of the fast-breeder and thermal (LWR power stations) reactor concepts.

It is proposed that two or three practical fuel-assembly reconstitution exercises be adopted. The first would involve recycling in a fast-breeder reactor, the second in a pressurized-water reactor and the third in a boiling-water reactor.

The amount of fissile plutonium needed would probably be about 15 kg for all three exercises.

These projects will cover the following aspects :

- transport of irradiated UO_2 - PuO_2 fuel;
- reprocessing of the irradiated UO_2 - PuO_2 fuel, including determination of the characteristics of the radioactive waste;
- design calculation for reloading into the reactor (reactivity coefficient, americium effect);
- fuel refabrication;
- transport of the refabricated fuel;
- monitoring of the fuel irradiations and isotopic analyses (at a later stage if desired);
- analysis of the environmental impact of this recycling by comparison with first-generation recycling.

A summary review of all these projects will be compiled.

The financial contribution by the Commission to these projects is estimated at: 3.5 m EUA.

Project N°5 Research and development work on the behaviour of LWR power stations using mixed-oxide fuels

The aim of this work is to supplement and complete the project carried out during the first programme with a view to improving knowledge on the safety of these stations and the radiation behaviour of mixed-oxide fuels.

(a) Safety and radiological impact on the environment of these power stations

This work will cover the study of typical incidents and accidents which were not studied during the first programme and tests on the dynamic behaviour of mixed fuels ^x (interaction between fuel and cladding) during rapid power transients; to ensure it follows the right lines, this work will be preceded by an analytical review of the present state of the art in this field.

(b) Post-irradiation examinations of mixed fuels irradiated in LWR power stations ^x

This work will include technological examinations and isotopic analyses of fuels selected on the basis of the potential information they are likely to provide (e.g., fuel representing a recent fabrication technology, high burnup). A comparison of the analysis results obtained by various Community laboratories will also be organized. Throughout the programme, there will be analytical reviews indicating the progress in the knowledge obtained.

The financial contribution by the Commission to this work is estimated at: 2.3 m EUA.

^x Acceptance by the Community of responsibility for the expenditure inherent in this work is conditional on the joint agreement of the fuel supplier and electricity producer to guarantee the availability of sufficient data for the proper understanding of the tests and examinations, without prejudice to the industrial and commercial interests of the parties involved.

5. Budget and staff

The Commission thus proposes to participate by way of contracts in the following main projects, as described above :

| | |
|---|------------|
| Project N°1 : General studies | 0,8 m EUA |
| Project N°2 : Safety of plutonium fuel fabrication | 7,0 m EUA |
| Project N°3 : Transport of plutonium and plutonium fuels | 3,3 m EUA |
| Project N°4 : Recycling in fast-breeder and thermal reactors of fuel irradiated in LWR power stations | 3,5 m EUA |
| Project N°5 : Behaviour of LWR power stations using mixed-oxide fuel | 2,3 m EUA |
| | <hr/> |
| Total : | 16,9 m EUA |

The contribution planned for each project is given as a guide and may be modified while the programme is under way in order to allow for the results obtained, technical development and changes in the order of priority.

The scientific and technical staff required to monitor the implementation of this programme is estimated to be :

- 4 Category A
- 3 Category B
- 2 Category C

This personnel will include the staff of three (2A + 1B) now assigned to the 1975-79 plutonium recycling programme which will have to be increased to cope with the greater workload under the proposed programme.

This staff's main task will be to handle the scientific management of the programme, including the detailed definition of the projects, in collaboration with experts. The preparation of precise specifications for the studies to be carried out, the equipment to be developed or the research and development to be done is a difficult task calling for close consultation, but is fundamental and indispensable in order to ensure that the programme will be fully effective.

This will guarantee both that the work carried out at Community level dovetails perfectly with Member State projects whilst avoiding duplication and that the work is done to best advantage by calling on the Community's most competent teams, chosen by means of Community wide invitations to tender.

The other tasks of this staff will be :

- to organize invitations to tender and to examine the tenders to select contractors;
- to hold meetings of experts ;
- to draft contracts and monitor their performance from the technical and scientific aspects ;
- to hold meetings of the Management Committee;
- to ensure that the results are disseminated, especially by drafting annual progress reports and periodically holding information meetings

This staff must be assigned to the programme throughout its duration.

This staff requirement makes allowances for the scientific support provided by the JRC.

The overall budget is evaluated at 20 m EUA; it includes contract expenditure, staff expenditure and administrative expenditure.

6. Advisory Committee on Programme Management - Programme review

In order to ensure that each of the operations to be initiated is as consistent as possible, the Commission proposes, as in the past, to be guided by the opinions of the Advisory Committee on Programme Management. The programme will be reviewed at the end of the second year and, to that end, a progress report will be prepared for the European Parliament and the Council.

7. Dissemination of information

In the dissemination of information, priority will be given to all Commission contractors under the plutonium-utilization programme. To that end, the required secondment of staff between contractors working on the same major project will be facilitated and information meetings will be held periodically by the Commission for the benefit of all the contractors.

All the results will then be communicated pursuant to Article 13 of the Euratom Treaty and, in particular, the general results not prejudicing the know-how or special technical knowledge of the contracting parties will be published.

8. Conclusions

Having regard to the arguments set out above, the Commission requests the Council to adopt the attached programme decision.

PROPOSAL FOR A COUNCIL DECISION ADOPTING A RESEARCH
AND DEVELOPMENT PROGRAMME FOR THE EUROPEAN ATOMIC
ENERGY COMMUNITY ON THE PLUTONIUM CYCLE
AND ITS SAFETY

(NUCLEAR INDIRECT-ACTION PROGRAMME)

1980-84

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 submitted after consultation with the Scientific and Technical Committee;

Having regard to the Opinion of the European Parliament;

Having regard to the Opinion of the Economic and Social Committee;

Whereas, in view of the very significant results obtained so far in the programme on the recycling of plutonium in light-water reactors (1975-79) ^{*} the knowledge already acquired at Community level should be increased so as to ensure maximum safety in the use of plutonium,

HAS ADOPTED THIS DECISION :

Article 1

A research and development programme on the plutonium cycle and its safety, set out in the Annex, is hereby adopted for a period of five years from 1 January 1980. The Annex forms an integral part of this Decision.

* OJ N° L 394/61, 26.12.1974

Article 2

The total requirements for the complete duration of the programme are estimated at 20 million European units of account and nine staff, the unit of account being that defined in Article 10 of the Financial Regulation of 21 December 1977. These figures are given solely as a guide.

Article 3

The programme set out in the Annex shall be reviewed not later than the end of the second year.

Done at Brussels,

For the Council

For The President

ANNEX 1

The main purpose of the programme is to ensure maximum safety in the use of plutonium as a nuclear fuel.

The programme covers areas relevant to the use of plutonium both in thermal and in fast-breeder reactors; it includes studies and research and development work on:

- expert reports on environmental impact and other work of general interest associated with plutonium use;
- safety of plutonium fuel fabrication,
- transport of plutonium and plutonium fuels,
- recycling in fast-breeder and thermal (light-water) reactors of fissile materials recovered from plutonium fuels previously irradiated in light-water reactors,
- behaviour of plutonium-fuelled LWR power stations.

This programme will be carried out by way of contracts.

FINANCIAL RECORD

1. RELEVANT BUDGET HEADING

- Item : 3355
- Heading: The plutonium cycle and its safety aspects.

1.1. TITLE OF THE PROJECT

The plutonium cycle and its safety aspects.

2. LEGAL BASIS

Application of Article 7 of the Treaty establishing the EAEC.

3. DESCRIPTION OF THE PROJECT

3.1. Description

This programme may to a certain extent be considered a continuation and development of the Programme on Plutonium Recycling in Light-Water Reactors covering the period 1975-79 (programme decisions of 17 December 1974 (OJ L 349/74) and of 10 October 1978 (OJ L 291/78)).

The new programme covers areas which help to ensure maximum safety of the plutonium cycle in thermal and fast-breeder reactors, and includes studies and R&D work on:

- Assessment of the environmental impact and other aspects of general interest associated with the plutonium cycle;
- safety of plutonium fuel fabrication;
- transport of plutonium and plutonium fuels;
- recycling in fast-breeder and thermal (light-water) reactors of fissile materials recovered from plutonium fuels irradiated in light-water reactors;
- behaviour of plutonium-fuelled light-water reactors.

This project, which is to be carried out under contracts, supplements the programme undertaken in the various Member States.

- 2 -

3.2. Objective

The aim of the programme is to ensure maximum safety in the use of plutonium as a nuclear fuel so as to enable all those involved (parliamentarians, governments and industry) to support their attitude to the use of plutonium fuels in reactors with a full knowledge of the facts.

4. JUSTIFICATION OF THE PROJECT

- Safety in the use of plutonium as a nuclear fuel;
- Industrial and energy policy;
- Rational utilization of plutonium so as to reduce enriched uranium needs.

5. FINANCIAL IMPLICATIONS OF THE PROJECT IN RESPECT OF THE INTERVENTION APPROPRIATIONS
(including staff expenditure and administrative and technical operating expenditure)

5.1. Overall cost for the whole of the expected duration of the project: approximately 35 m EUA

5.2. Chargeable to:

- Community budget 20,000,000 EUA
- National budgets (approximately
- Other sectors at national level (15 m EUA)

5.3. Multiannual timetable**5.3.1.1. Appropriations for commitment**

| Type of expenditure | 1980 | 1981 | 1982 | 1983 | 1984 | Total |
|---------------------|------------------|------------------|------------------|------------------|------------------|-------------------|
| Staff | 446,450 | 469,500 | 494,700 | 519,800 | 545,000 | 2,475,450 |
| Admin. operation | 92,550 | 101,500 | 110,300 | 115,200 | 135,000 | 554,550 |
| Contracts | 3,000,000 | 4,000,000 | 4,000,000 | 4,000,000 | 1,970,000 | 16,970,000 |
| Total | 3,539,000 | 4,571,000 | 4,605,000 | 4,635,000 | 2,650,000 | 20,000,000 |

5.3.1.2. Appropriations for payment

| Type of expenditure | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | Total |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| Staff | 446,450 | 469,500 | 494,700 | 519,800 | 545,000 | - | 2,475,450 |
| Admin. operation | 92,550 | 101,500 | 110,300 | 115,200 | 135,000 | - | 554,550 |
| Contracts | 1,000,000 | 3,000,000 | 4,000,000 | 4,000,000 | 3,000,000 | 1,970,000 | 16,970,000 |
| Total | 1,539,000 | 3,571,000 | 4,605,000 | 4,635,000 | 3,680,000 | 1,970,000 | 20,000,000 |

5.3.2. Method of calculation

(a) Staff expenditure

Staffing needs have been calculated on the basis of a staff of 9 for the program, i.e.:

- 4 Category A officials;
- 3 Category B officials;
- 2 Category C officials.

In addition to these figures, the calculations take into account the Commission staff salary-increase rates used for estimating the appropriations entered in the 1979 Budget; for the period 1980-82 an increase in volume corresponds to the trend in the general level of those prices in the Community which have been selected for arriving at the three-yearly estimates for this period, namely the following rates: 1980: 1.065, 1981: 1.120, 1982: 1.180. An increase of 6% per annum has been taken into consideration for 1983-84.

(b) Administrative and/or technical operating expenditure

This heading covers in particular expenditure involved in missions and the organization of meetings and receptions. The expenditure has been evaluated on the basis of the staffing and financial requirements of comparable programmes which are already in progress, i.e., approximately 15 meetings at 3600 EUA each and 70 missions at 400 EUA each per year.

(c) Contract expenditure

This heading covers the Community's financial participation in research conducted under shared-cost contracts (studies, research work, etc) which are to be concluded with specialized firms and laboratories in the Member States. Since the type of subject and the contractors' qualifications vary, it is not possible to establish a uniform method of calculation. Needs have been estimated by evaluating as accurately as possible the costs of the various technical studies and tasks involved in the programme in close collaboration with the national experts of the Advisory Committee on Programme Management responsible for the 1975-79 programme. It can be estimated that during this programme approximately 80 contracts will be negotiated with national bodies, specialized institutions and industrial firms, the Community's average financial participation in these contracts being approximately 50%. At all events, the Advisory Committee on Programme Management responsible for this programme will be required to give its opinion on the use of the appropriations.

6. FINANCIAL IMPLICATIONS ON THE STAFF AND NORMAL OPERATING APPROPRIATIONS

(See section 5 above)

7. FINANCING

7.4. The appropriations required to cover Community participation in this project are to be entered in future budgets.

8. IMPLICATIONS IN RESPECT OF REVENUE, IF ANY

- Community tax on officials' salaries
- Officials' contributions to the pension scheme.

9. TYPE OF CONTROL TO BE APPLIED

Scientific control: ACPM

Responsible officials in DG XII

Administrative control

By the Directorate-General for Financial Control with regard to implementation of the Budget and checking of expenditure and by the Administration of Contracts Division of DG XII.