COMMISSION OF THE EUROPEAN COMMUNITIES

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ANNEXES

DRAFT

REVISION OF THE MULTIANNUAL PROGRAMME OF THE J.R.C.
and
PROPOSAL OF NEW ACTIVITIES FOR THE PETTEN ESTABLISHMENT

MARCH 1974

COM(74) 500 final

ANNEXES

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Ispra, 30 January 1974

NOTE FOR THE ATTENTION OF THE MEMBERS OF THE COMMISSION

The programme of the JRC for the period 1973-76 was adopted by the Council of Ministers on 14 May (the part known as List A) and 18 June (List B) 1973. The corresponding texts, as published in the Official Journal of the European Communities, are attached to this note (Annex I). *In these texts, it is laid down, inter alia, that all the programmes will be subject to review at the beginning of the second year, that is at the beginning of 1974.*

In addition, the Council of Ministers was unable at its meeting on 5 February 1973 to approve the Commission proposal to close down the Petten establishment and called upon the Commission to present, before the end of 1973, suitable proposals for a new programme for this Establishment. It was thus decided, and confirmed at the Council meeting of 2 and 3 April 1973, that the Commission would avoid dismantling this Establishment pending the presentation of new programme proposals.

This document constitutes the results of the work of the ad hoc working party set up by the Commission to prepare the ground for the programme review.

A. PROGRAMMES FOR THE ISPRA, GEEL AND KARLSRUHE ESTABLISHMENT

The programmes currently in progress have been reexamined in the light of:

- the development of research priorities in the Community;
- the experience of the first year's work on these programmes.

As regards the research priorities in the Community, it is obvious that the energy crisis constitutes the most important new factor.

It is foreseeable that political decisions, far exceeding the scope of the JRC and the role which it can play, will be taken by the Community in the course of the next few weeks or months. In this case, it will naturally be necessary to adapt the JRC's programmes accordingly.

In any event, it is reasonable in the meantime to promote a closer orientation of the present work of the JRC towards the new requirements in the various fields of Community action.

As regards the experience of the first year's work in the four-year programme, it must be stated that the extent of the changes embodied in this programme, as compared with the activities carried out in the past, and the complexity of the problem of mobilizing the necessary skilled personnel are deterrents to any drastic modification in this first review of the programme.

On the basis of these considerations, the working party proposes the following amendments:

I. In respect of the energy field:

I.1 The "nuclear" programmes, the size of which has been appreciably reduced in recent years, must be maintained, or even extended, all the more so as their new orientation towards public service should easily fit in with the considerable acceleration of industrial effort that is forecast. This is certainly the case with programmes such as the safety studies programme or the programme of technical support for nuclear power plant operators being carried out at Ispra, as well as with the programmes at *the Geel and Karlsruhe establishments.*

Some reinforcement of the *reactor safety* objective is proposed; this is prompted essentially by the present situation of the relevant programme *(Annex II)* and by the opinions of the corresponding Consultative Committee on Programme Management (CCMGP).

As regards *technical support for nuclear power plant operators,* although it is easy to foresee that a marked acceleration in the construction of nuclear power plants cause operators quite considerable technical problems, it is proposed that the programme be maintained at its current level, since it is not yet forging ahead to the extent originally planned.

I.2 In the new energy supply context, the programme on *hydrogen production* by decomposition of water through chemical cycles clearly takes on a new importance. While an increase in the size of this programme at the Ispra establishment is considered to be a possibility, it seems more appropriate at present fine to give priority to the participation of other laboratories and of industry *(Annex III)* by means of contracts.

I.3 The recent programme on the use of *solar energy* (under the "new technologies" heading) is logically justified, and therefore of greater priority, in the new context of the energy crisis. It is therefore proposed to reinforce this programme so as to achieve an effective level of activity, and to improve the design of the experimental programmes *(Annex V).*

I.4 In accordance with the proposals in the field of thermonuclear fusion which have already been put forward by the JRC and acted on by the Council, and with the recommendations of the associations liaison committee, it is proposed that the JRC should participate in the joint effort on technological studies *(Annex VI).*

II. As regards to other aspects of the diversification of the JRC's activities, the only changed proposed are as follows:

II.1 In respect of the *remote sensing of the earth's resources* programme, the results already obtained and the prospects held out are such as to justify proposing an increase in the resources allocated *(Annex IV).*

II.2 In respect of the *recycling of raw materials* programme (under the "new technologies" heading), it seems to be preferable for the moment, bearing in mind the role that industry will be called upon to play in this field, to develop the evaluation studies in depth before undertaking loboratory work *(Annex V).*

II.3 As regards the *training* programme, it is important that the development of the Ispra establishment as a scientific meeting-place (on the European and international levels) should be continued. In addition to the post-university training courses which have already been initiated, it is planned to study the possibility of creating an institution for the organization of summer courses. This study will take several months, in view of the variety of problems involved *(Annex VII);* the results of this study will be embodied in a detailed proposal. In the meantime, it is proposed to make plans, at an organizational level in keeping with the potential currently offered by Ispra, for a summer course in 1973 which would make use of the Establishment's scientific personnel. The spending of 100 000 u.a. would be required for the relevant organization and infrastructure.

With a view to avoiding an increase in the staff authorized for each of the three Establishments (at Ispra, Geel and Karlsruhe), a critical examination of all the programmes currently in hand has been carried out in order to identify the activities which can be cut down or abandoned, so as to make possible the amendments outlined above. In addition to the cases already mentioned, the following measures are envisaged:

1. The maintenance in operation of the ESSOR reactor on the Ispra site makes it possible to give active consideration shutting down the *Ispra-1 reactor. Annex VIII* shows the actions to be undertaken to ensure continuity in the activation analysis work and in the operation of the EURACOS neutron converter.

2. The *waste programme treatment and stockage* programme needs to be reexamined, in spite of the fact that this problem is likely to become even more important. *Annex IX* gives an outline of this reexamination, the result of which is a proposal to reduce the number of staff.

B. PROGRAMME FOR THE PETTEN ESTABLISHMENT

In respect of the Petten establishment, a programme has been drawn up by a working party chaired by Commissioner Dahrendorf's Chef de cabinet. This programme is in line with the wishes expressed by the Council on 5 February 1973, and with the obligations assumed by the Commission *(Annex X)**.

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The overal situation in respect of the four Establishments' programmes before and after the proposed review is set out in *Annex XI.*

C. GENERAL CONSIDERATIONS AND FINANCIAL PROBLEMS

When the financial implications of the multiannual programme proposals were worked out, the Director-General of the JRC proceeded on the assumption of an average cost-of-living increase of 6% per annum. Recognizing, however, the probability of a less favourable short-term economic trend, he recommended to the Commission that an adequate financial reserve be formed in order to cushion, if necessary, the effects of a higher rate of inflation (see the letter from the Director-General to the Commission dated 5 October 1972, document CCR 500/72 – CCG 80).

This reserve was not set up, however, and even in the first year, the JRC's operating costs underwent a sharp increase, caused basically by the officials and other servants' salary increases which were decided by the Council and by the national authorities respectively (approximately 15% for officials, 18% for establishment and local staff at Ispra).

It should further be noted that the estimates of the resources necessary for the execution of the programmes were based in particular on the assumption that the Petten establishment was to be closed down. The Council decided otherwise, and the resources necessary for the maintenance in operation of this Establishment in 1973 had to be taken from the resources for the programmes at the Ispra establishment.

Thus it will not be possible to keep within the overall ceiling for the cost of the four-year programmes for Ispra, Geel and Karlsruhe without the creation of a suitable financial reserve designed to cover the salary increases resulting from decisions of the Council or of the national authorities.

In 1973, an agreement was reached with the Council on a provisional solution, in order to avoid this problem being raised during the discussion of the first budget, and all discussion on the principle involved was deferred until the review proposals were examined.

In the meantime it was decided by the Director-General of the JRC, in order to reduce the financial deficit as far as possible, to keep the JRC below establishment (in addition to a number of economy measures) in particular by deferring recruitment of nationals from the new Member States. Such a measure was, moreover, almost inevitable owing to the delay in the Council decision on the new staff regulations of officials and other servants of the JRC, and in the decision on the establishment of a new organization plan for the JRC, which was made all the more urgent by the implementation of special redundancy measures. These

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*) Financial estimates have been adjusted to bring them into line with the estimates in this document.

measures, which involve the departure of about 80 officials at the end of 1973 and of another 15 or so during the early months of 1974, will, moreover, make it impossible to continue with this understaffing policy, which would become incompatible with sound administration and optimum execution of the programmes.

On the basis of (a) the fact that in 1973 salary increases and other unforeseen expenditure were absorbed within the budget adopted by the Council (but will have certain repercussion on subsequent financial years), and (b) the hypothesis that at the end of 1974 staff will again be at the level laid down by the Council, a new overall programme time-table has been evolved *(Annex XII)* within the ceilings laid down by the Council. Added to these will be the forecasts for the expenditure relating to the new activities of the Petten establishment, estimated at approximately 4.750 million u.a. for the period 1974-76 *(Annex XII)*.

Assuming an annual increase in salary costs of 10% (corrective factors or scales), the reserve which will have to be set up is approximately 22.7 million u.a. *(Annex XII)*.

In order to balance the budget of the JRC and to aim at a more rational apportionment of administrative responsibilities within the departments of the Commission, discussions are monthly taking place among the Directorates-General concerned on a proposal for a transfer to the General Budget of the Commission of a number of posts, the functions attaching to which should, according to past experience or regulations, be concentrated around the Directorates-General at headquarters. These include:

1) the accounting officer of the JRC and his team, which should be set under the authority of Directorate-General XIX;
2) part of the JRC Personnel Department, to be set under the authority of Directorate-General IX;
3) the Ispra Establishment Security Office team; to be set under the responsibility of the Commission Security Office;
4) a number of individual officials, whose work is more logically identifiable with the general interest and the good organization of the departments of the Commission rather than with the execution of the JRC programmes.

It is estimated that all these proposals will affect 30 staff members, whose posts would have to be deleted from the JRC budget and reinstated in the General Budget.

D. CONCLUSIONS

Annexes XIII, XIII A and XIV give a general outline of the new detailed breakdown, resulting from the review proposals grouped together in Annex XI, of staff among the various objectives of the JRC programme.

In Annex XIII, allowance is made for the transfer of 30 staff members from the "Research" chapter of the General Budget to other chapters of the same budget.

Annex XIII A, on the other hand, does not make allowance for this transfer and thus reflects the situation which would exist should the Commission not consider it appropriate to carry out the transfer in question.

ANNEX I

COUNCIL DECISION

of 14 May 1973

adopting a research and training programme for the European Atomic Energy Community

(73/124/Euratom)

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 Council Resolution of 17 December 1970 on the detailed rules for the adoption of research and education programmes;

Whereas in the context of the common policy in science and technology the multi-annual research and training programme is one of the principal means whereby the Community can contribute to the rapid formation and expansion of nuclear industries and also to the acquisition and dissemination of knowledge in the nuclear field;

Whereas the Community research and training programme is defined taking account of the undertaking of the Italian Government to take over, for the period from 1 March 1973 to 31 December 1976, the ESSOR complex, made available to it by the Commission under an agreement to be concluded between the interested parties in accordance with Article 6 (c) of the Treaty establishing the European Atomic Energy Community in order to carry out a research programme;

Whereas the Community research and training programme is defined taking account also of the undertaking of the Belgian Government to take over, for the period from 1 March 1973 to 31 December 1976, the cost of the Euratom staff made available to it for the BR 2 reactor under Article 6 (c) of the Treaty establishing the European Atomic Energy Community;

HAS DECIDED AS FOLLOWS:

Article 1

A research and training programme, composed of a joint programme and supplementary programmes, as indicated in Annexes I, II and III, is hereby adopted for a period of four years from 1 January 1973. The Annexes form an integral part of this Decision.

Article 2

The maximum expenditure and staff necessary for carrying out this programme shall be 137·75 million units of account and 1 226 staff for the duration of the programme.

ANNEX I/1

The allocation of funds and staff, and the establishment of the scales of financial contributions from the Member States for supplementary programmes, are shown in Annexes II and III respectively.

The unit of account is defined in the Financial Regulation on the establishment and implementation of the budget of the European Communities and the responsibility of authorising officers and accounting officers.

Article 3

The programme defined in Annex I shall be subject to review at the beginning of the second year, in accordance with the appropriate procedures, and in the light of the decisions of the Paris Summit Conference.

Done at Brussels, 14 May 1973.

For the Council
The President
R. VAN ELSLANDE

ANNEX I/2

ANNEX I

JOINT MULTI-ANNUAL RESEARCH AND TRAINING PROGRAMME AND SUPPLEMENTARY MULTI-ANNUAL PROGRAMMES

DIRECT PROJECTS

1. **Handling and disposal of waste**

Joint programme

A maximum of 6·9 million units of account shall be allocated to this objective, the number of staff being fixed at 75 (including a programme staff of 40).

The objectives shall include:

— basic studies on the separation of fission products from irradiated fuel by the 'Saltex' process;

— feasibility studies on a system of self-burying capsules for the disposal of radioactive waste;

— studies and research on the chemical separation of actinides from high-level radioactive waste;

— studies of physical measurements to determine the neutronic properties of actinides;

— theoretical studies to reduce actinide concentration in irradiated fuel by optimising reactor operation.

These activities will be conducted for the most part by the Ispra establishment.

2. **Plutonium and Transplutonium elements**

(a) *Joint programme*

A maximum of 13 million units of account shall be allocated to this objective, the number of staff being fixed at 126 (including a programme staff of 63). The research constituting the programme based on plutonium and its compounds shall deal with the following:

— phase diagrams, thermodynamic properties and structures of ceramic compounds of plutonium (carbides, nitrides and their combinations);

— energy transport processes (thermal conductivity and diffusibility);

— mechanical properties of ceramic compounds in their microscopic aspects and the effect of irradiation on these properties;

— processes and kinetics of material transport phenomena and the effect of irradiation thereon.

The irradiation required for these basic studies will take place in instrumented capsules.

In addition, certain studies will be carried out on determining the physical properties of certain very high purity actinides and their compounds.

(b) *Supplementary programme*

A maximum of 8·65 million units of account shall be allocated to this objective, the number of staff being fixed at 84 (including a programme staff of 42). Research for the programme of applied studies will deal with the following:

— the study of the behaviour of advanced fuels in a fast reactor;

— the development of the manufacture of samples of materials of this kind for irradiation;

— the analysis of irradiated materials and fuels in existing power plants;

— work required by the projects.

These activities will be conducted at the European Institute for Transuranium Elements in Karlsruhe.

3. *Material science*

Joint programme

A maximum of 8·5 million units of account shall be allocated for this objective, the number of staff being fixed at 89 (including a programme staff of 50).

The objective shall include:

— studies of lattice defects;

— studies of surface reactions (particle-surface interaction);

— studies of mechanical behaviour, fractures of metals and compound materials (mechanical properties and structure, physical properties, plastic deformation and fracture);

— studies of the physical properties of materials at high temperatures (solid and liquid).

These activities will be conducted by the Ispra Establishment.

4. Reactor safety

Joint programme

A maximum of 21·1 million units of account shall be allocated to this objective, the number of staff being fixed at 232 (including a programme staff of 115).

The objective shall include:

— engineering research connected with serious accidents and their prevention;

— research on thermohydraulic phenomena in the coolant associated with accidents;

— early failure detection;

— reliability studies;

— reactor dynamics.

These activities are to be conducted by the Ispra Establishment.

5. Applied data-processing

Joint programme

A maximum of 6·05 million units of account shall be allocated to this objective, the number of staff being fixed at 51 (including a programme staff of 31).

The objective shall include:

— computer programme library activities for the Community (collection, testing and analysis of computer programmes, consultation on their use);

— studies of an integrated system of documentation and automatic translation;

— assistance in computer systems and methods (Caronte modular system, special programming language for experimental mathematics).

These activities will be conducted by the Ispra Establishment.

6. Information Analysis Centre

Joint programme

A maximum of 5·10 million units of account shall be allocated to this objective, the number of staff being fixed at 51 (including a programme staff of 27).

The objective shall include: three units for the compilation, analysis and distribution of scientific and technical information in the following fields:

— shielding of nuclear reactors (ESIS);

— integrated nuclear data (INDAC);

— structural mechanics connected with reactor technology (ESMIS).

These activities will be conducted by the Ispra Establishment.

7. Central Bureau for Nuclear Measurements (CBNM)

Joint programme

A maximum of 20·35 million units of account shall be allocated to this objective, the number of staff being fixed at 170 (including a programme staff of 92).

The objective shall include:

— determining basic neutron data;

— continuation of work in the field of nuclear metrology (measurements of radioactive elements, measurements of the isotopic composition of elements by mass spectrometry, calibration and standardization of methods of dosimetry);

— the preparation and definition of standard specimens and nuclear reference materials.

These activities will be the task of the Central Bureau for Nuclear Measurements at Geel.

8. Technical assistance to nuclear power plant operators

Joint programme

A maximum of 6·1 million units of account shall be allocated for this objective, the number of staff being fixed at 60 (including a programme staff of 23).

The objective is to consist of technical support in the following fields:

— water chemistry;

— in-pile inspection and operations;

— post-irradiation examination of fuel elements;

— methods of quality control for materials and components in stations, establishment of standard techniques, training of operators' personnel.

These activities will be undertaken by the Ispra Establishment.

9. Training

Joint programme

A maximum of 1·45 million units of account shall be allocated for this objective, the number of staff being fixed at 15 (including a programme staff of 10).

This objective includes three courses, at technical standard post-graduate courses and advanced specialized courses.

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10. Safeguards and management of fissile materials

Supplementary programme

A maximum of 5·4 million units of account shall be allocated for this objective, the number of staff being fixed at 57 (including a programme staff of 27).

This objective includes:

— systems analysis;

— development of destructive and non-destructive techniques;

— study of fool-proof sealing and identification techniques.

These activities will be carried out mainly by the Ispra Establishment, in cooperation with establishments in the Member States.

11. Contract research

Joint programme

A maximum of 1·85 million units of account shall be allocated for this objective, the number of staff being fixed at 17 per man year (including a programme staff of 5 men per year).

This objective is intended to help make facilities or techniques available to outside parties for payment.

The staff carrying out these activities will be assigned to the Ispra Establishment.

12. Management and coordination

Joint programme

A maximum of 8·1 million units of account shall be allocated for these activities, the number of staff being fixed at 79 (55 of these being for the management itself).

This item covers activities of general management, coordination and management of the Joint Research Centre programmes, and certain investments of a general nature.

13. Operation of the HFR reactor

Supplementary programme

A maximum of 23 million units of account shall be allocated for this objective, the number of staff being fixed at 95.

It covers operation of the reactor and the planning, execution and supervision of experiments for the benefit of the programmes of the participating States. Surplus capacity can be made available to outside parties for payment.

This objective will be carried out at the Petten Establishment.

14. Use of the Ispra I reactor

Joint programme

A maximum amount of 2·2 million units of account shall be allocated for this objective, the number of staff being fixed at 25 (including a programme staff of 15).

It covers operation of the reactor and its use for programmes to be carried out by the Ispra Establishment (in particular: handling and disposal of waste, information analysis centres, environmental protection, standards and reference substances).

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ANNEX II

TABLE OF STAFF AND MAXIMUM EXPENDITURE

Objectives	Joint programme		Supplementary programme			Total (in millions of u.a.)
	Amount (in millions of u.a.)	Staff	Amount (in millions of u.a.)	Staff	Participating countries	
DIRECT PROJECTS (JRC)						
Nuclear projects						
Handling and disposal of waste	6·900	75				6·900
Plutonium and transplutonium elements	13·000	126	8·650	84	B/G/F/L/N/Irl/D/UK	21·650
Material science	8·500	89				8·500
Reactor safety	21·100	232				21·100
Applied data processing	6·050	51				6·050
Information analysis centres	5·100	51				5·100
Central Bureau for Nuclear Measurements (CBNM)	20·350 (1)	170				20·350 (1)
Technical assistance to nuclear power plant operators	6·100	60				6·100
Training	1·450	15				1·450
Safeguards and management of fissile materials			5·400	57	B/G/I/L/N/Irl/D/UK	5·400
Contract research	1·850	17				1·850
Management and coordination	8·100 (1)	79				8·100 (1)
Operation of the HFR reactor			23·000	95	B/G/N	23·000
Use of Ispra I reactor	2·200	25				2·200
Total	100·700	990	37·050	236		137·750
Total joint programme + supplementary programmes	137·750	1 226				

(1) Including certain investments.

ANNEX III

DEFINITION OF THE SCALES FOR FINANCIAL CONTRIBUTIONS FROM MEMBER STATES FOR THE SUPPLEMENTARY RESEARCH PROGRAMMES AND EURATOM INVESTMENT

I. Scales based on 'relative shares'

— Plutonium and transplutonium elements

— Safeguards and management of fissile materials

} The scale applied corresponds, for each financial year, to the scale resulting from the 'relative shares' of the participating Member States being increased in proportion to the 'relative share' of the Member State (or States) which does (or do) not participate in the programme in question, except that for the new Member States the reduction coefficients provided for in Article 130 of the Accession Treaty are to be applied

II. Flat-rate scale (1)

— Petten (HFR) { Belgium, Germany, Netherlands } 100%

(1) The details of participation in this project, particularly the scale of contributions and the duration of participation, must be adopted before 30 April 1973.

COUNCIL DECISION

of 14 May 1973

adopting a research programme for the European Economic Community in the field of standards and reference substances (certified reference substances)

(73/125/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, in particular Article 235 thereof;

Having regard to the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Council Resolution of 17 December 1970 on the procedure for adopting research and training programmes;

Whereas, pursuant to Article 3 (a) and (h) of the Treaty establishing the European Economic Community, the activities of the Community shall include the elimination, between the Member States, of quantitative restrictions on the import and export of goods and of all other measures having equivalant effect, together with the approximation of the laws of the Member States to the extent required for the proper functioning of the common market;

Whereas the research projects which are the subject of this Decision therefore appear necessary in order to achieve certain Community objectives in the context of the functioning of the common market;

Whereas the Treaty establishing the European Economic Community made no provision for the powers required for these purposes;

HAS DECIDED AS FOLLOWS:

Article 1

A research programme for the European Economic Community in respect of standards and reference substances (certified reference substances) as set out in the Annex to this Decision is hereby adopted for a period of four years beginning on 1 January 1973. This Annex forms an integral part of this Decision.

Article 2

The upper limit for expenditure commitments and for *staff necessary for* the implementation of this programme shall be 5·40 million units of account, and 62 staff, the unit of account being defined in the Financial Regulation on the establishment and implementation of the budget of the European Communities and the responsibility of authorizing and accounting officers.

Article 3

The Commission shall ensure that this programme is carried out and, to this end, shall request the assistance of the Joint Research Centre. It shall submit an annual report to the Council on the subject.

Article 4

The programme defined in the Annex shall be subject to review at the beginning of the second year, in accordance with the appropriate procedures, and in the light of the decisions of the Paris Summit Conference.

Article 5

The information resulting from the implementation *of the parts* of the programme defined in the Annex will be disseminated in accordance with the conditions and within the limits which will be fixed at a later date.

Done at Brussels, 14 May 1973.

For the Council

The President

R. VAN ELSLANDE

ANNEX I/9

ANNEX

DIRECT ACTION
NON-NUCLEAR PROJECTS

Standards and reference substances (certified reference substances)

Joint programme

A maximum of 5·4 million units of account shall be allocated to this objective, the number of staff being fixed at 62 (including a programme staff of 34).

The objective shall include:

— technical assistance tasks for the secretariat of the project: inquiry on the needs of and the situation in the Community in this field, dissemination of information and processing of data;

— experimental work (chemical analysis, physical and technological properties of reference substances) in laboratories participating in the project;

— technical assistance to the Commission (elimination of technical obstacles, Common Customs Tariff, etc).

The experimental work will be carried out, for the time being, by the Ispra establishment.

ANNEX I/10

COUNCIL DECISION

of 14 May 1973

adopting a research programme for the European Economic Community on the protection of the environment

(73/126/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 235 thereof;

Having regard to the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Council Resolution of 17 December 1970 on the procedure for adopting research and education programmes;

Whereas Article 3 of the Treaty establishing the European Economic Community lays down that the activities of the Community shall include the elimination, as between Member States, of customs duties and of quantitative restrictions on the import and export of goods, and of all other measures having equivalent effect, the institution of a system ensuring that competition in the common market is not distorted, and also the approximation of the laws of Member States to the extent required for the proper functioning of the common market; whereas the activities defined in the Annex to this Decision are necessary, among others, for achieving these objectives and promoting, in accordance with Article 2 of the same Treaty, a harmonious development of economic activities throughout the Community and an improvement in conditions of life and employment in the Member States;

Whereas the research projects which are the subject of this Decision therefore appear necessary in order to achieve certain Community objectives in the context of the functioning of the common market;

Whereas the Treaty establishing the European Economic Community made no provision for the powers required for these purposes;

HAS DECIDED AS FOLLOWS:

Article 1

A research programme for the European Economic Community on the protection of the environment as set out in the Annex to this Decision is hereby adopted for a period of four years beginning on 1 January 1973. This Annex forms an integral part of this Decision.

Article 2

The upper limit for expenditure commitments and for staff necessary for the implementation of this programme shall be fixed at 13 million units account and 142 staff, the unit of account being defined in the Financial Regulation on the establishment and implementation of the budget of the European Communities and the responsibility of authorizing and accounting officers.

Article 3

The Commission shall ensure that this programme is carried out and to this end shall request the assistance of the Joint Research Centre. It shall submit an annual report to the Council on the subject.

Article 4

The programme defined in the Annex shall be subject to review at the beginning of the second year, in accordance with the appropriate procedures, and in the light of the decisions of the Paris Summit Conference.

Article 5

The information resulting from the implementation of the parts of the programme defined in the Annex will be disseminated in accordance with the conditions and within the limits laid down by the Commission.

Done at Brussels, 14 May 1973.

For the Council
The President
R. VAN ELSLANDE

ANNEX

DIRECT ACTION
NON-NUCLEAR PROJECTS
ENVIRONMENTAL PROTECTION

Joint programme

A maximum amount of 13.0 million units of account shall be allocated to this objective and the upper limit for staff shall be fixed at 142 staff (including 75 programme staff).

The objective shall be:

— analysis and supervision (particularly development of a multidetection unit; studies on teledetection and measurement of pollution; formation of a data bank for chemicals);

— spread and effect of pollutants (in particular studies of biological indicators of water pollution, genetic toxicity and bio-telemetry of subacute toxic effects on laboratory animals);

— model and systems analysis of the process of eutrophication of an alpine lake and of atmospheric pollution;

— theoretical studies on thermal pollution and the purification of water by catalytic oxidation.

— These activities will be carried out by the Ispra Establishment.

COUNCIL DECISION

of 14 May 1973

adopting a research programme for the European Economic Community in the field of teledetection of earth resources

(73/127/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community and in particular Articles 41 and 235 thereof;

Having regard to the proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Council Resolution of 17 December 1970 on the procedure for adopting research and training programmes;

Whereas Article 2 of the Treaty establishing the European Economic Community assigns to the Community, *inter alia* the task of promoting throughout the Community a harmonious development of economic activities, a continous and balanced expansion and an accelerated raising of the standard of living; whereas the objectives of the Community's activities for these purposes are set out in Article 3 of the same Treaty;

Whereas the purpose of the projects which are the subject of this Decision is, in the initial phase, to offer to the Community a means of drawing up statistics and forecasts which may be used in various fields including agriculture;

Whereas the problem of evaluating and using natural resources constitutes an important element of these objectives;

Whereas the research projects which are the subject of this Decision seem necessary in order to achieve certain Community objectives in the context of the functioning of the common market;

Whereas the Treaty establishing the European Economic Community made no provision for the powers required for these purposes;

HAS DECIDED AS FOLLOWS:

Article 1

A research programme for the European Economic Community in the field of teledetection of earth resources, as set out in the Annex to this Decision, is hereby adopted for a period of four years beginning on 1 January 1973. This Annex, forms an integral part of this Decision.

Article 2

The upper limit for expenditure commitments and for staff necessary for the implementation of this programme shall be 1·05 million units of account and 10 staff, the unit of account being defined in the Financial Regulation on the establishment and implementation of the budget of the European Communities and the responsibility of authorizing and accounting officers.

Article 3

The Commission shall ensure that this programme is carried out and, to this end, shall request the assistance of the Joint Research Centre. It shall submit an annual report to the Council on the subject.

Article 4

The programme defined in the Annex shall be subject to review at the beginning of the second year, in accordance with the appropriate procedures, and in the light of the decisions of the Paris Summit Conference.

Article 5

The information resulting from the implementation of the parts of the programme defined in the Annex shall be disseminated in accordance with the conditions and within the limits which are to be fixed at a later date.

Done at Brussels, 14 May 1973.

For the Council

The President

R. VAN ELSLANDE

ANNEX I/13

ANNEX

DIRECT ACTION
NON-NUCLEAR PROJECTS
TELEDETECTION OF EARTH RESOURCES

Joint programme

A maximum amount of 1·05 million units of account shall be allocated to this objective and the upper limit for staff shall be fixed at 10 staff (including 4 programme staff).

The objective shall comprise direct support activity to the Directorates-General of the Commission for the purpose of establishing a technique for global analysis of the conditions of the soil and its constituents by aerial and spatial observation.

These activities will be carried out by the Ispra Establishment in conjunction with the Directorates-General concerned.

ANNEX I/14

COUNCIL DECISION

of 14 May 1973

amending the Decision of 21 June 1971 adopting a five-year research and training programme of the European Atomic Energy Community in the field of biology and health physics

(73/128/Euratom)

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;

Whereas the programme which is the subject of the Council Decision of 21 June 1971 [1] adopting a five-year research and training programme of the European Atomic Energy Community in the field of biology and health physics should be adjusted, to take account of the accession of new Member States to the Community;

Whereas the proposal from the Commission constitutes an adequate adjustment which will strengthen the Community's potential in the field of research for the purpose of acquiring the information necessary to guarantee adequate protection of the individual, the general public and the environment against dangers arising from radiation;

Whereas this proposal ensures the continuity necessary for biological research;

Whereas it is in the common interest to amend the Decision of 21 June 1971 with a view to ensuring the active participation of the institutions of the enlarged Community in research work;

HAS DECIDED AS FOLLOWS:

Article 1

The programme defined in the Annex to the Decision of 21 June 1971 is replaced by the programme annexed to this Decision.

Article 2

Article 2 of the Decision of 21 June 1971 shall be replaced by the following:

'The *upper limit for expenditure commitments* and for staff necessary for the implementation of this programme shall be 18·886 million units of account and 97 Community servants in the case of the joint programme and 5·61 million units of account and 10 Community servants in the case of the complementary programme, the unit of account being defined in the Financial Regulation establishing and implementing the budget of the European Communities and concerning the responsibility of authorizing and accounting officers.'

Done at Brussels, 14 May 1973.

For the Council

The President

R. VAN ELSLANDE

[1] OJ No L 143, 29. 6. 1971, p. 31.

ANNEX

'BIOLOGY AND HEALTH PHYSICS' JOINT PROGRAMME AND COMPLEMENTARY PROGRAMME

1. **'Radiation protection' joint programme**

An amount of 18·886 million units of account shall be allocated to this objective and the upper limit for staff shall be fixed at 97 servants.

The aim of the work is to acquire and promote the scientific and technical knowledge necessary for the determination of permissible radiation levels in man and contamination of the environment for keeping such knowledge up to date and for the improvement of the practical organization of radiation protection by the Member States.

This aim also inlcudes studies on radioactive contaminants, with particular reference to the path which they follow in man and the environment, on the effects of radiation on living matter and on dosimetric methods and instruments.

These activities shall be carried out mainly under contracts of association or similar contracts and partly by the 'Biology' Group set up at the Ispra Establishment.

2. **'Adaptations' complementary programme**

(a) *Definition of programme*

An amount of 5·610 million units of account shall be allocated to the objective, and the upper limit for staff be 10 Community servants.

The aim of the work consists in the development of nuclear techniques and the application of nuclear methods with a view to their use in agricultural and medical research.

The work shall be carried out under contracts of association or similar contracts.

(b) *Financial contributions from the Member States to this programme*

Germany	41%
Italy	23%
Netherlands	36%

COUNCIL DECISION

of 14 May 1973

amending the Decision of 21 June 1971 adopting a five-year research and training programme of the European Atomic Energy Community in the field of fusion and plasma physics

(73/129/Euratom)

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;

Whereas the programme which is the subject of the Council Decision of 21 June 1971 [1] adopting a five-year research and training programme of the European Atomic Energy Community in the field of fusion and plasma physics, should be adjusted to take account of the Accession of new Member States to the Community;

Whereas the proposal from the Commission constitutes an adequate adjustment which will strengthen the Community's potential in the field of research on controlled thermonuclear fusion and plasma physics;

Whereas it is in the common interest to amend the Decision of 21 June 1971 with a view to ensuring the active participation of the institutions of the enlarged Community in research work;

HAS DECIDED AS FOLLOWS:

Article 1

The programme set out in the Annex to the Decision of 21 June 1971 is replaced by the programme annexed to this Decision.

Article 2

Article 2 of the Decision of 21 June 1971 shall be replaced by the following:

'The upper limit for expenditure commitments and for staff necessary for the implementation of this programme shall be fixed at 56·196 million units of account and 112 Community servants plus 20 temporary Community servants, the unit of account being defined in the Financial Regulation establishing and implementing the budget of the European Communities and concerning the responsibility of authorizing officers and accounting officers'.

Done at Brussels, 14 May 1973.

For the Council

The President

R. VAN ELSLANDE

[1] OJ No L 143, 29. 6. 1971, p. 33.

ANNEX I/17

ANNEX

FUSION AND PLASMA PHYSICS

1. An amount of 56·196 million units of account shall be allocated to this objective and the upper limit for staff shall be fixed at 112 servants and 20 temporary servants.

   This amount is intended to cover the expenditure on equipment concerned with operations accorded priority status and specified in point 5 which are to be carried out during the first three years of execution of the programme, the expenditure throughout the programme on the general activities to be carried out thereunder, and the expenditure for procuring mobility of staff between associated laboratories.

2. The subject-matter of the programme which will be executed by the associated laboratories shall be:

   — general physics in the sector concerned, in particular studies of a basic character or relating to confinement of plasmas with suitable devices and to methods for producing and heating plasmas;

   — research on the confinement on closed and open-ended configurations of plasmas of widely varying density and temperature;

   — production of and research on plasmas of high and very high density;

   — improvement of diagnostic methods;

   — investigation of technological problems connected with current research and of problems relating to thermonuclear reactor technology.

   This work shall be carried out under contracts of association.

3. The programme set out in point 2 shall be part of a long-term cooperative project embracing all work carried out in the Member States in the field of fusion and plasma physics. It is designed to lead in due course to the joint construction of prototypes with a view to their industrial-scale production and marketing.

4. Within the upper limit of 56·196 million units of account:

   (a) a maximum amount of 8·82 million units of account shall be allocated during the first three years of the programme to the financing of equipment for the operations specified in point 5, a standard preferential rate of participation equal to or less than 44% being applied. In return therefore, all members of the association shall have the right to take part in the experiments carried out with this equipment;

   (b) a maximum amount of 0·45 million units of account shall be set aside for expenditure for procuring mobility of staff between associated laboratories;

   (c) the amount which shall not have been set aside for the operations and expenditure specified in sections (a) and (b) shall form the upper limit of financial participation by the Community in other expenditure of the associations and in their management. This participation shall be at a standard rate of about 25%. By way of derogation from this principle, this rate shall be increased to a maximum of 30% for the Euratom/CNEN-CNR Association, which will further benefit from the assumption by the programme of the expenses in respect of the Euratom staff seconded thereto.

5. After conducting a technical examination of the various projects, the Commission will be able to finance during the first three years, within the following upper limits, the operations mentioned below, which are accorded priority status:

— low-beta stellarator and Tokomak	6·3 million units of account
— screw pinch and high-beta stellarator	1·7 million units of account
— heating and injection processes	1·3 million units of account
— very-high-density processes	0·8 million units of account

ANNEX I/18

COUNCIL DECISION

of 18 June 1973

adopting a research programme for the European Economic Community on the protection of the environment (direct project)

(73/174/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 235 thereof;

Having regard to the Proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Council Resolution of 17 December 1970 (1) on the procedure for adopting research and education programmes;

Whereas Article 3 of the Treaty establishing the European Economic Community lays down that the activities of the Community shall include the elimination, as between Member States, of customs duties and of quantitative restrictions on the import and export of goods, and of all other measures having equivalent effect, the institution of a system ensuring that competition in the common market is not distorted, and also the approximation of the laws of Member States to the extent required for the proper functioning of the common market; whereas the activities specified in the Annex to this Decision are necessary, among others, for achieving these objectives and promoting, in accordance with Article 2 of the same Treaty, a harmonious development of economic activities throughout the Community and an improvement in living and working conditions in the Member States;

Whereas therefore the research projects which are the subject of this Decision appear necessary in order to achieve certain Community objectives in the operation of the common market;

Whereas the Treaty establishing the European Economic Community made no provision for the powers required for these purposes;

HAS ADOPTED THIS DECISION:

Article 1

A European Economic Community research programme on the protection of the environment, as set out in the Annex, is hereby adopted for a period of four years beginning on 1 January 1973. The Annex forms an integral part of this Decision.

Article 2

The maximum expenditure commitment and number of staff required for the implementation of this programme shall be 2·85 million units of account and 30 staff, the unit of account being defined in Article 10 of the Financial Regulation of 25 April 1973 (2) applicable to the general budget of the European Communities.

Article 3

The Commission shall be responsible for the implementation of this programme and, to this end, shall avail itself of the facilities of the Joint Research Centre. It shall submit an annual report to the Council on the subject.

Article 4

The programme defined in the Annex shall be subject to review at the beginning of the second year, then annually, in accordance with the appropriate procedures, and in the light of the decisions of the Paris Summit Conference.

Article 5

Knowledge gained from the implementation of those parts of the programme defined in the Annex shall be disseminated in accordance with the conditions and within the limits to be laid down at a future date.

Done at Luxembourg, 18 June 1973.

For the Council

The President

A. LAVENS

(1) OJ No L 16, 20. 1. 1971, p. 13.

(2) OJ No L 116, 1. 5. 1973, p. 1.

ANNEX

DIRECT PROJECT

NON-NUCLEAR PROJECT

Environmental protection

JOINT PROGRAMME

A maximum amount of 2·85 million units of account, and a staff of 30 (including 18 programme staff), shall be allocated to this objective.

The objective, which supplements the programme adopted by the Council in the same field on 14 May 1973 (1), shall include:

— optimization of the operation of the data bank on chemical products in the environment,

— definition of criteria of compatibility of new industrial products with the environment (environment 'label', assessment and technical tests),

— study of the thermal balance in an urban system.

These activities will be carried out by the Ispra Establishment.

(1) OJ No L 153. 9. 6. 1973, p. 11.

COUNCIL DECISION

of 18 June 1973

adopting a research programme for the European Economic Community in the field of standards and reference substances (certified reference substances)

(73/175/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, in particular Article 235 thereof;

Having regard to the Proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Council Resolution of 17 December 1970 [1] on the procedure for adopting research and training programmes;

Whereas, pursuant to Article 3 (a) and (h) of the Treaty establishing the European Economic Community, the activities of the Community shall include especially the elimination, as between the Member States, of quantitative restrictions on the import and export of goods and of all other measures having equivalent effect, together with the approximation of the laws of the Member States to the extent required for the proper functioning of the common market;

Whereas the research projects which are the subject of this Decision therefore appear necessary in order to achieve certain Community objectives in the functioning of the common market;

Whereas the Treaty establishing the European Economic Community made no provision for the powers required for these purposes;

HAS ADOPTED THIS DECISION:

Article 1

A research programme for the European Economic Community in respect of standards and reference substances (certified reference substances) as set out in the Annex to this Decision is hereby adopted for a period of four years beginning on 1 January 1973. The Annex forms an integral part of this Decision.

Article 2

The maximum expenditure commitment and staff necessary for the implementation of this programme shall be 0·8 million units of account, and 9 staff, the unit of account being defined in Article 10 of the Financial Regulation of 25 April 1973 [2] applicable to the general budget of the European Communities.

Article 3

The Commission shall be responsible for the implementation of this programme and, to that end, shall avail itself of the facilities of the Joint Research Centre. It shall submit an annual report to the Council on the subject.

Article 4

The programme defined in the Annex shall be subject to review at the beginning of the second year, and subsequently each year, in accordance with the appropriate procedures, and in the light of the Decisions of the Paris Summit Conference.

Article 5

The information resulting from the implementation of the parts of the programme defined in the Annex will be disseminated in accordance with the conditions and within the limits which will be laid down at a later date.

Done at Luxembourg, 18 June 1973.

For the Council

The President

A. LAVENS

[1] OJ No L 16, 20. 1. 1971, p. 13.

[2] OJ No L 116, 1. 5. 1973, p. 1.

ANNEX

DIRECT PROJECT

NON-NUCLEAR PROJECTS

Standards and reference substances

(certified reference substances)

JOINT PROGRAMME

A maximum of 0·8 million units of account, and a staff of 9 (including a programme staff of 5), shall be allocated to this objective.

The objective, which shall complete the programme adopted by the Council on 14 May 1973 [1] in the same field, shall include:

- **technical assistance for Community projects within the framework of the elimination of technical barriers and the management of the Common Customs Tariff;**
- **experimental work on reference substances and methods (physical and technological properties).**

The experimental work will be carried out, for the time being, by the Ispra Establishment.

[1] OJ No L 153, 9. 6. 1973, p. 9.

COUNCIL DECISION

of 18 June 1973

adopting a programme of research in new technologies for the European Economic Community (use of solar energy and recycling of raw materials)

(73/176/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 235 thereof;

Having regard to the Proposal from the Commission;

Having regard to the Opinion of the European Parliament;

Having regard to the Council Resolution of 17 December 1970 [1] on the detailed rules for the adoption of research and education programmes;

Whereas Article 2 of the Treaty establishing the European Economic Community assigns to the Community, *inter alia*, the task of promoting throughout the Community a harmonious development of economic activities, a continuous and balanced expansion and an accelerated improvement of the standard of living; whereas the objectives of Community action for these purposes are set out in Article 3 of the same Treaty;

Whereas the use of solar energy as part of the exploitation of natural resources and the recycling of raw materials are important constituents of these objectives;

Whereas the research projects covered by this Decision therefore appear to be necessary to achieve certain Community objectives in the operation of the common market;

Whereas the Treaty establishing the European Economic Community makes no provision for all the powers required for these purposes;

HAS ADOPTED THIS DECISION:

Article 1

A programme of research for the European Economic Community in new technologies (use of solar energy and recycling of raw materials) as indicated in the Annex is hereby adopted for a period of four years from 1 January 1973. The Annex forms an integral part of this Decision.

Article 2

The maximum expenditure and staff required for implementing this programme shall be 3·05 million units of account and 30 staff; the unit of account is defined in Article 10 of the Financial Regulation of 25 April 1973 [2] applicable to the general budget of the European Communities.

Article 3

The Commission shall be responsible for the implementation of this programme and to that end shall avail itself of the facilities of the Joint Research Centre. It shall submit an annual report to the Council on this subject.

Article 4

The programme defined in the Annex shall be subject to review at the beginning of the second year and then annually, in accordance with the appropriate procedures and in the light of the Decisions of the Paris Summit Conference.

Article 5

Knowledge gained from the implementation of those parts of the programme defined in the Annex shall be disseminated in accordance with conditions and within limits to be laid down at a later date.

Done at Luxembourg, 18 June 1973.

For the Council

The President

A. LAVENS

[1] OJ No L 16, 20. 1. 1971, p. 13

[2] OJ No L 116, 1.5. 1973, p. 1.

ANNEX

DIRECT PROJECT

NON-NUCLEAR PROJECT

New technologies

(Use of solar energy and recycling of raw materials)

JOINT PROGRAMME

A maximum of 3·05 million units of account, and a staff of 30 (including a programme staff of 15), shall be allocated to this objective.

The initial phase will be devoted to the preparation of a detailed programme. The objective shall include:

Use of solar energy

- bibliographical research and technical and economic evaluation of the various concepts for the collection and storage of solar energy;
- studies and measurements in the field of heat pipes and selective surfaces;
- technico-economic and feasibility studies of autonomous units of 1 to 10 kW;
- studies and assessments on photolysis and thermodissociation of water, and biological conversion.

Recycling of raw materials

- general study of strategies (statistical studies of long-term trends, studies on the utilization cycle of materials);
- special studies on technical and/or technico-economic evaluations concerning:
  - the pyrolysis of plastics;
  - the separation of strongly-bound alloy waste;
  - other subjects which might arise during the general studies.

These activities shall be conducted by the Ispra Establishment.

COUNCIL DECISION

of 18 June 1973

adopting a research and training programme for the European Atomic Energy Community (direct projects)

(73/177/Euratom)

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 Council Resolution of 17 December 1970 [1] on the detailed rules for the adoption of research and training programmes;

Whereas in the context of the common policy in science and technology the multi-annual research and training programme is one of the principal means whereby the Community can contribute to the rapid formation and expansion of nuclear industries and also to the acquisition and dissemination of knowledge in the nuclear field;

HAS ADOPTED THIS DECISION:

Article 1

A research and training programme as set out in Annexes I and II is hereby adopted for a period of four years from 1 January 1973. The Annexes shall form an integral part of this Decision.

Article 2

The maximum expenditure commitment and staff for implementing this programme shall be 13·8 million units of account and 140 staff for the duration of the programme.

The allocation of funds and staff is shown in Annex II.

The unit of account is defined in Article 10 of the Financial Regulation of 25 April 1973 [2] applicable to the general budget of the European Communities.

Article 3

The programme set out in Annex I shall be subject to review at the beginning of the second year, and then annually in accordance with the appropriate procedures and in the light of the Decisions of the Paris Summit Conference.

Done at Luxembourg, 18 June 1973.

For the Council

The President

A. LAVENS

[1] OJ No L 16, 20. 1. 1971, p. 13.

[2] OJ No L 116, 1. 5. 1973, p. 1.

ANNEX I

DIRECT PROJECTS

NUCLEAR PROJECTS

JOINT PROGRAMME

I. Basic research on materials

A maximum of 5·1 million units of account, and a staff of 50 (including a programme staff of 29), shall be allocated to this objective.

The objective shall include basic studies on solid state physics as the groundwork of applied research on materials and shall consist of:

— studies of the effects of structural changes and cristalline imperfections on the properties of materials;

— studies of transport phenomena and structural behaviour in metals, polymers and other materials.

These activities shall be conducted by the Ispra Establishment.

II. Application of nuclear energy for purposes other than generating electricity (hydrogen production by decomposition of water on the basis of chemical cycles)

A maximum of 6·7 million units of account and a staff of 70 (including a programme staff of 37) shall be allocated to this project.

This objective shall include:

— chemistry studies: thermodynamic calculations, monitoring of unknown reactions, measurements of the physical properties of the compounds used, study of the effect of impurities, etc.;

— kinetics studies: calculation of reaction parameters (kinetics, yield etc.) and continuous simulation on laboratory scale of the various reactions and then complete cycles, again on laboratory scale;

— studies of materials: corrosion tests, firstly for indicative evaluations and then for quantitative measurements of the required materials;

— chemical engineering studies: preliminary definition of 'flowsheets', calculations for cycle optimisation, studies of the problems of coupling chemical processes with reactors.

Initially, emphasis will be placed on defining the data required for evaluating the technical and economic potential of the process, in cooperation with the circles involved.

These activities shall be conducted by the Ispra Establishment.

III. Technical evaluations in support of Commission activities

A maximum of 2 million units of account, and a staff of 20 (including a programme staff of 12), shall be allocated to this objective.

The objective shall include:

— public service activities using systems analysis techniques: collection and analysis of data, preparation of models, development of methods of calculation and codes for use on computers, studies of the results;

— prospection studies of the estimated development of electronic components required for making computers and their peripheral equipment.

These activities shall be conducted by the Ispra Establishment in cooperation with the relevant Directorates general.

ANNEX II

Table of staff and maximum expenditure commitments

Objective	Expenditure in million units of account	Staff
I. Basic research on materials	5·1	50
II. Application of nuclear energy for purposes other than generating electricity (production of hydrogen)	6·7	70
III. Technical evaluations in support of Commission activities	2·0	20
Total	13·8	140

ANNEX II

REVISION OF THE SAFETY PROGRAMME

The research programme in support of reactor safety has been evolving since 1969 in conditions of decline in all those activities of the JRC associated with reactor design and development. During these years the main demands on the JRC from European organizations requiring safety R and D have been predominantly in the experimental domain. This bias towards the experimental side has been convenient in the sense that there is a strong competence at Ispra in the experimental disciplines, and this has ensured a satisfactory execution of the work and a growing volume of activities carried out in collaboration with external bodies.

Examples of major activities in the 1974 safety programme which have developed in this way are the experimental model studies of hypothetical explosive accidents in fast reactors (strongly supported for many years by the DeBeNeLux-SNR and CNEN-PEC projects) and the large rig for the situation of light water reactor blowdown (initiated by a contract with the BMFT*, signed in December 1973). A summary of *all* activities proposed for 1974 is given in Table 1 in which these two particular examples figure as actions 1.1 and 2.2 respectively. In passing, we note here that the Community manpower allocated to the blowdown rig project (2.2) is supported by a further 10 men-years/year paid by the BMFT contract and not mentioned in Table 1.

Table 1 demonstrates clearly the above mentioned bias in favour of the experimental aspects of the safety domain. It will be noted that, out of the total manpower of 115 men-years/year, only 7 men-years/year (6% of the total) are available for theoretical studies. Although justified in the past, this bias is now felt to be inappropriate for the tasks ahead. Above all, we consider that a stronger *theoretical support* is essential for the scientific success of the experimental programmes, particularly those already cited: DBA modelling (1.1) and the blowdown project (2.2). The need for such theoretical support is very basic and independent of the detailed composition of the experimental programmes in the future. In addition to this basic internal need of the safety programme, there are also strong external trends demanding increased theoretical effort. In the forefront of these trends is the need for coordinated European effort in the field of "whole-core accident codes" for the assessment of fast reactor accident evolution. The "Safety Working Group of the Fast Reactor Committee" has established an expert sub-group for this purpose and Ispra has been requested in the official report of this body to play a central role in its activities.

These facts suggest strongly that the manpower available for all of the activities of chapter 5 of the programme (Table 1) must be radically increased. We have estimated that the manpower required for the visualized activities in the field of theoretical accident analysis should be at least 14 men-years/year (instead of the presently available 7 men-years/year) with a distribution roughly as follows:

5.1 DBA modelling theory	4.5 m-y/y
5.2 Blowdown theory and codes	4 m-y/y
5.3 Core accident codes	5.5 m-y/y

This proposal has been given the strong backing of the new "Advisory Committee for the Management of the Safety Programme". The creation of this Committee has greatly eased the task of directing safety research at Ispra in the sense that it brings together, as a matter of routine, safety experts from such major national organizations as the licensing and safety assessment authorities, utilities, industries and research centres.

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*) Bundesministerium für Forschung und Technologie.

The official advice of this Committee (document No. ACS-16-e) explicitly recommends "a strengthening and expansion of the work directed towards..... the development and validation of analytical tools for safety assessment". On blowdown theory and codes, the official advice, "considers that this work is an ideal field of activity for the JRC and recommends a substantial increase in the manpower allocated to it" and on core accidents codes "the Committee considers that the area of activity should be enlarged to include broader accident analysis in the fast reactor field and ..... draws attention to the activities of the Safety Working Group of the Fast Reactor Coordinating Committee and especially its offspring, the expert group on whole-core accident codes".

In conclusions, therefore, a revision of the safety programme is requested in which seven additional theoretical specialists are included, bringing the allowed manpower ceiling from 115 to 122 men-years/year.

Proposed Allocations

1st line personnel:	122 my
primary budget:	644,700 ua
computing machine:	290 hr

TABLE 1

SUMMARY OF THE 1974 SAFETY ORIENTED RESEARCH PROGRAMME

CHAPTER	ACTIONS	1st line pers. PRES.
1. Engineering research associated with catastrophic accidents or their prevention	1.1 DBA modelling, experiment	7.7
	1.2 Stress/Strain/Strain-rate measurements for steels	4.3
	1.3 Thermo-physical properties of core melts	3.5
	1.4 Fracture mechanics: fracture control in fast reactor structures	6
2. Coolant thermohydraulics studies associated with accidents	2.1 Basic depressurization studies; thermodynamic non-equilibrium studies	18.5
	2.2 Blowdown loop project; influence of PWR loops on blowdown	
	2.3 Transient boiling heat transfer in ECC conditions	6
	2.4 Boiling mixing in fuel bundles	6
	2.5 Basic studies on burnout in fuel rod bundles	2
	2.6 Fuel/water thermal interaction, tank experiment	5
	2.7 Fuel/sodium thermal interaction, tank experiment	3
	2.8 UO_2/Na and UO_2/H_2O thermal interaction, channel experiment	5
	2.9 Na-boiling thermohydraulics, basic studies	6
	2.10 Gas behaviour in Na loops. Liquid film characteristics	3.5
	2.11 Sodium thermohydraulics in rod bundles (design and tests)	4
	2.12 Basic analysis of rod bundle thermohydraulics	6
	2.13 Basic sodium boiling studies	3
3. Early failure detection	3.1 Ultrasonic Emission	4.5
	3.2 Neutron noise investigations	1.5
	3.3 Thermohydraulic noise analysis	4
4. Reliability	4.1 System Reliability	3
	4.2 Structural Reliability	4
	4.3 Data acquisition and processing	1.5
5. Theoretical accident analysis	5.1 DBA modelling, theory	2
	5.2 Blowdown theory and codes	2
	5.3 Core accident codes	3

Note: Full details of this programme are given in document No. ACS-18-e submitted to the 'Advisory Committee for the Management of the Safety Programme .

ANNEX III

REVISION OF THE HYDROGEN PRODUCTION PROGRAMME

Introduction

The study of a new industrial process for hydrogen production from water, as a possibility for a wider use of nuclear energy, is in the research phase. The task of the JRC in this phase is:

- to explore the possibilities of finding new chemical cycles for water splitting,
- to define their specific characteristics and to test their feasibility by experimental work.

The research phase must be concluded, in 3-4 years, with the preparation of a dossier containing information and data (probably for a couple of cycles) sufficient to design a pilot plant and to make fairly detailed technical-economic evaluations.

The activities performed at Ispra during 1973 in connection with the above mentioned task gave the following main results:

a) Concerning the search for new cycles, two possible "families", quite different from the already known families of chemical cycles, were defined and are now being studied for preliminary verification; the experimental tests are not yet sufficiently developed for a patent application. Amongst these new ideas, there are some cycles based on iodine, sulphur, oxygen and others based on an organic compound, ethylene. The last tests made for exploring possibilities for variants of the Mark 1 cycle have demonstrated uninteresting results for the Mark 1C and Mark 1S, which use copper and strontium respectively. For other cycles no experimental tests were made for various reasons: some difficulties in the realization of the experiments, less promising characteristics, the need to limit the global effort to a reasonable size.

b) Concerning the more detailed studies for obtaining more information on some selected cycles, work performed during 1973 was concentrated on the hydrolysis reaction of the Mark 1 cycle (and such related problems as physical property measurements) and on the reactions of the iron-chlorine family. Kinetics data were obtained, together with information useful for the realization of chemical reactions in steady state conditions.

   Corrosion tests for preliminary screening of materials resistent to hydrobromic acid and various bromides were completed (temperature from 126°C to 800°C, various concentrations, time up to 5 000 hours); tests with hydrochloric acid were also started.

   The computer programme OPTIMO was prepared, for the determination and optimization of the flow-sheets from the point of view of thermal efficiency and internal heat recovery. The programme has already been applied to calculations for the Mark 7 and the Mark 9 cycles. This last one may be particularly promising having only 650°C as maximum temperature and using iron and chlorine as chemical elements.

The development of the research taking into consideration also the situation of the other laboratories at present involved in these studies has probably reached the critical point at which some important decisions will have to be taken in the near future. We must take into account two important facts:

a) on the one hand, we are in a phase of considerable increase in the number of cycles; as a consequence we have interesting differentiation in the characteristics of the various chemical processes and an already wide range of choice. We can consider that in the near future the exploration of the possibilities will be sufficiently extended as to afford us a reasonable understanding of the potential of this new method;

b) on the other hand, for some of the chemical cycles the information already obtained is sufficient to start making technical economic evaluations, still in a preliminary way but nevertheless useful for making analyses. This will also be necessary for selecting the

promising process in view of the more expensive realizations of complete chemical cycles, and not only of single reactions.

From the above mentioned remarks we can draw some conclusions for the near future:

1) The laboratory tests involved in the search for new cycles and for the study of some critical reactions continue for completing information on the possibilities of these chemical cycles.

2) These studies will be followed by an increase in the program of kinetics measurements, and the experimental realization of complete bench-scale cycles, for some of them.

3) The transition from step 1 to step 2 of the above mentioned experimental work must be preceded by feasibility studies and technical economic evalaution of all the defined and possible cycles.

Work for step 1 is in progress at Ispra and corresponds to the competence of research laboratories. For 1974 the effort may be maintained essentially at the same level as in 1973, except for a few slight re-arrangements.

Work for step 2 will require the contribution of some industrial experience; in order to obtain rapid substantial results, it would be useful to engage industrial companies directly in these realizations. The starting point for step 2 will probably be in 1975, according to the results of the evaluations, which are indicated as step 3.

Work for step 3 is study for feasibility evaluation and economic calculation, based essentially on industrial competence. Work can start immediately, on the basis of available data, in order to gain in one year sufficient information to orient the expensive experimental tests of step 2. The opportunity to shorten the time schedule derives from the evolution of interest in these new process demonstrated by industry all over the world. During the last months in the U.S.A. and in Japan industrial companies have started experimental programmes on thermochemical production of hydrogen from water and will have some results in a short time.

In order to maintain its lead in this field, the European Community should speed up the passage to an industrial application by engaging the cooperation of industry so as to anticipate the bench-scale realizations.

Proposed Programme

According to the previously mentioned considerations, the programme proposed for 1974 is based on the following two points:

- laboratory work at JRC maintained substantially at the same level of 1973;
- increase of the engagement of industry, due to specific competence and the interest in reducing the time factor. This direct engagement of industrial experience could be put into practice, for instance by means of contracts. The subject of the research is well adapted to the characteristics of a common European action.

Proposed Allocations

1st line personnel:	37 my
primary budget:	142,450 ua + 200,000 ua (*)
computing machine:	20 hr

(*) Foreseen for contracts

ANNEX IV

REVISION OF THE REMOTE SENSING PROGRAMME

Introduction

The programme decided in February 1973 by the Council of Ministers was essentially based on the availability at the end of 1973 of the U.S. satellite ERTS-B to perform agricultural investigations in selected test-sites of Northern Italy, Southern France and Madagascar. To obtain the data collected by the satellite during its orbits above the considered test-sites, a proposal of research was submitted in February 1973 to the NASA (*). Due to unexpected delays in the launching of ERTS-B, some images collected by ERTS-A have been made available to the JRC, but in a random and unreliable mode. These images have nevertheless allowed the research staff, after only one year of preparation, to be able to demonstrate, in one case, the validity of the approach which was chosen.

The programme which was proposed contained a very small number of research scientists and technicians (4 men-year for the first line) and a small budget of research (20,000 ua). Due to the lack of experience of the JRC in this completely new field of research, it was, in fact, in 1972, considered that much prudence was necessary and that more ambitious aims should be delayed till a sufficient know-how would be obtained. After an intensive training of 2 physicists in the U.S.A. (NASA, Purdue University, Michigan University) and after the experience accumulated in one year of particular efforts, it is now recognized that the JRC remote sensing research staff has surmounted the first step.

It is now unprobable that ERTS-B be launched before the end of 1974. Although this delay disturbs the initial planning, a large part of the 1974 programme will be executed by substitution of aircraft flights to satellite flights.

Naturally, compared to the initial planning, some activities will be anticipated, some will be delayed till ERTS-B will be in orbit, and the repartition of efforts will be somewhat changed, but it is considered fundamental to obtain in 1974 clear decisive numerical results.

The revision of the remote sensing programme which is proposed corresponds thus to the following requirements:

a) the increase in manpower results from ascertaining that the present research staff is not any more sufficient to perform all the tasks in efficient conditions,

b) the increase in research budget results from two essential needs:

   - need to substitute the expected free available ERTS-B data (in exchange of the JRC results) by aircraft data in order to obtain in 1974 decisive results;
   - need to establish a contract for pre-processing methods, as the NASA pre-processing facilities associated to ERTS will not be available for aircraft flights.

The year 1973 was mainly used for the definition of methodologies to be applied to ERTS-data handling:

- Ground-truth instrumentation.
- Ground-truth preliminary investigations in rice-fields, lysimeters, poplar plantations and beech-forests.
- Rice spectral signatures determination.
- Atmospheric transfer corrections.
- Analog processing of preliminary aircraft flights (2 channel multispectral scanner).

(*) Agricultural investigations in Northern Italy and Southern France (Agreste Project). Proposal NASA No. 28790 in collaboration with the General Directorate of Agriculture, Aid to Development, Scientific Affairs, Statistical Office of the E.C. and several specialized national institutes.

- Thermographic measurements on rice deseases.
- Software elaborations for data processing.
- Microdensitometric processing of ERTS-A data on Italian rice-fields in a limited part of one of the test-sites: inventory (data obtained from NASA in May 1973).

The results will be published in an invited paper to the ESRO European-ERTS-users-Symposium in Frascati (January 1973) and to the 9th International Remote Sensing Symposium in Michigan (April 1973).

Proposed Programme

The criteria followed for this proposal are the following:

- to obtain practical results in order to demonstrate the feasibility of the initial objectives,
- to allow an easy transition between studies corresponding to aircraft and satellite flights,
- to improve the preparation of ERTS-B data processing for a successive better efficiency.

The 1974 activity will consist of:

- Systematic analysis of physiologic and morphologic parameters in lysimeters and in the fields.
- Study of relationships biomass-production.
- Study of diseases detection parameters.
- Continuation of the elaboration of atmospheric corrections and atmospheric transfer models.
- Study of bioclimatologic parameters.
- Campaign of correlated measurements between ground platforms (Cherry-picker) and an advanced aircraft multispectral scanner facility.

This campaign aims at the unambiguous identification of the vegetation species considered in the Agreste project.

- Digital data elaborations in view of thematic maps (using existing adapted and home-made classification softwares).

Proposed Allocations

1st line personnel:	8 my
primary budget:	30,800 + 20,000 ua (*)
computing machine:	200 hr

(*) foreseen for contracts

ANNEX V

REVISION OF THE "NEW TECHNOLOGIES" PROGRAMME

This programme consists of two activities:

1. Primary Materials Recycling
2. Solar Energy

The personnel necessary to carry out this programme was estimated to be 15 men-year (8 for the 1st and 7 for the 2nd activity). During the first year it already became evident that experimental work would not be possible in the frame of "Primary Materials Recycling", because of lack of personnel and we therefore plan to reduce our efforts in this field. On the other hand, better experimental facilities have been found for experimental work in connection with the proposals advanced concerning solar energy, and we suggest an increase in the personnel allocated to this field.

Action: PRIMARY MATERIALS RECYCLING

Introduction

Materials Recycling, i.e. the reutilization of industrial waste, is a process which has already been in use for some time. For example, during the mechanical transformations necessary to turn an ingot into a finished product, there is a production of from 30 to 50% waste. This is "new" waste, relatively pure and easily identifiable, and is normally recycled.

Consequently, one can state that:

- recycling techniques are already familiar,
- the amount of any given material usually recycled is defined by the economical advantage of the process.

Obviously, one can always study special techniques, such as waste selection, or metallurgical treatment, and make improvements which, by changing the economic balance, make a higher degree of recycling possible. This method of procedure, however, incurs the risk that a series of disparate problems will be studied, which are direct industrial applications and which cannot be easily justified as being of interest to the Community.

There are however, two conditions which might influence the economic balance and lead to higher recycling levels:

- the exhaustion of non-renewable sources, and
- the campaign against industrial pollution

In the first case one can make medium to long-term forecaste for an increase in the price of raw materials which will weigh the scales in favour of an increased application of recycling techniques.

In the second case, the existing or foreseeable anti-pollution norms will impose conditions which will render necessary and even economically interesting certain recycling processes which have not yet been performed.

The programme proposed should concentrate upon an analysis of the recycling of several raw materials in danger either of mineral exhaustion, or of becoming pollutants.

In the first case, the material chosen should have a medium term exhaustion forecast. At short term, in fact, one can reasonably suppose that economical compensation mechanisms are already in operation; on the other hand, any extrapolation for long term exhaustion forecasts can only give unreliable indications in view of the continuous evolution of technology. One early choice might be to study lead or tin.

In the second case, the material chosen should present, for one or more types of waste, some industrial pollution problems which necessitate recuperation, and consequently recycling or the substitution of non-pollutant products.
A first choice could be chrome.

Proposed Programme

During 1974 the activities of the JRC will be increasingly influenced by the desire of the Brussels Services to support Commission action in the field of industrial and environmental policies, and a possible raw material supply policy.
With this objective in view and with the hope that the various activities envisaged by the Commission will be realized (in particular that an inventory of the research in progress within the Community will be drawn up), we propose to devote 1974 mainly to developing a system analysis study and not to start any significant experimental work.
In particular, mathematical models will be used to represent the balances of the raw materials under consideration. On the basis of the present state and future consumption forecasts, spread if possible over various sectors of social and industrial activity, as well as available or foreseeable resources classed according to their ease of exploitation, the dynamic evolution of the demand for balance of the raw materials chosen will be studied. In some cases possible substitutions will be taken into consideration, and the value of the various degrees of recycling will be estimated. The model should also permit study of the sensitivity of the system to possible interventions.

The results of these studies, together with the indications drawn from Commission policies, may lead to a future decision to draw up an experimental programme.

For the activities described above, an allocation of 3 my is foreseen.

Action: UTILIZATION OF SOLAR ENERGY

Our research work involves the following items:

1. *Thermal Conversion,* including:
   - *1.1 Habitat* (domestic use of solar energy)
   - *1.2 Power set* (low temperature prime moving)
2. *Quantum Processes Conversion,* including:
   - 2.1 Photoelectric Energy Conversion by Semiconductor Photovoltaic Devices
   - 2.2 Photochemical Conversion
   - 2.3 Biochemical Conversion

Our detailed proposals for the research programme are described below.

1. Thermal Conversion

1.1 Habitat

With appropriate devices, the intercepted solar energy can be collected by solar receivers in which a working fluid such as water or air is heated. The heat is transported by natural or forced convection to an insulated storage tank and is subsequently distributed in the building. Suitable means must be provided for interrupting the heat transport between collector and heat storage during the cold periods of the collector in order to avoid back-flow of heat to the outside.

As for cooling, the energy consumption for air conditioning in summer can impose a very high load on the electric distribution networks. It is shown that it is possible to radiate

substantial amounts of thermal energy into space in the spectral region of a 8 to 13 μm. About 100 W/m^2 can be obtained with a clear sky.

Program Proposal

a) Development and Optimization of Solar Energy Collectors

- Improvement of collection efficiency by means of the use of antiradiation cells (FRANCIA effect) for reducing radiation losses.
- Design and testing of solar collectors using surface multiplication effect by corrugations, gravels etc.
- Design and testing of collector systems operating as automatic thermal valves.

b) Materials

- Measurement of the Radiative Properties of Collector Surfaces.

  The following will be measured:

  . The spectral absorptivity and emissivity respectively and its dependence from the beam direction.

  . Determination of the net absorption efficiency in the conditions of short wave irradiation by natural or artificial sunlight and long wave emission.

- Selective surfaces.

  Development and testing of simple selective surfaces by methods which lend themselves to large scale industrial production, like chemical and galvanic treatment, plasmajet and varnish. Evaluation of metallographic and optical properties, field testing of these materials, i.e. exposure to atmospheric conditions.

- Optical properties of glass.

  Improvement of transmitting properties of glass for the solar radiation and of the reflectance for thermal radiation (work in this field will be treated by specialized glass industries, by means of contracts).

c) Field Tests (solar house)

In order to assess the performance of solar-energy devices under realistic conditions, it is proposed to use and to trasform a wooden plyhouse existing on the ground of the JRC, Ispra, and build identical sections in each of which a particular device can be tested and compared.

1.2 Power Set

The power set systems, although of low "carnot" efficiency, seem to deliver lowest energy prices, are reliable and unsophisticated in design and operation. They correspond thereby to conditions and requirements of developing countries.

Program Proposal

a) Low Temperature Power Set

A high performance flat plate type solar collector should furnish a heat source for a power set of ~ 1 kW net at an operating temperature of ~ 130°C. The prime mover for the tests may be either an organic fluid turbine, a trochoid engine (WANKEL) or a reciprocating engine, powered by either steam or an organic liquid.

As for the prime movers, contacts are established with BORSIG-WANKEL (Berlin) and MENGIN (Montengis, France) to eventually develop together adequate engines. The modalities of collaboration are not yet established.

The test program foresees:

- determination of the Incident Radiation
  - . measurement of the total short wave radiation from sun and sky using a pyranometer of the Eppley-type;
  - . measurement of diffuse sky radiation with the same instrument screening the direct solar radiation;
  - . measurement of the long wave thermal radiation of the atmosphere using an actiometer (type Linke and Feussner);
  - . establishment of the useful power vs. operating temperature diagram;
  - . measurements of power generation as function of seasonal, daytime and cloud variations;
  - . measurements of overall, thermal thermodynamic and mechanical efficiencies at max. and averaged insolation;
  - . start up delays, influence of cloudiness on the dynamics of functioning.

(The General Direction VIII "Support for Developing Countries" is undertaking a study on the use of solar energy in developing countries and will propose a cooperation with the JRC on the design and realization of a power set).

b) A Feasibility Evaluation of Solar Power Sets Foresees:

- Intercomparison of efficiencies of existing laboratory realizations at low and high temperatures.
- Intercomparison of various open and closed thermodynamic cycles in different collector configurations.
- Intercomparison of various potential prime movers.
- Definition of advantages and inconveniencies of possible configurations.
- Feasibility and cost evaluation of complete systems.

14 people (1st line) are foreseen for the work on Thermal Conversion.

2. Quantum Processes Conversion

2.1 Photoelectric Energy Conversion by Semiconductor Photovaltaic Devices

The economy of a solar cell conversion system is determined mainly by the production cost of the converters. Present costs – tolerable for space applications in relation to the overall cost of such projects – lead to electricity expenses which are at the moment about two orders of magnitude too high in respect to the prices for electricity from grid lines. It is likely that a cost reduction by a factor 10 can be achieved by automation of the production processes within the next two or three years.

Program Proposal

The following studies are foreseen:

- Theoretical and experimental assessment of alternative photovoltaic cells: organic cells based on doped dyes or Schottky barrier solar cells.
- Experimental assessment of different concepts which allow a more economic utilization of silicone cells.

2.2 Photochemical Conversion

The conversion of light energy into stored chemical potential energy can be done by photoelectric cells in combination with galvanic batteries or electrolyzers, leading finally to chemical products which afterwards can be used to generate electricity or heat. This process

could be performed also in an integrated manner; it is the aim of the present part of the program to study corresponding methods with the ultimate hope that such integrated processes compared to the separate conversion/storage method would show advantages in respect of efficiency and/or economy.

Program Proposal

The program considers three different aspects of the chemical conversion problem:

a) Light Energy Conversion Bionics

Studies of bionics may elucidate on integrated systems such as natural photosynthesis for the storage of chemical energy by the phosphorylation of ADP (adenosine diphosphate). Direct conversion of light into chemical energy is also possible and could be realized in an efficient way by the choice of suitable redox-systems implemented – if necessary – by sensitizing pigments.

The form in which the chemical energy is produced should also be defined in the course of such a research program.

b) Photoregenerative Electrochemical Systems

Regenerative electrochemical cells combine in an integrated system favourable energy storage characteristics with photo and/or thermal regeneration of cell reactants to produce a closed-cycle electrochemical system.

It is proposed:

- to perform a bibliographic study of the so far known photoreactions with respect to their applicability in photoregenerative cells;
- to perform an experimental investigation of the feasibility of the photoregeneration using selected photochemical reactions;
- to investigate the possibility of combining photo and thermal regeneration.

c) Photoelectrolysis by Solid State Catalysis

Catalytic processes employing semi-conductors or other solid materials are looked for: those materials in contact with electrolytes, when exposed to light, may produce electric charges available for redox reactions.

Initially, it is proposed to perform:

- bibliographic studies on mechanisms and materials,
- experimental verification of partly known processes.

2.3 Biochemical Conversion

The biochemical conversion of sunlight in natural systems of our flora via the photosynthetic production of plant material, has global efficiencies of the order of 0.1%. Intense cultivation, reducing photosynthetic respiration, exposure to low grade light (very northern countries) may increase yields of crops or algae to reach efficiencies of 3% and more. This may be interesting for large scale photosynthetic production of plant materials to be utilized as: heat source for electric energy production, energetic source for gas production, protein source for animal nutrition or source of mineral salts.

Program Proposal

- Bibliographic study and collection of data on nature and possible utilization of the biological material.
- Evaluation of the flora production level in a hypereutrophic system.
- Studies to increase the productivity of a natural system.

9 people (1st line) are foreseen for the work on Quantum Processes Conversion.

Proposed Allocations

1st line personnel:	26 my
primary budget:	100,100 ua + 47,000 ua (*)
computing machine:	25 hr

(*) foreseen for contracts

ANNEX VI

THE FUSION REACTORS PROGRAMME

Introduction

The interesting perspectives opened by the thermonuclear controlled fusion as a means of long term energy production, represent an important stimulus for research and development in this area.

To date, the controlled Thermonuclear Programmes in the world and, particularly, in the Community, have devoted their resources to the problem of understanding the plasma state of matter. Lately, the investigation of the feasibility problems related to fusion power reactor plants has started.

During 1970-72, an analysis has been carried out of the know-how existing in the JRC related to the basic problems of fusion reactors. From this study it appeared that a consistent contribution could be given to the solution of a number of these problems. A first programme proposal was set and technically discussed in the frame of the preparatory work for a multiannual JRC-programme.

In April 1973 this proposal has been submitted for advice to the Liaison Group of Fusion Associations of EEC. The present programme is based on the recommendation given by the Liaison Group in its meeting of 12-13 December 1973.

Conceptual Studies and Related Feasibility Experiments

The JRC disposes of a number of calculation methods and design know-how for such kind of studies. In particular:

- nuclear data libraries and methods for the calculation of breeding ratio, neutron and gamma energy deposition in blanket and shielding, radiation effects (as displaced atoms and helium production rates). A modular code system to deal with these different parts of the nuclear calculation is already in operation;
- thermohydraulics and stress analysis codes to deal with up to three-dimension geometry problems. These codes are based on the "Finite Elements" method and then they are quite flexible;
- design of modular structures for high temperature applications;
- codes for the analysis of fast transients in complex geometries, both in one– and two-dimension approximation.

This experience is being exploited, in the frame of the action undertaken by the Advisory Group on Fusion Technology, to support the Study Groups defined among the Associated Fusion Laboratories of the Community.

Magnetically Confined System Studies

A collaboration has been agreed with the Plasma Laboratory of Frascati and University of Naples for the conceptual design study of an experimental power fusion reactor intended to precede the construction of a full prototype reactor of TOKAMAK-Type. This reactor will have the minimum dimensions compatible with the energy plasma balance criteria and will use well known materials and reactor technology.

The main assumptions made are as follows:

- the blanket should be arranged in a modular form, the modules being of as few types as possible, and limited in number;

- the type of cooling should be the same as that planned for the commercial reactor in order to simulate the engineering problems involved in the blanket structure. Helium as a coolant is considered as a first coolant material;
- owing to the fact that we do not have much experience with irradiation of refractory materials, stainless steel has been chosen as structural material, because it will probably be fully tested in fast breeder fission reactors when the demonstration fusion reactor is constructed. However, the blanket should be designed in such a way that tests on new materials of interest for commercial power stations are possible.

The above mentioned modular arrangement will be adopted, amongst others, to satisfy this requirement.

The JRC work will proceed along the following lines:

- optimization, from the tritium breeding point of view, of the blanket (lithium) dimensions and reflector (graphite or aluminium) position in the blanket;
- survey studies of the possible shielding materials in order to get reasonable neutron fluence and gamma deposition in the superconducting materials (divertors and magnet);
- study of the possible operation modes, including the case with the lithium in the blanket replaced by a non-tritium producing fluid (as for instance, sodium or organic liquids);
- sensitivity analysis to see the operation possibilities related to variations of some of the basic plasma parameters, for instance through the toroidal field or the poloidal current, the dimensions of the reactor being constant;
- analysis of the radiological hasard associated with the use of stainless steel, both from the point of view of operation and waste disposal.

In doing these studies, a continuous improvement of the calculation models and nuclear data is foreseen. The following points will be particular analyzed:

- gamma-production cross-section data, according to the recent evaluations and retrieval codes (LAPHAN series);
- number of energy groups for neutron and gamma calculations;
- kerma factors models;
- geometrical model for stress analysis calculations (two- and three-dimensional approximation);
- compatibility data between lithium-base materials, stainless steel and helium. In this area a limited experimental program is foreseen in order to test the stainless steel corrosion by lithium at high temperatures (more than 500°C) in static and dynamic conditions;
- radiation damage data on conducting (Cu) and superconducting materials.

Inertially Confined System Studies

A collaboration has been agreed with the Plasma Laboratories of the Max Plank Institute of GARCHING for a conceptual design study on inertially confined, laser ignited power reactors.

This initiative has been supported by the Advisory Group on Fusion Reactor Technology as a part of the system studies on different types of power fusion reactors underway in the European Associated Fusion Laboratories.

The conceptual design studies will move in the following areas:

- dense plasma time history;
- pellet production and injection;
- laser and beam guiding;
- containment;

- breeding and heat removal;
- energy conversion.

The study will be oriented to investigate the features of a module of the power reactor system, involving a single explosion chamber, with a power of 200-500 MW^{th}.

The JRC-Ispra contribution will cover the following aspects:

- explosion containment. A number of solutions are being envisaged based on both a "dry" or "wetted" wall concept. In all, evaporation and ablation of the surface material from the cavity characterizes the dominant phenomena to be investigated. A fluodynamic calculation method including as input the time and space dependent energy release by nuclear energy burn, as supplied by Garching, will be developed. The code will deal with the effect of X-rays and charged particles and will enable to determine the vaporization conditions of the wall for different cavity radia and wall materials.

  The thermomechanical effects in the blanket due to the repetitive neutron energy release will be studied with mono-dimensional and bi-dimensional codes (like REXCO) already developed at Ispra in the frame of the containment studies for fast breeder reactors (Reactor Safety Program). In the fusion-by-laser case, the input will be the temperature distribution resulting from the energy deposition.
- breeding, heat removal and energy conversion. For the nuclear calculations (tritium breeding, energy deposition by neutrons and gamma, shielding, radiation damage, etc.) the same modular calculation scheme already referred in the case of magnetically confined systems, will be used. Concerning thermohydraulics codes, the extension to the case of time-dependent problems will be considered.
- a first assessment of the reactor-module layout will be considered in order to see the engineering problems, from operation and maintenance point of view, and then indicate the future lines of investigation for such a type of reactor.

In order to support these studies, the following simulation experiments can be envisaged:

- shock-wave measurements on model containment systems, under repetitive operation. Fusion explosions of a given energy are not easily simulated by TNT explosives of the same energy because the latter should correspond to a much larger impulse. The possibility to employ shock-waves produced by electrical sparks, wire explosions and by intense electron beam heating in alternative to laser heating, should be investigated.
- study of the behaviour of wetted surfaces to be used for the containment under intense energy flux.
- research on blow-down techniques.

Proposed Allocations

1st line personnel:	12 my
primary budget:	36,480 ua (*) + 5,000ua (**)
computing machine:	180 hr

(*) according to the definition of the new experiments in 1975–1976 this figure should be increased;

(**) foreseen for contracts.

ANNEX VII

TRAINING AND EDUCATION

The programme "Training and Education" is new and started officially in May 1973. This annex gives a summary on the "Activity in 1973", "Activities planned for 1974" and an "Extension of the Activity". The activities planned for 1974 will allow to gain valuable experience in order to evaluate the possibilities of adding to the Ispra Establishment a European meeting place. As an extension of the present activities and parallel to them it is proposed to start a detailed study of an institution for which the working name "European Summer Schools" is chosen. This instituion organizes, in collaboration with the professional and scientific national or European societies e.g. European Physical Society, summer schools on an international scale.

I. Activities in 1973

The main tasks during the year were:

- the preparation of a course series "Safeguards and Nuclear Material Control" for new inspectors fo the Safeguards Directorate, Luxembourg, of the European Commission and:
- The preparation of "ISPRA-Courses" on technical and scientific subjects to be offered to possibly interested organizations within the European Community.

1. Course series "Safeguards and Nuclear Material Control"

The course series has been commonly prepared by the lecturers of the JRC Ispra, the Safeguards Directorate and four invited lecturers. The preparation of the course series has been completed in October 1973.

The series consists of four one-week courses.

1) Nuclear Fuel Cycle and Nuclear Material Control Systems.
2) Physics, Health Physics and Statistical Methods.
3) Non-destructive Assay in Nuclear Safeguards.
4) Chemical Assay and Sealing and Identification Techniques in Nuclear Safeguards.

The first two courses will be hold in Luxembourg with the participation of staff members from the Safeguards Directorate as lecturers and invited lecturers from the firms ALKEM (Germany), ENEL (Italy), EUROCHEMIC (Belgium) and NUKEM (Germany). The last two courses will be hold at Ispra with the participation of members of the divisions: Chemistry, Material, CETIS, Nuclear Studies and Health Physics.

2. "ISPRA-Courses"

A survey of fields in which the scientific technical personnel has acquired sufficient competence to organize training courses and to offer them to potentially interested organizations has been performed. The survey gave as result that, judged from the professional competence, 16 courses with a total duration of about 22 weeks can be prepared. For the courses, with the exception of 3, course coordinators have been nominated and work has been started to prepare the course content with the lecturers.

II. Activities planned for 1974

The activities planned for 1974 are:

1. Course series "Safeguards and Nuclear Material Control"

The course "Nuclear Fuel Cycle and Nuclear Material Control" and the course "Physics, Health Physics and Statistical Methods" will be hold in Luxembourg from February 4-15th and the courses "Non-destructive Assay" and "Chemical Assay and Sealing Identification Techniques" at Ispra from March 25th to April 5th, 1974.

2. "ISPRA-Courses" – 1974

The preparation of the content of the ISPRA-Courses continues with the aim of holding the first courses in fall 1974.
One of the main tasks is the creation of the required infrastructure:

- the construction of a lecture hall, and
- the settin-up of an adequate secretariat with the necessary technical means.

3. Summer School 1975 at Ispra

A summer school in the field of physics during the fall of 1975 is being considered.

III. Extension of the Activities "Training and Education"

The activities in this field will be extended by:

- a study on the proposal "European Summer Schools"

This should involve a scientific and administrative secretariat and should dispose of the required facilities: lecture halls and hotel accommodations for the participants and sufficient funds to realize the organization of summer schools on an international scale in collaboration with professional and scientific national and European societies.

It is proposed to prepare the final decision in five steps:

1) Analysis of the situation in Europe.
2) Definition of the goal and extent of "European Summer Schools".
3) Evaluation of the possibilities.
4) Reconsideration and eventually a redefinition of the aims and extent of "European Summer Schools", in the light of the obtained results.
5) Preparation of a precise proposal.

Preliminary Outline of the Problems to be Evaluated for the Proposal "European Summer Schools"

1) Analysis of the Situation in Europe
   - List of existing national institutions with the same purpose, e.g. Erice (Italy), Varenna (Italy), Oberwolfach (Germany),
   - Their budget and indication of the supporting organization.
   - For each institution: list of fields and list of professional societies or groups holding summer schools at these institutions.

   Additional required information:
   - Form of operation and use of the facilities and infrastructure of these institutions;
   - Degree of utilization of these institutions:
     . number of summer schools per year;
     . period of the year, during which they are operating;
     . duration of the summer schools.

- Participation at the summer schools:
  - total number of participants in one year;
  - minimum, maximum and average number of participants at one course;
  - distribution of nationality of the participants and the lecturers,
  - distribution of the languages used for the lectures.

2) Definition of the Aim and the Extent of "European Summer Schools"

Principal Decisions:

- Definition of the goal:
  - summer schools in fields for which exists a certain competence at Ispra, or
  - also in other fields with the cooperation of national professional groups or societies?
- Logistic questions:
  - Use of Club House with additional buildings possible? or
  - Contract with "Hotel Europa", Ispra, or the "ISTUD", Varese? or
  - Construction of new facilities?

3) Evaluation of the Possibilities

The evaluation will require the answering of questions as:

- Statement of interest of potentially interested national professional groups or societies to organize, in collaboration with the Organization, European Summer Schools on a European or international scale?
- Degree of competition by national organizations which, to a major extent, organize already now their summer schools on an international scale?

Cost Estimate for the Summer Schools 1975

A. Basis of the Estimate

- A summer school with a duration of 2 weeks with a teaching staff of about 14 lecturers, 8 from Europe and 6 from the United States, and between 50 and 70 participants.

B. Cost Estimate (in ua)

1. Expenses for the lecturer		15,000
— travel expenses	5,000	
— daily allowances	5,000	
— honoraire	5,000	
2. Grants for students		15,000
— 30 travel grants (Europe)	5,000	
— 30 grants for 12 daily allowances	10,000	
3. Expenses for the proceedings		p.m.
Total:		30,000

Furthermore an investment of about 70,000 ua is to be provided to take care of the necessary modifications of building and facilities.

ANNEX VIII

REVISION OF THE ISPRA-1 REACTOR PROGRAMME

1. Motivation

The decision taken by the Council of Ministers in February 1973 to cease neutron physics activities in the program "Physics of Condensed Matter" and to continue these activities only in the frame of a collaboration with the Max von Laue – Paul Langevin Institute at GRENOBLE had, during the year 1973, very strong consequences on the utilization of the ISPRA-1 reactor:

a) budgetary limitations which obliged to shut down the reactor in the middle of the year;

b) staff limitations (to 15 + 3 local staff) which obliged to use more than half of the previous reactor manpower for the other programs in complicated and unefficient time-schedules;

c) reduction of the available time of the reactor for the 2 activities which were maintained (Shielding-EURACOS experiments and irradiation experiments).

A realistic re-examination of the conditions of ISPRA-1 operation became consequently necessary. The criteria which were followed are the following:

- any new alternative solution must be more economical (manpower or specific budget);
- the interruption must be as short as possible in order not to damage the shielding and irradiation experiments;
- the best utilization must be made of the existing staff;
- the solution should improve the performance of the shielding and irradiation experiments;
- the solution should be examined taking into account the whole 1974–1976 remaining three years plan.

2. Alternatives

Many solutions have been carefully examined like the construction of the simple TRIGA reactor in the ISPRA-1 pool, the use of the ECO pool for a similar TRIGA, but finally only 2 alternatives resulted to be realistic:

- MODIFICATION of the ISPRA-1 reactor for an operation at 500 kW power level in easy operation and maintenance conditions;
- USE OF THE OTHER INSTALLATIONS for the Shielding-EURACOS and radioactivation activities.

2.1 Modification of ISPRA-1

In order to operate the reactor at a low power level (500 kW), a certain number of modifications are necessary in order to benefit from improved safety conditions (start-up, shut-down, control) simplifying strongly the operation and maintenance.

Some of these modifications concern the nuclear pile circuits; they are essentially:

- Loading of the core with only 18 fuel elements.
- Modification of the thermal column.
- Installation of a neutron source for the start-up.
- Elimination of some cooling circuits.
- Adaptation of the nuclear control instrumentation to lower neutron intensities.

Other modifications concern the conventional circuits, like:

- Modification of the cooling tower.
- Modification of the air-lock.
- Automatization of the climatization.
- Elimination of the rotating stabilizers and the Diesel power sets.

2.2 Use of Other Installations and Closing of ISPRA-1

2.2.1 Shielding Experiments:

The continuation of the present experiments with the EURACOS converter (Bench-mark experiments, study of neutron streaming through straight and bent slits) does not imply the use of high reactor powers. Contacts with various organizations and institutes have been taken in order to study the optimal possibilities of the EURACOS transfer. (For instance CESNEF-Milano, University of Pisa, University of Pavia, RCN-Petten). Presently, the possibilities of transfer to Pavia are the most promising.

2.2.2 Irradiation Experiments, Radioactivation:

The ISPRA-1 power reduction at 500 kW would strongly reduce the performance of radioactivation analysis and radiotracers experiments.

A strong improvement for these facilities would be obtained by using the ESSOR high neutron flux associated to better operating conditions (temperature, flux homogeneity).

Installation of an irradiation facility would be necessary; a study presented and discussed in another paper gives all details on the feasibility and costs of such an installation.

2.2.3 Irradiation Experiments, Radiation Damage:

These experiments have already begun in 1973 in the HFR of Petten (Material Science Program). A certain budget has been provided for this activity in the 1974 budget proposal.

The corresponding installations will be improved in order to fulfill the need of the low and high temperatures irradiations.

3. Budgetary Elements

3.1 First Alternative: Modification of ISPRA-1

The 1974 budget decision for ISPRA-1 (chapt. 2.27.0) is given here for the sake of clearness and comparison.

1974	Commitments	
Staff Overtime Technical operating expenditure Purchase of Uranium from USAEC Services to outsiders Infrastructure Central Workshop	224,314 27,000 136,000 p.m. (+ 24,000) 120,182 44,378	15 officials and 3 local staff
	527,874 ua	
1975	532,000 ua	
1976	532,000 ua	

The modification would imply the following expenses:

Staff	200,000	13 officials
Technical operating expenditure (starting from 1975)	45,000	
Bonuses for arduous working	8,000	
Purchase of 18 Uranium elements (4.5 kg of Uranium-235) from USAEC	65,000	(the leasing will end '74 and can not be renewed)
Retreatment of 96 elements (complement)	28,450*	
Retreatment and re-expedition to the USAEC of the remaining 35 elements	29,200	
Leasing during 1974 (13,000 + 8,400)	21,400	
Transport of 25 elements	2,000	
Modification of the reactor loops	100,000	
Add: Purchase of 5.5 kg of U-235 for EURACOS	72,000	

3.2 Second Alternative:

3.2.1 Transfer of EURACOS to PAVIA

	u.a.	
Modification of the converter, of the shielding, and of the cooling circuit		
Adaptation of the control circuits	110,000	
Purchase of the Uranium of the converter	72,000	(new regulations of the USAEC)
Contract for neutrons	5,000/y	
Total	182,000 + 5,000/y	

3.2.2 Construction of a RABBIT in ESSOR:

	u.a.	
Construction of the RABBIT	150,000	
Operating Costs	—	supported by the CNEN
Irradiations during 1974	25,000	
Maintenance	5,000	

* see table 3.2.3

3.2.3 Closing of the ISPRA-1 Reactor:

	u.a.	
Reprocessing of 96 fuel elements	28,450	(total cost:
Renting 1974 of 96 fuel elements	13,000	71,450 ua from which
Transport of 25 elements from Ispra to EUREX	2,000	43,000 ua were paid in
Reprocessing of 33 new elements	32,000	1973)
Renting 1974 of 33 elements	8,500	
Reprocessing of 20 elements EURACOS before transfer	22,000	
Renting 1974 EURACOS	6,500	
	112,450	
Provision for reprocessing prices variations in 1974 (CEA reprocessing)	40,000 (p.m.)	

The closing procedures imply the following operations:

- D_2O evacuation and reprocessing,
- Evacuation of the pool and transport of fuel elements to ESSOR pool.
- Handling and transportation of the EURACOS converter.
- Evacuation of contaminated parts.
- Evacuation of all experimental facilities.
- Cleaning and decontamination.
- Fuel elements reprocessing operations.

The manpower necessary for these operations is estimated to be about 5 men/year (average of 15 people during 4 months).

4. Conclusion

At the light of the previous elements, it appears that the most satisfactory solution is to close the ISPRA-1 reactor and to replace this facility by the transfer of EURACOS to PAVIA, the construction of a rabbit at the ESSOR reactor and the utilization of the PETTEN-HFR reactor.

The following diagram shows the time-schedule and the budget utilization during the 1974-1976 3-years plan.

This budget utilization diagram is presented with the reserve of acceptation of the scheduled closing procedures by the Italian authorities.

a) It is proposed to attribute to the "Information Analysis Office" a supplement of 182,000 ua for the 3-years plan, divided into:

1974 182,000 ua)
1975 5,000 ua) primary charges
1976 5,000 ua)

1 man/year during 1974 will be necessary for the EURACOS transfer project studies.

b) It is proposed to attribute to the Appropriation Account "Scientific and Technical support Chemistry" a supplement of 185,000 ua for the 3 years plan, divided into:

1974	175,000 ua	)
1975	5,000 ua	) primary charges
1976	5,000 ua	)

2 men/year during 1974 and 1 man/year during 1975 will be necessary for the Rabbit project, construction, tests and installation.

c) It is proposed to reduce the 1974 appropriation account "ISPRA-1 Reactor" from 163,000 ua (primary charges) and its staff of 15 men/year to 142,450 ua with a staff of 5 men/year.

d) The total 3-years-plan-expenditure will thus be increased from 491,000 ua to 519,450 ua.

PRESENT ISPRA-I SITUATION

1 / 1 / 74 — 1 / 1 / 75 — 1 / 1 / 76 — 31 / 12 / 76

136.000 UC (primary budget) — 137.000 UC — 137.000 UC
27.000 UC (suppl. working time) — 27.000 UC — 27.000 UC
15 men/year

TOTAL / 3 YEARS

410.000 UC
81.000 UC
Total 491.000 UC

1st ALTERNATIVE

MODIFICATION ISPRA - 1 500 KW

PROJECT MODIFICATIONS, TESTS

13 men / year

100.000 UC (modification)
45.000 UC (primary budget) — 45.000 UC
8.000 UC (personnel costs)

65.000 UC (purchase U)
← 57.650 UC (reprocessing) →
← 23.400 UC (centr. 74 & transp.) →
← 72.000 UC (purchase U-Euracos) →

100.000 UC
90.000 UC
8.000 UC
65.000 UC
57.650 UC
23.400 UC
72.000 UC
Total 416.050 UC

2nd ALTERNATIVE

EURACOS TRANSFER

PROJECT — MODIFICATIONS

110.000 UC (transfer)
← 72.000 UC (purchase U-Euracos) →
5.000 UC (neutrons) — 5.000 UC
← operation costs covered by "Information Centers Programme" →
1 man/year

110.000 UC
72.000 UC
10.000 UC

CONSTRUCTION OF A RABBIT - ESSOR

PROJECT — CONSTRUCTION — TESTS INSTALLATIONS

150.000 UC (construction)
5.000 UC (maintenance) — 5.000 UC
25.000 UC (irradiations)
2 men/year

150.000 UC
10.000 UC
25.000 UC

CLOSING OF ISPRA-I

DECONTAMINATION

112.450 UC (reprocessing and end of rental)
30.000 UC (closing)
5 men/year

112.450 UC
30.000 UC
Total 549.450 UC
(+ 40.000 p.m)

ANNEX IX

REVISION OF THE WASTE DISPOSAL PROGRAMME

This research program includes work on:

1. Pyrochemical Methods

During 1973 thermal decomposition experiments have been carried out with Uranyl and Plutonyl complexes dissolved in binary and/or ternary *eutectuc mixtures of fused nitrates.* The best results have been obtained with a temperature peak at 360°C, followed by a plateau of about 10 hours at 300-320°C. Under these conditions the Plutonium can be completely precipitated in the melt, while the Uranium remains in solution.

2. Actinide "separation"

In the field of the *solvent extraction*, preliminary contracts have been established with CNEN representatives concerning a new type of organic solvent patented as HX70 by CNEN-Casaccia Laboratories. The representatives of CNEN were highly interested in a collaboration with the Ispra Laboratories.

Concerning the research on *separation by Ion Echange* the experimental activity has been started on two items:

- Measurements of Distribution of Coefficients of Actinides on Ion Exchange Media, Organic and Inorganic,
- Distribution of Actinides between Liquid and Solid Phases, during the Concentration of High Activity Waste.

3. Actinide Management

Preparatory work has been performed in the field of Experimental Physics. The activity started consists in the following actions:

- Investigation of the Van de Graaf for nanosecond pulsing.
- Investigation of the electronic counting chain for the time of flight measurements.
- Investigation of the detector calibration procedure for the proton recoil spectrometry.
- Preparation of the experimental block.

4. Self Burying Process of the Waste

Concerning the studies on self-burying several blocks of salt (ca 1 m^3) have been machined to perform sinking tests with electrically heated capsules and different preliminary tests have been done to find out the best working conditions for the electric heaters.

A bibliographic study of the physical properties of the salt has been done but only values up to 400°C have been found; experimental measurements of the thermal conductivity of the salt up to 800°C have been initiated.

Corrosion tests of some Ni-alloys in-fused salt are in progress.

5. Collection and Evaluation of Data

Before starting our program on Waste Disposal and in order to orientate corrently our research, contacts have been taken with Research Centers and experts. The material collected and the data already published will be elaborated by a systematic analysis.

The allocation for 1973 has been of 75 men/year (40 of the 1st line) and 160,000 ua.

During the first year there has been a lack of manpower (15 professionals mainly in the chemical studies), due principally to the impossibility of recruiting chemical scientists. However, the work was mostly concerned with equipping the laboratories and did not require a great deal of skilled assistance. The real problem will be to find now the scientists necessary to achieve the envisaged work.

We intend to bring the research staff up to 32 professionals, which would enable us to carry out our program. The official number would be anyway decreased by 8 men/year. This reduction does not mean great disaccordance to the work proposed initially, since the work on Actinide Management (including Nuclear Data Updating) can be largely supported by the program INDAC; this support allows to reduce to 2 men/year instead of 7 men/year the contribution to this action of the program.
Other small differences can be generated by internal rearrangements of the research teams.

Proposed Allocations

1st line personnel:	32 my
primary budget:	147,200 ua
computing machine:	83 hr

ANNEX X

NEW ACTIVITIES OF THE PETTEN ESTABLISHMENT

At its meeting on 5 February 1973, the Council approved the JRC's multiannual research programme, which was drawn up on the assumption that the Petten establishment was to be closed down. The Council, however, requested the Commission to present suitable proposals for the Petten establishment as well (Doc. R/422/73 (ATO 25)).

At the Council meeting on 2 April 1973, the Commission stated that it whished to present new proposals as soon as possible, and in any event before the end of 1973. A working party was set up with the specific task of drawing up these proposals (Doc. R/1371/73 (ATO 105)).

The proposals were formulated on the basis of the following criteria:

a) the infrastructure and the skills of the Establishment are to be taken into account;

b) a disproportionately large reduction of the JRC staff at Petten is to be avoided; the number of staff as at 31 December 1972, that is approximately 160, must be considered as the minimum which can ensure the effective overall operation of the Establishment;

c) in the course of the multiannual programme, the Commission intends to concentrate at Ispra the research on materials association with reactors.

The programme proposals are set out below. They cover a period of three years from 1 January 1974, and involve a staff of 72 (all lines) at the end of the programme. The JRC staff employed at Petten would thus number 167*.

The proposed programme can be divided into two headings:

a) technical and scientific activity in the field of chemistry in support of certain of the Commission's departments. This proposal is geared in particular to the especially extensive requirements of the Administration of the Customs Union department.
This technical support activity should, however, become more clearly defined in time in other sectors as well, such as "technical barriers to the movement of goods", agriculture, etc.
This activity will be limited in the early stages, but will increase in importance progressively and may become the nucleus of a new vocation for the Establishment.
This work would have to develop in close contact with the competent Commission departments and in consultation with the national laboratories.
The work carried out for Administration of the Customs Union department could usefully be coordinated by the Committee on Common Customs Tariff Nomenclature set up by the Council (Regulation No 97/69, OJ No L 14/1 of 21 January 1969) and in particular by its Chemistry Subcommittee.

b) Research activity in the field of carbon technology and chemistry. The various research subjects proposed concern problems inherent in the protection of the environment, energy supplies and certain special uses of graphitic materials. This proposal enables the best possible use to be made of the special skills acquired over a period of many years at Petten in the field of graphites for nuclear uses.

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*) It should be pointed out that operation of the HFR is ensured by a decision on a complementary four-year programme from 1 January 1973 (with a staff of 95).

PROPOSAL No. I

SCIENTIFIC AND TECHNICAL SUPPORT FOR THE DEPARTMENTS OF THE COMMISSION

1. General Introduction

The contacts that have been made with a number of the Commission's departments have shown that there is an urgent need for a more direct form of scientific and technical support than has been available in the past. The need for opinions and support in the chemistry field and in allied fields has been stressed in particular.

In the establishment of the programme of action, the accent was laid on the problems of the Administration of the Customs Union department (known as "ACU"), since these problems are of a well-defined nature and can thus be tackled without delay.

1.A Definition of the Structure Peculiar to ACU

Council Regulation (EEC) no 97/69 of January 1969 emphasized the necessity for the nomenclature of the Common Customs Tariff to be uniformly applied and set up a committee composed of representatives of the Member States and chaired by a representative of the Commission to implement the measures laid down in the regulation.

The Tariff Division of ACU is responsible for the administration of the Common Customs Tariff. Its staff has to contend with problems of a scientific and technical nature which it is unable to resolve without expert advice.

A case in point is the preparation of tariff descriptions which call for an exact definition of a product, or group of products, with a precise indication of its chemical or physical properties, and the problems of classification which call for reference to methods of chemical analysis or other scientific methods.

Hitherto, this advice has been supplied on an ad hoc basis, partly by various national customs laboratories and partly by private laboratories. For a number of years, however, ACU has been trying to set on foot a system enabling it to obtain a more organized form of technical and scientific assistance from an independent laboratory. A number of countries have set up laboratories specializing in customs procedures and responsible for supplying tariff administrative with the scientific and technical assistance they need.

The creation by the Commission of a unit to back up ACU would in no way disturb relations with the customs laboratories of the Member States, whose task it is to supply their respective customs administrations with analyses and opinions.

1.B Other Problems

Similar problems are encountered in the departments responsible for the removal of technical barriers to trade. This work involves similar methods of work to those of ACU (mixed committees) and derives from the Commission's responsibilities concerning the harmonization of legislation; thus there is close collaboration between ACU and these departments.

2. Programme of Action

This proposal provides for the use of the Petten establishment to give direct scientific and technical support on problems connected with chemistry.

2.A Actions Concerning ACU

In this context, it is proposed that the Petten establishment be assigned the following role:

- to supply ACU with the scientific and technical advice that is necessary for the preparation of the common customs tariff and the rules which ACU is responsible for administering;
- to supply scientific and technical advice to resolve, within the common customs tariff, the classification problems that come before the Commission;
- to draw up proposals for harmonizing the methods of analysis and inspection to be used by the customs laboratories in the Member States;
- to promote cooperation between the Commission and customs laboratories in the Member States, to constitute a forum for the discussion of current technical problems and to ensure an effective and rapid exchange of information;
- to offer possibilities for the joint training and further training of the staff working in the customs laboratories;
- to advise and assist the customs services of the developing countries in respect of scientific and technical problems;
- to create consultative services for the developing countries which have, on various occasions, requested technical assistance from the Commission.

In the long term, the laboratory could also offer the Member States additional facilities: for example, it could acquire expensive equipment which would be made available to the national laboratories; it could also have facilities for the training and further training of customs laboratory staff and customs officials.

2.B Other Actions

A support service comparable to that described above, essentially involving expertise in the chemistry field, is also of interest to other departments, in particular those responsible for regulations in the fields of agriculture and the free movement of goods.

3. Execution of the Programme

3.A Initial Measures

Discussions with the government laboratories and with senior officials of ACU and other departments have clearly shown that it is impossible to supply effective scientific and technical support without first having accumulated a considerable amount of experience in the field in question. In order to overcome this difficulty, it is proposed that the building-up of the personnel and the tacking of the work be carried out.

The action to be undertaken should begin with coordination work involving:

- the establishment of the effective communications between the laboratory, the department of the Commission responsible and the competent national authorities by means of the creation of a technical secretariat and the appointment of the necessary officials to carry out this liaison work;
- the creation of working parties responsible for defining the laboratory method to be chosen for tackling the problems to be dealt with.

3.B Commencement of Work

The next stage would consist in bringing in alongside the JRC staff experienced personnel seconded from the appropriate administrative department of the Member States to form a joint team.

It would be appropriate, moreover, to begin with a training programme which would enable the staff to acquire a sound understanding of this type of work.

At the end of the three-year period, the staff at the Petten establishment responsible for this work should be at full strength.

It would be desirable for the members of the national customs laboratories to look upon Petten as a general-purpose centre where informal meetings can be held to discuss current technical problems and their possible solutions, and in the long-term as a centre for the exchange of technical information.

3.C Management Committee for the ACU Support Unit

A management committee will have to be set up as soon as possible in order that this unit can have the maximum degree of effectiveness and its work can be suitably coordinated. This committee would be composed of the heads of the government laboratories responsible for customs work and of representatives of ACU and of the Petten establishment.

Its responsibilities would be the following:

- to give opinions on organization and equipment;
- to plan the work undertaken;
- to take decisions on priorities.

4. Range of Activities

The detailed activities and their order of priority will be decided by the competent departments of the Commission case by case. ACU, for its part, will act in agreement with the management committee mentioned above.

Below is a preliminary list of the first-priority fields.

4.A Fields for which ACU is Responsible

- Milk and milk products.
- Oils and fats.
- Sugar, cocoa, cereals- and fruit-based preparations.
- Residues of the food industry.
- Petroleum and similar products.
- Products of the chemical industry.
- Plastic materials and synthetic rubber.
- Ceramic products.
- Common metals.

4.B Fields Connected with Agriculture

- Development and comparison of methods of analysis to verify criteria for composition and purity.
- Development of sampling which guarantee that random samples are representative.
- Assistance on scientific and technical problems involved in authorizing the use of certain constituents in food stuffs (vegetable fats in chocolate-flavoured products, for example) or in fixing specific limits.
- Supplying data on specific subjects (bibliographical studies, available methods of analysis, etc.).

4.C Fields Connected with the Free Movement of Goods

- methods for the analysis of fertilizers;
- methods for the analysis of cosmetics;
- determination of the biodegradability and toxicity of detergents;
- listing of dangerous substances;
- processed foodstuffs.

In view of the fact that the support activity implies work carried out in the short term, the mapping-out of a multiannual programme for all the staff would constitute a limitation on the range of such support operations. It is nevertheless desirable that a longer-term programme of activity be presented each year. The programme proposed for 1974 is set out in an annex to this document.

5. Budgetary and Staff Requirements

5.A "First-line" Requirements

	1st-line staff at the end of the 3-year period	Specific appropriations over 3 years (u.a.)
Technical secretariat, liaison officials, information services, etc.	9	20,000
Training programme and secondments	3	–
Technical and scientific activities	18	140,000
Total: first-line staff	30	160,000

5.B Heavy Equipment

At the moment, it is impossible to make a detailed analysis of heavy equipment requirements. An upper limit of 150 000 u.a. is proposed.

5.C Secondment from National Laboratories

An amount of 0.2 million u.a. would be set aside to meet the mission expenses of officials from national laboratories seconded to Petten for an extended period in the context of the collaboration between laboratories.

This action will only begin during the second year.

5.D Total Budget for Three Years

The total number of staff, including general services and the administration, is 40. The total budget is approximately 2,000,000 u.a.

PROPOSAL No. II

STUDIES ON THE RAW MATERIALS DERIVED FROM COAL

1. General Introduction

The aim of this proposal is to enable the best possible use to be made of the knowhow and equipment which has now been available at Petten for some seven years in a field of research the importance of which to the Community is going to be considerable — the field in question being the technology of carbon.

In recent years, this Establishment has been in the forefront of research and development in the field of carbon, and more particularly in the areas of studies on structure, behaviour under irradiation and the influence of corrosive environments on the graphites used in the nuclear industry. Techniques such as direct-image electron microscopy, X-ray diffraction studies on crystalline properties, chemical reactivity, etc., have reached a degree of quality at Petten which is acknowledged by all the specialists in this field.

Henceforward, this knowhow will be directed towards research on the raw materials obtained from coal and their possible applications.

These studies could prove a worth-while construction towards making more economic use of the products supplied by the coal industry. A similar activity, though directed more towards the technical aspects than to basic studies, has already been provided for by the Commission in its medium-term programme of technical research on coal, which was undertaken for a five-year period pursuant to Article 55 of the ECSC Treaty (Official Journal No 15/C 74 of 10 July 1972).

2. Problems of Carbon Technology

2.A Removal of Dust and Sulphur from Coal with a View to its Use as Fuel

Since a considerable increase in the consumption of energy is forecast for the next two decades and our dependence on uncertain supplies of crude oil will become even greater, it appears that coal and the coal industry will demand increased attention and more intense research work.

It is highly probable that a coal-processing industry will develop, and it is almost possible to establish a direct parallel between the coal industry of the future and the oil-refining industry of today.

One of the principal reasons for the development of the coal-refining industry as a matter of urgency is the increasing number of conditions imposed by environmental protection considerations, which will prohibit the large-scale use of coal with a high sulphur content. At the present time, the bulk of environmental protection work is concerned with the purification of fine gases. A better solution is to eliminate the sulphur during the refining of the rough coal. This process will be fairly costly but the expense will be compensated for in part by the improvement in the coal quality. Instead of the coal being used directly in the form in which it is extracted from the mine, a fully operational industry would be available to process the coal into a standardized product which could be used, not only for all its present applications as a fuel, but also as a raw material for a number of chemical products.

2.B Coal Extraction by Liquefaction using Solvents

The processing of coal is based essentially on extraction by organic solvents and by hydrogeneration.

The most ambitious long-term objective of these studies is the extraction of coal at a lower cost and under better safety conditions by means of in situ liquefaction with the aid of solvents and hydraulic transport to the surface. Similar techniques are already employed for washing out depleted oil wells. The indications are, therefore, that the technological difficulties raised by coal liquefaction using solvents can be overcome at essentially competitive prices.

2.C Raw Materials Obtained from Coal

The raw materials obtained from coal are also becoming increasingly important on account of the growing shortage of coke obtained from the refining of crude oil (petroleum coke). At the present time, the European Community is already importing two million tonnes of petroleum coke per annum. A few years ago, petroleum coke was a by-product, if not a waste product, of the oil industry, which was diposed of by burning in distillation plants. Nowadays oil refineries consider it as being of commercial value, but the primary aim in crude oil refining better fuel oil yields, which involves cracking at lower temperatures and little or no output of high-carbon-content materials. We can thus expect a serious shortage of the raw materials derived from oil-refining even though the steel and aluminium industries will be consuming ever greater quantities of carbon or graphite electrodes.

2.D New Uses

Carbon-based materials are being used increasingly for the treatment of waste water and waste gases, and the use of active granules seems destined to expand tremendously.

Future environmental standards will generate a need for very large quantities of activated charcoal for use especially in the treatment of waste water; this will be true whatever process (biological or physico-chemical) takes over as the principal method for the treatment of waste water.

At the present time, activated charcoal is manufactured from animal or vegetable raw materials. The sharp increase in demand and the particular specifications required for the treatment of waste water will oblige manufacturers to make use of raw materials of mineral origin, and especially those obtained from processed coal.

Smaller quantities of isotropic coke are required as a result of the development of high-grade graphites for particular applications in the nuclear, aerospace, biomedical, metallurgical, etc., sectors. These applications are having a considerable impact on modern technologies and the importance of studying these materials should not be underestimated.

3. Nature of the Proposed Work

3.A The Process of Carbonization

Underlying this research programme is the fact that there can be no process in carbon technology without a better understanding of the chemical and morphological processes of carbonization.

This programme should make it possible to design and produce carbon microstructures to meet the specifications peculiar to each intended use.

Recent work has shown that the morphology of carbon and graphite products is established when the raw material (generally a complex organic material derived from oil or

coal) passes through the final stage of the liquid phase of carbonization. This stage is characterized by the transformation of the mass undergoing pyrolysis into a viscous liquid crystal, partly ordered, which is known as the carbon mesophase. As a result, the choice of the process used to control the morphology and the properties of the end-product depends to an appreciable extent on the chemistry of the initial material. It is now a matter of exploiting this new technology by endeavouring.:

a) to improve the quality of conventional products by a more effective control of the microstructure, that is, by applying specific conditions of carbonization to selected raw materials;

b) to provide a more adequate scientific base for the development of new methods, not by random tests, but by the conscious application of our understanding of the behaviour of the mesophase during carbonization.

The general objective of the programme described here is thus to determine the technological basis for the manufacture of carbon and graphite products with specific morphologies. Although the main lines of future fundamental research on the carbon mesophase can be laid down now, the application of this technology to the development of specific products will have to be finalized after consultations with the interested parties.

3.B Raw Materials

The solvent extraction of coal gives rise to widely differing products depending on the type of coal and the extraction process used. Research in this field has so far been concentrated on coal desulphurization methods. The systematic research into the properties of these products from the point of view of their coking and graphitization has received far less attention.

4. Proposal for a Research Programme

The research programme that has been drawn up comprises three sections:

4.A Solvent Extraction of Coal

It is proposed that systematic research be carried out into the crude materials obtained from the coal extracted by solvents. The research should consider different varieties of coal and different methods of extraction. The essential aim of the study is to produce a wide range of chemical products which would constitute a suitable basis for the carbonization studies (see Proposal B).

A further objective is to assess the various solvent extraction processes with a view to their large-scale application in connection with the use of coal as a fuel.

4.B The Technology of Carbonization

The technical objective of the programme consists in sudying the way in which the morphology of carbon and graphite products can be controlled, and consequently in studying their properties by selecting the organic raw materials and by varying the different parameters of the carbonization process. A great effort should be made to improve the relationships between the molecular structure of the raw materials and the structures formed by pyrolysis.

A substantial effort should be devoted to studies on heteroatomic impurities (sulphur, oxygen and nitrogen) from the point of view of their influence on the formation of microstructures and of their affinity for certain microstructural constituents.

Quantitative data on the stability and the life (expressed in terms of time and

temperature) of the plastic state of the mesophase might be obtained for different types of mesophase structures. A study will be made of the kinetics of hardening and an attempt will be made to establish the temperature-time transformation curves similar to those which are used to characterize metallurgical transformations. The deformability and the characteristic curves of the mesophase will be observed and the effects of deformation on structure and plasticity will be determined.

The previous studies on the response of the hardened mesophase to thermal treatments up to graphitization temperatures will be extended to cover the different types of structures and to measure the physical properties which are of special importance in the manufacture of carbon- and graphite-based components. The process of densification will be studied, since it affects the overall mesophase and the dimensional changes at the microscopic level parallel and perpendicular to the orientation of the lyers of the mesophase.

Measurements of hardness and porosity will be carried out in parallel with the micrographic observations. Close attention will be paid to the phenomena of fissuration and contraction, since they make the interior accessible to impregnation or absorption products, and the fine porosity resulting from the release of heterogenous atoms will be determined by absorption measurements.

4.C Analysis of Certain Application and Case Studies

Under this heading, studies will be undertaken with the object of:

a) making an economic evaluation of certain proposed industrial applications based mainly on carbon;

b) defining, if possible, specifications for the materials in question and manufacturing new products on a laboratory scale.

As regards applications, particular attention will be paid to:

a) activated charcoal for the treatment of waste water;

b) special graphites for biomedical, metallurgical, aerospace, etc., applications.

5. Budget and Staff Requirements

5.A First-line Requirements

	1st-line staff at the end of the 3-year period	Specific appropriations over 3 years (u.a.)
Solvent extraction work involving different types of coal	4	50,000
Study on pyrolytic behaviour and on morphology control	10	150,000
Case studies and practical analyses	8	100,000
Total	22	300,000

5.B Heavy Equipment

Most of the heavy equipment is available. The budget will need to make provision for an appropriation of 130 000 u.a. to be applied principally to the purchase of a scanning microscope.

5.C Total Budget for Three Years

The total number of staff, including general services and the administration, is 32. The total budget is approximately 2,000,000 u.a.

ANNEX XI

REVISION OF THE 1974 JRC PROGRAMME

Summary table of proposals for changes by objective

Objective	No. of staff in programme (*)	Proposals +	Proposals −	New staff (*)	OBSERVATIONS
1. Waste	40	—	8	32	The definition of this programme in 1973 has enabled the first-line staff to be stabilized at 32 Community servants (cf. Annex IX).
2. Pu and TPu:					
— joint	63	—	—	63	Routine progress of programme.
— complem.	42	—	—	42	No change proposed.
Materials:					
3. — 'A'	50 (79	(	(	(	Experience in 1973 showed the need for a slight readjustment of first-line staff to assure better use of scientific and technical services without changing either the substance or the general pattern of the programme. For reasons of coherence and efficiency, an amalgamation of the two programmes 'A' and 'B' is suggested.
4. — 'B'	29 (	— (	5 (	74 (	
5. Reactor safety	115	7	—	122	In view of the normal course followed by the experimental part of this programme, a need was noted for greater theoretical support; it is proposed to increase this from 7 to 14 man-years, thus bringing the first-line staff from 115 up to 122 Community servants (cf. Annex II).
6. Data processing	31	—	—	31	Routine progress of programme. No change proposed.
7. Analysis office	27	—	—	27	Routine progress of programme. No change proposed.
8. CBNM	92	—	—	92	Routine progress of programme. No change proposed.
9. Assistance to operators	23	—	—	23	Routine progress of programme. No change proposed.
10. Training	10	—	—	10	Programme entering active phase. No change proposed.
11. Supervision of fissile materials	27	—	—	27	Routine progress of programme. No change proposed.
12. Research under contract	5	—	—	5	No change proposed. The part of the MAL (Medium Activity Laboratory) funded under this programme should be reduced in 1974 by the award of two contracts to the value of about 100,000 u.a.
13. Direction	55	—	—	55	The staffing indicated represents the status quo. Consideration should also be given to reducing the number to 30, certain management activities then coming under general budget (decision awaited from the Commission. cf. Annex XIII).
14. H F R	95	—	—	95	Routine progress of programme. No change proposed.
15. Ispra-1	15	—	15	0	The use of other installations should give the best chance of securing profitability from the services provided to date by Ispra-1, the closure of which is proposed (cf. Annex VIII).
16. C B R					
— 'A' (					Routine progress of programme. No change proposed.
— 'B' (	39	—	—	39	
17. Environment					
— 'A' (					Routine progress of programme. No change proposed.
— 'B' (	93	—	—	93	
18. Remote sensing	4	4	—	8	Completion of the first phase means that a proposal can be made to increase the number of first-line staff under this programme to 8 (cf. Annex IV).
19. New techniques					
— solar energy	7	16	—	23	The definition of this programme and completion of the first phase make it possible to propose an appreciable staff increase (cf. Annex V,sec.2). It is proposed to confine the initial programme to systems analysis studies and accordingly to reduce to 3 the first-line personnel engaged on this project (cf. Annex V, sec.1).
— recycling	8	—	5	3	
20. Hydrogen	37	—	—	37	Programme in progress. No change in staffing proposed. An increase of 150,000 u.a. in specific functs is, however, requested, so as to raise the contribution of outside bodies via contracts (cf. Annex III).
21. Assistance to Commission	12	—	—	12	Programme following normal course, under the responsibility of the Directorates-General concerned, charged to the general budget in the 1974 Budget.
22. Fusion	0	12	—	12	New programme confined to conceptual studies and the corresponding feasibility studies on the basis of the Fusion Liaison Group's recommendation of 12-13 December 1973 (cf. Annex VI).
23. Petten	0	52	—	52	New programme for the Petten Establishment, consisting of two main activities: studies on coal and back-up for customs union administration activities (cf. Annex X).
24. COST-11	4	—	—	4	For the record. Programme following normal course under the COST-11 agreement.
TOTAL	923	+91	−33	981	

*) Personnel engaged directly on research.

ANNEX XII

TOTAL PROPOSED RESOURCES IN PERSONNEL AND APPROPRIATIONS

1. The review of the objectives adopted by the Council on 14 May and 18 June 1973 does not in itself entail any direct effect on the total volume of the four-year programme (see Table 1), but it does entail a number of rearrangements or readjustments between objectives.

   On the basis of the 1973 budget estimates, an estimated time schedule of expenditure has been drawn up (see Table 2). The rate of expenditure for 1973 and 1974 has been restricted by the existence of a staff deficit (in all numbering about 40) resulting from conservative and reorganization measures at the start of programmes and from the departure of 94 employees under special termination of service measures (the "volontariat").

   From 1975, it is planned to bring the numbers employed up to the personnel authorized (see Tables 3 and 4) It should be noted that in 1973, besides a proportion of the increases for wages and salaries and for services provided, unscheduled expenditure on the completion of previous programmes was absorbed into the budget.

2. The expenditure and personnel required for the proposed new activities at the Petten establishment (1974-76) are shown in Tables 2 and 3 bis respectively.

3. The creation of an overall reserve is also necessary in order to meet pay increases not included in the original estimates, whether increases decided by the Council (officials) or increases resulting from local labour market conditions (establishment staff, local staff and staff performing certain services).

   An anticipative fraction of this reserve could be entered in each annual budget and formally allocated, for example, in September each year, in accordance with the data from the previous June-June period.

   At that same time, the budget for the succeeding year is being negotiated, and the reserve in question would be determined accordingly.

   This system constitutes a kind of "shielding plan" and should provide a constant view of the progress of the work and the trend of expenditure.

   Assuming that the pay increases are 10% per annum (5% on 1 January and 5% on 1 July), the amount of the overall reserve would be 22.7 million u.a. (see Table 2), a fraction of which would be estimated and corrected each year.

4. The time schedule of direct expenditure and the overall reserve are reduced through the transfer to other general chapters of the action "technical evaluation to assist the Commission", decided by the Council in 1974 (about 1,3 million u.a. for the 1974-76 time schedule). The transfers of certain functions proposed as part of the review would have the same effect.

TABLE 1

FOUR--YEAR PROGRAMME ADOPTED BY THE COUNCIL ON 14 MAY AND 18 JUNE 1973

OBJECTIVES		STAFF		INITIAL APPROPRIATION
Ref.	Description	1st-line	Tot.	
(1) JOINT PROGRAMME				
2.11	Waste processing and storage	40	75	6,900,000
2.12	Plutonium & transpl. elements	63	126	13,000,000
2.13	Materials science	50	89	8,500,000
2.13.1	Basic research on materials	29	50	5,100,000
2.14	Hydrogen production	37	70	6,700,000
2.21	Reactor safety	115	232	21,100,000
2.22	Applied data-processing	31	51	6,050,000
2.23	Information analysis office	27	51	5,100,000
2.24	Central Bureau for Nuclear Measurements	92	170	20,350,000
2.25	Technical support to power plant operators	23	60	6,100,000
2.26	Training	10	15	1,450,000
2.27	Use of the Ispra-1 reactor	15	25	2,200,000
2.28	Technical assessment to assist the Commission	12	20	2,000,000
2.30	European data-processing	4	7	1,000,000
2.40	Research under contract	5	17	1,850,000
2.51	Standards and reference materials	39	71	6,200,000
2.52	Environmental protection	93	172	15,850,000
2.53	Remote sensing of the earth's resources	4	10	1,050,000
2.54	New technologies	15	30	3,050,000
2.90	Direction and coordination	55	79	8,100,000
		759	1420	141,650,000
(2) COMPLEMENTARY PROGRAMME				
4.11	Plutonium and transplutonium elements	42	84	8,650,000
4.12	Supervision and management	27	57	5,400,000
4.13	H F R	–	95	23,000,000
		69	236	37,050,000
			1656	
	Biology infrastructure	–	20	
	COST-12 infrastructure	–	6	
(3)	T O T A L	828	1682	178,700,000

TABLE 2

GENERAL PATTERN AND TIME SCHEDULE OF 1973–76 PROGRAMME[1]

Headings	1973[7]	1974	1975	1976	Totals
ISPRA, KARLSRUHE, GEEL AND PETTEN (HFR)					
Staff pay [2] (Officials	17,695,154	19,552,432	20,903,274	21,697,598	79,848,458
(Establishment staff	2,952,347	4,132,153	4,089,545	4,212,231	16,386,276
(Local staff	2,305,251	2,412,804	2,461,437	2,535,280	9,714,772
(Total	23,952,752	26,097,389	27,454,256	28,445,109	105,949,506
Services provided (with increasing staff seniority) maintenance, cleaning, running expenses [3]	3,500,000	3,818,840	3,933,405	4,051,407	15,303,652
Operating appropriations [4]	12,611,030	(1,300,000[5]	14,502,648	15,206,833	57,446,842
		(13,826,331			
TOTAL	40,063,782	45,042,560	45,890,309	47,703,349	178,700,000
PETTEN ESTABLISHMENT (NEW ACTIVITIES)					
Staff pay (Officials	(8)	683,214	911,790	963,930	2,558,934
(Establishment staff	–	112,288	124,215	167,314	403,717
(Local staff		15,418	23,820	40,890	80,128
(Total		810,820	1,059,825	1,172,134	3,042,779
Operating appropriations		486,800	639,750	577,594	1,704,144
TOTAL		1,297,620	1,699,575	1,749,728	4,746,923
OVERALL RESERVE					
Estimate of pay increases [6] (O, ES, LS	1,373,000	3,010,000	6,300,000	9,820,000	20,503,000
(Services	–	290,000	700,000	1,180,000	2,170,000
RESERVE	1,373,000	3,300,000	7,000,000	11,000,000	22,673,000

(1) Leaving out of account transfers, either already or still to be effected, of certain activities falling outside the research budget (in 1974: Technical assessment to assist the Commission')
(2) With increasing seniority of staff: 1.038 percent per annum for officials and 1.03 percent per annum for other Community servants. These estimates do not take into account recruitment proposals in respect of some of the staff concerned (doc. COM(74) 16).
(3) With increasing staff seniority of 1.03 percent per annum.
(4) With a change of about 5 percent per annum.
(5) Investments of the CBNM.
(6) With a 10 percent per annum change in wages and salaries (5 percent on 1 January and 5 percent on 1 July).
(7) The total and the reserve are in accordance with the 1973 Budget.
(8) Expenditure absorbed in the 1973 Budget (mainly from 'staff awaiting assignment to a post').

TABLE 3

STAFF AUTHORIZED FOR 1974–76

(Ispra, Karlsruhe, Geel and Petten (HFR) Establishments)

O = Officials
ES = Establishment staff
LS = Local staff

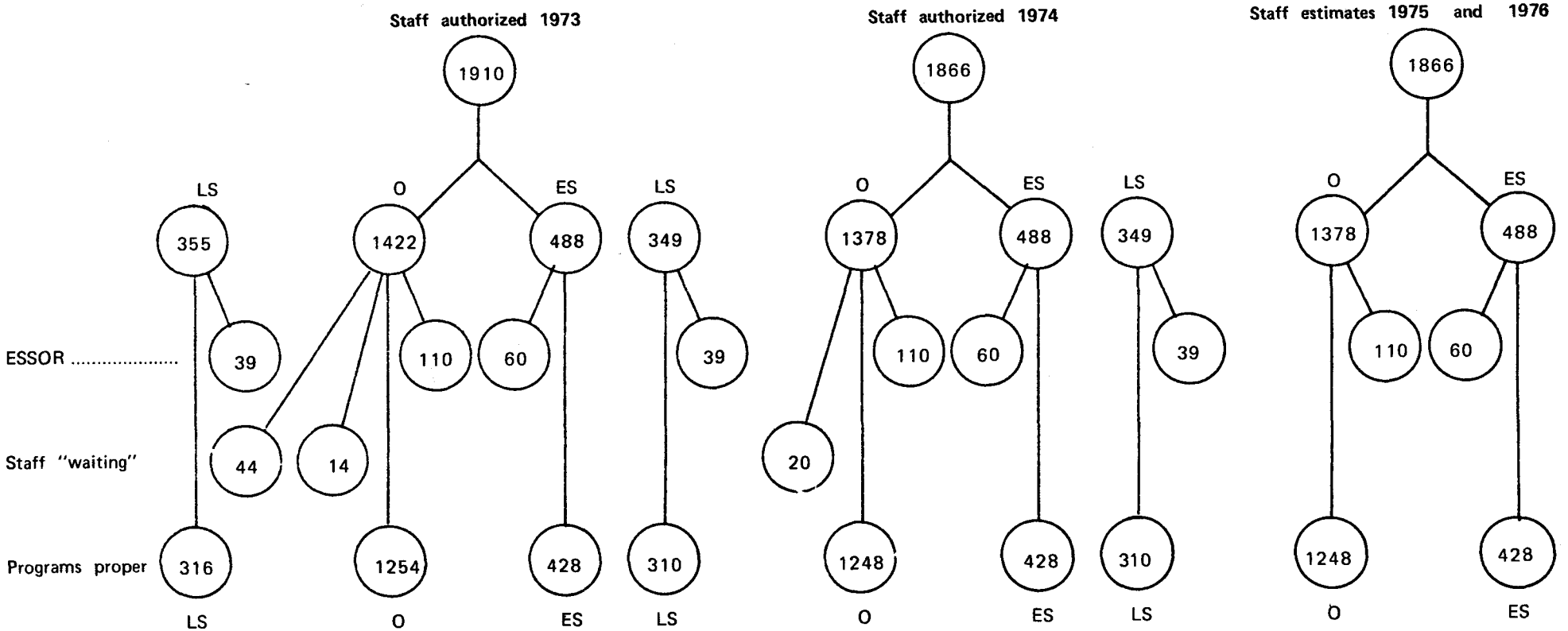

TABLE 3 bis

STAFF 1974–76

PETTEN ESTABLISHMENT (NEW ACTIVITIES)

O = Officials
ES = Establishment staff
LS = Local staff

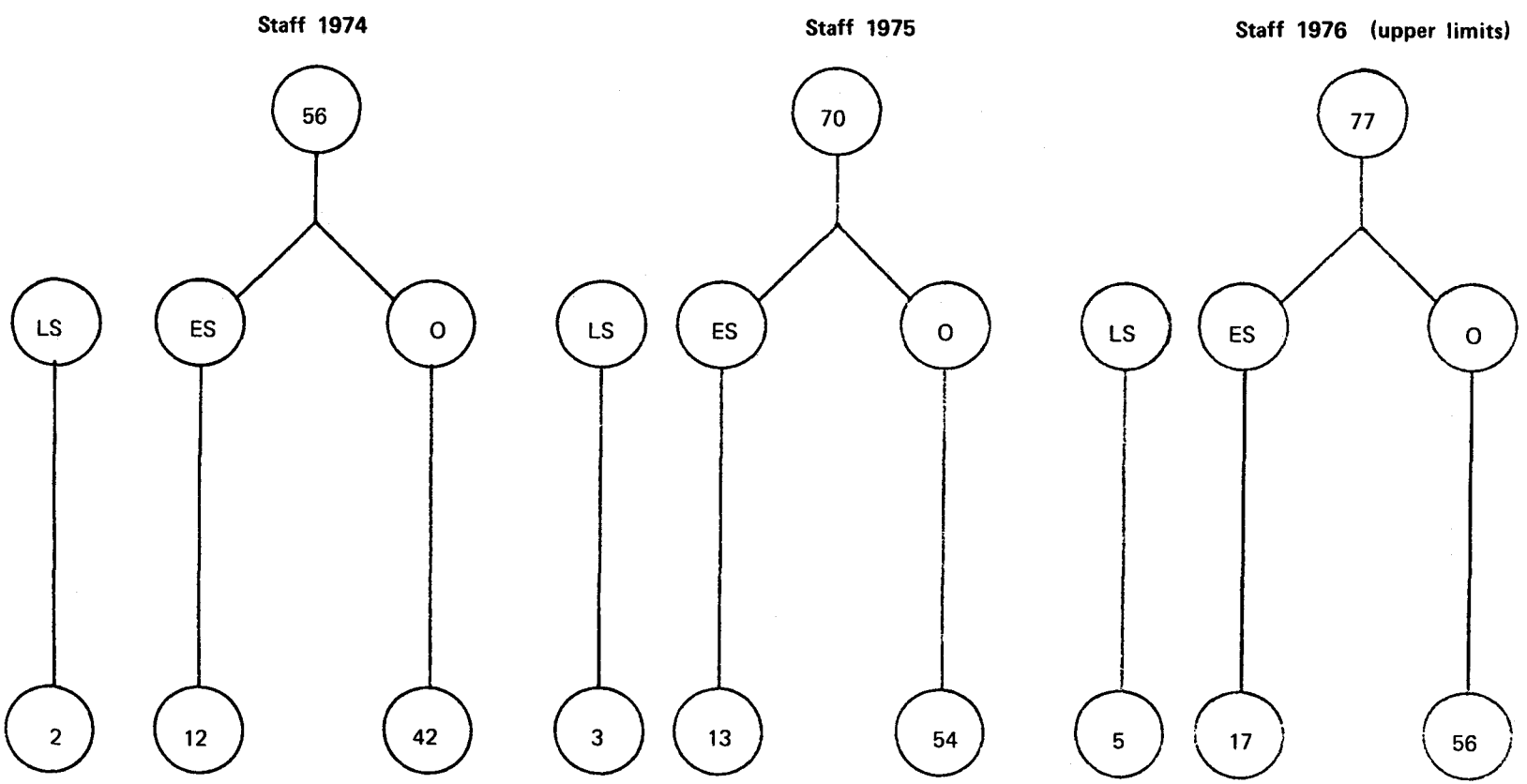

TABLE 4

STAFF AUTHORIZED PER CENTRE FOR 1973 AND 1974

(Officials and establishment staff according to the appropriation accounts in the Budget)

	Ispra		Petten	Karlsruhe	Geel	Total	
	1973	1974	(1)			1973	1974
First line				63 (PC) 42 (PCR)			
'Direct'	561	561		105	92	758	
Infra 1.50	69	73				69	
Ispra-1	15	15				15	
Dir. Gen.	55	55				55	
	700	704				897	901
Infrastructure (1.20 incl. gen.dir. infrastructure	289	279		27 18 45	27	361	351
Services (1.30)	182	182		14.4 9.6 24	30	230	236
Major install. (1.40 excl.)	36	36		21.6 14.4 36	21	93	93
H F R			95			95	95
TOTAL both programmes	1207	1201	95	210	170	1682	1676
of which COST 12 infra)	(6)	(0)					

(1) Estimates for Petten:

		1974	1975	1976
new activities	1.50	34	47	52
	1.20	16	16	16
	1.30	4	4	4
	Total	54	67	72
H F R	1.40	95	95	95
	Total Petten	149	162	167

ANNEX XIII

ISPRA ESTABLISHMENT

DETAILED BREAKDOWN OF STAFF BY OBJECTIVE

(TOTAL STAFF = 1171 AFTER TRANSFER OF CERTAIN MANAGEMENT FUNCTIONS TO THE GENERAL BUDGET)

	SCIENTIFIC DIVISION		SCIENTIFIC AND TECHNICAL SUPPORT					MAJOR INSTALLATION		Infra(3)	Carried over + other uses	Total rev. programme	Total present programme
	1st line	Direct Service	Design Office	Workshop	Electronics	Chemical	Planning	Computer Centre	MAL				
Waste processing & storage	32	4	2.10	1.20	1.80	1.20	0.30	0.80	–	11.9	0.8	56	75
Materials	74	10	4.70	13.10	1.80	2.60	0.20	0.90	–	29.5	2.0	139	139
Hydrogen production	37	5	1.80	6.80	1.00	2.40	–	0.20	–	14.9	1.0	70	70
Reactor safety	122	15	2.80	32.10	4.80	0.60	4.40	2.40	–	50.7	3.1	238	232
Applied data processing	31	5	–	0.50	–	–	–	3.00	–	10.8	0.7	51	51
Information analysis office	27	3	0.80	3.90	2.10	0.20	0.50	2.10	–	10.9	0.7	51	51
Assistance to power plant operators	23	3	1.60	4.50	1.60	1.00	–	0.10	8.0	11.8	2.3	57	60
Training	10	2	–	–	–	–	–	–	–	3.3	0.2	15	15
Use of Ispra-1	–	–	–	–	–	–	–	–	–	––	–	–	25
Assistance to Commission	12	1	0.80	–	0.90	–	0.50	1.10	–	4.5	0.3	21	20
COST-11	4	t.e.	–	–	0.60	–	–	0.20	–	1.3	0.1	6	7
Research under contract	5	t.e.	–	1.50	–	–	–	–	6.0	3.4	1.8	18	17
Standards and ref. materials	39	5	0.70	6.90	1.10	1.30	1.30	1.10	–	15.2	1.0	72	71
Environment	93	12	1.70	11.20	5.60	5.70	0.50	0.80	–	35.9	2.2	169	172
Remote sensing	8	1	0.30	1.10	0.90	0.60	1.30	1.70	–	4.1	0.3	19	10
New technologies	26	3	1.80	9.60	0.50	0.60	–	0.10	–	11.4	0.7	54	30
Supervision of fissile material	27	3	0.50	5.00	4.00	2.60	0.20	0.20	–	11.7	0.8	55	57
Fusion	12	1	0.40	0.80	0.30	0.20	0.80	0.80	–	4.5	0.3	21	–
Directorate general	30(4)	–	–	–	–	–	–	–	–	8.2	1.0	39	79
Biology	–	–	–	–	–	–	–	–	–	20	–	20	20
Other uses	–	–	–	7.80(1)	–	–	–	7.50(2)	–	4.0	–	–	–
TOTAL	612(4)	73	20	106	27	19	10	22	14	268(4)	–	1171(4)	1201

(1) of which: biology 0.3; infrastructure 2.4; support for electronics 0.6; support for chemistry 1.4; Medium Act. Lab. 3.1

(2) of which: infrastructure 3.2; design office 0.1; support for electronics 0.1; support for chemistry 0.1; Medium Act. Lab. 0.1; major installations CBNM 0.2; outside parties, incl. ESSOR 3.7

(3) Figures for guidance only; actual breakdown in proportion to total wage bills for staff attached to scientific divisions, services and major installations.

(4) 30 persons performing management duties are transferred to the general budget.

ANNEX XIII bis

ISPRA ESTABLISHMENT

DETAILED BREAKDOWN OF STAFF BY OBJECTIVE

(TOTAL PERSONNEL = 1201)

	SCIENTIFIC DIVISION		SCIENTIFIC AND TECHNICAL SUPPORT					MAJOR INSTALLATION		Infra(3)	Carried over + other uses	Total rev. programme	Total present programme
	1st line	Direct Service	Design Office	Workshop	Electronics	Chemical	Planning	Computer Centre	MAL				
Waste processing & storage	32	4	2.10	1.20	1.80	1.20	0.30	0.80	–	11.8	0.8	56	75
Materials	74	10	4.70	13.10	1.80	2.60	0.20	0.90	–	29.3	2.0	139	139
Hydrogen production	37	5	1.80	6.80	1.00	2.40	–	o.20	–	14.8	1.0	70	70
Reactor safety	122	15	2.80	32.10	4.80	0.60	4.40	2.40	–	50.3	3.1	238	232
Applied data processing	31	5	–	0.50	–	–	–	3.00	–	10.8	0.7	51	51
Information analysis office	27	3	0.80	3.90	2.10	0.20	0.50	2.10	–	10.8	0.7	51	51
Assistance to power plant operators	23	3	1.60	4.50	1.60	1.00	–	0.10	8.0	11.7	2.3	57	60
Training	10	2	–	–	–	–	–	–	–	3.3	0.2	15	15
Use of Ispra-1	–	–	–	–	–	–	–	–	–	–	–	–	25
Assistance to Commission	12	1	0.80	–	0.90	–	0.50	1.10	–	4.4	0.3	21	20
COST-11	4	t.e.	–	–	0.60	–	–	0.20	–	1.3	0.1	6	7
Research under contract	5	t.e.	–	1.50	–	–	–	–	6.0	3.4	1.8	18	17
Standards & ref. materials	39	5	0.70	6.90	1.10	1.30	1.30	0.10	–	15.1	1.0	71	71
Environment	93	12	1.70	11.20	5.60	5.70	0.50	0.80	–	35.6	2.2	168	172
Remote sensing	8	1	0.30	1.10	0.90	0.60	1.30	1.70	–	4.1	0.3	19	10
New technologies	26	3	1.80	9.60	0.50	0.60	–	0.10	–	11.3	0.7	54	30
Supervision of fissile material	27	3	0.50	5.00	4.00	2.60	0.20	0.20	–	11.6	0.8	55	57
Fusion	12	1	0.40	0.80	0.30	0.20	0.80	0.80	–	4.4	0.3	21	–
Directorate General	55	–	–	–	–	–	–	–	–	15.0	1.0	71	79
Biology	–	–	–	–	–	–	–	–	–	20	–	20	20
Other uses	–	–	–	7.80(1)	–	–	–	7.50(2)	–	4.0	–	–	–
T O T A L	637	73	20	106	27	19	10	22	14	273	–	1201	1201

(1) of which biology 0.3
infrastructure 2.4
support for electronics 0.6
support for chemistry 1.4
Medium Act. Lab. 3.1

(2) of which infrastructure 3.2
design office 0.1
support for electronics 0.1
support for chemistry 0.1
Medium Act. Lab. 0.1
major installations CBNM 0.2
outside parties, incl. ESSOR 3.7

(3) Figures for guidance only; actual breakdown in proportion to total wage bills for staff attached to scientific divisions, services and major installations.

ANNEX XIV

OTHER ESTABLISHMENTS

DETAILED BREAKDOWN OF STAFF

Establishment	Scientific divisions	Scientific & technical support	Major installations	Infrastructure	TOTAL
Inst. for Transuranic Elements					
– Joint programme	63	24	36	27	210
– Compl. programme	42			18	
C B N M	92	30	21	27	170
Petten					
– H F R	–	–	95	–	95
– New activities (1)	52	4	–	16	72

(1) Estimated staff for 1976