

COMMISSION OF THE EUROPEAN COMMUNITIES

COM (76) 395 final

Brussels, 23 July 1976

PROPOSAL FOR A COUNCIL DECISION Reviewing the energy
research and development programme adopted by the Council's
decision of 22 August 1975 (75/510/EEC)

(Submitted by the Commission to the Council)

COM (76) 395 final

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

Re : Review of the Research and Development programme in the field of Energy.

1. INTRODUCTION

1.1. By its decision (75/510/EEC) of 22 August 1975,* the Council adopted an energy R & D programme for a four-year period starting on 1 July 1975.

The Commission is responsible for the implementation of this programme which is to be carried out in two stages. The first stage extends from 1 July 1975 to 31 December 1976 with an appropriation of 12 million u.a. and the second from 1 July 1977 to 30 June 1979 with an appropriation of 47 Million u.a..

The aims of the programme are as follows :

- Energy conservation
- Production and utilization of hydrogen
- Solar energy
- Geothermal energy
- Systems analysis : development of models

The work involved will mainly be carried out under contract.

1.2. Article 4 of the decision (75/510/EEC) of 22 August 1975 states :

"The programme shall be reviewed at the end of the first year, after the Scientific and Technical Research Committee (CREST) has delivered its Opinion, so that any amendments to the programme resulting from that review can be implemented by the beginning of 1977 at the latest.

1.3. The present communication gives the reasons which have led the Commission to propose the review decision (Annex II). This proposal takes into account the result of discussions with different groups and persons concerned with implementing the programme (especially with the different ACPMs which assisted the Commission with its execution of the programme).

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*) O.J. nr. L 231 of 2 September 1975

1.4. After evaluating the performance of the programme (point 2) the document sums up the situation of each objective of the programme (point 3). The conclusions resulting from this are given in point 4.

The list of amendments proposed by the Council's decision (75/510/EEC) of August 22 1975, as well as the Council's decision concerning the programme review are found in annexes I and II.

2. STATE OF IMPLEMENTATION OF THE PROGRAMME

2.1. Activities

The first ACPM meetings took place between end of September (Systems analysis, Energy conservation, Solar energy) and mid October (Hydrogen, Geothermal energy). These followed after numerous meetings of specialists whose objective was to define in detail the scientific guidelines.

The first call for tenders was published in October 1975.

In parallel to this, standard contract terms, rules for diffusion of knowledge, proposal forms, information sheets etc. were elaborated and an organisation structure was set up to handle the expected requests and proposals.

About 450 research proposals received within the deadline have been assessed by the Commission's services and the ACPM's. Those selected are either under negotiation or already engaged by contract.

A certain number of expert contracts (mainly for project leaders) have been concluded since December 1975.

It is to be expected that most technical negotiations for those contracts to be concluded in the first phase of the programme will be finished by end of July 1976. Their administrative handling will then have to be spread over several months.

About 150 proposals arrived too late for being considered. It is to be seen if they can be taken into account in a second round this year, once the first bulk of contracts is signed, or if they have to wait for the next year.

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2.2. Collaboration with JRC

From the very beginning of the first phase a close collaboration was established between those in charge of the present programme and the different JRC services competent in energy R & D. Certain tasks of great importance for the implementation of the programme were undertaken by JRC representatives : secretariate of ACPM, scientific project leadership, chairmanship of working groups, assessment of research proposals etc. This has ensured a systematic harmonization between the different sectors of direct and indirect action.

2.3. First results

It is premature to expect scientific results from the programme.

However, certain positive coordination effects have already been observed. An intensive exchange of information on programmes and research carried out in the different countries has started to take place continuously during the ACPM meetings as well as among the members of the numerous working groups. This fills a flagrant gap observed since the first meetings : the gap of mutual information on activities going on elsewhere in the fields of common interest.

This coordination effect has led to concrete cases of collaboration between institutes and firms of different member countries, and in some instances even to common research proposals.

2.4. Financial situation

At the end of June the financial situation concerning the research contracts and those involving the engagement of experts (project leaders) will be as follows :

.../...

ANNEX B

Objectives	Credits already authorized	Contracts already signed or authorized or being approved	Balance available
Energy Conservation	2.239.984	604.590	1.635.394
Production and utilization of hydrogen	2.155.263	1.816.368	338.895
Solar energy	3.495.393	3.172.781	322.612
Geothermal energy	2.592.925	1.738.060	854.865
Systems Analysis	553.032	513.000	40.032

3. THE FIVE PROGRAMME OBJECTIVES (as of June 1976)

3.1. Energy Conservation

A call for proposals was launched in October 1975. About 160 replies have been received in time to be considered in a first round (about 100 proposals arrived much too late and will have to be processed later on). A Commission participation of about 12 Muc (first year) was requested. This exceeds the Commission's possibilities by at least a factor of six, but probably by more, because in certain cases it will not be possible to conclude contracts with one year's duration only.

The Commission, on advice of the ACPM, has selected a number of these research proposals by taking into account not only the quality and the overall energy impact of the proposed work, but also the fact that the first phase of this programme was meant to be exploratory.

35 proposals were selected for further consideration by the Commission. Many of them will have to be reviewed from the technical and financial point of view in the light of recommendation given by ACPM. Quite a number of proposals were dealing with work partly done and published elsewhere.

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ANNEX IB

The bulk of proposals (42, mostly paper studies) was registered in the field of "evaluation of the specific energy consumption of equipment, processes and techniques". 7 of them - dealing with topics ranging from oil refinery to steam turbines and building material industry - have been accepted in principle.

Proposals in the field of "storage of secondary energy" seemed to be particularly expensive (18 proposals, Commission participation requested : 12 Muc), probably because of practical development work to be included necessarily.

"Energy conservation" is a very broad theme for energy R & D and at this stage the ACPM found it difficult to develop a strategy by giving priority to one or several of eight fields with respect to the others.

Conclusion :

The majority of the delegates of the ACPM for "Energy conservation" felt that credits superior to those already designated would become necessary when the experimental research started in the second phase. However, the Commission does not think it necessary to ask for an increase of credits for this objective for the reasons given in section 4.3..

3.2. Production and utilization of hydrogen

A call for tenders was launched in October 1975, as a result of which about 100 research proposals had been received. Those 92 proposals which arrived in time to be dealt with in the ACPM meeting of 2/3 February, 1976 (after having been pre-assessed by the Commission and its 3 project leaders), can be subdivided as follows :

Thermochemistry (project A)	: 12
Electrolysis (project B)	: 25
Utilisation (project C)	: 52
Miscellaneous	: 3
	<hr/>
	92

For project A, for which almost 60% of the total "hydrogen" budget had been foreseen in the Commission's communication COM(74)2150, only 12 proposals had been received. Several of them were either premature or too ambitious to be accepted in the present state of the art and should have been preceded by exploratory research. Some proposals which were finally accepted, will have to be severely re-negotiated.

In the field of hydrogen production by electrolysis of water (project B), several projects were accepted for studies aiming at improving anodes and diaphragms used in conventional (low and medium temperature) electrolysis.

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There are good prospects for setting up an efficient collaboration between the different contractors. Not enough work has been proposed in the field of high temperature electrolysis (use of membranes and of solid organic electrolytes) and there seems to be a gap to fill by stimulating more proposals.

For project C (utilisation of hydrogen) more research proposals had been received than for projects A and B together. This is probably due to the fact that it is easier to undertake studies on uses than to do experimental work on production of hydrogen.

But, to the Commission's view the latter should remain the primary objective of the programme.

The part of the programme devoted to hydrogen storage should not be confined to studies on small scale storage (vehicle propulsion being not for the immediate future). Some work on industrial-scale (medium-size) storage and on the distribution of hydrogen should be envisaged (add chapter to project C).

Although the second phase will imply some very expensive experimental work (which, together with inflation should be reason enough to ask for a substantial increase), the Commission thinks that it should be possible to conduct a reasonable programme without increasing the financial appropriation.

Conclusion :

Besides adding a chapter on storage and distribution to project C, no modifications of the Council decision are requested.

3.3. Solar Energy

A public call for proposals was published in January, 1976 for projects A + C of this group. Bearing in mind their special nature the research or study proposals were taken from a list worked out by the project leaders and the Commission and approved by the ACPM.

On project A (Application to dwellings) it had been recommended by ACPM - in order to avoid proliferation of proposals - to limit the first call for proposals to the following topics :

- storage of solar energy, and
- systems studies.

About 50 proposals have been submitted to the Commission. Commission participation requested is of about 2,2 Muc (first phase). Funds available for the whole project A are 0,58 Muc.

By far most proposals are coping with studies of heating systems for dwellings and buildings.

They will be assessed at the ACPM meeting of 27/28 April 1976, 21 of them were selected for "first priority".

ANNEX B

Project B (power generating sets) is, for the moment being, coped with by a series of study contracts (about 100.000 U.C) aiming at preparing specifications and at identifying those problems which require further research. It is hoped that at the end of these studies it will be possible to take a decision on the construction of a 1 MW pilot plant.

Project C (photovoltaic conversion) About fifty proposals have been received and have been assessed by ACPM on 27/28 April 1976.

On the basis of discussion in the working group and in ACPM it is suggested to add two lines to the description of project C as given in the Council decision, namely

- new or improved encapsulating materials
- data collation.

Project D (photochemical, photo-electrochemical and photobiological processes) has led in the first phase, to a set of 20 contracts (some already concluded and the rest to be concluded in the near future), in the field of fundamental research aiming at the production of hydrogen by photochemical reactions. The other aspects of the programme can only be tackled in the second phase, given the reduced funds available. It should be envisaged to increase funding of this chapter in the second phase.

Project E (photosynthetic production of organic matter) suffered also from the very low funding available. Three contracts are under way for studies on agricultural residue (straw) utilization for energy production and one contract is being negotiated on energy plantations in Ireland.

Theoretical studies on various other aspects of conversion processes will be made in the second half of 1976.

Project F (data network relating to solar radiation) just started in these days with setting up a working group which should define the first actions. It was felt that these actions could not be started before the other projects of the programme had defined their needs for data. The working group will cope with data on meteorology and climatology and with standardisation of their measurement.

Conclusion :

Besides adding two new lines within project C no changes of the Council decision seem to be necessary.

Financial appropriation should be kept as a whole as it was foreseen. Some shifting in the internal distribution of allocations between projects (increase of projects D and E) could be made without increasing the total envelope (but this does not require modification of the Council decision).

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3.4. Geothermal energy

No public call for proposals was made for this part of the energy R & D programme because the delegates of this ACPM had through their own competence a sufficient understanding to designate the private and public groups capable of carrying out the research in this area. The proposals were introduced via the national delegations to avoid a proliferation of tenders. Proposals received in time (end of March '76) can be subdivided as follows :

Acquisition and collation of existing and new data (project A)	27
Improvement of methods of exploration (project B)	34
Sources of hot water (low enthalpy) (project C)	13
Steam sources (high enthalpy) and hot rocks (project D)	20

They have been discussed at ACPM meetings of 16 and 30 March 1976, after having been thoroughly looked at by the Commission and its project leaders.

Regarding project A it has been observed that the authorities of 5 countries have applied for carrying out the compilation of existing national data within the Community programme.

For compilation of new data many projects have been proposed. Some of them require shallow drilling work (150 to 200 m). Much survey work is to be carried out in potentially favorable areas.

Within project B for which also proposals were submitted coming from almost all countries, investigation of "favorable" zones is foreseen in order to determine their real geothermal potential. It has appeared however, that the original programme description laid down in COM(74)2150 (not in the Council decision, which is broader) which refers only to the use of geophysical methods, should be broadened by adding geochemical methods.

Proposals for project C and D, aiming at evaluation of the possibilities of extraction and of valorisation of geothermal energy, have mostly been introduced by those member countries who have a proven geothermal potential and who thus consider such technological work as foreseen in those two projects, as particularly promising. The other countries practically confined their proposals to projects A and B.

With respect to work on hot dry rocks (which is actually included in project D) it has been felt by ACPM that it should become the subject of a separate chapter. The Commission could accept this, if unanimity is reached on this point.

The Commission, in agreement with ACPM, would be in favour of choosing

.../...

ANNEX B

one or two test sites of common interest, on which, after thorough prospecting work, some deep drilling and even exploitation tests could be made. However, such an undertaking would require additional funds of several MUA. The Commission suggests not to increase the overall funding of the programme now, but to bring special cases to the attention of the Council if and when appropriate.

Duration of the programme is considered acceptable, if some latitude for exceptions (a few contracts) is given.

Conclusion :

Besides creating a separate chapter for "hot dry rocks", the programme can be kept unchanged for the second phase.

3.5. System Analysis : development of models

The working scheme for the first phase of the systems analysis' part of the energy R & D programme is based on a detailed report elaborated by an ad hoc expert group created by ACPM at its first meeting in September 1975. This report foresees a work programme, subdivided into four working levels, in order to give a clear operational structure to the programme, the primary aim of which is to create a tool for enabling the Commission to analyse alternative energy strategies for the Community (policy aspect) and to supply guidance to its energy R & D actions (long term R & D aspect).

The contracts to be concluded were selected on the basis of this report and after approval by ACPM (no public call for proposals was made). The first group of 6 contracts have been approved by the Commission and the remaining (about 4) are in the process of being approved.

On level I it is envisaged to conclude a contract with the Queen Mary College, London, in order to test the potential and the usefulness of its energy world trade model (Deam), which not only is intended to give more insight into the development of the oil/gas and world trade system, but also to provide input (boundary-conditions) for level II.

Level II aims at developing a European energy flow model. This includes building up of an energy reference data base, the necessary software for data management, coupling with a simulation model and with an energy flow optimization model, both developed out of existing models. In this system an attempt will be made to endogenize demand by an input/output model (EXPLOR).

The aim of this effort is to analyze the effects of possible changes in the energy supply situation on the economical system.

Several contractors will collaborate in order to fulfill this task, which during the first phase, will be applied to a single country.

.../...

On level III it is suggested to adapt to the Community the "integrated energy model" developed by KFA Jülich for Germany, in order to study the interactions between energy demand, supply, economy and environment, and the effect of alternative energy strategies.

This requires further methodological development. First results are expected at the end of the first phase.

Level IV investigates certain aspects linked to the work of the other three levels and develops certain sectional submodels.

Two Belgian and one Italian contractor are involved in this work.

It is obvious that at this stage of the programme results are not yet available. It is expected however, that by the end of 1976 the software related to the levels II and III will be ready in order to perform test runs and make the first case studies.

The second phase of the "energy systems analysis and modelling" programme should be a logical development of the initial phase (without excluding however incorporation of new interesting proposals).

In this initial phase emphasis had been laid on starting with the extension of existing static and dynamic models and by improving the necessary data base in order to get tangible results and the required know how within a reasonable time, before tackling the difficult task of setting up more comprehensive European models, as foreseen in the second phase.

Conclusion :

For the second phase the basic concept of the system analysis programme should remain unchanged, as well as the foreseen funding.

Somewhat more accent should be put on development of "long term" models (energy demand), but this does not change the text of the Council decision.

4. GENERAL CONCLUSION

4.1. Given the state of implementation of the programme, it does not seem indicated to make any major changes in the programme such as decided on August 22, 1975.

4.2. The technical and scientific content of the programme such as described in the Council decision and in document COM(74)2150 is still valid.

For this reason the Commission, as result of the experience gained while implementing the programme and bearing in mind the conclusions reached, after consulting the different Advisory Committee on Programme Management (ACPM), now proposes only the joining or separation of certain projects or sub-projects in the text of the annex of the Council's decision. (Production and utilization of hydrogen, solar energy, geothermal energy.) These modifications do not affect the basic decision as

it was initially made by the Council. Annex I gives the amendments proposed with respect to the annex to the Council decision of 22 August 1975.

- 4.3. On the financial side the Commission does not feel it necessary to increase the total amount allotted for the second phase (47 Muc).
As regards a redistribution of funds between different projects, the Commission proposes to maintain the breakdown as it was decided on 22 August 1976.

The priorities and financial estimates established at the adoption of the programme still are fully valid.

- 4.4. CREST, at its meeting of 28 and 29 June 1976, approved the proposals of the review presented by the services of the Commission.
Concerning the repartition of the financial appropriation between the 5 projects of the programme, CREST recommended that the Commission be authorized to modify it within a limit of 10% of the appropriation allotted per project depending on the results obtained by the middle of 1978.

SUMMARY OF PROPOSED AMENDMENTS
TO THE COUNCIL DECISION OF 22.8.75

DURATION : unchanged

FUNDING : unchanged

TECHNICAL CONTENT

1. Energy conservation
unchanged
 2. Production and utilization of hydrogen
Project A : unchanged
Project B : unchanged
Project C : add two sub-projects
 4. Studies related to the problems of industrial-scale (medium-sized) storage of hydrogen
 5. Studies of the possibility of using existing pipelines for the distribution of hydrogen
 3. Solar energy
Project A : unchanged
Project B : unchanged
Project C : add two sub-projects
 6. New or improved encapsulating materials
 7. Data collation
Project D : unchanged
Project E : unchanged
Project F : unchanged
 4. Geothermal energy
Project A : unchanged
Project B : unchanged
Project C : unchanged
Project D : delete sub-project 3 (hot-rocks) and replace by :
 3. Study of new stimulation methods
Project E : Hot dry rocks
(new)
 1. Studies and experiments on fracturation
 2. Studies and experiments on heat extraction
Project F : read as former project E (training of specialists)
 5. Systems Analysis
unchanged
-

XII/641/76 - E
orig : F

ANNEX II

PROPOSAL FOR A
COUNCIL DECISION
OF

Reviewing the energy research and development programme adopted by the Council's decision of 22 August 1975 (75/510/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,

WHEREAS the Council has adopted, by decision 75/510/EEC of 22 August 1975 *), in applying article 235 of the Treaty, an energy research and development programme,

WHEREAS article 4 of the aforementioned decision foresaw that the programme shall be reviewed at the end of the first year, after the Scientific and Technical Research Committee (CREST) has delivered its Opinion,

WHEREAS it is considered opportune, in order to assure optimum programme execution, to foresee the possibility of modifying the allocation of the funds attributed to the different objectives;

HAVING regard to the Opinion delivered by the Scientific and Technical Research Committee (CREST)

.../...

ANNEX II

HAS DECIDED AS FOLLOWS

Article 1

The following paragraph is added to article 3 of the aforementioned Decision of the Council.

"In execution of the programme the Commission can, in the course of 1978, after consultation of the competent ACPM and of CREST, proceed to transfers - within the limits of 10 % of the original appropriations - between the appropriations allocated to each objective following the annex, if it feels that these transfers are necessary for an optimum management of the programme".

Article 2

The annex to the aforementioned Council Decision is replaced, as effective from 1 January 1977, by the annex to the present decision.

The annex forms an integral part of this Decision.

XII/641/76 - E
orig : F
ANNEX II

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Article 2

The annex to the aforementioned Council Decision is replaced, as effective from 1 January 1977, by the annex to the present decision.

The annex forms an integral part of this Decision.

ANNEX III

INDIRECT ACTION
ENERGY RESEARCH AND DEVELOPMENT PROGRAMME

The aims of the programme are as follows :

1. ENERGY CONSERVATION

A maximum of 11.380 million units of account and a staff of 10 shall be assigned to this objective.

This programme covers the following sectors :

- Improved insulation of buildings
- Use of heat pumps
- Urban transport
- Residual heat recovery
- Materials recycling
- Production of energy from waste
- Evaluation of the specific energy consumption of equipment, processes and techniques
- Development of methods for storage of secondary energy.

This work shall be carried out under contract.

2. PRODUCTION AND UTILIZATION OF HYDROGEN

A maximum of 13.240 million units of account and a staff of four shall be assigned to this objective.

This programme comprises the following projects :

Project A - Thermochemical production of hydrogen

- Action
1. Research into chemical and electrochemical reaction cycles of high potential efficiency in the conversion of heat energy into hydrogen energy
 2. Practival experiments on promising cycles.

Project B - Electrolytic production of hydrogen

- Action
1. Improvement of existing electrolytic hydrogen production technology
 2. Study of the viability and economics of high-temperature and high-pressure electrolysis.

Project C - Utilization of hydrogen

- Action
1. Analysis of the potential applicability of hydrogen and of synthetic hydrogen-based fuels

.../...

2. Development of safety specifications for the handling of hydrogen
3. Improvement of the small-scale storage of hydrogen.
4. Studies related to the problems of industrial-scale (medium-sized) storage of hydrogen
5. Studies of the possibility of using existing pipelines for the distribution of hydrogen.

3. SOLAR ENERGY

A maximum of 17,500 million units of account and a staff of six shall be assigned to this objective.

This programme comprises the following projects :

Project A - Solar heat collectors and their application to dwellings

- Action
1. Low-temperature use of solar energy for heating and cooling buildings
 2. Study of plane surface collectors
 3. Pilot applications to dwellings for domestic use.

Project B - Self-contained generating sets for the production of mechanical and/or electrical power

- Action
1. The use in medium and high temperature areas of solar heat to produce mechanical and/or electrical power
 2. Improvement of low-power groups (1 + 1 kw)
 3. Pilot installation of 1 MWe.

Project C - Photovoltaic conversion

- Action
1. Development of alternative cells and improvement of existing cells.
 2. Feasibility study on new concepts
 3. New methods of preparing semiconductor materials
 4. Silicon thin film
 5. Automation of panel production
 6. New or improved encapsulating materials
 7. Data collation.

.../...

Project D - Photochemical, photoelectrochemical and photobiological processes

Action 1. Fundamental study of the most appropriate energetic systems for the different regions of Europe.

Project E - Photosynthetic production of organic matter

Action 1. Choice and development of the most suitable energy crops for the different regions of Europe

Project F - Data network relating to solar radiation

Action 1. Collection, standardization and distribution of comprehensive data on number of hours of sunshine throughout the Community
2. Definition of the implications of the large-scale use of solar energy.

This work shall be carried out under contract.

4. GEO THERMAL ENERGY

A maximum of 13 million units of account and staff of four shall be assigned to this objective.

This programme comprises the following projects :

Project A - Acquisition and collation of existing and new geothermal data

Action 1. Collation of existing geothermal data
2. Acquisition and collation of new additional geothermal data.

Project B - Improvement of methods of exploration

Action 1. Improvement and/or adaptation of existing prospecting methods to specific geothermal requirements and development of new methods of prospecting and exploration.

Project C - Sources of hot water (low enthalpy)

Action 1. Compilation of geothermal models in regions concerned
2. Full-scale experimental verification of theoretical models (operation)
3. Utilization tests on sources of hot water for district and agricultural heating.

Project D - Steam sources (high enthalpy) and hot rocks

Action 1. Construction of geothermal models in the areas concerned
2. Improvement of measuring and drilling techniques for experimental work at high temperatures
3. Study of new stimulation methods.

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Project E - Hot dry rocks

- Action
1. Studies and experiments on fracturation
 2. Studies and experiments on heat extraction

Project F - Training of specialists

- Action
1. Training courses and detachments.

This work shall be carried out under contract.

5. SYSTEMS ANALYSIS ; DEVELOPMENT OF MODELS

A maximum of 3,880 million units of account and a staff of seven shall be assigned to this objective.

This programme comprises the following action :

- Action
1. Static models (short term)
 2. Dynamic sector models (medium/long term).

This work shall be carried out under contract.

FINANCIAL RECORD SHEET

concerning the revision of the energy research and development programme adopted by the Council's decision 75/510/EEC of 22 August 1975*).

APPROPRIATIONS

1. BUDGET HEADING CODE (Research and Investment Budget)

- Chap. 3.61
- 3.62
- 3.63
- 3.64
- 3.65

2. TITLE OF BUDGET HEADING

- 3.61 Energy Conservation
- 3.62 Production and Utilization of Hydrogen
- 3.63 Solar Energy
- 3.64 Geothermal Energy
- 3.65 Systems Analysis: development of models

3. LEGAL BASIS

Article 235 of the EEC Treaty.
Council's decision 75/510/EEC of 22 August 1975 *).

4. DESCRIPTION, AIMS AND JUSTIFICATION OF THE PROJECT

The motives of the Council's decision 75/510/EEC, of 22 August 1975, explains the general objectives and gives the justification of the project. The annex, which forms an integral part of the decision and which develops in detail the programme, actually constitutes the description of the project and precises the particular objectives.

5. FINANCIAL IMPLICATIONS OF THE PROJECT (in U.A.)

The revision of the programme, as foreseen by Article 4 of the Council's decision 75/510/EEC of 22 August 1975 *) will not cause any new financial implication with regard to those defined by the aforementioned decision. In that way, the implications on the expenditure will be according to the following tables (sources: pre-budgetary project of the EC for the financial year 1977 Volume V, Section III. Commission, Annex I p. 64 et ...)

5.0 Implications in respect of expenditure

5.0.0. Multiannual timetable.

*) O.J. n° L 231 of 2 September 1975

APPROPRIATIONS FOR COMMITMENTS
VERPFLICHTUNGSERMÄCHTIGUNGEN

Objective: Energy Conservation (chap. 3.61)
Forschungsziel: Energieeinsparung (Kap. 3.61)

	1.7.1975	1976	1977	1978	30.6.1979
Foreseeable Commitments	9.586 (1)	2.373.267 (2)	4.502.976	4.000.933	476.233
Voraussichtliche Mittelbindungen					
Reserve staff appropria- tions in chapter 9.20			17.000		
Rücklage für Personal- kosten (Kap. 9.20)					
<u>Objective: Production and Utilization of Hydrogen (chap. 3.62)</u> <u>Forschungsziel: Produktion und Verwendung von Wasserstoff (Kap. 3.62)</u>					
Foreseeable Commitments	2.000 (1)	2.327.203(2)	5.402.395	4.814.099	682.703
Voraussichtliche Mittelbindungen					
Reserve staff appropria- tions in chapter 9.20			11.600		
Rücklage für Personal- kosten (Kap. 9.20)					
<u>Objective: Solar Energy (chap. 3.63)</u> <u>Forschungsziel: Sonnenenergie (Kap. 3.63)</u>					
Foreseeable Commitments	16.662 (1)	3.708.891(2)	7.002.976	6.020.106	734.365
Voraussichtliche Mittelbindungen					
Reserve staff appropria- tions in chapter 9.20			17.000		
Rücklage für Personal- kosten (Kap. 9.20)					

- (1) Commitments contracted
(2) Including appropriations for commitment outstanding from 1975.

- (1) Mittelbindungen
(2) Einschliesslich der noch vorhandenen Verpflichtungsermächtigungen aus 1975.

Objective: Geothermal Energy (chap. 3.64)
Forschungsziel: Geothermische Energie (Kap. 3.64)

	1.7.1975	1976	1977	1978	30.6.1979
Forceable Commitments Voraussichtliche Mittelbindungen	2.742(1)	2.747.999(2)	5.202.678	4.512.096	524.485
Reserve staff appropriations in chap.9.20 Rücklage für Personalkosten (Kap. 9.20)			10.000		
<u>Objective:</u> Systems Analysis: development of models (3.65) <u>Forschungsziel:</u> Systemanalyse: Ausarbeitung von Modellen					
Forceable Commitments Voraussichtliche Mittelbindungen	11.558(1)	745.533(2)	1.604.076	1.021.149	478.384
Reserve staff appropriations in chap. 9.20 Rücklage für Personalkosten (Kap. 9.20)			19.300		

- (1) Commitments contracted
- (2) Including appropriations for commitment outstanding from 1975.
- (1) Mittelbindungen
- (2) Einschliesslich der noch vorhandenen Verpflichtungsermächtigungen aus 1975.

APPROPRIATIONS FOR PAYMENT
ZAHLUNGSVERPFLICHTUNGEN

Objective: Energy Conservation (chap. 3.61)
Forschungsziel: Energieeinsparung (Kap. 3.61),

	1.7.1975	1976	1977	1978	1979	1980
Foreseeable payments Voraussichtliche Zahlungen	98.586(1)	2.131.533	3.005.276	4.000.933	1.641.086	485.566
Reserve staff appro- priations in chap. 9.20 Rücklage für Personal- kosten (Kap. 9.20)			17.000			
<u>Objective: Production and Utilization of Hydrogen (chap. 3.62)</u> <u>Forschungsziel: Produktion und Verwendung von Wasserstoff (Kap. 3.62)</u>						
Foreseeable payments Voraussichtliche Zahlungen	110.000(1)	2.073.323	3.648.195	5.014.099	1.773.056	609.727
Reserve staff appro- priations in chap. 9.20 Rücklage für Personal- kosten (Kap. 9.20)			11.600			
<u>Objective: Solar Energy (chap. 3.63)</u> <u>Forschungsziel: Sonnenenergie (Kap. 3.63)</u>						
Foreseeable payments Voraus. Zahlungen	148.662(1)	2.347.871	5.731.658	6.220.106	2.364.187	670.516
Reserve staff appro- priations in chap. 9.20 Rücklage für Personal- kosten (Kap. 9.20)			17.000			
<u>Objective: Geothermal Energy (chap. 3.64)</u> <u>Forschungsziel: Geothermische Energie (Kap. 3.64)</u>						
Foreseeable payments Voraus. Zahlungen	90.742(1)	2.297.941	3.564.478	4.612.796	1.901.978	522.065
Reserve staff appro- priations in chap. 9.20 Rücklage für Personal- kosten (Kap. 9.20)			10.000			
<u>Objective: Systems Analysis: development of models (chap. 3.65)</u> <u>Forschungsziel: Systemanalyse: Ausarbeitung von Modellen (Kap. 3.65)</u>						
Foreseeable payments Voraus. Zahlungen	50.558(1)	571.260	1.388.907	1.271.149	531.380	47.446
Reserve staff appro- priations in chap. 9.20 Rücklage für Personal- kosten (Kap. 9.20)			19.300			

(1) including appropriations for payment carried over to the next financial year.
(1) einschliesslich der auf das folgende Haushaltsjahr übertragenen Mittel.

5.1. Consequences for resource

None.

6. Control Measures

Scientific Control :

- the competent officials of DG XII
- the project leaders
- the five Advisory Committees for Programme Management (ACPM)
- the R&D energy sub-committee of CREST

Financial Control :

- the authorizing department itself
(annual control of the regularity of the expenses)
- following the usual arrangements for the execution of programmes of indirect action.

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