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PROPOSAL FROM THE COMMISSION
TO THE COUNCIL
CONCERNING
A SECOND YEAR ENERGY RESEARCH AND DEVELOPMENT PROGRAMME

VOLUME I

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S U M M A R Y

In 1975 the Council had approved a four-year Energy Research and Development Programme covering the following fields: Energy Conservation, Production and Use of Hydrogen, Solar Energy, Geothermal Energy, Systems Analysis; Development of Models. The programme comprises a budget of 59 MUA and a staff of 27. This programme expires on 30 June 1979 and the Commission is now proposing to the Council to approve a second four-year programme, constituting the follow-up of the first one.

The proposed programme would require 125 MEUA and a staff of 37. It would deal with the same five topics as the first one, but would be adapted in its content to the latest state of development. This implies that the work to be undertaken would be more oriented towards pilot projects and other work near to industrial application.

The programme would be carried out by letting cost-sharing contracts to industrial firms, research centres and universities in the Member Countries.

In the implementation of the programme the Commission would again be assisted by five Advisory Committees on Programme Management.

In those fields where a direct and an indirect action programme is existing simultaneously (hydrogen, solar energy), close collaboration will be sought with the Joint Research Centre (JRC).

PROPOSAL FOR
A SECOND FOUR YEAR ENERGY RESEARCH AND DEVELOPMENT PROGRAMME

I. INTRODUCTION

The Energy Research and Development Programme of the European Communities, approved by the Council on 22 August 1975 (1) is one of the actions with which the Community replied to the challenge arising from the energy price crisis. This Programme expires on 30 June 1979.

Given the present and the expected future energy supply situation of the Community, there is an obvious necessity for a continuing and further increasing effort to develop new energy sources and the associated technologies. Taking into account the promising work carried out in the course of the first Energy R & D Programme as well as its achievements in coordinating corresponding activities in the Member States, the Commission proposes to the Council a second four-year programme starting from 1 July 1979. This programme would constitute a logical follow-up of the first one.

The document presents the considerations (energy R & D strategy, results of the ongoing first programme) which lead the Commission to propose a second programme. It then gives a summary of the content, implementation and preliminary results of the first programme and finally an overview of the content of the proposed second programme.

The enclosed appendix, subdivided into five parts corresponding to the five sub-programmes, describes all these subjects in detail.

II. MOTIVATION

As about 60 % of the Community's primary energy is being imported, its main energy policy objectives consist in a reduction of this dependency giving due attention to the indigenous energy sources by moderating the future growth of energy demand without adversely affecting economic and social stability or the quality of life and last not least, by developing alternative energy sources.

(1) O.J. L 231, 2.9.1975

Concrete actions on the development of alternative energy sources, of new energy carriers and of technologies for energy conservation must be considered of high priority, as they show the potential of a considerable contribution to the European energy supply at medium and long term.

II.1 The Community Energy R & D Strategy

The main aim of the Community's energy policy consists in securing energy supplies for the future and creating the largest possible number of options. This objective is also governing the Community's strategy for energy research and development. The resulting activities in this field are all belonging to one of the following six strategic sectors, in which research and development is expected to contribute substantially to solve energy problems, namely

- fostering of energy conservation (reduction of losses in production and increase of efficiency in use),
- enhancement of the production of indigenous (fossile) fuel,
- promotion and application of nuclear fission energy,
- development of new sources of energy (fusion, solar and geothermal energy, possibly wind and tidal power),
- development of substitutes for crude oil (mainly coal conversion),
- identification and development of substitutes for electricity as an energy vector (mainly hydrogen).

Depending on the actual state of development of the above technologies, the lead time after which each of them can make a sizeable contribution to the Community's additional energy need may vary from case to case.

Short term (up to 1985) prospects can be credited to coal, nuclear fission and energy conservation techniques. In the medium term (up to 1995), the following technologies are expected to come into play: enhanced production of hydro-carbons, coal conversion, fast breeder reactors, solar energy (starting with solar heating) and geothermal energy. For the long term (beyond 1995), the most promising candidates are fast breeder reactors, solar electricity and possibly thermonuclear fusion.

This rather coarse and schematic subdivision into three time categories should by no means be considered as an attempt to fix priorities for research and development. As a matter of fact, all of them require an adequate effort by now, should they make the contribution in the time frame as indicated above.

The second Energy Research and Development Programme as proposed in this document, is intended to ensure this effort - together with corresponding activities in the Member States.

In fact, energy conservation R & D in association with demonstration projects, fiscal and other incentives should be able to contribute to a direct reduction of consumption by 1 to 2 % per year with respect to the originally forecasted figures. There is an enormous potential for energy savings in almost all energy consuming sectors (home, transport, industry, agriculture) which must be identified and exploited.

The progressive introduction of solar energy will be highly dependant on increased R & D efforts, which not only have to accelerate the further refinement of technologies for solar-thermal applications, but also pave the way for a possible, rather high contribution after the year 2000. Solar electricity production, mainly by solar cells but also - for certain geographic regions within Europe - by power plants based on thermodynamic cycles and from biomass, is therefore high ranking in the proposed second energy R & D programme. There are good chances that within the next ten years the prices of solar cells can be decreased to a level that makes them competitive with conventional equipment for power production. Of course, the intrinsic lead times up to market introduction and the associated problems to be solved in the field of energy transport and storage will require some additional time before a substantial contribution to the energy supply can be expected.

The possible energy impact of geothermal energy depends on the existence of a certain number of site specific conditions, but nevertheless geothermal energy is capable of saving a sizeable amount of energy which otherwise must be provided by other conventional sources. It is thought that the second R & D programme will lead to the identification and assessment of additional geothermal sources (which then might become further Community projects for the exploitation of geothermal sources). At longer range, the solution of the problems associated with the use of hot dry rock for exploiting geothermal energy at high temperature must be sought. An important place will therefore be given to this topic in the R & D programme.

The proposed programme covers also three other "horizontal" fields of action which are important elements of a coherent energy R & D strategy:

- The production and use of hydrogen as a long term means of transporting and storing energy. The R & D effort in this field must be continued, although at short range hydrogen cannot be considered as a competitive energy vector. Because of its important role as a feedstock in the chemical industry, however, strong interest in its efficient production is already existing and will continue to exist. Once oil has become scarce, hydrogen is surely the most promising option for many applications.

- Storage of energy: For particular applications of solar energy (including wind and ocean energy) as well as for the use of hydrogen, and for promising concepts on energy conservation, energy storage is of great importance and deserves a thorough R & D effort. For this reason, three of the five proposed programmes contain important parts dealing with energy storage.
- The study of energy policies and of strategic problems related to energy R & D by using the tools of energy systems analysis and modelling: The development of an instrument enabling the Community and the Commission to better understand the medium and long term energy demand and supply relationship will allow its users to examine and develop their strategies on a more rational basis using formalized methods and a great number of information which can only be correlated with such methods.

Energy policy and its implications have indeed become very complex, and in order to investigate the different options and to assess their impacts in such fields as economy, environment and others, extended systems studies and alternative strategy studies seem necessary.

II.2 The Choice of Community Actions

The concrete actions resulting from the strategy outlined in the preceding pages have been chosen on the basis of a set of general principles which are summarized below.

- a) The Community's future energy supply and demand structure will surely not be monolithic. Besides the fact that for a number of technical and other reasons such a structure would hardly be feasible, it would not be desirable either because of its vulnerability. Therefore, a multiple choice approach is necessary, allowing also for specific solutions to the particular needs of different regions in the Member States.
- b) Changes in energy structure take time, partly because of the long lead times involved with the introduction of new technologies. Hence, R & D actions must be initiated early enough at a sufficient level of effort and with continuity, despite the uncertainties they may imply. Energy R & D strategies must necessarily be based on a given set of assumptions; they are made difficult by unpredictable changes of the social or political scenarios or by unexpected trends in the development process.
- c) Community actions in the field of energy R & D should be set up according to the objectives of the Community energy policy. In addition, they should meet at least one of the following criteria:
 - Effectiveness: Cooperation at Community level should lead to greater effectiveness and/or rationalisation, be it by a direct bundling of the efforts or by the indirect effect of coordination

and avoidance of unnecessary duplication (this is for example the case for the majority of projects in all the five parts of the Energy R & D Programme and particularly for the implementation of costly prototypes, such as in the solar and the hydrogen part of the Programme).

- Transnational structure: The type of research requires transnational structures (e.g. for energy systems modelling, for general assessment studies in the actions related to the comparison of data and equipment for solar radiation measurements, etc.).
- Large market: Development costs and marketing opportunities call for markets exceeding the national frame, one example being the important market for new energy technologies in the Third World.
- Common requirements: The programme or projects satisfy the needs or interests common to the Member States of the Community (this is particularly true for the energy systems modelling programme).

In essence, the preceding strategy considerations were already known and applied when the current Energy R & D Programme was worked out in 1974. The awareness of their importance has ever been increasing since then and they formed the basis for the preparation of this second programme. However, the progress made in the various technical fields and the assessment of their future energy potential as candidate actions at Community level have led to a change in emphasis between the different sub-programmes.

Thus, in the second programme, much more relative emphasis will be put on solar energy (because of its very high long term potential) and on energy conservation (because of its expected short term impact), whereas the efforts devoted to the development of hydrogen technology have, in real terms, been decreased (hydrogen is expected to come into play somewhat later in time than originally estimated).

III. THE FIRST ENERGY R & D PROGRAMME

The Council Decision of 22 August 1975 approved a four-year programme extending from 1 July 1975 until 30 June 1979 covering the following "objectives" (sub-programmes):

Objectives	Funding (MUA)	Staff
- Energy Conservation	11,38	6
- Production and Use of Hydrogen	13,24	4
- Solar Energy	17,50	6
- Geothermal Energy	13,00	4
- Systems Analysis/Energy Modelling	3,88	7
	59,00	27

The five objectives are broken down into the following sectors, projects or actions:

Energy Conservation

- Sector a: Improved insulation of buildings
- Sector b: Use of heat pumps
- Sector c: Urban transport
- Sector d: Residual heat recovery
- Sector e: Materials recycling
- Sector f: Production of energy from waste
- Sector g: Evaluation of the specific energy consumption of equipment, processes and techniques
- Sector h: Development of methods for storage of secondary energy.

Production and Utilization of Hydrogen

- Project A: Thermochemical production of hydrogen
- Project B: Electrolytic production of hydrogen
- Project C: Utilization of hydrogen

Solar Energy

- Project A: Solar heat collectors and their applications to dwellings
- Project B: Self-contained generating sets for the production of mechanical and/or electrical power
- Project C: Photovoltaic conversion
- Project D: Photochemical, photoelectrochemical and photobiological process
- Project E: Photosynthetic production of organic matter
- Project F: Data network relating to solar radiation.

Geothermal Energy

- Project A: Acquisition and collation of existing and new geothermal data
- Project B: Improvement of methods of exploration
- Project C: Sources of hot water (low enthalpy)
- Project D: Steam sources (high enthalpy) and hot rocks
- Project E: Training of specialists.

Systems Analysis: Development of Models

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

This indirect action programme is carried out under the responsibility of the Commission by concluding cost-sharing contracts with industrial firms, research centres, universities, etc. in the Member States. The number of concluded contracts presently amounts to about 600 (June 1978).

In the implementation of this programme, the Commission is assisted by five Advisory Committees on Programme Management (ACPM) set up for this purpose. Their mandate is laid down in the Council Resolution of

18 July 1977 (1). The Scientific and Technical Research Committee (CREST) is kept involved in the overall coordination of the programme.

For the scientific monitoring of the projects the Commission is assisted by senior experts ("project leaders" or "expert rapporteurs") from the Joint Research Centre or from the Member Countries.

III.1 Results and achievements

Evaluation of a research programme has to take into account both the degree up to which the overall objectives and goals have been achieved and the concrete results obtained in each of the projects. Although it is hardly possible to make a final assessment of a programme which has been operational for less than three years, a certain number of conclusions can be drawn.

The overall objective of the current first programme is to enhance research and development in the five fields as specified in the Council Decision by stimulating work which can be done more efficiently at Community than at national level and by fostering coordination and collaboration across the borders. It can be said that considerable results have been achieved with respect to both parts of this objective.

In a sense, the results of the Programme cannot only be measured by assessing the scientific outcome, or the number of reports, publications and patents achieved. Due account must be taken of the not measurable indirect results from coordination and collaboration. In fact, the Commission's services have observed quite a number of cases, where, thanks to the programme, double work has been avoided, or technical obstacles have been better overcome through collaboration of contractors. In certain cases Community action has also generated specific new actions at national level.

With respect to scientific results it can be said that the work under way in the first programme has already contributed to the solution of the technical problems which are considered as the most urgent by energy R & D experts. The following concrete examples are given for illustration:

- Energy Conservation

A large air-water type heat pump driven by gas engine and combined with a floor heating and hot water production system has been developed for use in a building with 60 apartments. The device went into operation early this year and shows already satisfactory performances. This project very usefully complements a German project using river water as heat source. More-

(1) see O.J. n° C 192, 11.8.1977

over, an absorption type heat pump for individual houses was developed. Three prototypes of this pump are being built for testing in the laboratory and for comparison with a classical heating system. A patent application is requested.

A new method for recycling of used plastic materials from municipal waste has been developed. It resulted in a laboratory scale production of new products composed of different types of plastics. A market study has shown that there is a real interest in the utilization of these products, as they are cheaper and independent of the petroleum price.

In the field of energy storage, in particular on advanced high energy density batteries, a collaboration between 12 laboratories in four different countries (DK, D, F, UK) has been established, aiming at an exchange of experience and information, avoiding overlap of R & D, mutual use of installations for testing of samples, exchange of samples of different laboratories for comparison etc. Another group of contractors has started a systematic search for promising materials for battery electrodes and electrolytes. A patent application on a production method for alumina β electrolytes has been requested. (1)

- Hydrogen

Substantial improvements of the electrolytic production process have been achieved following different technical lines of approach. These results are actually confirmed either in small scale (5 - 10 kW) or in medium scale (up to 100 kW) electrolyzers. The laboratory results show that power consumption for water electrolysis has been lowered from an initial 5 kWh/Nm³ H₂ to 3.6 kWh/Nm³ H₂ at 5 - 10 kA/m².

The corresponding hydrogen cost will be around 8c UCE/Nm³ for an energy cost of 1,6 c UCE/kWh. This cost is not too far from the cost of hydrogen from methane reforming. (2)

- Solar Energy

Standardisation and experimental comparison of performance tests of thermal collectors has been launched (in collaboration with the JRC) with 19 institutes in the Member Countries. Common measuring procedures have been agreed upon and applied to three different types of collectors.

The design, development and testing of prototype components and the first phase of the construction of a 1 MW(el) central receiver power plant have been carried out.

In the field of photovoltaic conversion, interesting results were achieved on the various types of cells (Si, CdS, etc.) and on manufacturing techniques with an eye to reduce the production

(1) see Appendix "Energy Conservation", chapter II

(2) see Appendix "Production and Use of Hydrogen", chapter II

cost of cells.

The energy potential of the different types of biomass available in Europe has been assessed in several studies. Practical experiments with short-rotation forestry and straw utilization were launched in collaboration with institutes in several Member Countries. (1)

- Geothermal Energy:

The collection of heat flow data in all Member States, in view of the setting-up of heat flow maps for the whole Community has been organised and is progressing very well. - The testing of exploration sounding methods in known areas has been carried out in view of their further use in unknown areas. - Mathematical modelling and laboratory experiments of the propagation of cracks in an impermeable rock have been carried out in order to define further steps or new approaches in the field of hot dry rock technology. (2)

- Energy Systems Modelling:

The following work has already been carried out with the help of the models developed in the programme:

- Optimisation of the energy supplies and associated flows for France, Belgium and Germany in the context of the multi-national EC energy model;
- assessment of the potential of the new energy technologies and their long term contribution of the energy supplies of the EC;
- validation (with respect to methodology and to the data) of the EC sub-models, carried out by institutions in the Member States. (3)

III.2 Diffusion of knowledge and results

The results of the research projects carried out in the first programme become available in the final reports delivered at the end of each project. There are concrete instructions on their handling (4). These reports are generally quoted with a short summary in "Euro-abstracts" and can be obtained in full text or microfilms by everyone interested. The following additional means are currently used to cope with the need of providing early information whilst the projects are still under way:

- (1) see Appendix "Solar Energy", chapter II
- (2) see Appendix "Geothermal Energy", chapter II
- (3) see Appendix "Energy Systems Analysis and Strategy Studies", chap. II
- (4) Council Resolution (EEC) n° 2380/74 of 17.9.1974
O.J. n° L 255 of 20.9.1974

- i) Working parties and coordination meetings, kept with experts and the contractors working in the same field (not public; generally no open publication of papers).
- ii) Status seminars in which the content and the progress of the work is described and discussed in front of experts, members of ACPM and CREST-EN (semi-public; paper published. Example: Status Seminar "Geothermal Energy", December 1977).
- iii) Symposia and Conferences (either organized by the Commission or by third parties), in which work of EC contractors is presented in "free competition" with scientific papers submitted from all over the world (Example: 1977 Photovoltaics Solar Energy Conference in Luxembourg).
- iv) Publication in scientific reviews.
- v) Yearly Status Report (1977 report appeared in August 1977, 1978 report to come in autumn).
- vi) Diffusion of the list of titles and/or summaries of final reports to the ACPMs and to CREST-EN (started in the hydrogen programme).

III.3 International cooperation

The Commission's services are participating in many international activities, be it in the framework of IEA, NATO/CCMS, WMO or others.

Solar energy plays an important role in the Euro-Arab-Dialogue and in the collaboration of the Communities with the developing countries. The staff of the Energy R & D Programme is actively involved in a certain number of negotiations and initiatives led in cooperation with other services of the Commission (DG I, III, VIII, XVII etc.). In the field of "Energy Systems Modelling" the first contacts at working level have been made with corresponding institutes in the respective countries, seeking membership in the Community.

III.4 Collaboration with the Joint Research Centre

This collaboration has proved particularly fruitful in those indirect programmes for which exists a corresponding direct action, namely in solar energy and hydrogen production. The JRC contributes concretely to the indirect programme through certain project leaders: for "solar heating and cooling", "thermo-mechanical solar power plant" and for "thermochemical production of hydrogen". The very successful action of solar collector testing, funded by the indirect action (19 participants) is a practical example. In thermochemical hydrogen production practically all contracts of the indirect action are closely linked to work carried out in Ispra.

IV. THE SECOND PROGRAMME

The proposal of the Commission is again based on five sub-programmes ("objectives") with the following denominations:

- Energy Conservation,
- Production and Utilization of Hydrogen,
- Solar Energy,
- Geothermal Energy,
- Energy Systems Analysis and Strategy Studies.

The following is an outline of the proposed actions. More details are included in the Appendix.

- Energy Conservation

Instead of the subdivision into eight topical sectors used in the first programme, a new structure is proposed, following the three main energy consumption areas, namely

- A. Domestic and commercial applications,
- B. Industry,
- C. Transport.

Two particularly important sectors are added as chapters, namely:

- D. Energy transformation,
- E. Energy storage.

Within this frame programme, it is intended to support with priority such projects which promise to reach the stage of industrial maturity, of demonstration or even of market introduction within a reasonable delay without, however, neglecting some more basic (theoretical) work and certain paper studies of high interest.

As in the first programme, a very large number of interesting proposals is expected. The allocation of the funds to the different sectors will therefore have to be determined by considering, amongst others, the total energy saving potential. Based on preceding experience, the development of classical and of advanced heat-pumps will deserve major attention, as well as specific work aiming at the identification of possibilities for energy conservation in industry. Energy storage has a strong impact on all energy consuming sectors and also for new energy sources, and will, therefore, be another point of gravity.

Proposed funding: 25 MEUA

- Production and Utilization of Hydrogen

The basic structure of the first programme has been maintained, subdividing it into the following three projects:

- Project A: Thermochemical production of hydrogen
- Project B: Electrolytic production of hydrogen
- Project C: Transportation, storage and utilization.

For project A (in close cooperation with the Joint Research Centre) the main objective is to reach an experimental stage enabling, for a limited number of promising cycles, to obtain sufficient practical data and insight so as to allow a clear evaluation of their economic feasibility.

In project B the aim is to further develop new materials and new electrolytic technologies and to build pilot-plants (modules) for those approaches resulting from the work in the actual programme.

The broad range of work foreseen in project C will as well cover the compilation of safety manuals, as the analysis of storage methods and certain assessment studies on the role of hydrogen in the production of synthetic fuel and coal gasification, or even certain market studies. Also other problems might be investigated as much as they are of significance for a future large scale utilization of hydrogen.

Proposed funding: 15 MEUA

- Solar Energy

The presentation of this programme proposals follows the structure of the first programme (project A to F). Two chapters, one on wind energy (project G) and one on solar energy in industry and agriculture (project H) have been added.

Generally speaking, the main emphasis is laid on projects A, B, C and E, with a particular recommendation to develop and build prototype systems in these fields.

In the different projects, the following work is proposed:

- Project A (Solar Energy Applications to Dwellings): Besides continuation of ongoing work (system studies, storage, testing of collectors and complete solar heating systems for houses, cooling studies), new technologies will be investigated which can lead to "second generation systems" (air-fluid systems, community dwellings and villages, combined active and passive systems, high temperature collectors, seasonal storage, etc.).
- Project B (Thermo-mechanical Solar Power Plants): Emphasis will be laid on completion, testing and experimentation of the 1 MW tower power plant which is currently under construction by a European consortium at Contrasto, Sicily. Preliminary investigations on alternative cycles will be made.
- Project C (Photovoltaic Power Generation): This field deserves particular effort because rapid progress is being achieved world wide towards large-scale development of cost-competitive solar electricity plants. Continued effort will be made on improving the most promising solar cell and array technology in view of reducing cost of

photovoltaic electricity generators. In addition, a series of autonomous photovoltaic power systems will be developed. Design and construction of a number of experimental prototypes up to 1 MW is timely and urgent.

- Project D (Photochemical, Photoelectrochemical, Photobiological Processes): The studies of natural and synthetic systems (aiming, for example, at the photolysis of water) will be continued.
- Project E (Energy from Biomass): The work set out in this field is:
 - . further assessment of the present and future contribution of biomass to the energy supply of the Community,
 - . experimental study of the technical and economic feasibility of various concrete biomass/energy concepts specially suitable in the European context: (1) direct use or conversion into gas or "green" fuel of solid and liquid organic residues (straw, wood waste, algae etc.), (2) development of conversion methods (gasifiers, fermenters), (3) exploitation of currently unused forests for energy purposes combined with other purposes, (4) growing of photosynthetic matter for energy purposes on poor or marginal land (short rotation forestry, algae, etc.).
 - . promotion of the exploitation of concepts feasible within Europe.
- Project F (Solar Radiation Data): The actions of the ongoing programme will be continued (coordination of national radiation services, calibration of instruments, production of atlases and data books, diffusion of data).
- Project G (Wind Energy): There is not yet sufficient consensus as to the concrete work to be carried out in a Community programme. An "ad hoc" groupe of experts nominated by CREST-EN will elaborate on this and make appropriate suggestions.
- Project H (Solar Energy in Agriculture and Industry): Mainly assessment studies will be carried out (no hardware work).

Proposed funding: 58 MEUA (including 3 MEUA for project G).

- Geothermal Energy

Whereas the first programme is subdivided into five "classical" projects A to E (geothermal data, exploration methods, hot water sources, steam sources, hot dry rocks), the proposal for the second programme is based on the novel philosophy that now research should mainly concentrate - without completely neglecting basic research - on the integrated development of geothermally promising regions up to a stage where a clear decision on the economic feasibility of a further exploitation can be taken (in view of possible demonstration projects). This approach is also translated into the new presentation of the programme, now based on a subdivision into the following four projects:

- Project A (integrated geological, geophysical and geochemical investigations into selected areas): Collection of data and other information on certain selected areas with the final aim of selecting sites for possible test drillings, is the main objective.
- Project B (subsurface problems of natural hydrothermal sources): Improvement of the directly related technologies, definition of reservoir parameters and study of reinjection problems will receive priority.
- Project C (surface problems, related to the use of hydrothermal resources): Tackling of technological problems related with fluid extraction, study of environmental impact, economies of geothermal energy utilization, etc. is foreseen.
- Project D (hot dry rocks): Research will concentrate on the investigation of the general feasibility of heat extraction from low permeable hot dry rocks, by experiments at shallow depth and the study of fracture propagation, heat exchange problems and environmental impact.

Proposed funding: 20 MEUA

- Energy Systems Analysis and Strategy Studies

In order to better represent the task description of this sub-programme, the term "Strategy Studies" has been added to its original title.

As in the first programme, no rigid "project structure" is envisaged. The proposal for the second programme is made on the following basic working structure:

— Improvement and further development of the work done in the first programme

This will include, amongst others, tasks like

- . maintenance and improvement of the data base and the energy flow model,
- . implementation of the national model systems in local research organisations,
- . improvements in the estimation of parameters used in the different models,
- . complementary developments of the existing models,
- . regionalisation of the long term energy demand model,
- . dynamic net energy analysis.

— New energy systems' representation

This will include:

- . dynamization of certain (static) models,
- . development of "condensed" (simplified) models for special purposes,
- . study of new methods of analysing energy policies, etc.

— Communication with potential model users

This will include a certain number of measures to facilitate the practical use of models such as

- . a priori identification and analysis of problems of potential interest,
- . computation of alternative energy trends, events, policies, etc.,
- . development of software facilitating the dialogue of non-modellists with the models (conversational language).

— World energy modelling

This will imply a certain quantity of work ensuring that the representation of the "outer world" within the EC models is adequate. This will be done in cooperation with the "International Institute for Applied Systems Analysis (IIASA)", Laxenburg, the "International Energy Agency (IEA)", Paris, "Brookhaven National Laboratory (BNL)", USA, and other modelling organisations.

The main accent of the programme (about two thirds of the effort) will be laid on the activities outlined in the first paragraph. It is stressed that this programme requires the existence of a certain competent staff ("in-house capacity") at the Commission's services, as much of the work to be carried out by contract needs a thorough guidance by a central body and also trial runs on the Commission's own computing facilities.

Proposed funding: 7 MEUA

IV.1 Consultation of the Advisory Committees on Programme Management (ACPM)

The draft texts for the proposals relating to each of the sub-programmes, after having been prepared by working groups and the Commission's staff, were all submitted to the respective ACPMs. The present proposal takes into account most of the remarks made by the different ACPM delegations.

All ACPMs supported the objectives, the scope and the technical content of the draft proposal. There was, however, some difference of opinion on the repartition of the efforts within the objectives and to the overall level of funding (the present proposals of the Commission are lower than the figures generally recommended by the Advisory Committees).

IV.2 Funding

The funds required for the execution of the second Energy R & D Programme amount to a total of 125 MEUA over four years. These funds would be committed as follows.

	1979 2nd sem.	1980	1981	1982	1983 1st sem.	TOTAL
	MEUA					
Energy Conservation	1.5	10.0	10.0	3.0	0.5	25.0
Production and Utilization of Hydrogen	1.0	6.0	5.0	2.0	1.0	15.0
Solar Energy	3.0	26.0	16.0	10.0	3.0	58.0
Geothermal Energy	1.0	8.0	6.0	4.0	1.0	20.0
Energy Systems Analysis and Strategy Studies	0.5	2.5	2.5	1.0	0.5	7.0
TOTAL	7.0	52.5	39.5	20.0	6.0	125.0

As already outlined, the relative distribution of the financial effort among sub-programmes has changed with respect to the first programme.

When comparing the total amount of 125 MEUA to the financial outlay of the first programme (59 MEUA), the following factors have to be considered:

- Inflation over a four-year period,
- the necessarily very low rate of expenditure during the first year of the first programme (start-up) which will not occur in the second programme,
- the increased cost per project when work progresses from the research stage to the stage of component testing and pilot development.

When due account is taken of these points, it is realized that the proposed budget represents only a modest increase in real terms.

IV.3 Staff requirements

The staff of 27 currently in place would have to be increased to 37 in order to carry out the proposed programme. This staff would be assigned as follows:

- Energy Conservation	7
- Hydrogen	5
- Solar Energy	9
- Geothermal Energy	6
- Energy Systems Analysis and Strategy Studies	10
TOTAL	<u>37</u>

This staff comprises several persons to be assigned for coordination and administration work and a number of secretaries.

This necessity for staff increase is not only a consequence of the increased budget but also of the fact that the projects to be launched in the second programme require a more thorough monitoring by visits, negotiations and contacts in writing. Together with the preparation of yearly more than 15 ACPM- and some 70 coordination meetings, workshops, etc., as well as an increasing participation in international activities, this represents too heavy a workload for 27 persons. Additional tasks, such as the consultancy of the solar energy staff to the Commission's services dealing with developing countries and the participation of the systems analysis staff in the application of the EC models for strategy development studies have also to be taken into account. The staff requirements indicated are based on the assumption that use can be made of external specialists (project leaders) in all sub-programmes.

V. CONCLUSION

Given the preceding arguments, the Council is requested to approve the proposal for a second four-year Energy R & D Programme as outlined in chapter IV of this document.

PROPOSAL FOR A COUNCIL DECISION

adopting an Energy Research and Development Programme

1979 - 1983

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 (1),

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

Whereas Article 2 of the Treaty assigns to the Community the task of promoting throughout the Community a harmonious development of economic activities, a continuous and balanced expansion and an accelerated raising of the standard of living; whereas Article 3 of that Treaty defines the aims of Community action to these ends;

Whereas energy research and development is an important factor in achieving these objectives;

Whereas the energy research and development programme adopted by the Council Decision of 22 August 1975 has led to positive results and has opened promising perspectives for the objectives studied (2);

Whereas the research and development activities which form the subject of the present Decision therefore seem necessary and constitute a adequate means to prolong activities already underway with a view to implementation of certain Community objectives within the functioning of the common market;

Whereas the Council regulations (EEC) n° 1302/78 and n° 1303/78 of 12 June 1978 regarding the financial support for projects exploiting alternative sources of energy and for demonstration projects in the field of energy saving (3);

Whereas such a support would only be given to projects whose industrial and commercial viability had already been shown by previous studies and research;

(1) OJ No

(2) OJ No L 231, 2.9.1975, p. 1

(3) OJ No L 158, 16.6.1978, pp. 3 and 6

Whereas the Treaty has not provided the powers necessary for these purposes;

Whereas the Council adopted the resolution concerning Community energy policy objectives for 1985 on 17 December 1974 (1);

Whereas the Council adopted the resolution on an initial outline programme of the European Communities in the field of science and technology on 14 January 1974 (2);

Whereas the Scientific and Technical Research Committee (CREST) expressed its opinion,

HAS DECIDED AS FOLLOWS:

Article 1

An energy research and development programme for the European Economic Community is hereby adopted in the form set out in the Annex hereto for a four-year period starting on 1 July 1979. The 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 is evaluated at 125 Million European units of account and 37 employees respectively for the duration of the programme.

The European unit of account is defined in Article 10 of the Financial Regulation of 21 December 1977 (3) applicable to the general budget of the European Communities.

Article 3

The Commission shall be responsible for the implementation of this programme and shall be assisted by advisory committees on programme management set up for this purpose and shall keep the Scientific and Technical Research Committee (CREST) informed.

At the end of the programme's second year, a report of analysis and state of advancement will be drawn up for the Parliament and the Council.

(1) OJ No C 153, 9.7.1975, p. 1
(2) OJ No C 7, 29.1.1974, p. 6
(3) OJ No L 356, 31.12.1977, p. 1

Article 4

The information resulting from the implementation of the programme defined in the Annex shall be disseminated in accordance with Council Regulation (EEC) No 2380/74 of 17 September 1974 adopting provisions for the dissemination of information relating to research programmes for the European Economic Community (1).

Done at Brussels,

For the Council

The President

(1) OJ No L 255, 20.9.1974, p. 1

ANNEX

INDIRECT ACTION

ENERGY RESEARCH AND DEVELOPMENT PROGRAMME

The aims of the programme are as follows:

1. ENERGY CONSERVATION

An expenditure of 25 million European units of account and a staff of seven are estimated as necessary for the realization of this sub-programme. This subprogramme covers the following sectors:

Sector A: Residential and commercial applications

Sector B: Industry

Sector C: Transport

Sector D: Energy transformation

Sector E: Energy storage

This work shall be carried out under contract.

2. PRODUCTION AND UTILIZATION OF HYDROGEN

An expenditure of 15 million European units of account and a staff of five are estimated as necessary for the realization of this sub-programme.

This subprogramme comprises the following projects:

Project A: Thermochemical production of hydrogen

Project B: Electrolytic production of hydrogen

Project C: Transportation, storage and utilization of hydrogen

This work shall be carried out under contract.

3. SOLAR ENERGY

An expenditure of 58 million European units of account and a staff of nine are estimated as necessary for the realization of this sub-programme.

This subprogramme comprises the following projects:

Project A: Solar energy applications to dwellings

Project B: Thermomechanical solar power plants

Project C: Photovoltaic power generation

Project D: Photochemical, photoelectrochemical and photobiological processes

Project E: Energy from biomass

Project F: Solar radiation data

Project G: Wind energy

Project H: Solar energy in agriculture and industry

This work shall be carried out under contract.

4. GEOTHERMAL ENERGY

An expenditure of 20 million European units of account and a staff of six are estimated as necessary for the realization of this sub-programme.

This subprogramme comprises the following projects:

Project A: Integrated geological, geophysical and geochemical investigations in selected areas

Project B: Subsurface problems of natural hydrothermal resources

Project C: Surface problems related to the use of hydrothermal resources

Project D: Hot dry rocks

This work shall be carried out under contract.

5. ENERGY SYSTEMS ANALYSIS AND STRATEGY STUDIES

An expenditure of 7 million European units of account and a staff of ten are estimated as necessary for the realization of this sub-programme.

This subprogramme comprises the following actions:

Action 1: Improvement and further development of the medium and long term EC energy models

Action 2: Development of new concepts for energy systems' representations

Action 3: Development of new means for better communication between model builders and model users

Action 4: World energy modelling.

This work shall be carried out under contract.

FINANCIAL RECORD

A. PART 1 : EXISTING AND NEW PROJECTS

1. RELEVANT BUDGET HEADING CODE

CHAPTER 33 ITEM 3357 FINANCIAL PLAN CODE 357.0

2. TITLE OF BUDGET HEADING

ITEM 3357 : Energy Research and Development
FINANCIAL PLAN CODE: 357.0 Energy Conservation

3. LEGAL BASIS

Proposal for a programme approved by the Commission on 26 July 1978
(1 July 1979 - 30 June 1983).

4. DESCRIPTION, OBJECTIVE(S) AND JUSTIFICATION OF THE PROJECT

4.1. Description

The programme covers the following subjects :

- domestic and commercial applications
- industry
- transport
- transformation of energy
- energy storage

4.2. Objective

Coordination of and participation in studies carried out under contracts between the Commission and specialized bodies in the Member States.

4.3. Justification

In accordance with the decisions taken by the governments of the Member States, the Commission has been given the responsibility of promoting, coordinating and harmonizing studies and experimental programmes relating to the optimum use of the common sources of energy and the development of new methods for recovering energy from waste. For this purpose, it is authorized to conclude contracts with the specialized agencies of the Member States.

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5. FINANCIAL IMPLICATIONS OF THE PROJECT IN EUA, (at current prices)

5.0. Expenditure

5.0.0. Total cost of the project for the whole of its expected duration

- to the Community Budget	<u>25.000.000</u> EUA
- to national authorities	
- to other sectors at national level	
Total cost	<u>25.000.000</u> EUA

5.0.1. Multianual timetable

Duration of the project : 4 years (1.7.79 - 30.6.1983)

Continuation and extension of the first programme

Appropriations for commitment

	1979	1980	1981	1982	1983	1984	Total
Staff	150.450	322.000	340.100	361.200	191.100		1.364.850
Admin.	36.000	38.500	40.700	43.200	22.900		181.300
Techn. Op.	2.700	5.800	6.000	6.500	3.400		24.400
Contracts	1.310.850	9.633.700	9.613.200	2.589.100	282.600		23.429.450
Total	1.500.000	10.000.000	10.000.000	3.000.000	500.000		25.000.000

Appropriations for payment

	1979	1980	1981	1982	1983	1984	Total
Staff	150.450	322.000	340.100	361.200	191.100		1.364.850
Admin.	36.000	38.500	40.700	43.200	22.900		181.300
Techn. Op.	2.700	5.800	6.000	6.500	3.400		24.400
Contracts	675.550	5.100.000	9.600.000	6.299.800	1.700.000	54.100	23.429.450
Total	864.700	5.466.300	9.986.800	6.710.700	1.917.400	54.100	25.000.000

5.0.2. Method of calculation

a) Expenditure on staff

Requirements are assessed on the basis of a staff complement of seven for this objective :

- 4 category A officials
- 1 category B official
- 2 category C officials

In addition to the average costs for staff in the different categories, the calculations take account of the parameters laid down during preparation of the Draft Budget for 1979. The calculations make no provision for an increase in purchasing power; they merely allow for a revision of salary weightings to take account of general price trends in the Community.

b) Administrative expenditure

This covers requirements for mission and duty travel expenses and expenditure on meetings.

c) Expenditure under contracts

A uniform method of calculation cannot be laid down in view of the nature of the subject and the qualifications of the contracting parties. In any case, the Advisory Committee on Programme Management (ACPM) provided for in the Council decision will be consulted on the allocation of appropriations.

d) Multiannual estimates

The following rates have been adopted for the purpose of calculating the multiannual estimates : 1979 - 1.07; 1980 - 1.13; 1981 - 1.20; 1982 - 1.27; 1983 - 1.34 ; 1984 - 1.41.

5.1. Revenue

6. TYPE OF CONTROL TO BE APPLIED

- Scientific monitoring : **Competent** officials of DG XII
 - Project leaders
 - Advisory Committee
 - Subcommittee on Energy R&D (CREST)
- Budgetary implementation and correct administration of expenditure : Financial Control
- Administration : Contracts department of DG XII

7. FINANCIAL IMPLICATIONS OF THE PROJECT

7.0.

7.1.

7.2.

7.3. Appropriations to be entered in the forthcoming budget.

FINANCIAL RECORDA. PART 1: EXISTING AND NEW PROJECTS1. RELEVANT BUDGET HEADING CODE

Chapter 33 ITEM 3357 FINANCIAL PLAN CODE 357.1

2. TITLE OF BUDGET HEADING

ITEM 3357 Energy Research and Development

Financial Plan Code: 357.1 Production and utilisation of hydrogen

3. LEGAL BASIS

Proposal for a programme approved by the Commission on 26 July 1978
(1 July 1979 - 30 June 1983).

4. DESCRIPTION, OBJECTIVE(S) AND JUSTIFICATION OF THE PROJECT4.1 Description

Research programme aimed at using hydrogen as a new energy source. It is subdivided into three parts:

- thermochemical production of hydrogen,
- electrolytic production of hydrogen,
- transport, storage and use of hydrogen.

4.2 Objective

Coordination of and participation in studies carried out under contracts between the Commission and specialized bodies in the Member States.

4.3 Justification

Hydrogen is a new energy sector and its production techniques and use should be developed. Studies to date indicate that this non-polluting substitute fuel could be of great interest in the long term if produced at lower cost.

For this reason the Community should continue to encourage this research.

5. FINANCIAL IMPLICATIONS OF THE PROJECT IN EUA (at current prices)5.0. Expenditure5.0.0 Total cost of the project for the whole of its expected duration

- to the Community Budget	<u>15.000.000</u> EUA
- to national authorities	
- to other sectors at national level	<u> </u>
Total cost	15.000.000 EUA

5.0.1 Multiannual timetable

Duration of the project : 4 years (1.7.1979 - 30.6.1983)

Continuation and extension of the first programme

Appropriations for commitment

	1979	1980	1981	1982	1983	1984	Total
Staff	131.500	281.400	297.200	315.600	167.000		1.192.700
Admin.	18.000	38.500	40.700	43.200	22.900		163.300
Techn. Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	847.800	5.674.300	4.656.000	1.634.700	806.700		13.619.500
Total	1.000.000	6.000.000	5.000.000	2.000.000	1.000.000		15.000.000

Appropriations for payment

	1979	1980	1981	1982	1983	1984	Total
Staff	131.500	281.400	297.200	315.600	167.000		1.192.700
Admin.	18.000	38.500	40.700	43.200	22.900		163.300
Techn. Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	348.000	2.400.000	5.500.000	3.400.000	1.700.000	271.500	13.619.500
Total	500.200	2.725.700	5.844.000	3.765.300	1.893.300	271.500	15.000.000

5.0.2. Method of calculation

a) Expenditure on staff

Requirements are assessed on the basis of a staff complement of five for this objective :

- 3 category A officials
- 1 category B official
- 1 category C official

In addition to the average costs for staff in the different categories, the calculations take account of the parameters laid down during preparation of the Draft Budget for 1979. The calculations make no provision for an increase in purchasing power; they merely allow for a revision of salary weightings to take account of general price trends in the Community.

b) Administrative expenditure

This covers requirements for mission and duty travel expenses and expenditure on meetings.

c) Expenditure under contracts

A uniform method of calculation cannot be laid down in view of the nature of the subject and the qualifications of the contracting parties. In any case, the Advisory Committee on Programme Management (ACPM) provided for in the Council decision will be consulted on the allocation of appropriations.

d) Multiannual estimates

The following rates have been adopted for the purpose of calculating the multiannual estimates : 1979 - 1.07; 1980 - 1.13; 1981 - 1.20; 1982 - 1.27; 1983 - 1.34 ; 1984 - 1.41.

5.1. Revenue

6. TYPE OF CONTROL TO BE APPLIED

Scientific monitoring : Competent officials of DG XII
Project leaders
Advisory Committee
Subcommittee on Energy R&D (CREST)

Budgetary implementation and
correct administration of expenditure : Financial Control

Administration : Contracts department of DG XII

7. FINANCIAL IMPLICATIONS OF THE PROJECT

7.0

7.1

7.2

7.3 Appropriations to be entered in the forthcoming budget.

FINANCIAL RECORDA. PART I: EXISTING AND NEW PROJECTS1. RELEVANT BUDGET HEADING CODE

CHAPTER 33 ITEM 3357 FINANCIAL PLAN CODE 357.2

2. TITLE OF BUDGET HEADING

ITEM 3357 : Energy Research and Development
FINANCIAL PLAN CODE: 357.2 Solar Energy

3. LEGAL BASIS

Proposal for a programme approved by the Commission on 26 July 1978
(1 July 1979 - 30 June 1983).

4. DESCRIPTION, OBJECTIVE(S) AND JUSTIFICATION OF THE PROJECT4.1 Description

Research programme on the use of solar energy, subdivided as follows:

- solar collectors and their application in the home,
- self-contained generating sets for the production of mechanical and/or electrical power,
- photovoltaic conversion,
- photo-electrochemical, photochemical and photobiological processes,
- photosynthetic production of organic matter,
- solar radiation data network,
- wind power,
- solar heating in industry and agriculture.

4.2 Objective

Coordination of and participation in studies and research carried out under contracts between the Commission and specialized bodies in the Member States.

4.3 Justification

Solar Energy is an inexhaustible and non-polluting source, but still used only on an experimental basis.

Technical as well as economical constraints limit its present use and require further research work to ensure its development.

The Commission was asked to stimulate this area of research which needs to be developed.

5. FINANCIAL IMPLICATION OF THE PROJECT IN EUA (at current prices)

5.0 Expenditure

5.0.0 Total cost of the project for the whole of its expected duration

- to the Community Budget	<u>58.000.000</u> EUA
- to national authorities	
- to other sectors at national level	<u> </u>
Total cost	58.000.000 EUA

5.0.1 Echéancier pluriannuel

Duration of the project: 4 years (1.7.79 - 30.6.1983)

Continuation and extension of the first programme.

Appropriations for commitment

	1979	1980	1981	1982	1983	1984	Total
Staff	213.550	456.900	482.500	512.400	542.300		2.207.650
Admin.	34.100	73.000	77.100	81.800	43.300		309.300
Techn. Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	2.749.650	25.464.300	15.434.300	9.399.300	2.411.000		55.458.550
Total	3.000.000	26.000.000	16.000.000	10.000.000	3.000.000		58.000.000

Appropriations for commitment

	1979	1980	1981	1982	1983	1984	Total
Staff	213.550	456.900	482.500	512.400	542.300		2.207.650
Admin.	34.100	73.000	77.100	81.800	43.300		309.300
Techn.Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	982.850	11.800.000	21.500.000	12.600.000	8.575.700		55.458.550
Total	1.233.200	12.335.700	22.065.700	13.200.700	9.164.700		58.000.000

5.0.2. Method of calculation

a) Expenditure on staff

Requirements are assessed on the basis of a staff complement of nine for this objective :

- 4 category A officials
- 1 category B official
- 4 category C officials

In addition to the average costs for staff in the different categories, the calculations take account of the parameters laid down during preparation of the Draft Budget for 1979. The calculations make no provision for an increase in purchasing power; they merely allow for a revision of salary weightings to take account of general price trends in the Community.

b) Administrative expenditure

This covers requirements for mission and duty travel expenses and expenditure on meetings.

c) Expenditure under contracts

A uniform method of calculation cannot be laid down in view of the nature of the subject and the qualifications of the contracting parties. In any case, the Advisory Committee on Programme Management (ACPM) provided for in the Council decision will be consulted on the allocation of appropriations.

d) Multiannual estimates

The following rates have been adopted for the purpose of calculating the multiannual estimates : 1979 - 1.07; 1980 - 1.13; 1981 - 1.20; 1982 - 1.27; 1983 - 1.34 ; 1984 - 1.41.

5.1 Revenue

6. TYPE OF CONTROL TO BE APPLIED

Scientific monitoring: Competent officials of DG XII
Project leaders
Advisory Committee
Subcommittee on Energy R & D (CREST)

Budgetary implementation
and correct administration
of expenditure: Financial Control

Administration: Contracts department of DG XII

7. FINANCIAL IMPLICATIONS OF THE PROJECT

7.0

7.1

7.2

7.3 Appropriations to be entered in the forthcoming budget.

FINANCIAL RECORD

A. PART I : EXISTING AND NEW PROJECTS

1. RELEVANT BUDGET HEADING CODE

Chapter 33 ITEM 3357 FINANCIAL PLAN CODE 357.3

2. TITLE OF BUDGET HEADING

ITEM 3357 : Energy Research and Development
FINANCIAL PLAN CODE: 357.3 Geothermal energy

3. LEGAL BASIS

Proposal for a programme approved by the Commission on 26 July 1978
(1 July 1979 - 30 June 1983).

4. DESCRIPTION, OBJECTIVE(S) AND JUSTIFICATION OF THE PROJECT

4.1 Description

A research programme has been set up on the use of geothermal energy in the context of efforts to use available natural resources. It includes:

- integrated geochemical, geophysical and geological research and studies in regions with geothermal potential,
- study of underground problems relating to the use of natural thermal springs,
- study of surface problems relating to the use of natural thermal springs,
- hot dry rocks.

4.2 Objective

The study programme will enable natural heat resources to be listed and used to produce electrical energy or to provide urban and agricultural heating. These activities will be carried out under contracts with specialist laboratories in the Member States.

4.3 Justification

The increasing energy needs of large urban centres make it essential to find natural resources which are economic and non-polluting. Moreover, as industrial society expands, it needs heat to increase productivity. Geothermal energy is a source of heat which can be used to produce electricity or for industrial purposes if the temperature is high enough (superheated steam), while lower temperatures (hot water) can be used for district heating.

5. FINANCIAL IMPLICATIONS OF THE PROJECT IN EUA (at current prices)

5.0 Expenditure

5.0.0. Total cost of the project for the whole of its expected duration

- to the Community Budget	<u>20.000.000</u> EUA
- to national authorities	
- to other sectors at national level	<u> </u>
Total cost	20.000.000 EUA

5.0.1 Multiannual timetable

Duration of the project: 4 years (1.7.1979 - 30.6.1983)

Continuation and extension of the first programme.

Appropriations for commitment

	1979	1980	1981	1982	1983	1984	Total
Staff	119.700	271.100	286.300	304.100	160.900		1 142.100
Admin.	19.000	41.000	42.900	45.600	24.100		172.600
Techn. Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	858.600	7.682.100	5.664.700	3.643.800	811.600		18.660.800
Total	1.000.000	8.000.000	6.000.000	4.000.000	1.000.000		20.000.000

Appropriations for payment

	1979	1980	1981	1982	1983	1984	Total
Staff	119.700	271.100	285.300	304.100	160.900		1 142.100
Admin.	19.000	41.000	42.900	45.600	24.100		172.600
Techn. Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	350.000	3.600.000	6.900.000	4.800.000	2.500.000	510.800	18.660.800
Total	491.400	3.917.900	7.235.300	5.156.200	2.688.400	510.800	20.000.000

5.0.2. Method of calculation

a) Expenditure on staff

Requirements are assessed on the basis of a staff complement of six for this objective :

2 category A officials

3 category B officials

1 category C official

In addition to the average costs for staff in the different categories, the calculations take account of the parameters laid down during preparation of the Draft Budget for 1979. The calculations make no provision for an increase in purchasing power; they merely allow for a revision of salary weightings to take account of general price trends in the Community.

b) Administrative expenditure

This covers requirements for mission and duty travel expenses and expenditure on meetings.

c) Expenditure under contracts

A uniform method of calculation cannot be laid down in view of the nature of the subject and the qualifications of the contracting parties. In any case, the Advisory Committee on Programme Management (ACPM) provided for in the Council decision will be consulted on the allocation of appropriations.

d) Multiannual estimates

The following rates have been adopted for the purpose of calculating the multiannual estimates : 1979 - 1.07; 1980 - 1.13; 1981 - 1,20; 1982 - 1.27; 1983 - 1.34; 1984 - 1.41.

5.1 Revenue6. TYPE OF CONTROL TO BE APPLIED

Scientific monitoring: Competent officials of DG XII,
Project leaders,
Advisory Committee,
Subcommittee on Energy R & D (CREST)

Budgetary implementation
and correct administra-
tion of expenditure: Financial Control

Administration: Contracts department of DG XII

7. FINANCIAL IMPLICATIONS OF THE PROJECT

7.0

7.1

7.2

7.3 Appropriations to be entered in the forthcoming budget.

FINANCIAL RECORDA. PART I: EXISTING AND NEW PROJECTS1. RELEVANT BUDGET HEADING CODE

CHAPTER 33 ITEM 3357 FINANCIAL PLAN CODE 357.4

2. TITLE OF BUDGET HEADING

ITEM 3357: Energy Research and Development

FINANCIAL PLAN CODE: 357.4 Energy Systems Analysis and
Strategy Studies

3. LEGAL BASIS

Proposal for a programme approved by the Commission on 26 July 1978
(1 July 1979 - 30 June 1983).

4. DESCRIPTION, OBJECTIVE(S) AND JUSTIFICATION OF THE PROJECT4.1 Description

This action programme was decided upon in order to study and provide a fuller understanding of world and Community energy resources. It aims to set up a reference data base using sectoral sub-models in an integrated model and thus arrive at an energy strategy for the Community.

4.2 Objective

This project continues and consolidates the first programme, especially the application of the EEC multinational model in the Member States. Under the new programme, work will begin on:

- improvement and further development of the medium and long term EC energy models,
- development of new concepts for energy systems' representations,
- development of new means for better communication between model builders and model users,
- world energy modelling.

4.3 Justification

In order to arrive at a cohesive European energy policy including research and development, it is essential that energy supply systems be analysed, the corresponding models be set up and the necessary data be assembled for their implementation.

5. FINANCIAL IMPLICATIONS OF THE PROJECT IN EJA (at current prices)5.0 Expenditure5.0.0 Total cost of the project for the whole of its expected duration

- to the Community Budget	<u>7.000.000</u> EJA
- to national authorities	
- to other sectors at national level	<u> </u>
Total cost	7.000.000 EJA

5.0.1 Multianual timetable

Duration of the project: 4 years (1.7.1979 - 30.6.1983)

Continuation and extension of the first programme.

Appropriations for commitment

	1979	1980	1981	1982	1983	1984	Total
Staff	201.800	499.400	527.400	560.000	296.400		2.085.000
Admin.	24.000	51.400	54.200	57.600	30.500		217.700
Techn.Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	271.500	1.943.400	1.912.300	375.900	169.700		4.672.800
Total	500.000	2.500.000	2.500.000	1.000.000	500.000		7.000.000

Appropriations for payment

	1979	1980	1981	1982	1983	1984	Total
Staff	201.800	499.400	527.400	560.000	296.400		2.085.000
Admin.	24.000	51.400	54.200	57.600	30.500		217.500
Techn.Op.	2.700	5.800	6.100	6.500	3.400		24.500
Contracts	110.000	1.150.000	1.900.000	1.100.000	300.000	112.800	4.672.800
Total	338.500	1.706.600	2.487.700	1.724.100	630.300	112.800	7.000.000

5.0.2. Method of calculation

a) Expenditure on staff

Requirements are assessed on the basis of a staff complement of ten for this objective :

- 4 category A officials
- 3 category B officials
- 3 category C officials

In addition to the average costs for staff in the different categories, the calculations take account of the parameters laid down during preparation of the Draft Budget for 1979. The calculations make no provision for an increase in purchasing power; they merely allow for a revision of salary weightings to take account of general price trends in the Community.

b) Administrative expenditure

This covers requirements for mission and duty travel expenses and expenditure on meetings.

c) Expenditure under contracts

A uniform method of calculation cannot be laid down in view of the nature of the subject and the qualifications of the contracting parties. In any case, the Advisory Committee on Programme Management (ACPM) provided for in the Council decision will be consulted on the allocation of appropriations.

d) Multianual estimates

The following rates have been adopted for the purpose of calculating the multianual estimates : 1979 - 1.07; 1980 - 1.13; 1981 - 1.20; 1982 - 1.27; 1983 - 1.34; 1984 - 1.41.

5.1. Revenue

6. TYPE OF CONTROL TO BE APPLIED

Scientific monitoring : ~~Competent~~ officials of DG XII
Project leaders
Advisory Committee
Subcommittee on Energy R&D (CREST)

Budgetary implementation and
correct administration of expenditure : Financial Control

Administration : Contracts department of DG XII

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7. FINANCIAL IMPLICATIONS OF THE PROJECT

7.0

7.1

7.2

7.3 Appropriations to be entered in the forthcoming budget.