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PROPOSAL FOR A COUNCIL REGULATION (EEC)

on the granting of financial aids to demonstrate projects
in the field of energy-saving

PROPOSAL FOR A COUNCIL REGULATION (EEC)

on the granting of financial support for projects to exploit
alternative energy sources

(submitted to the Council by the Commission)

COM(77) 187 final.

COMMISSION
OF THE
EUROPEAN COMMUNITIES

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PROPOSAL FOR A COUNCIL REGULATION (EEC)

on the granting of financial aids to demonstrate projects
in the field of energy-saving

FINANCIAL ASSISTANCE FROM THE EUROPEAN COMMUNITY
TO PROMOTE DEMONSTRATION PROJECTS IN THE FIELD OF ENERGY-SAVING

I. THE OBJECTIVES OF THE PROPOSED SCHEME

1. In its communication to the Council of the 24 February 1977 (1), the Commission took the view, amongst other proposals, that the Community should assist in the financing of selected demonstration projects to promote energy saving. In this communication, the Commission describes in detail the scheme it now submits to the Council for adoption.
2. Demonstration projects are intended to reduce uncertainty about the commercial and economic viability of energy saving techniques which are either newly developed or which have remained unused because of such uncertainties. Generally, this means that it is intended to demonstrate the commercial viability of energy saving techniques both to the manufacturers of plant, equipment, and appliances and to their potential customers. In a few cases however, demonstration projects may be justified by wider considerations, taking into account the economic benefits to society as a whole of an introduction of the techniques in question.
3. Uncertainties can be of two kinds. For a newly developed technique which is not proven on an industrial scale, there will be uncertainties about the technical and cost implications of its large-scale application. For both newly-developed and existing techniques there will also be a lack of familiarity on the part of potential customers or users which makes it very difficult for the manufacturer of equipment and appliances, or the supplier of services, to evaluate the potential market, and which may discourage them from investing in a particular technique. Projects can be assisted which are inhibited by either of these two kinds of uncertainty.
4. In short, demonstration projects have as their objective the bringing into the market place of energy saving techniques. While they differ therefore from research and development programmes, whose objective is

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(1) COM(77)39 final "An intensification of the Community's programme for energy saving".

the conception and design of technologies, they are a natural complement to them. The scheme for demonstration projects in the energy saving field must therefore be managed in close conjunction with national and Community research and development programmes in this field.

II. THE SCOPE OF THE PROPOSED SCHEME

5. In its communication to the Council of the 24th February 1977, the Commission gave the following examples of possible demonstration projects :

- (i) heat pumps,
- (ii) heat recovery,
- (iii) the combined production of heat and power,
- (iv) energy storage,
- (v) selected projects for reducing waste in industry,
- (vi) low energy houses.

6. Projects to demonstrate the combined production of heat and power will typically involve a much larger scale of financial assistance than other projects, and are therefore worth a detailed consideration. The Commission believes that, in the medium term, substantial savings of the same order or even more than those expected as a result of improved standards of thermal insulation or more efficient individual heating systems (2), could be obtained by a more general introduction of the combined production of heat and power. Combined heat and power production can also help to reduce the energy requirements of industry for process heat and to encourage the recycling of such heat where possible.

7. While there will be opportunities to demonstrate new technologies in the field of combined heat and power - particularly as regards heat

(2) Proposals for a Community programme of this kind are made separately in document COM(77)....

storage and the distribution system - the dominant uncertainty arises out of the long lead times for development and concerns the evaluation of the future market. This is particularly difficult where potential customers have no comparable experience of such a system, and are therefore reluctant to commit themselves to it in advance.

8. It is true that combined heat and power lacks sponsors for a multitude of reasons, many of them quite unrelated to its commercial viability. Organisational and legal frameworks are frequently obstructive and such constraints are difficult to overcome when no enterprises exist which are in the business of selling combined heat and power. For this reason, the Commission has proposed to the Council that it adopts a recommendation to Member States which sets out to tackle these problems [COM(77) ...], but the Commission also believes that demonstration projects sponsored by the Community and Member States are an essential further action to take, to encourage investors to accept the risks inevitably imposed by the long lead times mentioned above.

9. Community assistance need not necessarily involve participation in the costs of the project itself. The feasibility studies which have to be carried out in great detail before such important investments are decided upon, are often themselves relatively complicated and costly. Where they seem particularly promising, the Community could consider helping to meet the costs of such feasibility studies.

10. In addition to demonstration projects in the field of combined heat and power, the Commission believes that the Community should assist each year, a small number of relatively large industrial projects which may involve important energy savings in industrial processes or the launching of new products or processes with important energy-saving characteristics, and of general application, into the market.

Finally, there may be expected to be a number of small projects involving commercial trials of particular applications of heat pumps, methods of heat recovery and heat storage, or the design and functioning of low-energy houses.

11. Based on a level of activity which would enable the Community to support every year a minority share of the costs of around two district heating schemes, two applications of the combined production of heat power in industry, around five or six major industrial projects and a number of small projects involving commercial trials of particular applications, the Commission proposes, within the framework of provisions to be made for this purpose in the general budget of the Communities, to provide financial assistance to the demonstration of energy saving technologies.

12. After a trial period of three years, the scheme would be reviewed to determine, in particular, future levels of financial assistance.

III. THE MANAGEMENT OF THE PROPOSED SCHEME

13. The Commission would be responsible for the detailed management of the proposed scheme with the benefit of expert advice from consultants as necessary, but would seek the opinion of an advisory committee created for the purpose and composed of representatives of the Governments of the Member states. The Commission would seek the opinion of the advisory committee on the following points in particular :

- (i) the priorities for action,
- (ii) the criteria for project evaluation,
- (iii) the terms of the standard contract or contracts by which the Commission would define the respective rights and obligations of the Commission and of the beneficiaries of any financial assistance,

- (iv) the relationship of the Community's scheme to national schemes, if any, for the support of comparable demonstration projects.
- (v) the relationship of the scheme to national and Community research and development programmes in the same field.

14. Apart from the general indications given in section II above, the Commission will propose priorities for action on the basis of the projects submitted to it.

15. The criteria for project evaluation will place particular emphasis on the need to determine :

- (i) the commercial or economic viability of the technology to be demonstrated, allowing for the fact that the demonstration project itself may not be commercially viable from the outset, but must be defensible on the basis of a comparison of the costs and benefits of support for society as a whole;
- (ii) the precise definition of the reasons which prevent the enterprise drawing on internal or national sources of finance to undertake the project;
- (iii) the degree to which the technology is suitable for general application in all the Member states of the Community;
- (iv) a precise definition of the benefits to be obtained in terms of energy savings by a general introduction of the technology throughout the Community.

16. The terms of the standard contract or contracts to be drawn up by the Commission would cover in particular:

- (i) the rights of access of persons accredited by the Commission to have access to information and to the project itself, and the rights of the Commission with regard to a non-voting participation in the management of the project where the scale of the support or the nature of the project should justify it;

- (ii) the rights and obligations of the beneficiaries of Community assistance, and the protection of proprietary information and patents;
- (iii) the conditions for repayment of the financial assistance given by the Community in the event of commercial success, and the rights of the Commission to seek independent verification of the degree of commercial success.
- (iv) the circumstances in which the Commission shall be entitled to terminate its participation in a project and require repayment of its financial assistance.

17. The Community scheme is designed to complement and not replace financial assistance which may be offered by the Member states themselves. Subject however to the Commission being satisfied that this condition is fulfilled, the Community may find it advantageous to participate with individual Member states in appropriate cases, in the financial assistance to be given to a demonstration project.

18. Finally, as was stated in paragraph 4, the scheme to support demonstration projects must be managed in close conjunction with national and Community research and development programmes in this field and the proposed advisory committee can help the Commission to maintain the necessary close liaison with national research and development programmes.

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PROPOSAL FOR A COUNCIL REGULATION ON THE GRANTING OF FINANCIAL
AIDS TO DEMONSTRATION PROJECTS IN THE FIELD OF ENERGY-SAVING

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

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

Having regard to the proposal from the Commission,

Having regard to the Opinion of the European Parliament,

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

Whereas, by virtue of Article 2 of the Treaty, the Community has the duty
to promote the harmonious development of economic activity throughout the
Community, a continuous and balanced expansion and an increase in stability,

Whereas in the present energy situation, a reduction in the rate of increase
in energy consumption will contribute effectively to the achievement of these
objectives;

Whereas, in its Resolution of 17 September 1974 concerning a new energy policy
strategy for the Community¹, the Council approved the objective of a "reduction
of the rate of growth of internal consumption by measures for using energy
rationally and economically without jeopardizing social and economic objectives";

Whereas encouraging the demonstration of new technologies which directly result
in energy savings in that they improve energy efficiency provides a means of
achieving this objective;

Whereas the first responsibility for financing such industries should be for
industry; whereas, in view of the risks and large investments implied by such
activities, particularly with technologies which have not been subjected to full-
scale trials or applied commercially, provision should nevertheless be made for
the Community to support these activities particularly where they may benefit
the Community as a whole;

¹OJ No. C 153, 9.7.1975, p. 1.

Whereas, in view of the need to limit such support to that which is strictly essential, the Community must have at its disposal every means of assessing, case by case, the possible benefits to it of such projects and their conformity with the objectives of Community energy policy;

Whereas, to this end beneficiaries shall assume obligations towards the Community, in return for the benefits received;

Whereas the Treaty does not foresee the powers necessary for these purposes;

HAS ADOPTED THIS REGULATION:

Article 1

As provided for in the following articles, the Community may grant support for "Community projects" of paramount importance to improving the efficiency with which energy is used.

Article 2

1. Every such project shall be related to the creation of installations making use on an industrial scale of new equipment, processes or products for saving energy. Every project must genuinely be the first of its kind capable of providing a benchmark and of being an encouragement for other installations of the same type in the Community.

2. Community projects shall relate inter alia to the following areas :

- heat pumps
- heat recovery
- combined production of heat and power
- energy storage
- rationalization of the use of energy in industry
- low-energy dwellings.

Article 3

Responsibility for every project shall devolve upon a natural or legal person constituted in accordance with the laws in force in the Member States of the Community.

If the creation of a legal entity to carry out a project involves additional costs for the participating undertakings, the project may be carried out with no more than cooperation between natural or legal persons. In this case, these persons shall be jointly and severally liable for the obligations resulting from Community support.

Article 4

Support granted for a project may take the form of Community participation in the project through financial support in the form of grants repayable under certain conditions within the appropriations provided for this purpose in the general budget of the Communities, and taking into account any other Community or national financial assistance to the project. Such support shall constitute only a minority share of the financing.

Article 5

1. Every project by individuals or undertakings in the Community shall be subject to scrutiny by the Commission.

Every project must provide information on the following factors;

- a detailed description of the project,
- the financial situation and technical capabilities of the person or persons responsible for the project,
- the significance of the project for energy savings in the Community,
- the nature and extent of the financial risks of the project and its expected profitability,
- the cost of the project and the financing arrangements proposed for its implementation,
- any other matter which might justify the type and extent of the support for the project, from the Commission,
- the time scale for the execution of the project,
- any support provided by or expected from Member States for the project,
- how it is proposed to publicize the results.

The Commission shall determine which Community projects shall be granted financial aid and shall be assisted by an Advisory Committee on the Management of Demonstration Projects consisting of representatives of the Member States.

Article 6

The benefits granted by the Community must not affect the conditions of competition in a way incompatible with the principles contained in the relevant provisions of the Treaty.

Article 7

1. The Commission shall set out the rights and obligations of each party in a contract with the beneficiary or beneficiaries of support for a Community project.
2. The person or persons responsible for implementing a project in receipt of Community support shall send to the Commission, each year or at its request, a report on the fulfilment of contractual obligations towards the Commission and in particular the progress of work on the project and the expenditure incurred on it.
3. The Commission shall have access at all times to the accounts relating to the project. It may have checks performed in situ and from documentary evidence as a means of monitoring the performance of the contract and in particular the progress and implementation of Community projects.
4. Where the extent of financial support from the Commission and the size of the project so warrants, the Commission may propose, when the contract is drawn up, to have a right to participate in the management of the project without a vote.

Article 8

The Commission shall report periodically on the application of this Regulation to the European Parliament and to the Council which shall express an opinion on the report.

Article 9

This Regulation shall enter into force on the day following its publication in the Official Journal of the European Communities.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

COMMISSION
OF THE
EUROPEAN COMMUNITIES

PROPOSAL FOR A COUNCIL REGULATION

on the granting of financial support for projects to exploit
alternative energy sources

(Presented by the Commission to the Council)

12

EXPLANATORY MEMORANDUM

In order to attain its objective of reducing dependence on imported energy, the Community must both seek to save energy and develop the resources available in its territory. As the Commission has pointed out on several occasions (see COM(77)20 and COM(76)508 final) this endeavour, which certain Member States have already begun, requires specific action by the Community in some cases. This is particularly true of the application on an industrial or semi-industrial scale of new technologies, processes, equipment or products which are scientifically proved, but whose ^{technical-economic} viability has not yet been demonstrated.

2. The attached proposal for a Council Regulation comes under the Council energy policy programme for 1977. Its purpose is to enable support to be given for demonstration projects or pilot plants using new techniques or technologies for exploiting alternative energy sources. This kind of financial participation is a means of:

- (a) encouraging and expediting the execution of projects entailing financial, technical, and/or technological risks;
- (b) making successful installations set an example, thereby promoting swifter dissemination of the technology concerned.

Of specific concern here are projects to exploit geothermal fields (Annex 1), coal gasification and liquefaction projects (Annex 2) and, for example, certain types of equipment for advanced nuclear reactors.

An indication of the financial implications for the Community in the two above mentioned fields are given in the Annexes.

This proposal is to be seen as part of a bigger package of Community measures to promote the production of alternative energy sources (e.g. technological projects in the hydrocarbons sector, uranium prospecting, Euratom loans etc., other measures referred to in documents COM(76)20 and COM(76)508 final).

PROPOSAL FOR A COUNCIL REGULATION
on the granting of financial support for projects to exploit
alternative energy sources

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

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

Having regard to the proposal from the Commission,

Having regard to the Opinion of the European Parliament,

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

Whereas, under Article 2 of the Treaty the Community shall have, as its
task to promote the harmonious development of economic activities throughout
the Community, a continuous and balanced expansion and an increase in
stability,

Considering the Council Resolutions of 17 December 1974 and 13 February 1975
concerning the objectives of Community energy policy and measures for
achieving them;

Whereas, in the present energy situation, greater exploitation of
alternative energy sources in the Community will reduce dependence on
imported energy, diversify energy supply and contribute to
the attainment of these objectives;

Considering the Council Decision of 22 August 1975 adopting an energy
research and development programme;

Whereas financial support should be granted after the research stage for
exploration for and utilization of alternative energy sources, in view
of the financial risks implied by new techniques and technologies and the
high capital cost of such projects;

Whereas reference projects which will provide encouragement for other
projects and thus promote their execution will be eligible for such
support;

Whereas of these proposed alternative energy sources the exploitation of geothermal fields and the conversion of solid fuels into hydrocarbons, in particular, offer development prospects;

Whereas the execution of such projects bring with it the development in the Community of an industry with the relevant skills as well as providing potential access to industrial outlets of some substance outside the Community;

Whereas the granting by the Community of benefits envisaged must not adversely affect the conditions of competition in a manner incompatible with the principles embodied in the relevant provisions of the Treaty;

Whereas, in view of the need to limit such support to that which is strictly essential, the Community must have every means of assessing, case by case, the possible benefits to it of such projects and their conformity with the objectives of Community energy policy;

Whereas, to this end, beneficiaries shall assume obligations towards the Community in return for the benefits received;

Whereas the Treaty does not provide the powers necessary for these purposes;

HAS ADOPTED THIS REGULATION:

Article 1

As provided for in the following articles, the Community may grant support for reference projects, known as "Community projects", to exploit alternative energy sources in the Community which constitute a reference and have sufficiently good economic prospects.

Article 2

1. The projects referred to in Article 1 shall have as their basis the exploitation of energy sources using new techniques or technologies capable of providing a reference and encouragement for other installations of the same type.
2. Community projects shall relate to the following sectors inter alia:
 - exploitation of geothermal fields;
 - conversion of solid fuels into hydrocarbons.

Article 3

Responsibility for every project shall devolve upon a natural person or a legal person constituted in accordance with the laws in force in the Member States of the Community.

If the creation of a legal entity to carry out a project involves additional costs for the participating undertakings the project may be carried out with no more than cooperation between natural or legal persons. These persons shall then be jointly and severally liable for the obligations resulting from Community support.

Article 4

Support granted for a project may take the form of Community participation in the project through financing in the form of grants, repayable under certain conditions, from the appropriations provided for this purpose in the general budget of the Communities, and taking into account any other Community or national financial assistance to the project. Such support shall constitute only a minority share of the financing.

1. Every project put up by individuals or undertakings in the Community shall be subject to scrutiny by the Commission. When examining each project the Commission shall take into consideration inter alia the following factors:

- a detailed description of the project and the time scale for its execution,
- the significance of the project for the reduction of dependence on imported energy, diversification of supply and possible energy savings,
- the financial situation and technical capabilities of the person or persons responsible for the project,
- the cost of the project and the following arrangements proposed for its execution,
- the nature and extent of the ^{financial}risks of the project and its expected profitability,
- any other matter which might justify the type and extent of the support proposed for the project by the Commission,
- any support provided by or expected from Member States for the project,
- how it is proposed to disseminate the results.

2. The Commission shall determine which Community projects shall be granted financial aid and shall be assisted in this by Advisory Committees on the Management of Reference Projects consisting of representatives of the Member States.

Article 6

The benefits granted by the Community must not adversely affect the conditions of competition in a manner incompatible with the principles embodied in the relevant provisions of the Treaty.

Article 7

1. The Commission shall set out the rights and obligations of each party in any contract with the beneficiary or beneficiaries of support for a Community project.
2. The person or persons responsible for implementing a project in receipt of Community support shall send to the Commission, each year or at its request, a report on the fulfilment of contractual obligations towards the Commission and in particular the progress of work on the project and the expenditure incurred on it.

3. The Commission shall have access at all times to the accounts relating to the project. It may have checks performed in situ and from documentary evidence as a means of monitoring the performance of the contract and in particular the progress and implementation of Community projects.

4. Where the extent of financial support from the Commission and the size of the project so warrants the Commission may propose, when the contract is drawn up, to have a right to participate in the management of the project without a vote.

Article 8

The Commission shall report periodically on the application of this Regulation to the European Parliament and to the Council, which shall both express an opinion on the report.

Article 9

This Regulation shall enter into force on the day following its publication in the Official Journal of the European Communities.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

A. **USES FOR GEOTHERMAL ENERGY**

1. Geothermal energy may be defined as the Earth's natural heat energy, most of that heat being produced by the radioactivity of deep-lying rocks. Apart from seasonal variations, which only affect some tens of meters under the surface the temperature increases with depth by an average of one degree per 30 meters; this implies a flow of heat outwards from the interior. The temperature in the center of the earth probably reaches a level of several thousands of degrees.

Most of this thermal energy of the earth, however, is too diffuse to lend itself for commercial exploitation. Nevertheless there are zones where the heat is concentrated at depths within reach of economical drilling - in the order of some thousands of metres down.

In the most favourable cases geothermal energy is delivered by steam at a comparatively low temperature, of about 200° to 300° C. It is consequently a form of energy that does not lend itself readily to transport for more than a few tens of kilometres.

2. Two types of geothermal source are presently exploited:

- a) "high-enthalpy" sources - i.e. fields of steam or water/steam mixtures at temperatures over 150 - 200° C; and
- b) "low-enthalpy" sources - consisting chiefly of water at less than the above temperature.

In both cases, a degree of ground permeability permits water to circulate which, depending on the geothermal gradient, the succession of permeable and impermeable strata, etc., produces deposits of this kind.

A further possibility of using this natural heat is based on the geothermal content of impermeable "hot rocks" although this calls for very complex engineering on which studies and research work are at present in progress.

3. Fields of this type referred to in paragraph a) can be used for electricity generation. By the end of 1975 installed generating capacity throughout the world amounted to 1,300 MW, with approximately 420 MW in Italy and 500 MW in the U.S.A. Nearly 700 MW of capacity was under construction.

Fields of the type described in paragraph b) can be used chiefly for non-electricity purposes; the chief uses are for space heating, principally of dwellings, but also in buildings for industrial, agricultural or stock-raising purposes.

B. TECHNICAL AND ECONOMIC ASPECTS OF THE EXPLOITATION OF GEOTHERMAL PRODUCTION

4. The bringing of a geothermal field into production carries with it financial risks which arise from geological uncertainties, and it calls for heavy investment.

There are two successive phases marking such exploitation:

- pre-drilling project design and estimates; and
- tailoring of the scheme to drilling results.

The viability of such a project depends on the quantity of heat that can be recovered; this in turn depends on the flow from the well, the temperature of the fluid and the number of hours' utilisation. But, when a field is discovered it is extremely difficult to determine its potential output, for it will be necessary to establish the probable values of geological, hydraulic, and thermal parameters such as:

- depth and thickness of the deposit;
- temperature and chemical properties of the geothermal fluid;
- permeability of the deposit; and
- the deposit's heat capacity (or equivalent thermal conductivity).

Although the first two of the above parameters can be established without an excessive margin of uncertainty, serious uncertainties may remain about permeability and conductivity.

Not only, therefore, are the cost of drilling and its uncertainties highly variable; the investment called for in successive stages is also fairly high. Furthermore, the lead time elapsing before full development is often long and profit in the early stages of exploitation may be modest.

5. Geothermal power stations are usually built up from 30 MW units, but they may go up to 110 MW. Above such capacities the turbines ought to be fed from a large number of wells, which would make costs higher than the benefits deriving from the economy of scale with larger turbines sets.

The most wide-spread types of unit throughout the world are:

- back-pressure turbines, fed with straight natural steam which is thereafter discharged to atmosphere; these are small, readily transportable units for bringing a new field on line swiftly;
- condensing turbines, also fed with straight natural steam which is then passed into a condenser.

The back-pressure type has a low specific capital cost, of approximately 250 e.u.a./kW, but its specific steam consumption is approximately twice as high as the condensing type's (20 kg/kWh net compared with less than 10 kg/kWh net); the latter, by contrast, has a specific capital cost in the order of 500 e.u.a./kW.

6. In the exploitation of "low enthalpy" fields, the heating systems installed are of greater or lesser technical complexity according to the outlet temperature of the geothermal fluid and its salt content, which causes problems of corrosion and scaling.

Operation with superheated or saturated steam poses no corrosion problems. Hot water is generally laden with salts; consequently it pollutes the environment and attacks materials. Furthermore, the temperature involved do not permit of large differentials whence the need for suitable heat-exchange areas.

The water is drawn from extraction wells generally surrenders part of its heat to the (fresh) heating water in heat exchangers and is then reinjected into the soil via return wells; this also has the effect of keeping the field under pressure. The heat-extraction system, then, is based on twin wells for drawing and reinjecting, the cost of which vary between 1 and 2 million e.u.a.

From the heat exchanges, and depending on water temperature, the heat is piped to the heating network and distributed by radiators, through the floor or by other means. The placing of a heat pump in the circuit promotes heat extraction and permits better matching of the temperature of the heat extracted to the type of space heating and to climatic conditions.

7. The value of the heat drawn from the earth is obviously equivalent to the cost of the energy which it is able to substitute.

In the field of electricity production the specific cost arising from fuel sets an upper limit to the relationship between the investments in prospecting, research and drilling needed for opening up a deposit, and the value of the available fluid. Judging from experience gained, the costs arrived at are lower than those of the fuel burnt in a conventional power station.

In the field of district heating it is true that the provision of geothermal energy does necessitate heavier initial investments than those needed in the case of conventional boilers; nevertheless, after the first years of operation one can expect the users to find their heating expenses diminished.

C. PROSPECTS FOR GROWTH IN THE USE OF GEOTHERMAL ENERGY

8. As geological surveys and research now stand, and without, for the time being, taking into consideration the possibilities of "hot rocks", prospects for growth in the use of geothermal energy are attractive in several Community countries. In the short term, however, prospects are better in Italy and in France, where the exploitation of indigenous energy sources is of particular importance, in view of these countries' dependence on imported energy.

9. In Italy a programme has been formulated, chiefly with the aim of locating new geothermal sources for electricity generation. Phase 1 of the research, consisting of geological, geophysical and geochemical surveys, covered 20 000 km² in the area of the western Pre-Appenines; of that some 1 500 km² have been selected as displaying promising characteristics for the discovery of "high-enthalpy" fields. Phase 2, consisting of the drilling of exploration wells, has begun and some of these wells have led to the discovery of four reservoirs, varying in their characteristics but seeming exploitable.
"Low-enthalpy" deposits were also located during both phases of the exploration programme.
In the course of the 1980's installed geothermal generating capacity might double, to approximately 1 000 MW, and geothermal space heating might rise to some tens of MWth.

10. In France all the major sedimentary basins contain bodies of ground water at up to 80° C. Low-enthalpy geothermal systems are now in operation and by 1985 about 500 twin-well systems might be commissioned, half of them in the Paris area. From that year onwards geothermal energy might thus be providing the equivalent of 1.5 million toe for space heating.
With regard to "high-enthalpy" deposits, surveys and exploration to date show that the best prospects are chiefly to be found in the Massif Central and in French overseas territories.

11. In the United Kingdom the geothermal structures of possible interest are, according to present knowledge, in Cornwall, Durham, the Hampshire Basin and Scotland. These zones comprise hot rocks of between 100 and 200° C, from which it will be possible to draw the energy at lower costs than those of fossile fuels presently in use. A recent report on the country's geothermal potential estimated that, in the long term, this source of energy might provide the equivalent of 2.8 million toe.

In the Federal Republic of Germany the most promising sources are in the Rhine trough. The highest-temperature rocks are situated at a depth of about 3000 m, with temperatures above 200° C.

In the other Community countries, a number of prospection and research activities are under way, with the chief objective of obtaining knowledge about the geothermal potential hidden underground.

12. Also a number of research institutes in various Community countries are engaged in projects relating to the use of this sources of energy.

Under the Council Decision of 22 August 1975 adopting an energy research and development programme (1), the Commission, which is responsible for seeing that the programme is carried out, the projects being chiefly on a shared-cost basis, let the first batch of contracts of research projects on the following subjects (Annex):

- a) the acquisition and collation of new and existing geothermal data; work to collate the data available on the Community's geothermal potential and acquire data at present lacking to enable its geothermal potential to be better estimated;
- b) improvement of exploration methods; research to perfect methods of exploring specifically for geothermal fields and related methods of interpretation;
- c) sources of hot water (low-enthalpy); theoretical studies using mathematical models and experimental work on the use of geothermal waters (behaviour of geothermal reservoirs, feasibility and viability of exploitation);
- d) steam sources (high-enthalpy) and hot rocks; research and development to improve the exploitation of geothermal fields producing steam and

(1) CJ No L 231, 2.9.1975.

also work on the possibility of extracting heat from dry rocks, particularly by fracturation to make them permeable.

The programme will be carried out in two stages extending over four years: from 1 July 1975 to 31 December 1976 and from 1 January 1977 to 30 June 1979. The Commission is assisted in the execution of the programme by an Advisory Committee set up for the purpose.

D.

DESIRABILITY OF PROMOTING GROWTH IN THE USE OF GEOTHERMAL ENERGY

13. While, on a near time span (1980-85), we must take a sober view of the contribution that geothermal energy can make to the Community's total energy balance, in the longer term its contribution might be far from negligible, especially if research directed towards the exploitation of hot rocks leads to commercial applications. And, although we must realise that geothermal energy will not solve the Community's energy problems, it will contribute to savings on imports of hydrocarbons and will produce more rational use of energy, if only for transport reasons. In regional terms - and bearing in mind that the countries where prospects are the most attractive are among those with the highest dependence on outside energy sources - exploitation of geothermal resources is genuinely attractive.
14. It is not easy to produce a quantitative estimate of the prospects for the use of geothermal energy, owing to the uncertainties attending the discovery and bringing into production of deposits. On the basis of surveys, research and projects now in progress, a rough estimate of the geothermal contribution to the covering of future energy needs nevertheless, arrives at several percent. While it is a comparatively small contribution, in relative terms, in absolute terms it is nevertheless not inconsiderable, since 1% of the Community's energy consumption in 1985 will be over 13 million toe which at present prices means a saving of foreign currency of the order of 1 000 million EUA. These figures might be much higher in the future if research directed towards the exploitation of hot rocks should lead to commercial applications.
15. Furthermore, any contribution to the development of a "geothermal energy industry" in the Community may have favourable effects on industry generally and on the balance of payments, in view of the size of the potential market outside the Community. Several of the countries in question, which have recently embarked on accelerated geothermal exploration and drilling programmes, have neither the engineering skills nor an adequate industrial base to exploit such deposits. The Community industry might therefore find substantial markets.
16. Geothermal energy, moreover, can be regarded as one of the least polluting forms of energy in view of the successes achieved in reinjection of the

liquid, after heat extraction, into the reservoir from which it was extracted or into very deep (over 1 000 m) strata at the edge of the geothermal field. The gaseous phase normally consists of CO₂ with traces of H₂S. Experience in Italy and the USA shows that the nuisance value is minimal.

17. Beyond the R & D stage, one means of promoting the use of geothermal energy is to support practical projects which can serve as references and to promote the setting-up of industries with the necessary skills. The major obstacles in the way of the development of geothermal energy are the high investment costs and the geological uncertainties, which bring with them financial risks of some magnitude.

A degree of hesitancy when faced with a new form of activity, together with the comparatively long period elapsing between the decision to invest and the accrual of operating revenues, are other factors which may slow the growth of the use of geothermal energy. Because of this fact, private operators may not find great attraction in this type of investments; it is mainly at public/^{authorities} level that the interest lies in the development of the use of this energy source. Hence the need to facilitate private investment by a public support, which should be limited in duration and should favour entry into the market by private operators.

E. **ELEMENTS OF THE COMMISSION PROPOSAL**

18. The Commission proposes to employ Community funds for the purpose of encouraging the realisation of projects to exploit geothermal resources. The selected projects should have a character that serves as a point of reference in this field, and sufficient promise of profitability.
19. A full-scale geothermal project comprises three stages: research, exploration and utilisation of a deposit. By research, the layers having geothermally favourable factors are identified; in the exploration stage, a number of samples and drillings are conducted and particular studies made to evaluate the possibilities for commercial exploitation of a deposit; in the utilisation stage, the production wells are finally drilled and the investment for commercial exploitation of the deposit is carried out.
20. The support is based on subsidies to be repaid under certain conditions and by non-repayable subsidies; it will represent a minority only of the funds with which the project is financed. It may cover at the most 40% of the funds invested during the exploration stage, 50% of which being repayable in the case of positive results and 20% of funds invested at the utilisation stage, the whole of which would be repaid (1).
21. Clearly the promoters of the project must themselves provide the funds needed to cover the investment not covered by Community support. Consequently that support does not replace but rather strengthens and encourages national efforts.
22. Possibilities to obtain the support would be limited in time. The support may stretch over a period of 5 years beginning on 1.1.1978 and thereby ensure the logical advancement of the Community's research policy in this area, where it would mark the transition into the production stage. After this time limit, the projects carried out would in fact have to serve as a reference for other projects, thereby furthering their attainment.

(1) For instance, in the case of a 30 MW station requiring approximately 3 million EUA during the "exploration" stage and 15 million EUA during the "utilisation" stage, the Community support could amount to 1.2 million EUA for the first stage, .6 million EUA of which would be repaid in the case of positive results, and 3 million EUA for the second stage to be repaid fully.

23. The repayable parts of the amounts will be paid back, beginning with the second year of commercial operation of the deposit. The total amount to be repaid will be divided into payments stretching over a maximum period of 8 years. The detailed conditions for repayment of the repayable amounts will be defined separately for each project.
24. The Commission proposes that the support operation should be carried out through the Community budget. As the chief object of the proposed support is to develop indigenous energy sources and thereby to reduce the Community's external dependency in relation to imported oil, the support would take place under the EEC Treaty.

Subject : Gasification and liquefaction of coal

1. The question of coal gasification, and of underground gasification in particular, was raised at the meetings of the Energy Council of 19 October and 21 December 1976. At its meeting of 25-26 November 1976, CREST put forward a series of recommendations with regard to energy research and development, including bi- or multilateral cooperation for the gasification and liquefaction of coal.
2. In 1975 and 1976 the European Parliament adopted, on the basis of reports on the gasification and liquefaction of coal prepared by its Committee on Energy, Research and Technology, resolutions which, among other things, invited the Commission of the European Communities to promote research and development in these two fields. This resolution was submitted to the Council. After having studied the problems within its services and in collaboration with a committee of experts, the Commission expressed itself on the subject on several occasions; it made a clear statement in its Medium-term Guidelines for Coal, 1975-1985.

Collaboration with the United States has been established bilaterally with the United Kingdom and the Federal Republic of Germany. The interests of the United States are, however, very different because of the lower cost of American coal.

3. On the technical level, the processes may be divided into two groups. On the one hand, there are conventional processes which have reached the industrial stage but which cannot yield the range of products desired (such as SNG) and can use only certain types of coal; their production costs, moreover, are still too high. On the other hand there are proposed new systems which are still mostly at the laboratory or small pilot plant stage. These are aimed at widening the range of coals that can be utilized and of products that can be obtained, as well as at reducing production costs. The use of nuclear reactors as a source of heat could be included in the range of gasification processes that are most economically viable. The combined gas turbine and steam turbine cycle for electricity generation appears promising. With regard to lead times, it must be emphasised that the development of new processes on the pilot scale will take 6 to 8 years to reach the point at which the results obtained are applicable on the industrial scale. The time lags anticipated and the technical problems that have still to be solved demonstrate the need to avoid delay in making the transition from the laboratory or small pilot stage to the semi-industrial stage so that the Community may have new techniques available within the desired time.
4. Except in a few special, isolated cases, underground gasification of coal by traditional methods (preferably using coals of high volatile matter content at shallow depths) has not, up to now, yielded economically useful results, mainly because the gas has been too lean and its quality irregular. In contrast, new ideas and proposals are currently being given serious attention with a view to improving the quality and cost of production of the gas obtained. The processes in question will operate under pressure, at greater or lesser depths, using boreholes from the surface.

5. Work is being carried out, in the context of basic scientific research, in the research centres of the Community's coal producing countries either with financial aid from the E.C.S.C. within the framework of the programme "Chemical and Physical Valorisation of Coal" or with national funding within governmental programmes. Research and development and a number of tests on the pilot- or smaller scale are under way in the national programmes on coal gasification and liquefaction, principally in the Federal Republic of Germany, the United Kingdom and Belgium. Furthermore, several projects go beyond the national level and merit the launching of a programme of action by the Commission. Moreover, the technological developments lie more within the province of industry than in that of the research centres.

6. Coal gasification and liquefaction is, in the long term, the most promising means of obtaining substitute petroleum products. This technique is of positive interest to the Community not only under the difficult economic situation and effects on the balance of payments due to petroleum imports, the price of which threatens to be increased in the near future. As well, coal gasification and liquefaction is likely to replace petroleum production when a lessening of gas and petrol reserves is felt. These technologies can make use either of the Community's own resources (the Community has extensive coal reserves) or coal imported from Third countries. Because transport of a gasified or liquefied product is easier than the transport of coal, a demand from the whole Community could be met, even in areas without coal resources or liquefaction and gasification installations.

7. In consequence, considering the growing interest in the Community in coal gasification and liquefaction, the important technical and economic problems that have still to be solved, the time needed to achieve results that can be applied industrially and the reserves of solid fuel that exist in the Community, and taking into account the importance of these problems in the sphere of energy supply in the longer term, the Commission is of the opinion that financial support by the Commission for the construction and operation in the Community of pilot installations for the gasification and liquefaction of coal is necessary.

GASIFICATION AND LIQUEFACTION OF COAL

1. Gasification of coal

a) Techniques

- The techniques for gasifying coal are based on known methods. Processes for gasifying hard coal or lignite with steam to produce a fuel gas or a synthesis gas (the high-pressure LURGI process, the KOPPERS-TOTZEK process, etc.) have been used on the industrial scale over a long period.
- The aim of more recent methods, on the other hand, is to produce a gas from coal to replace natural gas (Substitute Natural Gas = SNG); SNG is obtained either by methanation of the synthesis gas produced by steam gasification (LURGI, SYNTHANE, COED-COGAS, BIGAS, CO₂-ACCEPTOR processes, etc.) or by gasification brought about by direct hydrogenation (HYDRANE and HY-GAS processes). These processes are, for the most part, at the laboratory- or small pilot-scale stage, and semi-industrial scale tests have still to be carried out.
- Interesting attempts are being made to use heat from high-temperature nuclear reactors instead of burning coal to provide the heat required for the gasification process. Such a technique could be used to produce various types of gas from either hard coal or lignite, and would have some potential advantages: less rapid exhaustion of reserves, a lower gas price, and a favourable impact on the environment. On the other hand, there are some technical problems - notably that of transferring the nuclear heat at the high temperatures required for the gasification reaction (about 800°C for lignite, and 1000°C for hard coal). The outlook for this gasification technique depends mainly on the development of nuclear reactor technology.

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- In parallel with the development of the above gasification techniques, there exist new possibilities for utilizing the gas produced, particularly in connection with combined cycles (gasifiers, gas and steam turbines) for electricity generation. Such methods should permit a more rational utilization of coal, thanks to their higher thermal efficiency, and hence a reduction in the cost of electricity (about 17% for a 600 MW power station).
- It should be pointed out that gasification is a suitable technology in relation to the protection of the environment because the major part of the pollutants can be eliminated from the gas by relatively simple means. However, problems could arise in connection with the supply and purification of water and, in certain cases, the utilization of the waste products.

b) Raw materials

In order to put gasification into practice it is necessary to have available sufficient quantities of coal to supply a coal refinery. As a guide, the production of 1 milliard m³ of SNG (of the same quality as natural gas) requires 1.8 to 2 million tonnes of hard coal or 6 million tonnes of lignite if conventional gasification techniques are used. If, on the other hand, nuclear heat is used, the quantities required are estimated to be 1 to 1.2 million tonnes of hard coal or 4 million tonnes of lignite - in other words, an expected saving of 30%. In addition to the problem of the availability of these amounts of coal, questions arise in connection with the amount of water needed for all the processes. Furthermore, it is necessary to manufacture significant quantities of hydrogen in order to produce SNG. Another problem that should be borne in mind is that of utilizing the waste products that will be formed in greater or lesser quantities, depending on the gasification process used.

e) Economic problems of gasification

The cost of gasification depends mainly on the price of the coal used. These costs are shown in the following table for the gasification of hard coal (reference year 1974).

Price of hard coal in UA/Gcal	3	4	5	6	7
Cost of production of SNG (UA/Gcal)	8.85	10.30	11.70	13.15	14.60
Conventional	9.75	11.25	12.70	14.15	15.55
by nuclear heat	7.60	8.45	9.30	10.15	11.00

The corresponding figures for the production of SNG from lignite are of the order of 8 UA/Gcal for conventional gasification and 6.20 UA/Gcal for gasification by nuclear heat. These figures include the cost of the pretreatment necessary for lignite (price of raw lignite: 1.55 UA/Gcal).

It should be noted in this connection that the costs of conventional gasification can be calculated with some precision, thanks to the experience gained in industrial installations, while estimates for the newer processes can be obtained only by extrapolating laboratory or semi-industrial scale results, with all the uncertainty that that involves. This is particularly the case for gasification by nuclear heat, where the cost of producing the gas depends strongly on both the profit gained from the electricity that is produced simultaneously (calculated here at 0.01 UA/Gcal) and the cost of the nuclear heat (estimated to be between 2.20 and 3.70 UA/Gcal).

It can thus be said that the cost of transforming coal into gas increases the price of the calories obtained by a factor of 2 to 3. According to some estimates, the current costs should be 15% higher because of increased capital costs, while the ratio of coal price to gas price remains more or less constant. By way of example, the current price of imported natural gas is 6 to 7 UA/Gcal, and the price of SNG made from Community coal (average price) is estimated to be between 13 and 10 UA/Gcal, depending on whether gasification is achieved by conventional methods or by nuclear heat. The figures quoted give only an approximate idea of the costs. Only pilot plants on the semi-industrial scale can give precise answers.

2. Underground gasification of coal

As in the case of gas production from coal in surface installations, several processes for and experiments on underground gasification go back to the period 1945-1960 (U.S.A., U.S.S.R., Great Britain, Belgium, Morocco). The technical principle consists of making a reaction front advance in a coal seam by supplying oxygen (air) either from two boreholes drilled from the surface or from existing mine workings, and then drawing the resulting gas mixture to the surface for further treatment.

All tests so far carried out on such processes have failed in practice for the following reasons:

- only a fraction of the energy content of the coal is utilized
- the gas mixture produced has only a very low calorific value (about 1000 kcal/m³) and is of very variable composition
- it is extremely difficult or totally impossible to control the reaction temperature because of geological disturbances, falls of ground and the possible influx of water
- the risks of surface subsidence (damage to buildings and drainage systems) and pollution of ground water cannot be eliminated
- the cost of gas production is consequently very high.

Since 1973, the problem of underground gasification has been re-examined and, as a result, under certain very favourable geological conditions (very thick seams, high volatile matter content, shallow depth), processes of the conventional type are being used with some success in the U.S.A., although the calorific value of the gas is still low.

In Europe, on the other hand, and notably in Belgium and the Federal Republic of Germany, new investigations are under way with a view to carrying out gasification under pressure at greater or lesser depths. The aim is to achieve better control of the gasification reactions and to obtain a richer gas, with the objective of making use of deposits that cannot be exploited economically by traditional mining techniques. Collaboration has been established between the two countries in order to carry out joint research work. What are the prospects for this new process? The answer to the question can be obtained only by full scale tests, following a series of preliminary laboratory studies, which will confirm or deny the economic value of the new technique.

3. Liquefaction of coal

The technology of coal liquefaction is based on three known processes which have already been applied on the industrial scale:

- ▼ hydrogenation of coal under pressure (BERGIUS/PIER)
- ▼ extraction of coal (POTT-BROCHE/UHDE)
- ▼ synthesis of petrol from water gas (FISCHER-TROPSCH)
(practised on the industrial scale at SASOLBURG, South Africa).

Several new methods based on these principles are being developed in the U.S.A., the Federal Republic of Germany and Great Britain in order to improve the technique and the yield, e.g. the H-COAL process (hydrogenation), the CONSOL SYNTHETIC FUEL and SOLVENT-REFINED COAL processes (extraction), the GENERAL ATOMIC/GULF (liquefaction/gasification with nuclear heat) and EXXON processes, and the hydrogenation process (NCB).

Similarly, the classical process of low-temperature carbonization (pyrolysis) is attracting renewed interest, particularly in connection with carbonization in multi-stage fluidised beds where the char is used in combined processes for the production of electricity or gas (COED and COGAS processes). Another variation involves preliminary distillation of coal (LURGI-RUHRGAS) in order to obtain by-products before combustion of the residue in power stations.

The tonnages of coal needed for the classical liquefaction processes are of the following order (per tonne of petrol)

- hydrogenation: 3.2 tonnes of hard coal, or 9.3 tonnes of lignite
- synthesis: 4.8 tonnes of hard coal, or 16.4 tonnes of lignite

These figures could be improved by using nuclear heat. The cost of petrol made from Community coal is estimated at 0.13 to 0.16 UA/litre, or 16 to 21 UA/Gcal, while the cost of producing petrol in an oil refinery is of the order of 0.10 UA/litre.

For this reason it would be sensible to produce, in the first place, only a heavy oil from coal at a price of about 0.11 UA/litre. This heavy oil could act as a substitute for the fuel oil that is currently burnt in power stations, thus making the latter material available for cracking and production of lighter hydrocarbons. It is necessary, however, to take account of the facts that no experience of the new processes has yet been obtained on the industrial scale, that the capital costs depend mainly on the product that it is desired to obtain (oil, gas, petrol), and that it is very difficult to estimate production costs.

It is only by pilot scale tests that precise information about production costs and the technical and economic value of the processes can be obtained.

FINANCIAL IMPLICATIONS
presented only as indication *

I. Demonstration projects for saving energy

Financial year 1978

1. Relevant budget heading code Article 324
2. Title of budget heading : "Community demonstration projects under the Community's energy-saving programme".
3. Legal basis :
 - 3.0. Article 235 of the EEC Treaty.
 - 3.1. Proposal for a Council Regulation on the granting of financial aids for demonstration projects for saving energy
4. Description, objectives and justification of the project
 - 4.0. Description of the project/persons concerned
 - 4.0.0. Description : Financial support for operations demonstrating new technologies, processes, equipment or products liable to increase the energy efficiency of installations, with a view to establishing their viability and speeding up their dissemination.
 - 4.0.1. Persons concerned
 - 4.0.1.0. Category : Community enterprises
 - 4.0.1.2. Number : About 50
 - 4.0.1.3. Location : Community territory
 - 4.1. Objectives
 - 4.1.0. General objective : In view of the size of the deficiency expected in the production of energy from indigenous sources and the difficulties of again speeding up developments - particularly in the nuclear sector - the Council recognized, on 29 March 1977, the need to intensify the Community's energy-saving programme, specifically by financing demonstration projects. **
 - 4.1.1. Specific objective: The projects to be financed :
 - must genuinely be the first full-scale ones of their kind executed and be capable of providing a benchmark and encouragement for other installations of the same type throughout the Community.

* These amounts will be submitted for approval in the frame of the budgetary procedure

** COM (77)39 final

2.

- must offer sufficient prospects of paying off in terms of savings in energy and operating costs. Should their technical viability be demonstrated, as a result of this financing, the only consideration promoting the dissemination of the technologies or equipment in question is to be financial attractiveness for users;
- must be sufficiently widely applicable, so that their dissemination can provide significant medium-term energy savings at Community level.

Demonstration projects which the Commission is intending to finance will be chiefly in the following areas :

- (i) heat pumps
- (ii) heat recovery
- (iii) combined heat and power production
- (iv) energy storage
- (v) reduction of waste of energy in industry
- (vi) low-energy dwellings.

This proposal could be examined by the Council in the second half of 1977. The Council meeting of 29 March 1977 has already agreed to the principle of the operation as outlined in Doc. COM(77)39. Practical action to save energy is also one of the priorities mentioned most frequently by the Council.

4.2. Justification of the form of action chosen to attain the objectives

Although the increase in energy prices has made investments for saving energy economically attractive - or more so - , investors are still made hesitant because little, if anything, similar has actually been built or installed. Hence a system of Community aid is proposed to get investment for saving energy under way and produce significant savings as swiftly as possible.

This aid is for the purpose of financing selected demonstration projects and the results would be made available to the Member States on a non-discriminatory basis.

5.0. Implication in respect of expenditure

5.0.0. Operations covering several years to be charged to the Budget as appropriations for commitment and appropriations for payment ("differentiated appropriations")

5.0.0.0. Multianual schedule of appropriations for commitment and appropriations for payment (in mEUA) at current prices

	Schedule of commitments	Schedule of foreseeable payments = appropriations for payment required				
		1978	1979	1980	1981	Subsequent financial years
2. New appropriations for commitment						
- 1978	45	17	13	15		
- 1979	48	-	18	15	15	
- 1980	51	-	-	20	15	16
TOTAL	144	17	31	50	30	16

5.00.1. Method of calculation, general economic situation and factors of uncertainty

5.00.1.0. Method of calculation, in relation with the general economic situation

Appropriations for commitment for 1978, 1979 and 1980 and schedule of payments.

- Community participation will in no case exceed 40 %.
- It is estimated that 39 mEUA could provide support for all the following projects :
 - two projects in combined heat and power production
 - two district-heating projects
 - five to ten fairly big projects on industrial processes
 - up to 40 small projects in the industrial, commercial and residential sectors.
- This variety of types of project would be financed either on an annual basis or over a period of three years :
 - annual basis (about one-quarter of the total appropriations) for heat pumps, reduction of waste of energy in industry and low-energy dwellings. Payment to be made in full in one year.
 - over three years (the remainder, i.e. three-quarters of the appropriations) for more costly projects : combined heat and power production, district heating, heat recovery and energy storage.

In this case, payments would generally be made as follows :
 20 % when the contract is signed,
 40 % in the second year,
 40 % in the third year.

This programme would initially run for a period of three years. It would subsequently be reviewed to decide whether or not to extend it.

4.

At 1977 prices, an estimated 39 mEUA per annum would be required to finance the Community projects in 1978, 1979 and 1980. Assuming that the price and cost index moves from 100 in 1977 to 108 in 1978, 116 in 1979 and 124 in 1980, appropriations for commitment emerge as :

1978	: 45 mEUA
1979	: 48 mEUA
1980	: 51 mEUA

By way of example, this is how 1978'S appropriations for commitment were calculated :

- payments for 1978:	25% (39 x 1,08)	+ 20% x 75% (39 x 1,08)	= 17 mEUA
1979:		40% x 75% (39 x 1,16)	= 13 mEUA
1980:		40% x 75% (39 x 1,24)	= 15 mEUA
			Total = 45 mEUA

5.00.1.1. Factors of uncertainty

Factors of uncertainty operate in three areas :

- a) commitments : the amount of support to be afforded depends on the number of projects put up, and on their quality, on the investment needed to carry them out and the level of support for which the Council opts;
- b) payments : the projects selected may be abandoned, modified or delayed before completion, entailing changes in the schedule of payments. And the Commission may suspend or withdraw financing in certain cases;
- c) repayment of capitale : some of the money requested could be provided on the condition that it is paid back if the project is successful, and might then be reallocated.

Control arrangements

No provision is made for checks by the Member States. The authorizing department and Financial Control will carry out periodical checks in situ and from documentary evidence and monitor the projects through the medium of periodical, technical and financial reports which the firms are required to send.

- 6.1. The Commission is required to present to the Council a periodical progress report on each project and the costs incurred, and to inform the Council and the Assembly about the application of the Regulation which is being prepared.

7. Financial implications of the action throughout its expected duration

Support for demonstration projects as part of the Community's energy-saving programme is a three-year programme renewable each year.

It is therefore a continuous operation, the cost of which in an average year would be split about 40/60 between the Commission and the firms responsible for projects financed on an annual basis (see paragraph 5.00.1.0.).

With projects which are financed over a three-year period, the Commission would finance the net extra cost, compared with a conventional type of the installation under test.

II. Financial support for projects to exploit geothermal resources

A. Projects to exploit geothermal resources

1. Relevant budget heading code : .327 .
2. Title of budget heading : Community financial support for projects to exploit geothermal resources.
3. Legal basis : Article 235 of the EEC Treaty

4. Description :

To reduce the Community's dependence on imported oil, use must be made of indigenous, economically-workable energy resources (see the Council Resolutions of 17 December 1974 and 13 February 1977).

After the research stage, the main aim of which is to define the Community's geothermal potential, greater exploitation of geothermal power is conditioned by the development of new technologies, the existence of geological hazards which introduce a high element of risk in respect of returns from the investment and the substantial investment required.

Community financial support for projects to exploit geothermal resources would enable the financial risk to be reduced and the new techniques disseminated by a process of demonstration.

Initially, this would be a five-year operation.

5. Type of expenditure

Support would be granted to firms planning to invest in the exploitation of geothermal power for electricity generation and to make use of geothermal heat. It would take the form of grants repayable under certain conditions, but constituting only a minority share of the financing, and not exceeding :

- 40 % of the reservoir exploration phase, 50 % of which would be repayable if the results were positive,
- 20 % of the financing of the reservoir utilization phase, which would be repayable in full.

Support could cover 20 to 40 % of the financing, depending on the type of project. The total amount requested is 83 mEUA, which could enable support to be given to 15 to 30 projects.

6. Justification

In view of the need to develop new technologies, the geological contingencies and the high cost of this type of investment, the great financial risks entailed would deter the firms concerned from launching such projects. Community support is therefore needed so that these firms do not pull out of this field, leaving a new source of energy untapped.

7. Method of calculation

Support totalling no more than 83 mEUA over 5 years, with the following commitments :

- 10% in 1978
- 15% in 1979
- 25% in 1980
- 25% in 1981
- 25% in 1982

It is difficult to estimate the payments corresponding to these commitments, but in order to indicate a schedule of appropriations for commitment and appropriations for payment until 1980 (see table below) it is proposed that the projects cover three years, payments being made as follows :

- 20% when the support contract is signed
- 40% in the second year
- 40% in the third year

The appropriations for commitment will have to take into account cost increases during the period of execution. At 1977 prices, 8,33 mEUA would be needed for 1978, 12,5 mEUA for 1979 and 2,8 mEUA for 1980. Assuming an increase in the price index from 100 in 1977 to 108 in 1978, 116 in 1979 and 124 in 1980, the following appropriations for commitment are obtained (round figures) :

- 1978 : 9,8 mEUA
- 1979 : 15,7 mEUA
- 1980 : 27,4 mEUA

By way of example, the calculation for 1978 is as follows :

$$\begin{aligned}
 \text{payments for 1978} &: 2 \times 1,67 = 1,8 \text{ mEUA} \\
 &1979 : 4 \times 3,33 = 3,8 \text{ mEUA} \\
 &1980 : 4 \times 3,33 = 4,2 \text{ mEUA} \\
 &\underline{\hspace{10em}} \\
 &9,8 \text{ mEUA}
 \end{aligned}$$

New appropriations for commitment	Schedule of Commitments	Payments				
		1978	1979	1980	1981	Ensuing years
- 1978	9,8	1,8	3,8	4,2		-
- 1979	15,7	-	2,9	6,2	6,6	
- 1980	27,8	-	-	5,2	11,0	11,6
			1,8	6,7	15,6	11,6

B. Gasification and liquefaction of coal

- 1978 Financial year -

1. Relevant budget heading code : 323
2. Title of budget heading : "Projects on construction and trial of pilot plants for the conversing of solid fuels into hydrocarbons"
3. Legal basis : - Article 235 of the EEC Treaty
 - Proposal being drawn up by the Commission departments
 - Preliminary draft Council Regulation under preparation
 - the fourth indent of Item 44 of the Medium-term guidelines for coal (Doc. COM (74) 1860), adopted by the Commission on 2 November 1974 and published in OJ No C 22 of 30 January 1975.
4. Description, objectives and justification of the project
 - 4.0. Description of the project
 - 4.0.0. Description : The granting of financial aid by the Commission to Community undertakings or bodies to encourage the construction and trial of pilot plants for the gasification and liquefaction of coal (hard coal and lignite) including subterranean gasification.
 - 4.0.1. Persons concerned :
 - 4.0.1.0. Category : Community undertakings
 - 4.0.1.2. Number : 15
 - 4.0.1.3. Geographical location : Community territory
 - 4.1. Objectives of the project
 - 4.1.0. General objective : To establish an energy policy; to construct, in the medium and long term, factories to obtain liquid or gas products from Community solid fuels as a substitute for petroleum in order to reduce the Community's dependence on petroleum imports and to help ensure security of energy supply in the longer term (there are extensive hard coal and lignite reserves within the Community).
 - 4.1.1. Specific objective: To provide incentives for technological projects on the techniques for converting solid fuels into hydrocarbons. The introduction of gasification techniques (including subterranean gasification) and liquefaction of coal at the industrial stage gives rise to technological and economic problems.

Basic scientific research has shown that it is possible to overcome these problems. Many research and development projects are now under way. The aim of this project is to confirm or prove unfounded the results obtained in the laboratory by constructing pilot plants and conducting trials. The economic and technical value of different coal gasification and liquefaction processes can be found out only by moving to the semi-industrial stage, and this will also enable the Community to make an exact estimate of the investment involved. The objective of this Community project is the industrial development of this technology so that the conversion of solid fuels into hydrocarbons, a higher grade of energy, can be retained as a feature of energy policy in respect of energy supply.

4.2. Justification of the project chosen to attain the objectives

For several reasons - the technical risks, the high cost of such projects which cannot be borne by one country alone, the increasing importance of problems of coal gasification and liquefaction in the Community, the technical and economic problems still outstanding, the time required to arrive at results which can be used on an industrial scale, the extensive reserves of solid fuels in the Community, the importance of these problems with regard to energy supply - for all these reasons this project could not be carried out without financial support from the Commission, as these industrial technologies must be made available to the Community in good time. It is impossible to pool technologies and make them available in all Community countries without financial support from the Community. Any other form of Community intervention would not be capable of producing the same results.

5.0. Implications in respect of expenditure

5.0.0. Multiannual projects to be entered in the Budget in appropriations for commitment and appropriations for payment ("differentiated appropriations")

5.0.0.0. Multiannual timetable for the appropriations for commitment and the appropriations for payment (in ECU, at current prices)

	Timetable for commitments	Timetable for payments forecast = requirements in appropriations for payment				
		1978	1979	1980	1981	1982
New appropriations for commitment						
- 1978	16 mEUA	6,0	4,8	5,2		
- 1979	23 mEUA		8,7	6,9	7,4	
- 1980	26 mEUA			9,2	7,3	9,5
	Total	6,0	13,5	21,3	14,7	9,5

5.0.0.1. Method of calculation; the connection with the general economic situation; factors of uncertainty

5.0.0.1.0. Method of calculation and connection with the general economic situation

The Community schemes for the conversion of solid fuels into hydrocarbons will be launched over a period of three years. The project should be in operation for 10 to 15 years. As a general rule, payments will be phased approximately as follows :

- 40 % when the support contract is signed
- 30 % in the second year
- 30 % in the third year

The commitment criteria must take account of rising costs over the three years.

By way of example, the appropriations for commitment for ^{1978,} 1979 and 1980 are 23 and 26 mEUA respectively, weighted at 108, 116 and 124

5.0.0.1.1. Factors of uncertainty

There are factors of uncertainty at two levels :

- a) Commitment level : the amount of support depends on the number of projects to be implemented, which in turn depends on their soundness and value to the Community.
- b) Payment level : some of the projects selected could run behind or ahead of schedule. The level of investment (construction) will also affect payments.

6. Type of control to be applied

6.0. The authorizing department (DG XVII) and Financial Control will carry out annual on-the-spot inspections and will examine the supporting documents in order to follow the financial development of the projects. An ad hoc committee of experts, to meet twice a year or whenever necessary, will be set up to inspect the technical execution of the project.

6.1. Each year the Commission will report to the Council on the state of progress and on the expenditure incurred.

7. Financial implications of the project (for the whole of its expected duration)
(in EUA)

The project is expected to extend over a period of 10 to 15 years starting in 1978 at 20 mEUA per year. This is a long-term project and the cost is to be shared between the Commission and the undertakings in charge of the projects.

8. Information regarding staffing and the appropriations for administrative expenditure necessary for the implementation of the project

8.0. a) Investigation of applications and technical management

One committee of experts from the countries concerned, comprising 17 national experts and scientists

Frequency of meetings : three meetings a year, two of which in the field for the technical management of the project.

b) Administration by Commission departments

The project to be administered by the administrative unit XVII-B-4, Coal Research and Technology.

9. Financing the project

By appropriations in the General Budget under Article 235 of the EEC Treaty.

10. Appropriations to be entered in future budgets

20 mEUA a year at 1977 prices for a period of 10 to 15 years.