

COMMISSION OF THE EUROPEAN COMMUNITIES

COM(76) 709 final.

Brussels, 23 December 1976.

REPORT

from the Commission to the Parliament
and the Council on the application of
Regulation (EEC) No 3056/73 on the
support of Community projects in the
hydrocarbons sector

COM(76) 709 final.

M O T I V A T I O N

1. The Council of the European Communities adopted on 9 November 1973 Regulation (EEC) No 3056/73¹ on the support of Community projects in the hydrocarbons sector. This support is intended to encourage technological development activities directly connected to exploration, exploitation, storage or the transport of hydrocarbons, which by their nature improve the security of the Communities' energy supply.
2. In applying this Regulation, the Council, by its Decisions of 19 December 1974 and 4 May 1976, granted 55 technological development projects support amounting to 77.4 m.u.a. Moreover, the Council charged the Commission with the task of negotiating and concluding the contracts with the beneficiaries and with ensuring the management of these contracts.
3. In accordance with Article 10 of the aforesaid Regulation, the Commission now submits to the Assembly and the Council, the attached report on the results obtained to date in applying this Regulation.

¹OJ No L 312/1 of 13 November 1973

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INTRODUCTION

1. On 9 November 1973, the Council of the European Communities adopted Regulation (EEC) No 3056/73 on the support of Community projects in the hydrocarbons sector.
2. This financial support is intended to promote technological development projects directly connected with prospecting for, extracting, storing or transporting hydrocarbons and likely to improve the security of the Community's energy supplies.
3. When that Regulation was adopted, the Council noted that the Commission planned to enter in the Communities' Budget an average annual appropriation of only about 25 m u.a. to finance this operation during the period 1974-76.
4. The funds made available by the Council and the Parliament for the application of Regulation No 3056/73 in fact total 78 m u.a. so far, of which 25 m u.a. were made available in 1974, 25 m u.a. in 1975 and 28 m u.a. in 1976.
5. The Commission presents herewith its first report on the results of the application of the Regulation during the period specified. The details relating to the implementation of the Regulation are given in Annex I.

FIRST SERIES OF PROJECTS (1974-1976)A. Call for applications and examination of applications

6. Following the adoption of Regulation No 3056/73 on 9 November 1973, the Commission published a Communication in the Official Journal of the European Communities inviting undertakings to submit, before 30 March 1974, applications for support for Community projects in the hydrocarbons sector.
7. By the deadline laid down in the Communication, 13 undertakings had submitted to the Commission 23 technological development projects, for which the support requested totalled 74.2 m u.a. for the first three years.

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8. The projects submitted to the Commission were first examined to ensure that they were eligible under Regulation No 3056/73. The purpose of the examination was to establish that the projects in question:
 - are technological development projects directly connected with prospecting for, extracting, storing or transporting hydrocarbons and are likely to improve the security of the Community's energy supplies;
 - are to be carried out by a natural or legal person constituted in accordance with the laws in force in the Member States.
9. After the Member States had been consulted on each dossier, the Commission examined the technical, economic and financial aspects of each project.
10. Following this examination, the Commission selected 21 of the 23 projects submitted and drew up proposals for support in the form of a subsidy which would be repayable if the results were exploited commercially and ranging between one-third and almost 50% of the cost of the planned investment, depending on the nature and objective of each project.
11. The Commission considered that the amount of support granted should depend on the results expected from the project, and in particular, on the extent to which the project could improve the security of the Community's supplies of hydrocarbons. The Commission therefore proposed that maximum support (49.9%) be granted to projects for the development of prospecting and extracting techniques and a medium support (33.3%) to projects for the development of storage and transport methods.
12. The total amount of support proposed by the Commission for the implementation of 21 projects during the period 1974-76 was fixed at 58 861 066 u.a., for total investments costing approximately 126 m u.a.
13. The Commission's proposal was sent to the Council on 25 July 1974 (Doc. COM(74) 890 final).

B. Council Decision

14. The Council's Working Party on Energy began its study of the Commission's proposals on 10 September 1974. Even at the first few meetings, it became clear that agreement could not be reached on the Commission's conclusions as to the amount of support to be granted to the 21 projects selected. While recognising that very advanced technology was involved in the projects, some delegations did not consider that the Community should contribute 50% of the investment costs, especially in view of the limited budgetary resources.
15. At its session of 17 December 1974, the Council decided to grant the following support at the following rates:
- 40% for projects on hydrocarbon prospecting and extracting techniques;
 - 35% for certain projects on the development of equipment and machinery for extraction operations;
 - 30% and 25% for technological development projects on the transport and storage of hydrocarbons.

The total aid authorised by the Council amounted to 42 503 159 u.a., for work conducted between 1 April 1974 and 31 December 1976.

The list of projects receiving support is given in Annex II.

C. Conclusion of contracts and administration

16. Early in 1975 the Commission drew up a model contract for the grant of Community support.
17. The principles of the contract are as follows:
- support is granted for a limited period of time and the amount is fixed;
 - support is granted in the form of a subsidy repayable with interest if the results of the project are exploited commercially;

- the contractor assumes the technical and financial responsibility for the implementation of the project;
- the contractor informs the Commission periodically of the progress of the work and of the expenditure incurred;
- the contractor sends to the Commission any information on the commercial exploitation of the results obtained in the performance of the contract;
- the Commission and the contractor together establish an acceptable form of cooperation if other undertakings receiving Community support are working towards objectives similar to those of the contractor;
- any knowledge acquired in the implementation of the project is the property of the contractor;
- the contractor undertakes to use a considerable part of the results obtained from the implementation of the project for the benefit of the Community. In particular, he undertakes to give priority to supplying to persons and undertakings in the Community, on non-discriminatory commercial terms, the products, equipment and service based on those results.

18. Once the standard contract had been adopted (12 May 1975), the Commission proceeded to conclude individual contracts, to commit expenditure and to authorize the first payments.
19. Following the withdrawal of two undertakings, the appropriations committed in the 1974 and 1975 Budgets were reduced to 38 913 959 u.a. from the 42 503 159 u.a. decided on by the Council. Of that amount, payment of 25 469 125 u.a. had been authorized at 31 December 1975 as advanced and the first interim payments. The balance, i.e. 13 444 834 u.a., should be settled by 31 December 1976. As a result, the recipients have already received, on average, 65% of the support granted by the Council, and, in some cases, 80%. The latter recipients will not receive the remainder of their allocation until the final report has been approved by the Commission.

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SECOND SERIES OF PROJECTS (1975-1977)

A. Call for applications and examination of applications

20. The second call for applications for support for Community projects was published in the OJ of 21 December 1974. By the deadline laid down in that Communication (28 February 1975), 63 Community undertakings had sent the Commission applications for support for the implementation of 120 projects involving investments estimated at approximately 300 m u.a.
21. As certain undertakings withdrew their applications and some projects were subsequently amalgamated, the number of projects to be examined was reduced to 86, and the amount of investments and associated expenditure fell to 247 m u.a. for the period 1975-77. After the projects had been examined to ensure that they were eligible under Regulation No 3056/73, and after the Member States had been consulted, the Commission assessed each project and decided on the amounts of financial support which could be authorized by the Council.
22. In view of the large number of projects under examination and the limited financial resources available compared with the number of applications, the Commission eliminated the least important projects and reduced the amounts of investment proposed by the undertakings, in some cases quite considerably. The Commission also decided not to consider two projects until the following financial year.
23. Once these operations had been completed, the number of projects eligible to receive Community support was reduced to 38, and the corresponding investments totalled 117 853 142 u.a. for the period 1975-77. The Commission proposed the same rates of support, ranging from 25 to 40%, as those adopted by the Council in its Decision of 17 December 1974, for the investments planned, to obviate any discrimination.
24. In accordance with the criteria applied when the projects submitted in 1974 were examined, the Commission considered that those projects expected to produce results likely to increase available supplies and/or speed up the exploitation of the Community's hydrocarbons resources should be granted the maximum rate of support (40%) whereas projects in the storage and transport sectors should in principle be granted a medium rate of support (35%).

The minimum rate of support (30%, and sometimes even 25%) was granted to projects for the development of services. Only if the implementation of such projects led to the elimination of a major bottleneck could they benefit from a higher rate of support.

25. On the basis of these principles, the amount of support which the Commission proposed to grant during the period 1975-77 to the 38 projects selected totalled 44 683 758 u.a. This sum was covered by the appropriations to be entered in the General Budget of the Communities for Community projects. The Commission had requested the entry of 40 m u.a. (instead of the expected sum of 25 m u.a.) for 1976, which, with the non-automatic carry-over of 11 m u.a. from 1975, would have covered the amount of aid proposed.
26. The Commission's proposals were forwarded to the Council on 3 September 1975 (Doc. COM(75) 424 final).

B. Council Decision

27. The work of the Council's Working Party on Energy was affected by the uncertainty surrounding the budgetary resources available for 1976. When those resources were finally fixed at 28 m u.a., including 25 m u.a. granted by the Council and 3 m u.a. by the European Parliament instead of at 40 m u.a. as the Commission expected, it was found that the Commission's proposal for support exceeded the amounts available for 1975 and 1976 together by approximately 6 m u.a.
28. To keep within the new limits on budgetary resources, the Commission re-examined the applications for support which it had selected and cut the amount of support initially proposed by 6 235 123 u.a. The cut was arrived at by eliminating three projects which were less important, by reducing the amount of support initially proposed for four other projects by 5% and by postponing three projects until the next financial year.

29. The amount of support proposed by the Commission for the period 1975-77 was thereby reduced from 44 683 758 u.a. to 38 448 635 u.a. This amount was covered by the appropriations entered in the 1976 Budget (28 m u.a.) and by the balance of appropriations (11 085 148 u.a.) from the 1975 Budget, which the Council brought forward to the current Budget.
30. The Council reached unanimous agreement on this amount of financial support and on the conclusions reached by the Working Party on Energy, and on 25 March 1976 it approved the support to be granted to the remaining 34 projects. The list of projects is given in Annex III.

However the Commission intends to draw attention within the framework of the next budgetary exercise, to the need to extend the validity of this decision until the end of 1979.

I. THE TECHNICAL AND ECONOMIC SYNTHESIS OF THE APPLICATION OF THE
REGULATION

31. Before crude oil arrives in the refineries to be transformed into petroleum products, and before natural gas can be supplied to consumers, deposits must be found, and opened up, equipment installed, transport facilities created, processes developed, operating teams trained and a complicated logistics system developed. The application of Council Regulation (EEC) No 3056/73 has been confined to the most important steps in this complex technical field, i.e. in particular, to the offshore production of oil and natural gas and to the secondary recovery of oil.
32. Large new undersea deposits of oil and natural gas are likely to be found on the continental shelf, in particular. Technological development must therefore concentrate especially on processes and equipment designed to enable hydrocarbons to be extracted from underwater deposits. Such processes and equipment must enable oil and gas to be extracted at economically acceptable costs, even in unfavourable natural conditions, but safely and without endangering the environment. Extraction operations must not be affected by ocean currents, storms, ice or snow. Divers cannot be used to operate equipment and carry out work at a depth of more than 200-400 m below the surface of the sea; remote-controlled and even automated equipment must be used to extract hydrocarbons from deposits located at such depths. It is therefore particularly difficult, costly and risky to develop processes and equipment for deep-sea production. The major oil companies can assemble the requisite funds by stages and therefore slowly, and even of the major companies which have embarked on systematic technological development in all sub-sectors, only two are known to have carried out extensive and successful work to solve their specific problems.
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33. The large-scale search for undersea oil and natural gas deposits began only about ten years ago. In this process, and when opening up the deposits found, the oil industry found itself confronted with entirely new, unsolved technical problems.
- 3 4. Until reliable technical equipment is available for drilling, extracting, storing and transporting hydrocarbons, the best possible results obtained from the search for undersea hydrocarbons will remain worthless. All sub-sectors must be developed at the same pace as the lack of an economically-applicable and technically-reliable solution to the problems in a particular sub-sector can limit or render impossible the application of the results achieved in other sub-sectors.
35. So far, 17 projects¹ have been started, as the first instalment of the work referred to in the Council Decision of 19 December 1974, they will be completed in 1976/1977. Consequently, only the results of the following projects, which have already been completed or almost completed, can be assessed:
- 3 5.1. Drilling platforms and drilling ships have so far been used only at depths of 300-400 m, except in the case of one American ship. With the drill-ship "Petrel" and its future sister ships the Community's oil industry will have at its disposal equipment for drilling deposits located at as much as 600 m under the sea. Further prospection will thus be possible in large areas of the continental shelf.
- 3 5.2. In another project relating to drilling methods, some steps have already been taken to overcome the problems connected with drilling at depths down to 1,000 m.
- 3 5.3. Hitherto, divers have had to help with the erection and operation of extraction equipment on the seabed at depths of up to 200-300 m. The use of divers at greater depths can hardly

¹ A short description of all the projects is given in Annex IIA.

be justified. The development and experimental use of a remote-controlled extraction system in one oilfield - where the equipment is located on the seabed and can be operated by remote control - constitutes an important step forward in the endeavour to ensure the safe and economic extraction of deep-sea deposits. The same applies to two further projects for the development of remote-controlled Christmas trees for individual wells or for those whose wellheads can be contained in a single frame (template). In the light of the results of the projects referred to above, it is to be expected that when deep-sea deposits of oil and natural gas are opened up and worked, the Community will have at its disposal the suitable, proven extraction equipment.

- 5.4. It was impossible to lay pipelines at a depth of more than 200 m until the Straits of Messina project had been successfully completed. During that project the method to be applied at depths of up to 350 m was developed by adding pipe-handling booms to the equipment of a pipe-laying barge. These results served as the basis for the further development of the equipment and process for use at depths of up to almost 600 m in the Sicilian Channel as part of the second project undertaken by the same firm.

Without this method, the planned commercial transportation of large quantities of Algerian natural gas by pipeline from Hassi R'Mel via Tunisia to Italy, would not have been possible; this would have been to the detriment of the Community's supplies of hydrocarbons.

6. However, it is not only the discovery and opening-up of new deposits in the Community's territory which represent a decisive factor in the Community's oil supplies, but also improved extraction methods in existing oilfields involving secondary and tertiary recovery processes. Such processes have enabled the output of deposits already being worked to be increased from the current average figure of 30% to 40, 50 or possibly even 60%.

Secondary and tertiary recovery processes from operating fields were developed and tested to only a limited extent when crude oil prices were relatively low, because of the high costs involved. As crude oil prices have risen, sub-processes have become considerably more important.

During the search for hydrocarbons, there have been found on Community territory, extensive oil deposits in recent years which cannot be extracted by current processes. New extraction processes must therefore be developed, but the costs involved are so high that the companies concerned cannot embark on them without Community support for a number of years yet.

37. Technological development projects in the hydrocarbons sector, which are of fundamental importance for the security of the Community's supplies as defined in Council Regulation No 3056/73, have, in both of the three-year periods introduced so far, been selected both from projects concerning offshore methods and from projects involving secondary recovery processes, so that almost all aspects of the complex technology of oil and natural gas have been covered.
38. When selecting the projects to be promoted, preference was given, in the case of projects involving the same degree of technological innovation, to those which were likely to lead to the extraction of more hydrocarbons earlier.
8. The implementation of the projects will speed up technological development in the most difficult sectors of the oil industry. It is the companies in the Community which will primarily promote and benefit from this acceleration. The financial support provided by the Community will also enable smaller undertakings to participate in these developments.

An indirect success achieved by the financial support of technical development projects in the field of hydrocarbons technology has been that undertakings in the various Community countries have

begun to cooperate. Related and/or partially-overlapping programmes can be financed only once. The undertakings are therefore compelled to harmonize their programmes and to use their individual funds in the best possible way. The Commission's Steering Committees for the individual sub-sectors have played their catalyzing role successfully.

39. Because of the necessary delays in establishing the model contract, the contracts between the Commission and the undertakings were only concluded by the end of 1975 and some undertakings found themselves unable to begin the work before this date.

It is therefore understandable that the undertakings will not be able to complete their work before the end of 1977 or even before the beginning of 1978, and that some have had to find additional funds, particularly seeking new partners, to enable them to carry out the planned work. These difficulties have likewise led to delays in the work programmes or to limits being imposed on the scope of the work originally proposed.

ANNEX IDETAILS OF THE IMPLEMENTATION OF REGULATION NO 3056/73

1. The procedure used by the Commission to apply the Regulation comprises three main stages:
 - (a) the call for applications and the examination of the application for support,
 - (b) the Council Decision on the support to be granted,
 - (c) the conclusion and administration of contracts.

Call for applications and the examination of the applications for support

2. The applications for support submitted to the Commission by the deadlines laid down in the call for applications published in the Official Journal are transmitted to the Member States for an opinion. The Commission examines the technical, economic, financial and legal aspects of each dossier, after noting any comments submitted by the Member States.
3. The main purpose of the examination is to ascertain:
 - whether the dossier submitted is eligible for support;
 - the extent to which the implementation of the project can improve the security of the Community's supplies of hydrocarbons;
 - the technological innovation inherent in each project;
 - the nature and seal of the technical and financial risks involved in the implementation of the project and its estimated economic profitability;
 - the risks of duplication with an existing technique or with one that is being developed;
 - the technical and financial capacities of those responsible for the project;
 - the means of financing the project and possible intervention by the EIB or national bodies.
4. Following this examination, the Commission draws up a general report on each project, containing a general assessment of the merits of the project and a proposal concerning the amount of support which it should receive. The report is transmitted to the Council for approval.

Council Decision

5. The Commission's proposals on the support to be granted to each project are submitted to the experts in the Council's Working Party on Energy. The Working Party analyzes the Commission's conclusions on each project and makes any amendments which it deems necessary.
6. The results of this examination are submitted to the Council, which decides on each project by unanimous vote. In its Decision, the Council lays down the maximum amount of support to be granted to each project as a percentage of the costs of implementing the project, and authorizes the Commission to negotiate and conclude the contracts and administer their performance.

Conclusion and administration of contracts

7. The contracts for the grant of support are drawn up on the basis of the standard contract approved by the Commission on 12 May 1975.
8. Each contract comprises four parts:
 - general provisions;
 - a technical annex describing the work involved in the implementation of the project, the time required and the estimated costs;
 - a financial annex setting out the procedures for paying the subsidy and for repayment and defining what is meant by the commercial exploitation of the results;
 - a third annex setting out the contractor's obligations as regards the dissemination of the knowledge acquired during the implementation of the project.
9. The subsidy is paid as follows: after an advance has been paid, payments are authorized after an examination of the records and an inspection on the spot, and after the Commission has approved the expenditure effected during the period covered by the report submitted.
10. If the results of the project are exploited commercially, the contractor repays the Commission the subsidy which he had received, with interest calculated from the date on which the timetable for the repayments is laid down by the Commission. The interest rate is that applied by the European Investment Bank on that same date.

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11. The definition of the commercial exploitation of the results depends on the objective of each project. The following may be regarded as examples of commercial exploitation:
 - the transfer of industrial property rights or licences for such rights against a lump-sum payment;
 - sales of equipment on the basis of the results, whether or not protected, and any other form of direct exploitation of such results by the contractor, and the supply of services based on the processes developed in the performance of the contract;
 - the exploitation by the contractor himself, or by a licence-holder, on his own premises, of equipment and processes developed in the performance of the contract.

12. The administration of the performance of the contracts consists of monitoring the implementation of the project to ensure its conformity with the programme for which the contract was concluded and monitoring expenditure. In addition, on-the-spot inspections are carried out. These periodic inspections are carried out by officials in the authorizing department (Directorate-General for Energy) and in the Directorate-General for Financial Control in the Commission.

13. The administration of the contracts also includes the dissemination and exploitation of the results obtained in performance of the contract and the organizing of collaboration and cooperation between those undertakings receiving support with a view to encouraging the exchange of information on experience gained and preventing duplication of effort.

Organization of the work

14. For the implementation of Regulation No 3056/73, the Commission has formed a provisional ad hoc unit within the Directorate-General for Energy composed of four officials engaged in administrative and advisory duties and two assistants, working under the Hydrocarbons Director.

15. This unit is advised in its work by independent technical experts, particularly in the fields of oil technology and geophysics.

Furthermore, the Directorates-General for:

Research, Science and Education;

Scientific and Technical Information and Information Management;

Budgets;

Financial Control; and

the Commission's Legal Service

are associated with the various stages in the work.

ANNEX II

SUPPORT GRANTED FOR COMMUNITY PROJECTS
IN THE HYDROCARBONS SECTOR
FOR THE PERIOD 1974/1976

P R O J E C T	S U P P O R T		
Definition of the project and those responsible	Total investments for the period 1974 to 1976 in units of account	Rate of support	Corresponding amount in units of account
A. <u>EXPLORATION</u>			
Seismic Data Acquisition Equipment COMPAGNIE GENERALE DE GEOPHYSIQUE	1,440,000	30%	432,000
Deep Sea Drilling COMITE D'ETUDES PETROLIERES MARINES	13,200,000	40%	5,280,000
Dynamically Positioned Drillship ACKERMANS--VAN HAAREN etc.	10,250,000	40%	4,100,000
B. <u>EXPLOITATION</u>			
Deep Sea Production to 1,000 metres COMITE D'ETUDES PETROLIERES MARINES	18,350,000	40%	7,340,000
Pump down tool for "SEAL" Intermediate System (SIS) SEAL LTD.	1,341,000	35%	469,350
Flowline and pipeline diverless connection SEAL LTD.	9,272,000	35%	3,245,200

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Subsea remotely operated pipeline pigging equipment SEAL LTD.	1,196,000	35%	418,600
Remote-controlled separators and transfer pumping systems SEAL LTD.	3,415,000	35%	1,193,250
SEAL "ultimate system" wellhead SEAL LTD.	3,036,000	35%	1,062,600
Automated subsea wellhead TECNOMARE SpA	2,281,600	35%	798,560
Research into the exploitation of heavy oil deposits in the Adriatic AGIP-SHELL	3,605,922	35%	1,262,073
Acquisition of a production technique for the exploitation of deep sea deposits of hydrocarbons LAING-EPTM-ATKINS	2,400,000	40%	960,000
Remote-controlled subsea handling device WINN TECHNOLOGY LTD.	960,000	40%	384,000
C. STORAGE			
Development and construction of an underground reservoir in a salt dome for storage of liquified natural gas (LNG) HJHRGAS	5,020,000	30%	1,506,000
Subsea crude oil storage TECNOMARE SpA	2,400,000	30%	720,000

Research into the utilization of underground petroleum reservoirs for the storage of liquid and/or gaseous hydrocarbons AGIP	2,072,000	30%	621,600
Cryogenic underground storage of liquified natural gas in a rock structure GEOSTOCK	2,540,000	30%	762,000
D. <u>TRANSPORT</u>			
Deep sea steel pipeline COMITE D'ETUDES PETROLIERES MARINES	12,720,000	30%	3,816,000
Deep sea pipe-laying TECNOMARE SpA	3,124,464	30%	937,339
Laying of a subsea pipeline in the Straits of Messina SNAM SpA	7,396,125	30%	2,218,837
Laying of a subsea pipeline between Sicily and Tunisia SNAM SpA	19,895,000	25%	4,973,750
TOTAL	125,915,111		42,503,159

Brief description of the projects in the first phase: 1974, 1975 and 1976

The first phase of the implementation of the Regulation included a project in the field of prospecting for hydrocarbons designed to improve seismic measuring and processing equipment.

Under this project an apparatus was developed for transmitting the seismic signals picked up by geophones in the field via a simple two-core cable, instead of the usual cable with some fifty cores; this device picks up signals at the rate of 125 per millisecond or 250 signals per 2 milliseconds or 500 per 4 milliseconds - instead of the usual maximum of 96 signals per millisecond - and prepares them for interpretation, using a small field process computer. The project is a few months behind schedule and expected to be completed early in 1977. It will considerably facilitate the geophysicists' field work and lead to improved interpretation of the measurement data.

Two projects were concerned in particular with improving offshore drilling techniques. The first involved fitting the ship "Petrel" with drilling equipment, making it one of the most modern drillships in the world. This drillship completed its first test drilling off Gabon in relatively shallow water - about 170 metres - in the summer of 1976 and will shortly start drilling deposits at a depth of more than 400 metres below the surface, increasing to 600 metres.

The second project concerns the development of optimum components of a drilling system for use on deposits as deep as 1,000 metres under the sea. This includes not only the improvement of dynamic positioning, as installed and tested on the drillship "Petrel" at depths of as much as 600 m, but also the development and testing of conventional anchors to hold a drillship or a drilling rig with cables or chains, and the development of improved risers between the wellhead on the sea-bed and the drillship or drilling platform on the surface.

The results have so far been good. When the work is completed it is expected that the various elements of drilling equipment listed will be available for drilling at great depths under water.

As regards extraction techniques, equipment for extraction from submarine deposits is being developed in four projects. The first scheme concerns an extraction system for use in depths of as much as 600 metres initially and down to 1,000 metres on completion of a further project. It includes the improvement of a gimbal-mounted collection unit on the sea-bed at depths of as much as 200 m to fit it for use at depths down to 600 m, the development of an intermediate storage container for the crude oil extracted before loading into ships and the development of all the other elements of a remote-controlled extraction system installed on the sea-bed, including the processes and equipment for its installation, operation and maintenance. The first prototype of this equipment is currently in operation off Gabon. It was transported to the field and installed on the sea-bed without difficulty. The equipment is to be tested at the end of 1976 on three drillings.

In the second project a blow-out preventer was developed which is set on the sea-bed and operated by remote-control. It is at present installed in a North Sea oilfield. Testing is due to start before the end of 1976. On the successful completion of these tests, the industry will have a remote-controlled wellhead which can be used in any depth of water for the extraction of crude oil and natural gas. Divers are not required for either installation or operation.

The third project is aimed at developing a remote-controlled blow-out preventer which can be used at depths down to 600 m, so that the measurement values from the wellhead and the command signals from the production platform can be transmitted and received acoustically or, if the acoustic system breaks down, electrically. The acoustic transmission

system is designed for use in depths of water down to 600 m with a range of up to 8 km between the wellhead and the control panel on the surface. Laboratory experiments carried out to date on a small prototype and tests in the Ionian Sea to investigate the transmissibility of sound signals have yielded satisfactory results. They are being continued with tests on an industrial-scale prototype. If the project is successful, it will provide the industry with another solution to the remote-controlled operation of blow-out preventers.

In the fourth project a process and equipment are being developed for the remote-controlled connection of pipelines within undersea and sea-bed extraction systems.

In the offshore sphere both extraction and drilling equipment is being built on platforms, which are supported on structures which are either set on the sea-bed or held in place by gravity. Even in depths of as much as 200 metres, these are among the largest and most difficult constructions man has ever undertaken.

One company has investigated the question of how best to incorporate these units into a comprehensive scheme of detection and extraction of crude oil from under-sea deposits. All the major types supported on steel structures were examined; for two selected types specific solutions were found which are suitable for use in depths down to 200 metres of water. Work is in progress as the project continues on bases for these rigs for use in depths down to 300 metres of water and under the difficult environmental conditions of the North Sea. In the final phase of this project, this development work extends also to a new floating platform anchored to the sea-bed.

Another company is developing a crude oil container with a maximum capacity of 160,000 m³. The possibility is also being investigated under this project of developing the roof of the tank to support a production platform. The outcome of this project will be a further element in the system of extracting oil from deposits at depths down to 300 metres under the sea.

Another project in the field of storage aims at developing facilities for the storage of liquefied natural gas at very low temperatures - about 160° C below zero - in caverns; pilot-scale trials are envisaged. In view of the increasing role of liquid natural gas for the Community's natural gas supplies, this project will produce a valuable addition to the conventional method of storing gas in containers on the surface.

The one project relating to the storage of petroleum or natural gas in an operational oilfield will - if successful - yield valuable results for the secondary processes too. When the hydrocarbons pumped in are recovered, some of the oil present in the deposit which cannot otherwise be extracted so quickly should be recovered with it.

Heavy crude oil of high specific weight and high viscosity can be extracted only under favourable deposition conditions with the existing methods. Resources of several hundred million tonnes have been proven and these are recognized as unsuitable for extraction for technical or economic reasons and so have not been tapped; these resources include some under the seabed. Under one project, two petroleum firms are developing a process for extracting a very heavy type of oil from an offshore deposit and carrying out pilot studies. If this research proves successful, the field concerned will be exploited and will thus contribute to the Community's supplies. Other fields containing similar resources could follow.

Since in recent years a series of fields of oil and gas has been discovered in the Community's continental shelf, and one is to be exploited, efforts are concentrating on ensuring that the oil and gas is, as far as possible, transported by pipeline. With the aid

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of experience gained in other production areas such lines in the Community have hitherto been laid in shallow water at depths of down to 200 metres and high costs have been accepted as inevitable.

Experimental pipelines are being laid in an attempt to solve the problems connected with laying pipelines in the deeper waters of the Straits of Messina and the Sicilian Channel in depths down to 600 m. If the tests prove successful from the technical point of view, all the prerequisites will be met for laying the pipeline for supplying the Community with natural gas from North Africa.

Two projects are designed to develop improved and completely new techniques for laying pipelines at depths down to 1,000 m under the sea. Moreover, one of these projects, which is being carried out by oil companies aims at developing processes for the repair of pipelines on the sea-bed.

The use of all the above-mentioned equipment in the offshore field requires strict observance of underwater procedures and work with a small but nevertheless significant expenditure of energy. Divers can operate at depths of more than 200 metres only on certain conditions. So far, attempts have been made in particular to replace divers by manned or unmanned submersible craft and diving bells. In one project, however, an unmanned underwater tracked vehicle is being developed which can be operated by remote control in any depth of water and can perform tasks of a fairly high degree of intricacy.

2. Brief description of the projects in the second phase: 1975, 1976 and 1977

Two projects are concerned with the further development of seismic methods of prospecting for hydrocarbon deposits. One of these projects relates to prospecting for under-sea deposits and the other to methods of detecting

deposits lying deep down below thick beds of strata.

The knowledge of the mechanical properties of the sea-bed required for building platforms, containers and other structures on the sea-bed is being gained through tests on core samples. Direct tests of this kind can be supplemented by microseismic measurements and the analysis thereof. One project aims to develop these methods further.

The rapidly-developing technology of drilling at sea and its progress in other areas outside the Community is to be applied under another project to the development of the latest drilling equipment for drillships for the Community oil industry. The project will provide the EEC petroleum industry with the most advanced drillship, able to operate in water down to 1,000 metres depths.

Five projects will develop modern production techniques; new floating and anchored steel or concrete platforms are to be designed. As regards the floating, anchored systems, the aim is to develop platforms which can be moved relatively easily from one deposit to another so that smaller fields, which would otherwise not have been economically workable, may be exploited.

Two projects are concerned with designing mobile platforms equipped with facilities for liquefying natural gas on the spot, again for the working of smaller, otherwise unworkable, gas deposits or for the utilization of the gas extracted with the petroleum from relatively large oil fields. One project is designed to facilitate the exploitation of only small gas fields by using the natural gas produced to generate current and transporting it to the coast as a high-voltage d.c. current.

Another area of significance in the search for hydrocarbons for the Community - an area offering good prospects for oil and gas - is a large part of the Arctic and North Atlantic region where ice is a major hazard. Here equipment on the sea-bed can be endangered by icebergs in shallow water, and in deeper water, the risers between the floating installations

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on the surface and fixed installations on the sea-bed can be destroyed by floating ice. Production techniques designed for ice-free areas have to be adapted to these different environmental conditions. This is the purpose of one project.

The anchoring of all floating drilling and production platforms is of paramount importance for their safety and efficiency. As depths increase, the limitations of existing systems will prevent the use of the corresponding floating structures. Yet even within these limits improvement of the automatic adjustment of anchoring systems to changing winds and currents can make their use safer. One project is concerned with this.

Four companies are to develop new secondary processes in connection with their projects. Two of them are developing microemulsions to increase the effect of flooding with water and one is concentrating on the use of heat. The fourth project, if successful, will make it possible to extract crude oil from finely-faulted limestone deposits, which have hitherto been economically unworkable.

Under one project, the possibilities of extracting crude oil from shale oil deposits are being developed.

The second project is developing modern equipment for taking core samples, to be installed on board a service ship.

The third project concerns new methods for investigating the mechanics of the sea-bed.

Continuing the development of the underwater tracked vehicle, the same firm is in the second three-year phase, designing additional advanced equipment.

Two projects concern the development of submersible craft for underwater work and observation. One of them is designing a small submersible with sophisticated equipment which can be used in depths down to 1,000 metres. The second project aims at developing a parent ship which in bad weather can carry on the work of the submarines as a semi-submersible.

One project aims at a substantial improvement of existing television equipment for underwater observation.

One project is serving to bring about a further improvement in techniques of laying pipelines in deep water.

Flexible pipelines can do much to simplify the construction and operation of underwater extraction systems. Under one project further work is to be done on a flexible pipeline already tested and in widespread use in small and medium diameters, to increase the diameter. In a second project, a completely new system of flexible pipelines for the transport of hydrocarbons within production systems underwater is to be designed.

The purpose of one project is to develop insulated pipelines for the short-range transport of liquid natural gas.

For all water vehicles in service under the surface, it is advisable in certain circumstances to generate current inside the vehicle under the sea, instead of transmitting current from the surface by cable. The main technique available is the fuel cell. In one project, a high-capacity fuel cell is to be developed and tested.

For delicate operations under the water's surface and in bad weather, equipment which reduces the effects of the movement of the sea could be of great use. In one project, a device is being developed and tested which can considerably reduce the effects of wave movements.

Under one project a new method for storing petroleum in caverns was to be developed, which would also be suitable for use in difficult work conditions, but the applicant undertaking has cancelled this programme.

SUPPORT GRANTED FOR COMMUNITY PROJECTS
IN THE HYDROCARBONS SECTOR
FOR THE PERIOD 1975/1977

PROJECT	SUPPORT		
	Investment during the period 1975/1977 (in u.a.)	Rate of support	Amount in u.a.
A. <u>EXPLORATION</u>			
Study of particular problems involved in seismic prospecting at sea GERTH-CGG	3,888,950	35%	1,361,133
Research into methodologies and geophysical techniques related to particularly complex geological situations AGIP-CGG	5,280,000	35%	1,848,000
B. <u>DRILLING</u>			
Design and development of new drilling equipment for a dynamically positioned drillship BEN ODECO LTD.	3,708,000	40%	1,483,200
C. <u>PRODUCTION SYSTEMS AND PROCESSING OF HYDROCARBONS</u>			
Exploitation of oil and gas fields in deep waters using floating platforms TECNOMARE SpA	2,416,000	40%	966,400

Intermediate and deep sea production platform VICKERS LTD.	4,423,000	40%	1,769,200
Research and development project for production of oil and gas from deep waters TAYLOR WOODROW LTD.	6,672,000	40%	2,668,800
Novel offshore production system BP TRADING CO.	11,640,000	40%	4,656,000
Offshore production system ("Exboy" project) FREEMAN FOX & PARTNERS	1,800,000	40%	720,000
Production offshore in Arctic zones GERTH	5,707,000	40%	2,282,800
Separation processes BP TRADING CO.	1,130,000	40%	452,000
Mobile offshore natural gas liquification plant PREUSSAG AG	1,429,370	40%	571,748
LNG and methanol production on platforms SALZGITTER AG	1,634,700	40%	653,880
LNG loading arm DAVID BROWN VOSPER LTD.	2,490,000	40%	996,000
Mobile platform for power generation using the gas production of small oil fields DEUTSCHE BABCOCK & WILCOX AG	2,800,000	40%	1,120,000

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Development of an automated mooring system WHARTON ENG. CO. LTD.	1,800,000	35%	630,000
D. <u>SECONDARY RECOVERY</u> <u>INCLUDING OIL SHALES</u>			
Improved crude oil production and treatment BP TRADING CO.	1,492,000	40%	596,800
Project of a pilot micro-emulsion and polymer flood in the Châteaurenard reservoir GERTH	3,500,000	40%	1,400,000
Development of heavy oil production processes in the Federal Republic of Germany WINTERSHALL	1,385,000	40%	554,000
Hydrocarbon recovery from chalk deposits SHELL INTERNATIONAL	11,665,745	40%	4,666,298
Exploitation of oil shale deposits GERTH	353,000	40%	141,200
E. <u>SERVICE SHIPS, SUBMERSIBLES</u> <u>AND SOIL INVESTIGATION</u>			
Geotechnical studies of sea bed and subsoil in deep water conditions CGG-SERCEL	197,000	40%	78,800
Specialized service ship for offshore soil investigation PREUSSAG AG	3,508,196	30%	1,052,459

Soil investigation in the North Sea FUGRO-CESCO	276,243	30%	82,873
A submerged vehicle tool system WINN TECHNOLOGY LTD.	1,297,738	35%	454,208
Design and construction of a submarine vehicle for work and inspection operations ("Telesub") TECNOMARE SpA	7,907,276	30%	2,372,183
Service ship for submersibles BRUKER-PHYSIK	3,858,750	35%	1,350,563
Subsea viewing and visualization system FERRANTI OFFSHORE SYSTEMS LTD.	667,200	25%	166,800
F. <u>ENVIRONMENTAL INFLUENCES</u>			
Swell damper to protect offshore installations BERTIN & CO.	270,066	30%	81,020
G. <u>PIPE-LAYING</u>			
New technology for pipe-laying at sea BOUYGUES	1,740,000	35%	609,000
H. <u>TRANSPORTATION BY PIPES</u>			
Development of a flexible pipeline and laying, lifting and repair techniques for deep waters COFLEXIP	1,240,000	35%	434,000

<p>High pressure hoses for transport and exploitation of underwater hydrocarbons</p> <p>STANDARD TELEPHONES & CABLES LTD.</p>	1,651,200	35%	577,920
<p>Cryogenic pipeline for LNG transportation</p> <p>OMNIUM TECHNIQUE DES TRANSPORTS PAR PIPELINES (O.T.P.)</p>	1,920,000	30%	576,000
<p><u>I. POWER GENERATION UNDER THE SEA</u></p>			
<p>Development of fuel cells as autonomous energy sources underwater</p> <p>ALSTHOM</p>	2,441,000	30%	732,300
<p><u>J. STORAGE</u></p>			
<p>Study on cavern storage</p> <p>BP TRADING CO.</p>	1,143,500	30%	343,050
TOTAL	103,332,934		38,448,635

