COMMISSION OF THE EUROPEAN COMMUNITIES

COM(77) 704 final
Brussels, 23 December 1977.

MEMORANDUM

CONCERNING A COMMUNITY COAL RESEARCH PROGRAMME IN THE FIELD OF MINING ENGINEERING WITH A VIEW TO OBTAINING FINANCIAL AID UNDER THE TERMS OF ARTICLE 55 § 2 c) OF THE E.C.S.C. TREATY

(Budgetary year 1978)

MEMORANDUM

CONCERNING A COMMUNITY COAL RESEARCH PROGRAMME IN THE FIELD OF PRODUCT BENEFICIATION WITH A VIEW TO OBTAINING FINANCIAL AID UNDER THE TERMS OF ARTICLE 55 § 2 c) OF THE E.C.S.C. TREATY

(Budgetary year 1978)

TWO MEMORANDA

The Commission of the European Communities places the highest value on coal research, since the latter contributes, through the results that it yields, towards the maintenance of the economy of the coal industry, and the improvement of the working environment and safety in mines. The Commission has made it clear that this is included in its energy policy in its Medium-term Guidelines for Coal (1975-1985) and has insisted on the importance of Community coal research. It has done its utmost, furthermore, despite considerable difficulties, to provide the necessary funds from the E.C.S.C. budget.

The maintenance of Community coal production at the 1975 level, i.e., 250 million tce, increased productivity, the stabilisation of prices, improved product upgrading, and the improvement of the working environment continue to comprise the objectives of the coal industry and hence of coal research.

One means, among others, of achieving these objectives is to intensify coal research at the Community level. The Commission, aware of these problems, put its actions in concrete form by providing, for 1975, 1976 and 1977, about 50 million EUA for aid to coal research projects.

For 1978, the Commission has received a series of requests for financial aid under the terms of its Medium-term Coal Research Aid Programme (1975-1980) and Article 55 § 2 c) of the E.C.S.C. Treaty. These proposals have been studied and examined by the Services of the Commission in collaboration with the Experts' Committees and the Coal Research Committee (CRC) with a view to concentrating the E.C.S.C.'s financial efforts on projects that correspond most closely to the criteria of the Medium-term Coal Research Aid Programme.

The draft selection, containing 26 research projects and representing a total expenditure of about 26 million EUA, received approval after examination by the Coal Research Committee. The total aid necessary to carry out this research amounts to 15.73 million EUA including the cost of dissemination of information.

./..

Two memoranda have been drafted corresponding to the projects under consideration, one relating to programmes on mining engineering and coal preparation for which aid of 9.925 million EUA is envisaged, and the other relating to coal upgrading for which 5.705 million EUA of aid is foreseen.

A sum of 100 000 EUA is envisaged to cover the costs of dissemination of information and related expenses.

MEMORANDUM

CONCERNING A COMMUNITY COAL RESEARCH PROGRAMME IN THE FIELD OF MINING ENGINEERING WITH A VIEW TO OBTAINING FINANCIAL AID UNDER THE TERMS OF ARTICLE 55 § 2 c) OF THE E.C.S.C. TREATY

(Budgetary year 1978)

I. Introduction

The energy policy of the Community is, like that of the other industrialised countries of the West, based in the long term on reducing dependence on imported energy and guarding against the threat of a gap in energy supplies.

Apart from some other, new energy sources which will require a long time for full development and which will, in any case, cover only a small fraction of energy requirements, coal in particular will be called on to play a larger rôle than before in the future energy structure of the Community.

In this connection, in addition to the two major traditional outlets for hard coal and lignite, namely the production of metallurgical coke for the iron and steel industry and the generation of electricity, the transformation of coal into high value products, i.e., by gasification and liquefaction, will acquire increasing significance.

Although reliance will undoubtedly be placed on increased quantities of imported coal for these purposes, a proper place must also be granted to indigenous hard coal and lignite as secure sources of energy. The Commission is, therefore, still of the opinion that, in the long term, the Community's hard coal production must be maintained at the level of 250 million t/year.

./..

The Community coal mining industry can, however, only reach this objective if it succeeds in achieving the following aims:

- Provision of the raw product at competitive or at least reasonable prices

  This is one of the most important requirements for the survival of the European coal mining industry, regardless of the general level of energy consumption. A lower coal price is of especially decisive significance with regard to coal gasification and liquefaction because the coal cost can amount to up to 60% of the production costs of these processes.

  For the mining industry the reduction of operating costs requires a further increase in underground output and a thoroughgoing rationalisation of operating techniques.

- Increased safety in mines and improvements in the working environment

  Every means of increasing safety in mines and improving the working environment must be adopted in order to retain the working force necessary for a production of 250 million t/year and to be able to attract new personnel. In some areas of operations this will certainly involve rationalisation, mechanisation or automation at any cost, even though, in certain individual cases, no favourable effect on operating results can be expected.

- Efficient utilization and extension of reserves

  The maintenance of output under safe conditions will involve the replacement of existing production capacity by the construction of new pits or the development of new areas from existing mines. This will require increased effort in the future in the field of development work, i.e., the necessary roadways must be driven more quickly and more cheaply than in the past, and must have a larger cross-section.

  In order to delay the transition to greater depths, with its associated unfavourable geological and climatic conditions, that is linked with the creation of new capacities it is necessary to achieve more efficient utilization of reserves that have already been opened. This means that results obtained under favourable conditions must be generalized, and new techniques must be sought so that poorer seams can be worked successfully.

- Considerations of environmental protection

The increasingly strict requirements for environmental protection must be taken into account in the very first stages of processing the raw product. This involves increasing effort in the field of coal preparation which, however, simplifies the further use of the coal, be it in power stations, coking plants or coal transformation plants.

The aims that have been mentioned will make considerable demands on research and development work in the coming years because the basis for tomorrow's success must be established today.

On these grounds the Commission proposes the approval of a Community research programme in the field of mining engineering for which financial aid under the terms of Article 55 § 2 c) of the E.C.S.C. Treaty has been requested, and which will be carried out in close cooperation by the following institutions and undertakings:

- The National Coal Board, London (NCB)
- The Steinkohlenbergbauverein, Essen (StBV)
- The Westfälische Berggewerkschaftskasse, Bochum (WBK)
- The Centre D'Etudes et Recherches des Charbonnages de France, Paris (CERCHAR)
- The Institut National des Industries Extractives, Liège (INIEX)
- The N.V. Kempense Steenkoolenmijnen, Houthalen (KSM)
- The Institut d'Hygiène des Mines, Hasselt (IHM), and
- The Université Catholique de Louvain (UCL)

II. Aims and objectives of the programme

Some of the above-mentioned tasks also represent the objectives of the new research programme and should therefore be explained in more detail.

Safety in mines, working environment and environmental protection

Because an increased occurrence of firedamp must be reckoned with at greater depths, more importance must be given to techniques for its removal, e.g. by drainage. In this connection, predicition of the rate

./..

of emission to be expected if of great importance because it facilitates the planning of operations with an extensive elimination of risks.

In the same context, ventilation control should be mentioned, for which the most modern methods for control and adaptation to sudden changes in conditions are needed.

The knowledge and prediction of the rock pressure phenomena to be expected at greater depths is of overriding importance not only for mine safety. A pressure-free winning procedure and a correct choice of supports can lead also to good economic results. A better working environment involves not only the improvement of environmental conditions in the work place itself by, e.g., climatic measures or reduction of dust formation. In addition, ergonomic considerations must be taken into account from the start in the design of new machines.

Technology

In development work, emphasis is on the further development and optimisation of full-face and boom header machines and the widening of their fields of application in order to eliminate as far as possible the conventional technique of shotfiring.

In coalwinning, the main interest is, as in the past, the increase of face productivity. This must, however, as already mentioned, be made possible not only under good conditions, but also in bad seams.

In the field of outbye services underground future emphasis should be placed on the main possibilities of increasing throughput by extensive rationalisation and automation of the various operational procedures. This applies particularly to all conveying and transport procedures in main- and gate roads.

In coal preparation the treatment of fine and very fine particles, which occur in increasing quantities, is especially important.

./..

Organization of operations

In addition to the purely technical aspect of underground operations, the most modern techniques of information and control technology must be brought into consideration in order to detect and eliminate sources of disturbance. The same applies to the collection and processing of data to provide the basis for long-term operational planning.

The proposed new research programme takes into account the requirements mentioned. It concentrates on six fields which will be studied in the following programmes:

- Development work
- Methane and climatic problems
- Rock pressure
- Coal winning
- Outbye services underground
- Coal preparation

III. Programme of work envisaged

The new research programme consists of six sub-programmes with a total of 15 projects which are described individually below. The overall programme will be carried out with close collaboration between the research institutions and the Community's coal mines.

Programme "Development work"

The work here is concentrated on a very extensive project.

1. Optimisation of heading machines (StBV)

   This project is aimed at extensive instrumental observation of drivages using full-face and boom header machines as a basis for the optimisation of heading systems.

   Total cost: 4 012 500 DM

Programme "Methane and climatic problems"

The programme contains four projects dealing with the control of firedamp and the improved control of climate. They have considerable importance in relation to mine safety.

2. Control of firedamp (StBV)

Further development of earlier work on methane control and adaptation to increasing requirements resulting from greater depth, increasing concentration of workings and more stringent safety regulations (methane kinetics, methane drainage, emission properties).

Total cost: 2 800 000 DM

3. Prediction and method of control of firedamp emission (INIEX)

The project is aimed at extending existing knowledge of the prediction of methane emission and of drainage, and also at improving techniques for controlling firedamp, particularly in deep workings.

Total cost: 25 000 000 FB

4. Computer control of ventilation (KSM/UCL/IHM)

The research is aimed at optimising the distribution of air flow to individual working areas in relation to safety and hygiene factors, making the most rapid possible use of information about conditions in the ventilation network, the gas analysis and the mine climate. The optimum distribution will be achieved by centralized computer control of underground fans and ventilation doors.

Total cost: 17 700 000 FB

5. Application of computer-based environmental monitoring schemes (NCB)

Solution of technical and organizational problems in the further development and introduction of computer-based monitoring systems for the underground environment (ventilation, firedamp, etc.). It is planned to instal four complete systems underground.

Total cost: £ 979 000

Programme "Rock pressure"

This programme is formed from three parts of a Community project aimed at the interpretation and prediction of rock pressure phenomena, particularly at increased depths.

6. Theoretical and practical studies towards improved control of strata around mine roadways (NCB)

Comprehensive studies of rock pressure phenomena in roadways as a basis for the choice of improved drivage and support techniques (study of fracture zones, new packing techniques, development of mathematical models).

Total cost: £ 452 000

7. Prediction of rock properties of importance in mining (StBV)

Study of possibilities for more exact prediction of important rock properties in the region ahead of the coal face on the basis of available data (Rock properties, rock temperature, tectonics, mathematical models).

Total cost: 2 500 000 DM

8. Effect of depth and natural factors on the behaviour of mine workings (CERCHAR)

The aim of this project is to determine whether rules already established for the behaviour of mine workings (roadways and faces) can be applied to workings at greater depths. Measures against new phenomena such as quasi-static deformations and dynamic phenomena.

Total cost: 5 150 000 FF

Programme "Coal winning"

The programme consists of a single project aimed at increasing face output.

./..

9. The application of wide-web mining systems to medium-to-thin seams (NCB)

Improvement of machine utilization by increasing the depth of cut to 1.2m in medium-to-thin seams. It is planned to instal a floor-based shearer in conjunction with heavy-duty lemniscate shield supports.

Total cost: £ 1 005 000

Programme "Outbye services underground"

This programme comprises five projects, of which two are concerned with the improvement of transport and conveying technology while a three-part Community project deals with improvement in organization and control techniques.

10. Improvement of conveying and transport techniques (StBV)

Adaptation of the capacity of conveying, transport and transfer installations to increasing requirements resulting from greater concentration of workings and increasing underground distances (Automatic operation of belt conveyors in coal winning areas, drivage and braking systems for equipment transport systems, transfer installations for heads of drivages).

Total cost: 3 500 000 DM

11. Increasing the carrying capacity of monorail and positively-driven railway vehicles (WBK)

Increased carrying capacity of railways and suspended monorails by improvement of the ratio of useful weight to dead weight without changing the prime mover and without adversely affecting safety. A reduction of 10 - 15% in the dead weight is anticipated.

Total cost: 2 994 000 DM

./..

12. Development of computer-based colliery information and control systems (NCB)

A monitoring and control system for the coalface will be developed on the basis of an existing computer-control system for coal flow. Both systems, which operate with minicomputers, will be linked to a larger computer to facilitate satisfactory collection and analysis of data on a large scale.

Total cost: £ 2 313 000

13. Application of micrologic to the control of production operations (CERCHAR)

Perfection of systems for automation, telemechanization, telemetry and remote control. Development of a control centre for the operation of wheeled vehicles, and of an autonomous recorder for gas concentration, air velocity and other data.

Total cost: 2 041 000 FF

14. Risk analysis in the planning of coal winning operations (StBV)

Application of modern operational research techniques (simulation models, stochastic network planning) to the establishment of long-term plans which, in addition to the normal data (target dates, tasks, control, costs, output, etc.) will also include the possible risks (geological, technical and organizational problems) and will evaluate their effect on operating results.

Total cost: 1 150 000 DM

Programme: "Coal preparation"

This programme contains one project on the optimisation of the treatment of fines, leading to improvement of output.

15. Study of the interactions between flotation- and sedimentation agents in relationship to the quality of washery water in coal preparation plants (StBV)

Study of the influence of sedimentation agents (flocculating agents) which enter the flotation process and impair the operation of the flotation agents.

Total cost: 1 200 000 DM

IV. Estimated cost and duration of the research work

The total cost foreseen for the programme is

16 542 000 EUA*

The cost and duration of the individual projects is given in the following table.

No.	Project	Proposer	Duration years	Total cost E.U.A.
	DEVELOPMENT WORK			
1.	Optimisation of heading machines	StBV	3	1 530 500
	METHANE AND CLIMATIC PROBLEMS			
2.	Control of firedamp	StBV	3	1 068 000
3.	Prediction and methods of control of firedamp emission	INIEX	3	612 000
4.	Computer control of ventilation	KSM/UCL/ IHM	2	433 500
5.	Application of computer-based environmental monitoring schemes	NCB	3	1 503 000
				3 616 500
	ROCK PRESSURE			
6.	Theoretical and practical studies towards improved control of strata around mine roadways	NCB	3	694 000
7.	Prediction of rock properties of importance in mining	StBV	3	953 500
8.	Effect of depth and natural factors on the behaviour of mine workings	CERCHAR	3	916 500
				2 564 000

* Rates of conversion from national currencies are those of 26.10.1977

No.	Project	Proposer	Duration	Total cost E.U.A.
	COAL WINNING			
9.	The application of wide-web mining systems to medium-to-thin seams	NCB	2	1 543 000
	OUTBYE SERVICES UNDERGROUND			
10.	Improvement of conveying and transport techniques	StBV	3	1 335 000
11.	Increasing the carrying capacity of monorail and positively-driven railway vehicles	WBK	3	1 142 000
12.	Development of computer-based colliery information and control systems	NCB	3	3 550 00
13.	Application of micrologic to the control of production operations	CERCHAR	3	363 500
14.	Risk analysis in the planning of coal winning operations	StBV	3	439 000
				6 830 000
	COAL PREPARATION			
15.	Study of the interactions between flotation- and sedimentation agents in relationship to the quality of washery water in coal preparation plants	StBV	3	458 000
	Total			16 542 000

./..

V. Expected repercussions of the new programme

The most important results to be expected from the research projects forming the new programme may be summarized as follows:

Mine safety and working environment

The major outcome of the work on firedamp is expected to be the development of a comprehensive, generally valid model for the prediction of gas emission (Projects 2 and 3). The advantages of this with respect to mine safety and the whole sequence of operations are obvious.

In the field of climatic problems it is expected that the proposed research (Projects 4 and 5) will lead to reliable monitoring of complex ventilation systems, with rapid, automatic adaptation to changes in conditions which could, otherwise, have dangerous consequences.

The research on rock pressure (Projects 6 to 8) should have, on one hand, a direct influence on mine safety through better control of the roof and, on the other hand, indirect effects through improved coal winning procedures and the choice of optimal supports in varying circumstances.

Conditions in work places should be favourably affected through the ergonomically correct design of machines (e.g., Project 1), through the use of the most up-to-date methods for monitoring environmental conditions and for controlling operations (Projects 5, 12, 13) and, finally, through the improvement of conveying and transport equipment (Projects 10 and 11).

Technology

In the field of development work it is anticipated that the technical and economic requirements for a wider use of full-face and boom header machines will be established. The corresponding abandonment of shotfiring will lead to improved stability of roadways because the fracture of surrounding rocks by explosives will be eliminated (Project 1).

For coal winning, the introduction of increased cutting depth will give higher face output and hence better operating results, particularly in medium-to-thin seams (Project 9).

./..

In connection with conveying and transport systems, the elimination of faults in the field of operations downstream of the face and improved provision of working areas are expected. This has special significance in the light of increasing output and increasing quantities and weights of materials (Projects 10 and 11).

An improvement in coal preparation is expected, leading particularly to increased output from the flotation process, which is important in relation to the increaasing fines content of raw coal (Project 15).

Organization of operations

The use of up-to-date methods for the monitoring and control of operations will lead, particularly in the field of outbye services, to simpler operation with fewer disturbances. Results in this field are urgently required in order to increase underground output (Projects 12 and 13).

In the same connection, an intensive analysis of data could form the basis for the long-term planning of coal extraction in order to optimise underground operations.

VI. Research results

The E.C.S.C. Experts' Committees which are already concerned with research work in the six fields of the new programme will also supervise and keep under review the execution of the research work that forms the subject of the requests.

The agreements to be concluded with the beneficiaries of the aid will define the rights and obligations of the contracting parties. They will be designed primarily to ensure that the research results will be made available to all concerned in the Community, in accordance with Art. 55 of the E.C.S.C. Treaty.

VII. Conclusions

In view of the importance and interest of the proposed research programme for the technology, the safety, the working environment and

./..

the economy of surface- and underground operations in the Community's coal mining industry, the provision of financial aid by the E.C.S.C. for the execution of the individual projects is judged to be appropriate and justified.

For the execution of the research programme whose total cost is 16 542 000 EUA the Commission proposes to grant aid totalling 9 925 200 EUA to cover its share of the research costs.

Distribution of aid

CERCHAR (France)	768 000 EUA
INIEX (Belgium)	367 200 EUA
KSM/UCL/IHM (Belgium)	260 100 EUA
NCB (Great Britain)	4 374 300 EUA
StBV (Germany)	3 470 400 EUA
WBK (Germany)	685 200 EUA

MEMORANDUM

CONCERNING A COMMUNITY COAL RESEARCH PROGRAMME IN THE FIELD OF PRODUCT BENEFICIATION WITH A VIEW TO OBTAINING FINANCIAL AID UNDER THE TERMS OF ARTICLE 55 § 2 c) OF THE E.C.S.C. TREATY

(Budgetary year 1978)

I. General remarks

It is widely recognized that coal must play a significant part in helping to secure future energy supplies in the world at large as well as in the European Community. Reserves of other fossil fuels are limited, the development of nuclear energy has been less rapid than was originally envisaged, and the alternative sources of energy that are now being studied are not expected to make a major contribution for some years to come. Consequently coal, whose reserves are far greater than those of other fuels, provides the only means of filling the energy gap that is expected to occur before the end of the present century.

Such considerations have led, in recent years, to increased investment in the coal mining industry, aimed at exploiting new reserves and maintaining or even increasing production capacity, and an increasing coal research effort both within and outside the Community. The development of new processes and new technology, aimed at improving the efficiency and safety of coal mining operations or at improving the utilization of coal, requires considerable periods of time and it is, therefore, essential that this effort should continue at an undiminished level, even in periods of reduced and stagnating economic activity and temporary energy surplus if the technology in question is to be available when it is required.

The manufacture of blast furnace coke provides one of the main outlets for Community coal, and research on this topic has been encouraged by the Community over a long period of time. Such research is of importance in relation to extending the utilization of coal reserves, the improved operation of coke ovens and the prevention of pollution, and is of technical and economic interest to both the coal and steel industries. The other principal outlet for coal lies in the field of electricity generation, where research can help to maintain and enlarge the market by the development of techniques that will enable cheaper, lower grade coal to be used as a boiler fuel.

Although coal will continue to be used in these traditional applications it will also be required, in the future, to act as a source of chemical raw materials and of cleaner, more convenient gaseous and liquid fuels, and thus to provide a substitute for other fossil hydrocarbons. It is in this field, in particular, that uninterrupted research and development is needed to ensure that the relevant conversion processes will be available within the required time and will be technically and economically viable. Some gasification and liquefaction processes are at the stage where testing on the pilot- or demonstration scale is required but, in all cases, it is necessary to obtain more detailed knowledge of the fundamental chemistry and physics of coal transformation in order to provide a firm basis for further development. In this connection, it is important that the programmes of basic studies and small pilot scale investigations initiated by the Community should be continued. These programmes include work related not only to coal conversion but also equally important studies of the further processing of the products and the practical application of materials made from coal.

The Community has already given financial assistance to programmes of research in the field of product beneficiation, and the following Community institutions:

./..

Arigna Collieries, Ltd., and the Electricity Supply Board, Dublin (Arigna/ESB)

The British Carbonization Research Association, Chesterfield (BCRA)

The Centre d'Etudes et Recherches des Charbonnages de France, Paris (CERCHAR)

The Deutscher Braunkohlen-Industrie-Verein, Cologne (DEBRIV)

Hoogovens IJmuiden BV, IJmuiden

The National Coal Board, London (NCB)

Nuova Fornicoke, S.P.A., Savona

The Steinkohlenbergbauverein, Essen (StBV)

The Université Libre de Bruxelles (ULB)

have submitted requests for financial aid under the terms of Article 55 § 2 c) of the E.C.S.C. Treaty for further research projects in this field.

The projects that form the subjects of these requests form two Community programmes of research in the fields of coking and briquetting of coal, and new chemical and physical processes and new products from coal which are a logical extension of earlier Community programmes but which also include new elements. The allocation of tasks within the programme takes account of the facilities and expertise existing in the various Community countries, and a close collaboration between research workers and coal producers is assured.

II. Aims and objectives of the programme

The research projects in the field of product beneficiation for which aid is requested are related to two main topics, and thus form two programmes:

- the coking and briquetting of coal, and
- new chemical and physical processes and products from coal.

./..

It has been felt for some time that the standard methods for characterising blast furnace coke are inadequate, since they are not related to the conditions that the coke encounters in use. The Community has shown an interest in this problem by supporting studies, in the steel sector, of the changes in the properties of coke as it passes through the blast furnace. The programme in the field of coking and briquetting of coal includes a complementary project in which the direct effect on coke properties of heating and reaction will be investigated. Developments in coking technology and changes in coking blends give rise to a number of technical problems, including that of the swelling and shrinkage of the coal charge, phenomena that can have a strong influence on the safety and efficiency of coke oven operation. The Community has already supported interesting studies on this topic, and it is proposed to continue the work in the present programme. The programme also includes a project aimed at rationalising the repair of damaged oven walls which will contribute towards improved operation by helping to avoid unnecessary further damage. The manufacture of formed coke for the blast furnace represents a potentially important means of widening the range of coals that can be carbonized, and it is intended to continue an existing study in this area. The remainder of the programme is devoted to problems of pollution in the coking industry. It includes the continued development of a smokeless charging machine that can be used on existing coke oven batteries and whose purpose is not only to reduce atmospheric pollution, but also to improve the distribution of the charge in the oven. A further project deals with the development of techniques for the analysis of a family of particularly harmful organic compounds and will thus contribute towards the study and elimination of pollution by these substances both in the coking industry and in other coal processing techniques. The final project concerns a pilot scale study of the treatment of liquid effluents by a combination of methods, aimed at achieving improved standards of waste water purity.

./..

The research programme in the field of new chemical and physical processes and products from coal consists chiefly of a large group of interrelated studies carried out by a number of Community institutions. The studies are, in part, continuations of long-term programmes in this field, and include: fundamental work related to the gasification and liquefaction of hard coal and lignite and the production of organic chemicals and other high-value materials from coal and its derivatives; the study of coal liquefaction processes on the small pilot scale; the use of coal-derived active carbon for gas purification; and a number of small investigations related to topics such as carbonization and spoil upgrading. The research programme also includes an investigation of the application of the important technique of fluidised bed combustion to the combustion of high ash coals.

III. Programme of work envisaged

The proposed research programme in the field of product beneficiation can be summarised as follows:

Programme "Coking and Briquetting of Coal"

Properties of coking coals and carbonization products

1. Thermal stability of metallurgical coke (NCB)

   Investigation of the effects of heating and contact with reactive gases on the size, strength and other properties of coke in order to obtain information about its degradation under the conditions in which it is used in the blast furnace. Study of the influence of coal blend properties on coke characteristics.

   Total cost: £ 274 000

./..

Development of conventional coking techniques

2. Lateral shrinkage of the charge and pressure on the walls in coke ovens (CERCHAR)

Investigation of the mechanisms governing lateral charge shrinkage, and the relatinship between shrinkage and pressure. Determination of the influence of carbonization parameters on shrinkage, with the aim of avoiding operational difficulties and damage to ovens.

Total cost: 3 000 000 FF

3. The repair of coke chamber walls of a coke battery in operation (Hoovovens)

Investigation of the problem of regulating the temperature of the refractories to avoid the formation of new cracks during the repair of damaged coke oven walls.

Total cost: 512 000 Hfl

New methods of coking for coal

4. Formed coke (CERCHAR)

Continuation and extension of current research into the manufacture of formed coke from an extended range of coals and the testing of the product in the blast furnace.

Total cost: 2 200 000 FF

Technical and economic problems in environmental protection

5. Experimental smokeless charging machine with differential charging system (Nuova Fornicoke)

Continuation and extension of development of a charging machine that can be used on existing coke oven batteries to reduce atmospheric pollution and to improve the charge distribution. Improvements in operational efficiency and extension of range of application.

Total cost: 287 000 000 Lit

./..

6. Analysis of polycyclic aromatic hydrocarbons (BCRA)

Development of a fast, reliable technique for the routine analysis of polycyclic aromatic hydrocarbons occurring in the carbonization of coal and the processing and use of carbonization by-products. Application of the technique to practical problems.

Total cost: £ 84 750

7. Purification of coke oven effluents (Nuova Fornicoke)

Testing, on the pilot scale, of a combination of processes (active carbon and biological treatments) for purifying liquid effluents from coke ovens in order to improve the quality of waste water.

Total cost: 489 000 000 Lit.

Programme "New Chemical and Physical Processes and Products from Coal"

Fundamental research for new chemical and physical processes

8. Chemical and physical upgrading of coal (StBV)

Continuation of a wide variety of basic studies aimed at developing and improving coal upgrading techniques and at increasing the range of products that can be obtained from coal.

Total cost: 4 650 000 DM

9. Physical and chemical upgrading of coal and its by-products (CERCHAR)

Extension of a current programme of fundamental research aimed at improved upgrading of by-products such as pitch, tar and spoil, and at investigating problems related to gasification (particularly underground gasification) and rapid pyrolysis of coal.

Total cost: 2 500 000 FF

./..

10. Study of the improvement of the performance of active carbons for the treatment of foul-smelling gaseous effluents (CERCHAR)

Further development of investigations into the utilization of active carbon for the treatment of foul-smelling gaseous effluents. Study of improvements in effectiveness of treatment obtained by the combined use of active carbon and ozone, and by impregnation of active carbon.

Total cost: 1 800 000 FF

11. Chemical refining of coal (NCB)

Conversion of extracts from supercritical extraction of coal into chemical feedstocks, hydrocarbon oils and fuel gases. Development of an integrated coal liquefaction process employing hydrogen and liquid solvents to obtain light, distillable oils and high-value carbons. Synthesis of resins, adhesives and polymers from coal-derived materials.

Total cost: £ 1 943 000

12. New processes for obtaining industrial chemicals from the by-products formed during the gasification and coking of coal (ULB)

Investigation of the post-cracking of tars during carbonization and the influence of this phenomenon on the properties of coke. Continuation of studies of tar upgrading. Study of the formation of liquid products during the preliminary stages of complete gasification of coal under pressure aimed at optimising the yield of high-value by-products.

Total cost: 34 746 000 FB

13. Relationship between raw material quality, process conditions and product quality in the manufacture of high-value products from lignite (DEBRIV)

Investigation of the petrographic, physical and chemical properties of lignite in order to determine the parameters relevant to various upgrading processes (e.g. gasification, carbonization, liquefaction)

./..

and to optimise process conditions with respect to the raw material properties and the products required.

Total cost: 1 330 000 DM

Improved methods of combustion and utilization of heat

14. Production of steam for electricity generation or other uses from high-ash coals using fluidised bed combustion techniques (Arigna/ESB)

Tests on existing experimental installations aimed at solving problems associated with the handling and combustion of high-ash coals (ash content 45 to 65%) in a fluidised bed, and at obtaining data for the design of a power station boiler.

Total cost: £ 134 969

IV. Estimated cost and duration of the research work

The total cost foreseen for the programme is 9 508 000 EUA *.

The cost and duration of the individual projects is given in the following table.

---

* Rates of conversion from national currencies are those of 26.10.1977

No.	Project	Proposer	Duration (years)	Total cost E.U.A.*
	Coking and Briquetting of coal			
	Properties of coking coals and carbonization products			
1	Thermal stability of metallurgical coke	NCB	2	421 000
	Development of conventional coking techniques			
2	Lateral shrinkage of the charge and pressure on the walls in coke ovens	CERCHAR	3	534 000
3	The repair of coke chamber walls of a coke battery in operation	Hoogovens	2	182 000
	New methods of coking for coal			
4	Formed coke	CERCHAR	1	392 000
	Technical and economic problems in environmental protection			
5	Experimental smokeless charging machine with differential charging system	Nuova Fornicoke	1	281 500
6	Analysis of polycyclic aromatic hydrocarbons	BCRA	3	130 500
7	Purification of coke oven effluents	Nuova Fornicoke	2	480 000
	Total			2 421 000

./..

No.	Project	Proposer	Duration (Years)	Total cost E.U.A.
	New Chemical and Physical Processes and Products from Coal			
	Fundamental research for new chemical and physical processes			
8	Chemical and physical upgrading of coal	StBV	3	1 773 500
9	Physical and chemical upgrading of coal and its by-products	CERCHAR	3	445 000
10	Study of the improvement of the performance of active carbons for the treatment of foul-smelling gaseous effluents	CERCHAR	3	320 500
11	Chemical refining of coal	NCB	3	2 982 500
12	New processes for obtaining industrial chemicals from the by-products formed during the gasification and coking of coal	ULB	3	850 500
13	Relationship between raw material quality, process conditions and product quality in the manufacture of high-value products from lignite	DEBRIV	2	507 500
	Improved methods of combustion and utilization of heat			
14	Production of steam for electricity generation or other uses from high-ash coals using fluidised bed combustion techniques	Arigna/ ESB	2	207 500
	Total			7 087 000
	Grand Total			9 508 000

* The rates of conversion from national currencies are those of 26.10.1977

V. Research results

The E.C.S.C. Experts' Committees which are already concerned with all research work in these fields will also supervise and keep under review the execution of the research work that forms the subject of the requests.

The agreements to be concluded with the beneficiaries of the aid will define the rights and obligations of the contracting parties. They will be designed primarily to ensure that the research results will be made available to all interested parties in the Community, in accordance with Art. 55 of the E.C.S.C. Treaty.

VI. Expected consequences of the research programme

From the technical and economic points of view, the proposed investigations related to the coking and briquetting of coal will lead, through a better understanding of the behaviour of coke at high temperature, to the possibility of producing coke that is better suited to its use in the blast furnace and this, in turn, will make a contribution to the efficiency and economy of the Community's steel industry. Studies of the behaviour of the coal charge, the repair of coke ovens and improved oven charging will give rise to improvements in the safety and efficiency of coke oven operation, with consequent beneficial effects on productivity and profitability. The continued development of formed coke of a type that has already given encouraging results in blast furnace trials will provide a new fuel for the iron and steel industry and will widen the range of coals that can be carbonized, thus helping to reduce dependence on expensive coking coals. The large programme of studies of the chemistry and physics of coal upgrading will make major contributions towards the improved processing of coal to give a wide range of products that can help to reduce the Community's dependence on imported raw materials. Similarly, the investigation of the combustion of low grade coals will enable Community reserves to be exploited to better effect.

./..

In relation to social and environmental problems, the main effects of the research will be felt in the coking industry. The proposed programme will make contributions to the reduction of air and water pollution and will have beneficial effects on working conditions as well as on the general environment. Research in this field is of great importance to Community coking plants whose future is threatened by increasingly severe legislation. The work proposed will also have useful consequences with regard to the assessment of health hazards not only in the coking industry, but also in connection with other coal processing techniques, thus helping to ensure that the new technologies for coal conversion can be implemented with the minimum risk to health and the environment.

VII. Conclusions

For the reasons outlined above, the provision of financial aid by the Community for the proposed research work in the fields of coking and briquetting of coal and new chemical and physical processes and products from coal is judged to be appropriate and justified.

The research programme will cost 9 508 000 EUA and the Commission proposes to grant aid totalling 5 704 800 EUA.

Distribution of aid

Arigna/ESB (Ireland)	124 500 EUA
BCRA (Great Britain)	78 300 EUA
CERCHAR (France)	1 014 900 EUA
DEERIV (Germany)	304 500 EUA
Hoogovens (Netherlands)	109 200 EUA
NCB (Great Britain)	2 042 100 EUA
Nuova Fornicoke (Italy)	456 900 EUA
StBV (Germany)	1 064 100 EUA
ULB (Belgium)	510 300 EUA

N.B. Rates of conversion from national currencies are those of 26.10.1977