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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 (2c) OF THE E.C.S.C. TREATY
(Budgetary year 1976)

MEMORANDUM

CONCERNING A COMMUNITY COAL RESEARCH PROGRAMME IN THE FIELD
OF PRODUCT BENEFCATION WITH A VIEW TO OBTAINING FINANCIAL
AID UNDER THE TERMS OF ARTICLE 55 (2c) OF THE E.C.S.C.
TREATY
(Budgetary year 1976)

TWO MEMORANDA

The Commission of the European Communities has made clear and repeated statements with regard to the events of 1973 and to their consequences in the energy sector which have shown that coal will be called on to play a more important rôle in the coming years. It is sufficient to recall the documents "Towards a new Energy Policy Strategy", "Community energy policy objectives for 1985" and "Medium-term Guidelines for Coal 1975-1985".

With regard to coal, one of the means of attaining the objectives for production and productivity that the Community has set for the next decade consists of an intensification of R & D efforts.

The priority areas for research have been defined very precisely in the Medium-term Coal Research Aid Programme, OJ, 25 May 1974 No. C60, completed by the publication in the OJ No. C160 of 30 December 1974 in which the criteria for research were re-specified, and in the Medium-term Guidelines for Coal 1975-1985, OJ No. 22 of 30 January 1974.

In 1975, in order to give concrete form to this R & D activity, the Commission decided to grant aid of 11.2 million u.a. and 6.8 million u.a., on 15 May 1975 and 24 July 1975 respectively, for the realisation of coal research programmes.

For 1976 the Commission of the European Communities has received, within the framework of application of the Medium-term Programme 1975-1980, a series of requests for financial aid under the terms of Art. 55 § 2 c) of the Treaty for the purpose of research.

The research projects that form the subject of the requests have been studied and examined by the Services of the Commission in collaboration with the Coal Research Committee with a view to making a selection which will enable the Commission to concentrate its financial effort on research projects that enter into the Medium-term Programme and which correspond most closely to the criteria given therein, particularly those defined in the OJ of 30 December 1974.

As a result of examination by the Coal Research Committee at its meeting of 24 October 1975 the proposed selection, which comprises 36 projects representing a total expenditure of 22 826 740 u.a., received a favourable opinion.

The total aid necessary for the realisation of these programmes amounts to 14 168 725 u.a., of which 13 756 044 u.a. is to cover the Commission's participation in the cost of the research and 412 681 u.a. is to meet the cost of dissemination of information and other expenses.

Two memoranda corresponding to the projects selected, one relating to mining engineering and the other to the valorisation of coal, have been drafted. These are Documents XVII/371 and XVII/372/75.

The following table gives a summary of the programmes, the costs and the proposed aid:

Document No.	Duration	Research programme	Total cost u.a.	Aid u.a. *)
XVII/371/75	3 years	Development work	3 318 050	1 990 830
	2-4 years	Methane, rock pressure and supports	3 366 200	2 079 720
	3 years	Coal winning techniques	8 120 010	4 872 006
	3 years	Outbye services underground	200 370	120 222
Total			15 004 630	9 062 778
XVII/372/75	2-3 years	Coking and briquetting of coal	4 675 410	2 805 246
	2-4 years	New physical and chemical processes	3 146 700	1 888 020
Total			7 822 110	4 693 266
Grand Total			22 826 740	13 756 044

*) Conversion rates for 1974 balance

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 1976)

I. General remarks

The events of the last two years have shown that coal can play a larger part in the future structure of the European energy economy than was possible up to 1973. In the medium term the two traditional outlets for coal, namely electricity production and the production of coke for the iron and steel industry, will be particularly important. In the long term, on the other hand, new possibilities for the use of coal could emerge from the production of synthetic fuels by gasification and liquefaction.

Coal, and especially the European Community's hard coal, can, however, only be of use for these future applications if there is success in:

- offering competitive products, which entails reducing the prime costs of coal extraction, or at least slowing down the increase in costs, and
- maintaining the labour force necessary for future coal extraction, and consequently establishing working conditions for men employed underground that are more acceptable in comparison to conditions in other branches of industry.

The first aim, improvement of the economic results of operation, requires that the Community's coal mines should make use of all the available technical possibilities and should look for new solutions in order to increase the productivity of underground operations so that future increases in the cost of labour and materials can be offset as far as possible.

The second aim, the development of a more tolerable underground environment, requires, on the one hand, the full utilization and the continuous further development of all available processes for the improvement of mine safety and working conditions and, on the other hand, a proper regard for these two problem areas in the development of new technical solutions.

The most important means of ensuring that these future tasks are performed satisfactorily lies in an intensification of research and development work in the various fields of mining engineering. In this connection, the following research institutions:

- the Centre d'Etudes et Recherches des Charbonnages de France, Paris (CERCHAR),
- the Institut National des Industries Extractives, Liège (INIEX),
- the National Coal Board, London (NCB), and
- the Steinkohlenbergbauverein, Essen (StBV)

have submitted requests for financial aid under the terms of Article 55 § 2 c) of the E.C.S.C. Treaty to carry out research work in the various crucial areas of underground operations. This Community programme takes into account the above-mentioned requirements in a well-balanced way, namely the further development of technology that is needed and the improvement of underground working conditions and mine safety.

II. Aims and objectives of the programme

In recent years, certain critical problem areas in mining engineering have become apparent. In these areas noteworthy partial progress has already been made - not least as a result of the extensive research and development work promoted by the E.C.S.C. - but, as is common in all branches of technology, continuous further development or the introduction of completely new solutions is required.

Some of these critical problems form the subject of the research programme which stems from the following considerations.

Technical problems

In order to ensure the maintenance of current production levels and for the opening of new mines or coal reserves, development work is of outstanding importance. In this connection, the further development of existing techniques and the introduction of new, more compact machines for driving roadways in seams, the methods of construction of roadways in stone and blind shafts, and especially the integration of drivage and support techniques, are all of special interest.

In the field of coal winning itself, where about 50% of underground operating costs are incurred, effort is concentrated - apart from on face supports - on the search for new winning techniques, on the adaptation of face conveyor systems to increasing production rates, on improved methods for controlling winning machines, on adaptation to changing seam characteristics and, on the urgent need to solve the difficult problems of the very dangerous area of face/roadway intersections. In addition, the further development of winning techniques for inclined seams deserves particular notice because at present, for economic reasons, the large reserves in such seams in all Community coal-producing countries are being exploited only very slowly.

On the other hand, the increased concentration of working associated with increasing daily production rates in individual faces makes considerable demands in the field of outbye operations, particularly in relation to the transport of coal and shale, materials, and personnel. There is a considerable potential for cost reduction here by the development of new techniques as well as by continuing detailed work in the fields of technology and organisation. In this connection work on automation, remote control and improved communications is of special interest.

Safety and working conditions

Two aspects of mine safety have acquired particular importance as a result of the increasing depth of mines and increasing output from individual faces:

In the field of rock pressure and supports there has been a considerable development of knowledge in recent years, partly as a result of the introduction of new types of support, and partly as a result of changing natural conditions. It is now necessary to collate the results of this scientific work and hence to determine the basis for further practical work. Such a study should also make easier the two major tasks in this field, namely the search for new and mechanised methods of roadway support and the further development of face supports, especially shield supports.

For the control of firedamp it is particularly desirable to be able to predict the expected gas release during subsequent extraction. The techniques that have previously been developed for this purpose suffer from a certain degree of unreliability. In particular, little is known about the influence of neighbouring seams and rock strata.

The improvement of working conditions is closely linked to technical developments because the natural conditions underground can be influenced only by technical means. As examples of this, the lightening of the heavy work of setting roadway supports, improving the possibility of movement in faces with powered supports, the reduction of machine noise and the suppression of dust, may be underlined.

Economy and organisation

In addition to being influenced by technical innovations, the economic results of underground operations can be improved by organisational and preventive measures. Even though these activities, aimed at greater reliability, a higher degree of utilization and increased working life of equipment are closely linked with technical progress and must be taken into account in nearly all research projects, it may be useful to underline the pre-assessment of the deposit as a means of avoiding the premature abandonment of winning districts, and the prevention of corrosion of equipment resulting from the severe conditions underground.

Finally, the multiple interactions and relationships between technology, safety and working conditions and economy may be underlined.

III. Programme of research work

The new research programme consists of four sub-programmes whose various projects are described individually below. The overall programme will be carried out with close collaboration between the Community's research institutions and mines.

Programme "Development work"

The proposed programme comprises four projects which take into account the level of development and the differing conditions in the individual countries.

1. Dirt-absorbing headings (NCB)

It is planned to develop a method for retreat mining with separate extraction and packing of dirt, using the Inseam Heading Machine for drivage. The profits from the coal produced should cover the operating costs.

Total cost: 275 835 £

2. Mechanical coal headings (StBV)

The aims of this project are increased utilization, improved drivage rates and economic results, and the widening of the field of application of boom rippers.

Total cost: 5 152 000 DM

3. Construction of blind shafts (INLEX)

The technique of conventional sinking and support of blind shafts should be developed further for the opening of new coal reserves.

Total cost: 20 000 000 FB

4. Mechanisation of roadway supports (StBV)

This project is aimed at improving mine safety and increasing drivage rates by the development of new support techniques, and improved design and mechanisation of supports.

Total cost: 2 656 500 DM

Programme "Methane, rock pressure and supports"

This programme consists of six projects which are partly based on current work and take into account the present state of development, but should also demonstrate new methods.

5. Prediction of firedamp emission (NCB)

Experiments are planned on the application and testing of a method for predicting firedamp emission based on a new theory of description which takes particular account of the influence of neighbouring strata and seams.

Total cost: 162 500 £

6. Comparative examination of theories of rock pressure

A comparative, critical examination of the various new theories about the causes and occurrence of rock pressure is envisaged. This should lead to the information necessary for the improvement of supports and also to a better utilization of funds in the field of rock pressure research.

The realisation of this examination will be carried out with collaboration between the Community's coal-producing countries.

Total cost: 150 000 u.a.

7. Rock consolidation and improvement of support in roadways in coal and stone (INIEX)

This project is directed towards the improvement of stability in roadways in coal and stone, particularly in deep mines with soft surrounding rocks. Points of particular interest are: roadside packs, avoidance of creeping, injection and bolting, use of the so-called Austrian method, and further development of panel supports.

Total cost: 25 000 000 FB

8. Breakdowns caused by face supports (StBV)

The aim of this project is the improvement of mine safety by systematic testing and further development of face supports, particularly shield supports and supports at the intersections between roadways and faces.

Total cost: 3 453 750 DM

9. Corrosion protection of powered roof supports (NCB)

Improvement of the reliability, efficiency and life of powered supports and reduction of repair and maintenance costs by the development of improved corrosion protection systems and materials.

Total cost: 395 260 £

10. Caliper-shield supports at face ends (NCB)

This project should establish the requirements for the insertion of caliper-shield supports at the end of advancing faces with and without packs.

Total cost: 375 190 £

Programme "Coal winning techniques"

This programme comprises nine projects which are concerned with various aspects of winning techniques and are partly based on the results of previous work.

11. Fault location using seismic techniques (NCB)

Early detection of face anomalies and faults by using seismic reflection and computational techniques to avoid the premature abandonment of extraction panels.

Total cost: 210 835 £

12. Heavy-duty conveyors in relation to modern mining systems (NCB)

Adaptation of face conveyors to increased requirements (higher production rate, integration with winning machines and supports). Improvement of safety, reliability and working life. The project will be carried out in close collaboration with the Steinkohlenbergbauverein. (See No.13).

Total cost: 1 077 620 £

13. Development of high-performance conveyors for modern mining systems (StBV)

Second part of the joint StBV and NCB project, with similar aims to No.12.

Total cost: 753 000 DM

14. Chainless haulage systems for power loaders (NCB)

Improvement of mine-and operational safety by elimination of haulage chains for shearer-loaders. Further development of the "Conveyor-Reactive-Haulage" principle for use in thin seams and with various winning machines.

Total cost: 433 000 £

15. Winning machines and face conveyors (CERCHAR)

This project is aimed at the adaptation of drum shearers and face conveyors to increased daily production rates. Systematic tests are planned on individual components with particular attention to dust suppression.

Total cost: 2 407 000 FF

16. Face end systems (NCB)

Improvement of previously-developed ripping systems, with particular emphasis on packing of the dirt, driveheads and supports.

Total cost: 486 835 £

17. Direct digital control of machines for automatic horizon control (NCB)

The aim of this project is the improvement of the capacity of winning machines using direct horizon control by digital computer.

Total cost: 422 240 £

18. Integrated mechanisation in cutting and crushing coal winning (StBV)

This project is concerned with the further development and optimisation of the "Schneidscheibenlader". This machine makes it possible to cut coal at a defined angle and thus has great advantages from the points of view of operation and safety.

Total cost: 6 712 000 DM

19. Coal winning in semi-steep seams (CERCHAR)

This programme is aimed at the optimisation and further mechanisation of coal winning techniques for semi-steep seams with emphasis on rising faces, the testing of a winning machine for shortwall working (attaques multiples) and the development of a powered support for scraper ploughs.

Total cost: 4 800 000 FF

Programme "Outbye services underground"

Extensive work was started in this field in 1974 and 1975. The new programme consists of a single project which forms a logical complement to current work.

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20. Underground telecommunications: remote monitoring and control of loading machines and conveyor installations (CERCHAR)

Project concerned with further development of underground telecommunications and techniques of remote control and monitoring, especially for equipment for trackless transport, which is becoming of more and more interest

Total cost: 1 197 000 FF

IV. Estimated cost and duration of the programme

The total cost foreseen for the programme is

15 004 630 u.a. *

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

* N.B. Rates of conversion from national currencies are those of 31.12.1974 (E.C.S.C. balance)

No.	Project	Proposer	Duration	Total cost	
				National currency	u.a.*
<u>Development work</u>					
1	Dirt-absorbing headings	NCB	3	275 835 £	481 840
2	Mechanised coal headings	StBV	3	5 152 000 DM	1 600 110
3	Construction of blind shafts	INIEX	3	20 000 000 FB	411 040
4	Mechanisation of roadway supports	StBV	3	2 656 500 DM	825 060
Total					3 318 050
<u>Methane, rock pressure and supports</u>					
5	Prediction of firedamp emission	NCB	3	162 500 £	283 870
6	Comparative examination of theories of rock pressure	-	1-2	-	150 000
7	Rock consolidation and improvement of supports	INIEX	3	2 500 000 FB	513 800
8	Breakdowns caused by face supports	StBV	2	3 453 750 DM	1 072 670
9	Corrosion protection of powered roof supports	NCB	4	395 260 £	690 460
10	Caliper-shield supports at face ends	NCB	2	375 190 £	655 400
Total					3 366 200

No.	Project	Proposer	Duration	Total cost	
				National currency	u.s.*
	<u>Coal winning techniques</u>				
11	Fault locating using seismic techniques	NCB	4	210 835 £	368 300
12	Heavy-duty conveyors in relation to modern mining systems	NCB	3	433 000 £	756 380
13	Development of high-performance conveyors for modern mining systems	StBV	2	753 000 DM	233 870
14	Chainless haulage systems for power loaders	NCB	3	433 000 £	756 380
15	Winning machines and face conveyors	CERCHAR	3	2 407 000 FF	402 920
16	Face end systems	NCB	3	486 835 £	850 420
17	Direct digital control of machines for automatic horizon control	NCB	3	422 240 £	737 590
18	Integrated mechanisation in cutting and crushing coal winning	StBV	3	6 712 000 DM	2 084 620
19	Coal winning in semi-steep seams	CERCHAR	3	4 800 000 FF	803 480
	Total				8 120 010
	<u>Outbye services underground</u>				
20	Underground communications	CERCHAR	3	1 197 000 FF	200 370
	Grand Total				15 004 630

* N.B. Rates of conversion from national currencies are those of
31.12.1974 (E.C.S.C. balance)

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V. Research results

The E.C.S.C's experts' Committees which are already concerned with all research work in the four 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. Technical and economic repercussions of the programme and effects on mine safety and working conditions

Because any research project is subject to certain risks and uncertainties, it is difficult to make predictions about the results or to give figures. Nevertheless, an attempt will be made here to draw some conclusions about the expected effects that will result from the proposed research programme.

From the technical viewpoint, nearly all the projects have the aim, directly or indirectly, of enabling Community coal reserves to be won more easily, more effectively and, consequently, more economically either through the development of new technology or by the combination of developments that have already been initiated. In addition, the pre-requirements will be created for the winning of reserves which have been considered for various reasons, not worth exploiting up to the present time.

With regard to mine safety and working conditions, some projects have the explicit purpose of avoiding accidents and disasters by the improvement of the means of combating the natural hazards of underground work. In other projects the improvement of working conditions and environment is on an equal footing with technical development. In addition, it should not be forgotten that the further development of techniques and processes leads to a higher level of training, and hence to the creation of a better-qualified labour force.

From the economic viewpoint, finally, it is to be expected that the new research programme will lead, through the avoidance of breakdowns as well as through optimisation and the increased working life of the components of underground equipment, to operational improvements and, above all, to an improvement of economic results.

In conclusion, attention may be called to the fact that only by a combination of effort in the three fields of technology, safety and working conditions, and economy, can the desired end be achieved.

VII. Conclusions

In view of the significance and interest of the proposed research programme in relation to technology, safety, working conditions and economy in underground operations in the Community's coal mines, the provision of financial aid by the Community for the realisation of the individual projects appears justified and desirable.

The research programme will cost 15 004 630 u.a. and the Commission proposes to grant aid totalling 9 334 661 u.a., of which 9 062 778 is to cover its share of the research expenditure and 271 883 u.a. will meet the cost of dissemination of information and additional expenses.

Distribution of aid

CERCHAR (France)	5 042 400 FF	844 062 u.a.
INIEX (Belgium)	27 000 000 FB	554 904 u.a.
NCB (Great Britain)	2 303 589 £	4 024 014 u.a.
StBV (Fed. Rep. of Germany)	11 236 350 DM	3 489 798 u.a.
		150 000 u.a.
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		9 062 778 u.a.

N.B. Rates of conversion from national currencies are those of
31.12.1974 (E.C.S.C. balance)

November 1975

MEMORANDUM

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

(Budgetary year 1976)

I. General remarks

As a result of developments in the energy sector in recent years, coal will be required to continue to play a significant part in the pattern of Community energy consumption. In order to ensure that the Community's coal industry can meet the demands that will be made on it in the future, it is necessary to try to ensure that coal can be produced safely, efficiently and economically, that traditional markets for coal are preserved and strengthened, and that new markets are developed by the creation of a range of new, upgraded coal products to fulfil future requirements.

Metallurgical coke production currently represents one of the major outlets for Community coal, and will continue to do so for many years to come, in spite of the progress that has been made in the development of new techniques by the Community's steel industry. Research in the field of coke production is necessary in order to ensure that the future demands of coke consumers can be met with regard to both quantity and quality, and that the best use is made of coal reserves to produce coke economically and efficiently. Developments in this direction will have a beneficial effect on the economy of the steel industry.

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Research into the development of new processes and new coal products has an important part to play in helping to reduce the Community's dependence on external energy supplies by enabling products, notably gases, liquid fuels and organic chemical feedstocks, to be manufactured from coal instead of from imported raw materials.

In addition to its concern with energy problems, the Community is deeply interested in problems of pollution and the environment and great importance is attached to research in this field aimed at ensuring that new and traditional products of the coal industry can be manufactured in an environmentally acceptable manner.

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

The British Carbonization Research Association, Chesterfield (BCRA)

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

The Steinkohlenbergbauverein, Essen (StBV)

The National Coal Board, London (NCB)

Nuova Fornicoke, S.p.A., Savona (FORNICOKE)

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

Fusion et Volatilisation, St.-Etienne (FUVO)

The Centro Sperimentale Metallurgico, Rome (CSM)

Naamloze Vennotschap DSM, Heerlen (DSM)

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 subject 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 products from coal which are a logical extension of earlier Community programmes but which also include new aspects. The allocation of tasks within the programme takes account of the facilities and expertise existing in the various Community countries concerned, 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 form two programmes:

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

It is important that metallurgical coke should be of the quality required by the consumers, but insufficient knowledge exists about criteria for specifying blast furnace coke quality. The programme therefore includes three complementary research projects aimed at obtaining an improved understanding of the properties of coke in relation to its behaviour in the blast furnace. The Commission has already shown its interest in the problems of improving the productivity and profitability of coke ovens and widening the range of coking coals by supporting successful research on techniques, such as charge preheating and high-intensity carbonisation, which are now at, or near, the stage of exploitation. Aid is now sought for three interrelated research projects whose purpose is to further the development of these techniques and to ensure that they can be applied safely and profitably on the industrial scale. Coke production presents many pollution problems, and Community research has already been undertaken in this connection. The seventh project in the present programme is aimed at developing technology which will enable partial modernisation of existing coke oven batteries to be carried out in order to minimise pollution during the charging of ovens and to improve battery operations. The by-products of the coking industry form a potentially valuable source of gas and organic chemicals which can provide substitutes for fuels and chemicals normally produced from other sources. As part of a continuing programme of work on the upgrading of such by-products, three complementary requests for aid are included in the new programme. Formed coke manufacture offers a method of both widening the range of coals that can be carbonised, thus enabling lower-grade Community coals to be utilised, and producing new fuels, and the Community has already financed research in this important field. As a complement to existing work on the upgrading of lignite, which is a

significant source of indigenous energy, and also as an extension to earlier Community research in the manufacture of formed coke, the last request in the field of coking and briquetting of coal is related to the production of formed coke from lignite for use as a special fuel in the electrometallurgical industry.

In the field of new chemical and physical processes and products from coal the programme includes a project aimed at upgrading non-coking coals to provide alternative fuels for the blast furnace and other processes in the iron and steel industry. The purpose of this work is to conserve valuable coking coals and to reduce the consumption of expensive blast furnace coke. The second project in this field is aimed at developing a technique for hydrogenating coal to produce raw materials for the petrochemical and plastics industries, and the third at investigating the elimination of pollutants by means of active carbon made from coal. Earlier programmes have included research into the profitable and environmentally safe disposal of colliery spoil, and the last two projects in this field are extensions of earlier work on the same subject. This group of projects thus has an important bearing on optimising the utilisation of Community coal, providing new outlets for coal and new methods of manufacturing products that are normally made from imported raw materials, solving the serious problems of disposing of the by-products of the mining industry, and protecting the environment.

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. Further developments in measuring coke texture (BCRA)

Extension of research into improved methods of characterising cokes and identifying features that can be related to the behaviour of coke under operational conditions.

Total cost: 43 300 £

2. The formation, structure and gasification of metallurgical coke (BCRA)

Work aimed at understanding the behaviour of metallurgical coke under operational conditions.

Total cost: 91 900 £

3. Characterisation and properties of formed coke (CERCHAR)

Development of tests related to blast furnace operating conditions for more precise and realistic characterisation of cokes, with particular emphasis on formed cokes.

Total cost: 1 852 000 FF

Mechanism of coking

4. Charge shrinkage and wall pressure in coke ovens (CERCHAR)

Study aimed at the formulation of rules for the safe operation of coke ovens in the light of changing coal quality and increased intensity of oven operation.

Total cost: 1 020 000 FF

Development of conventional coking techniques

5. Charging wet and preheated coal into a magnesite coke oven (StBV)

Study of coke production under non-standard conditions to obtain information about the technical operation of full-scale magnesite ovens, the formulation of coal blends suitable for high-intensity carbonization, and the effect of charge preheating on coke quality.

Total cost: 5 655 000 DM

6. Preheating oven charges to extend the range of coals carbonized and to improve coke quality (NCB)

Continuation and extension of investigations into the influence of coal blend preheating on the range of coals that can be carbonized and on coke quality, aimed at obtaining the maximum benefit from the preheating technique.

Total cost: 430 000 £

Development of conventional coking techniques, and technical and economic problems in environmental protection

7. Experimental anti-pollution coke oven charging machine with differential charging system (FORNICOKIE)

Development of a charging machine that can be used widely on existing batteries to reduce atmospheric pollution and the entrainment of dust into the by-product recovery system during oven charging, and to improve the distribution of the coal charge in the oven.

Total cost: 450 000 000 Lit.

Production and beneficiation of by-products and coking gas

8. Transformation of coke oven gas to reducing- or synthesis gas (StBV)

Continued research into the transport and conversion of hot, raw coke oven gas, aimed at producing a clean, upgraded gas for reduction or synthesis processes.

Total cost: 900 000 DM

9. Aromatisation of coal-derived raw materials (NCB/ULB/BCRA)

Study of the formation of aromatic compounds from coal tars and extracts aimed at improved understanding of reaction mechanisms and optimisation of the yields of aromatic compounds that can be used as chemical feedstocks and petrol additives.

Total cost: 150 625 £

10. Recovery of by-products from the carbonization of lignite (DEBRIV)

Research into the better utilization of by-products obtained in the manufacture of formed coke from lignite by the development of improved techniques for upgrading tars and gases and processes for purifying waste water and recovering valuable chemicals.

Total cost: 715 000 DM

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Methods of manufacturing smokeless briquettes from coal

11. Upgrading of high-volatile coals (FUVO)

Adaptation of a previously-developed formed coke manufacturing process to the carbonization of coals of very high volatile matter content (e.g., lignite) with the aim of extending the range of coals that can be carbonized and producing a new fuel for the electrometallurgical industry.

Total cost: 1 020 000 FF

Programme "New Chemical and physical processes and products from coal"

Gasification

12. Non-coking coal treatment in fluidized beds for obtaining gas to be injected into blast furnaces and char for ironmaking or formed coke processes (CSM)

Research into the upgrading of non-coking coals (especially high-volatile coals) to provide alternative fuels for the iron and steel industry and thus to reduce the consumption of coking coal and blast furnace coke.

Total cost: 395 000 000 Lit.

Hydrogenation and hydrocracking of coal, extraction products and tar aromatics

13. The conversion of coal into liquid hydrocarbon distillates by hydrocracking (NCB)

Development and evaluation of a continuous hydrocracking process for the conversion of coal into aromatic distillates suitable for the petrochemical and plastics industries.

Total cost: 787 000 £

Adsorption agents from coal

14. Adsorption of waste water impurities by active carbon (DSM)

Fundamental investigation of the adsorption of pollutants from industrial waste water by active carbon (especially active carbon made from coal or lignite) as a means of removing impurities that cannot be eliminated by other techniques.

Total cost: 1 224 000 Hfl.

Building and other materials from coal and shale

15. Utilization of colliery (washery) tailings (NCB)

Continuation of work on fluid bed combustion of thickened washery tailings to produce a material that can be combined with untreated tailings for safe and environmentally acceptable disposal. Investigation of commercial outlets for the treated material.

Total cost: 422 000 £

16. Upgrading of washery tailings (StBV)

Investigation at finding large-scale uses for colliery spoil in a wide range of civil engineering applications. Transformation of tailings into weather-resistant materials. Use in the construction of roads, dams, etc.

Total cost: 700 000 DM

IV ESTIMATED COST AND DURATION OF THE RESEARCH WORK

The total cost foreseen for the programme is

7822 110 u.a. *

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

* Rates of conversion from national currencies are those of 31.12.1974 (E.C.S.C. balance)

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No.	Project	Duration (years)	Total cost	
			National currency	u.a.*
	<u>Coking and briquetting of coal</u>			
	<u>Properties of coking coals and carbonization products</u>			
1	Further developments in measuring coke texture (BCRA)	2	43 300 £	75 640
2	The formation, structure and gasification of metallurgical coke (BCRA)	3	91 900 £	160 540
3	Characterisation and properties of formed coke (CERCHAR)	2	1852 000 FF	310 010
	<u>Mechanism of coking</u>			
4	Charge shrinkage and wall pressure in coke ovens (CERCHAR)	2	1020 000 FF	170 740
	<u>Development of conventional techniques</u>			
5	Charging wet and preheated coal into a magnesite coke oven (StBV)	3	5655 000 DM	1756 340
6	Preheating oven charges to extend the range of coals carbonized and to improve coke quality (NCB)	3	430 000 £	751 140
	<u>Development of conventional coking techniques and technical and economic problems in environmental pollution</u>			
7	Experimental anti-pollution coke oven charging machine with differential charging system (FORNICOKE)	3	450 000 000 Lit	515 540
	<u>Production and beneficiation of by-products and coking gas</u>			
8	Transformation of coke oven gas to reducing- or synthesis gas (StBV)	2	900 000 DM	279 530
9	Aromatisation of coal-derived raw materials (NCB/ULB/BCRA)	2	150 625 £	263 120
10	Recovery of by-products from the carbonisation of lignite (DEBRIV)	2	715 000 DM	222 070

(continued..)

No.	Project	Duration (years)	Total cost	
			National currency	u.a.*
11	<u>Methods of manufacturing smokeless briquettes from coal</u> Upgrading of high-volatile coals (FUVO)	2	1 020 000 FF	170 740
	Total			4 675 410
12	<u>New chemical and physical processes and products from coal</u> <u>Gasification</u> Non-coking coal treatment in fluidized beds for obtaining gas to be injected into blast furnaces and char for iron- making or formed coke processes (CSM)	2	895 000 000 Lit	452 530
13	<u>Hydrogenation and hydrocracking of coal, extraction products and tar aromatics</u> The conversion of coal into liquid hydrocarbon distillates by hydro- cracking (NCB)	3	787 000 £	1 374 760
14	<u>Adsorption agents from coal</u> Adsorption of waste water impurities by active carbon (DSM)	3-4	1 224 000 Hfl	364 830
15	<u>Building and other materials from coal and shale</u> Utilization of colliery (washery) tailings (NCB)	2	422 000 £	737 170
16	Upgrading of washery tailings (StBV)	2-3	700 000 DM	217 410
	Total			3 146 700
	Grand total			7 822 110

* Rates of conversion from national currencies are those of 31.12.1974
(E.C.S.C. balance)

V. Research Results

The E.C.S.C.'s 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. Technical and economic repercussions and social environmental aspects

From the technical viewpoint the results expected will benefit the Community's coal industry by:

- improving the ability of coke manufacturers to meet the requirements of the steel producers with regard to both the quality and quantity of blast furnace coke
- improving the productivity and technical operation of coke ovens,
- leading to the development of processes for the manufacture of a new solid fuel for electrometallurgy, an improved range of gaseous and liquid coking by-products, alternative fuels for iron production, and organic chemicals,
- helping to solve technical problems of air and water pollution, particularly in the coking industry and giving improved knowledge of the elimination of pollutants by a material manufactured from coal,
- developing solutions to the problems of upgrading and disposal of the waste products of the mining industry.

From the economic viewpoint the results will lead to:

- better utilisation of the Community's hard coal and lignite reserves by a widening of the coking coal basis and improved upgrading of cheaper coals,

- the improvement of existing markets for coal and the creation of new markets,
- reduction of the Community's dependence on imported energy supplies by the development of methods of manufacturing gaseous and liquid products from indigenous raw materials,
- improved profitability for the coking industry as a result of improvements in carbonisation techniques and the upgrading of by-products,
- opportunities for the mining industry to profit from the utilisation of its waste products.

In the social and environmental sphere benefits will arise from:

- improved techniques for eliminating pollutants from waste water which will help Community industries to comply with increasingly severe regulations for the purity of water discharged into rivers, etc.,
- the development of methods for purifying liquid effluents from coking plants and reducing the emission of dust and gases during oven charging, with consequent improvements in working conditions and in the surrounding environment,
- the development of methods for processing colliery spoil which will enable this material to be disposed of more safely, and the development of uses for spoil which will reduce the need for the formation of unsightly and inconvenient tips as well as giving rise to the possibility of eliminating existing tips.

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.

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The research programme will cost 7822 110 u.a. and the Commission proposes to grant aid totalling 4634 064 u.a., of which 4693 266 u.a. will cover its share of the research expenditure and 140 798 u.a. will meet the cost of dissemination of information and additional expenses.

Distribution of aid

BCRA (Great Britain)	81 120 £	141 708 u.a.
CERCHAR (France)	1 723 200 FF	288 450 u.a.
StBV (Fed.Rep.of Germany)	4 353 000 DM	1 351 968 u.a.
NCB (Great Britain)	1 073 775 £	1 875 714 u.a.
FORNICOKE (Italy)	270 000 000 Lit	309 324 u.a.
DEBRIV (Fed.Rep.of Germany)	429 000 DM	133 242 u.a.
FUVO (France)	612 000 FF	102 444 u.a.
CSM (Italy)	237 000 000 Lit	271 518 u.a.
DSM (Netherlands)	734 400 Hfl	218 898 u.a.
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		4 693 266 u.a.

N.B. Rates of conversion from national currencies are those of
31.12.1974 (E.C.S.C. balance)