REPORT OF AN IIASA SEMINAR ON SYSTEMS ANALYSIS IN THE COAL INDUSTRY HELD IN SZCZYRK, POLAND, 6-9 NOVEMBER 1979

Jan Stachowicz
Rolfe Tomlinson

September 1980
WP-80-140

INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS
A-2361 Laxenburg, Austria

PREFACE

This paper summarizes the proceedings of the IIASA seminar that was held in Poland in November 1979 to discuss the results of collaborative work under the generic title "Coal--Issues for the Eighties" and to establish a general policy and plan for the future and presents the main conclusions. Three main topics were discussed during this seminar:

-- Organization, Management and Computers,
-- Planning for Planning, and
-- Environmental Problems.

This paper covers the first two topics in some detail. The papers themselves are available separately as an IIASA Collaborative Paper, CP-80-23. The presentations and discussion on environmental issues are being issued separately as CP-80-24. All the proceedings will be published as IIASA Collaborative Papers.

TABLE OF CONTENTS

REPORT OF AN IIASA SEMINAR ON SYSTEMS ANALYSIS IN THE COAL INDUSTRY HELD IN SZCZYRK, POLAND, 6-9 NOVEMBER 1979

Jan Stachowicz, Rolfe Tomlinson

BACKGROUND TO THE IIASA STUDY

This IIASA Industry Study is the first under the general heading "Issues for the Eighties". Work on the coal industry started in 1979, and on the forest industry in 1980. The objectives of these studies are to identify the key issues facing the industry, to define the way that systems analysis can contribute to the solution of those issues, and to develop and refine methods for analyzing those alternatives.

The reasons why IIASA should undertake such comprehensive industry studies are not hard to find, and are set out in the IIASA Research Plan for 1981-85.

> Never before has there been so much uncertainty about the future of economic development. In many countries productivity is not sustaining the hope for growth; in others, technological change is making obsolete those industries on which they have traditionally relied. Many smaller countries in particular suffer from economies of scale that force them to very large investments, stultifying individual initiative and creating vulnerability to changes in the market or in energy costs. Furthermore, different regulatory actions, scarcity of raw materials and skilled labor, changing demand and supply patterns, new needs and products, and so on, are affecting industry more and more.
>
> Though many of the problems studied by IIASA are relevant to the particular needs of industry, few look at the problems as a whole. Yet it is here that, by looking at problems as a whole, the systems approach can make its most important contribution.

> The purpose of IIASA Industry Studies is to bring managers and analysts from interested countries together to identify the critical problems facing each industry in the next ten years, to identify where systems analysis can help, to identify the current state of the art, and to engage in collaborative research where necessary.
>
> The main research is done in the industry itself, with IIASA providing coordination and technical advice as well as undertaking specific research tasks that are best done centrally. The long term aim is to assist the industry through more effective use of systems analysis and to provide the analysts in the industry with better information and tools.

The coal mining industry is particularly appropriate for such a comprehensive study because it is a critical energy industry faced with expectations of greatly increased demand before the end of the century, and with the need to make major investment to decisions at a time when existing capacity is not fully utilized. Markets in the future may be very differently located from the present, and the transport situation needs to be reassessed. The future use of the product is uncertain--it might be needed for electricity generation, gasification, liquefaction or other end uses. The production technology is undergoing change, and the impact of the computer is only just beginning. At the same time, concern about pollution of earth, water and air is growing leading to major regulatory controls of various kinds. It is an industry in transition, and most of these critical issues are appropriate subjects for systems analysis.

Moreover, the coal mining industry has developed over a long period of time under a variety of conditions, and has a good record of international collaboration. This gives a good basis for comparative studies that can be used to provide results of general applicability. Two recent meetings, the 10th World Mining Congress in Istanbul in 1977 and the UNO Coal Seminar in Katowice, Poland, in 1979 have confirmed the potential return from developing international scientific cooperation in the scope of coal mining. In this connection it may be worth quoting from the report of the UN Symposium on World Coal Prospects held in Katowice, Poland, 1979, and attended by about 170 experts from developed and developing countries. The following quotations are taken from the report of Mr. Zygmunt Wegrzyk, Chairman of the Coal Committee of the UN Economic Commission for Europe.

> The results of the 10th World Conference, Istanbul, 1977, indicated that on the basis of coal equivalent coal comprises 81% of fossil fuel resources, oil 17%, and gas 2%, while in 1977 production, the shares of these fuels were: coal 33%, oil 46%, and gas 21%. These figures showed that there was on the one hand a disproportion between petroleum resources and production, and on the other an enormous potential to increase coal production.

An indispensable factor in reducing the technical and economic difficulties in mining was the active development of research and development. This was aimed at providing increased productivity, improved safety, protection of environment, and more favorable economics.

The present and future energy problems and worldwide dimensions had, therefore, to be solved on an international scale.

Issues concerning coal as one of the basic primary energy forms were subjects of interest at numerous centres in the world. An approach consisting in tackling the essential matters from various angles was extremely useful in the light of safeguarding sufficient energy supplies and, consequently, of minimizing tensions not only in the world energy situation, but in the world at large.

Systems analysis has, as we have said, a major part to play in tackling the problems that are revealed in this summary. "Coal--Issues for the Eighties" is intended to contribute towards this, and the Szczyrk seminar is a step in this process.

ORGANIZATION OF THE SEMINAR

The main purposes of this seminar were:

-- to discuss progress since the inaugural task force meeting which was held at IIASA in March 1979,
-- to facilitate the exchanges of experience, results, methods, etc., and
-- to establish a plan for the future.

The seminar was attended by participants from Austria, CSSR, Federal Republic of Germany, Hungary, Italy, United Kingdom, USSR, USA, and Poland. (A list of participants is given in Appendix A.) An important feature of the participants was their practical experience from a range of technical backgrounds and their willingness to cooperate. There was a strong representation from the Polish hosts including representatives from the Polish Coal Mining Ministry and the Silesian Branch of the Polish Academy of Sciences.

All the papers at the seminar were presented in a plenary session and there were in addition two panel discussions. The first of these dealt with management, organizational, computer applications and planning problems, the second with environmental issues. (The Agenda is given in Appendix B.)

A brief reference to the conference location, and to other activities may also be useful. Szczyrk is a health-resort in the Beskid Mountains, and the house where the seminar was organized was a well equipped holiday home for miners and their families. The seminar participants visited the Manifest Lipcowy Colliery in

the Rubnik Coal Region where they were acquainted with practical problems of Polish coal mining. They also visited the notorious Concentration Camp at Oswiecim (Auschwitz).

Eighteen presentations were made by participants from six countries and three by IIASA participants. (A list of the papers is given in Appendix C.) Most of the presentations concentrated on the main seminar topics, i.e.,

-- management and organization problems,
-- planning for planning (i.e. development of a methodology for the use of systems analysis in new capacity planning),
-- environmental issues,

but some of them, in whole or part, were devoted to general problems of coal mining prospects in the different countries.

In the following sections we divide the topics discussed into four different groups, and briefly summarize the most important points made in the presentations and discussion related to each topic.

GENERAL PROBLEMS OF COAL MINING INDUSTRY IN THE DIFFERENT COUNTRIES

Three presentations from USSR, Poland and the UK were devoted to these problems.

Dr. V.B. Moskvin, Chief, Laboratory for Technical and Economic Analysis, Central Research Institute of Economics and Scientific and Technical Information for the Coal Industry of the USSR, gave some salient facts concerning the USSR mining industry. The coal industry of the USSR is characterized by high rates of development--in 1978 the total run-of-mine coal production amounted to 723,6 million tons (664,4 million tons of salable coal), an increase of 100 millions tons, or 16% as compared to 1970. The development of the coal industry is accompanied by coal production concentrations--the number of mines decreased over the said period from 700 to 581. Coal mining in the USSR faces adverse geology, which becomes more and more complicated--an average annual increase of mining depth amounts to 10 meters; by the end of 1978 the average working depth was 436 meters. The share of coal output from underground mines with high gas emission rates is also steadily increasing. In conclusion, Dr. Moskvin stressed that increased levels of production, mechanization and coal output concentration under conditions of worsening geology, called for continued improvements in the field of management and production engineering.

Dr. Wojciech Łakomy, General Director of New Technology Department, Polish Coal Mining Ministry, discussed the coal mining situation in Poland and the problems arising from it.

Since the second world war, coal output in Poland has risen steadily. From 1970 to 1979, production has increased from 140 million tons to above 200 million tons, with an average annual increment of 6,6 million tons. Several factors contribute to this steady increase in production. First of all, older mines and even some of the newer ones are in the process of being renovated and many new collieries have been constructed.

Finally, by increasing mechanization in the mining process, the output of a single face has increased considerably. For example, between 1970 and 1977 the average daily output from a longwall face with caving increased from 600 to 1000 tons per day; the output from a single production level rose from 2300 to 4000 tons a day during this period. Ninety-five percent of the mining production process along face, particularly longwall faces, can be mechanized support, with the number of mechanized faces increasing rapidly.

Forecasts of coal production for the 1980's assume even further increases in output, although a corresponding increase in employment will be limited. In 1980 Poland should produce over 210 million tons of coal; 240 million tons is predicted for 1985. It is anticipated that increasingly inaccessible coal will have to be mined to achieve this increase, with the accompanying problems of air-conditioning, rock burst, etc.

As a result, the problems of organization, management, planning and environmental protection are of special interest to the Polish coal industry.

Mr. I.R. Turner, Operational Research Executive, National Coal Board, U.K. His presentation was devoted to the work of the Operational Research Executive devoted to production planning. Initially, however, he gave some background statistics. The UK National Coal Board operates 230 deep mines, which have an annual production of about 105 million tons. It uses a conventional "line and staff" management organization structure, and divides the country into 12 geographical groups called "Areas". There are three levels of management, namely:

-- the National Board,
-- the 12 "Area" Directors,
-- the 230 Colliery Managers.

Both the National Board and each Area Director has substantial staff divided according to the following functions: production, mining, engineering, finance, marketing, personnel, purchasing. The Colliery Manager's staff is very small, and contains specialists in production, engineering and personnel only.

In addition to the line and staff organization described above, there are a number of operating and advisory bodies within the National Coal Board which lie outside the line and staff

structure. Some of these are operated like wholly-owned subsidiary companies, e.g.:

-- the Opencast Executive,
-- Coal Products Limited,
-- Conpower Limited.

Others have a more advisory or research function. Examples of these are the three technical research establishments, i.e., the Mines Research and Development Establishment, the Coal Research Establishment, and the Operational Research Executive.

The Operational Research Executive is comprised of 125 operational research scientists. The fields of work may be divided into three main groups:

-- work for national headquarters departments, such as mining or finance,
-- work for "Area" managements,
-- long term research.

A small amount of consultancy work is also carried out for other organizations.

There were also general introductions to the seminar by Mr. R. Tomlinson, Chairman of the Management and Technology Area, International Institute for Applied Systems Analysis; Professor A. Melich, President of the Polish Academy of Sciences, Silesian Branch; and Dr. Zygmunt Wegrzyk, Chairman of the Coal Committee of the UN Economic Commission for Europe.

PLANNING FOR PLANNING

Four presentations were wholly devoted to this topic and two presentations discussed it in part. Taken together, they provided a wide overview of OR and systems applications at all design states in the mining planning for planning activity as well as presenting a good deal of useful experiences on the use of computers in support for planning in the coal mining industry. These presentations with the discussion on them, not only provided a useful exchange of ideas and experience, but also provided an experimental base for future collaborative studies not only directly related to planning methods improvement but also on more general topics, as for example, management under uncertainty. Two of these presentations were on papers introduced by UK specialists from the National Coal Board which gave an overview of OR method applications for planning process needs in UK coal mining.

Mr. W. Hancock, of the Operational Research Executive of the National Coal Board at Coleorton, UK, presented a paper on "OR in New Mine Planning" by J.J. Lewis and M.J. Sadnicki, which described the OR methods developed and used at North East Leicestershire (NELP) in the United Kingdom.

In the mid-1970's a major new prospect was proved in a previously unworked region of North East Leicestershire. Preliminary estimates from borehole information showed over 500 million tons of recoverable resources.

A special planning team was set up to coordinate the work for the two local areas: South Nottinghamshire and South Midlands (the team was led by Mr. J.J. Lewis, co-author of this paper). The presentation described the OR methods developed and used at NELP, in six sections, reserves assessment, underground layout assessment, manpower availability, manpower requirements and productivity, surface capacities and financial assessment. Finally, a few remarks and recommendations were made on the use of OR systems in the context of the difficulties encountered by mining engineers in solving the complex optimization problem of planning a new mine.

The main part of the work had been a careful system analysis and structuring of the overall problem. This, without the application of specific OR techniques, was of great use in itself. Allied to the application of specific OR methods, the potential contributions to mine planning are enormous.

Mr. I.R. Turner. This presentation was concerned with planning for production at the colliery level. He presented the results of the Operational Research Executive studies on planning for production (for a group of 18 mines in England). The purpose of this work was to render assistance in planning a mining business dealing with uncertainty about the outside world concerning (the cost of raw materials and the demand for the products of the business) and with uncertainty about internal coal face factors. This work consisted of the following steps:

-- historical analysis,
-- building a forecasting model.

Furthermore, the author gave details of the calculations made with this model, that are performed for three sets of collieries for which the analysis was used, i.e., thin-seam advancing, thick-advancing, and retreat. It is worth emphasizing that the accuracy of this model is very high.

Dr. Zygmunt Wegrzyk presented a paper by J. Pazdiora, who is the General Director of Mining Studies and Design, Katowice, Poland, on "Computerized Designing Processes for the Development of Coal Regions and Coal Mines", which described the range of computerized methods application by his office.

These methods are used in design (planning for planning) practice both for planning processes such as coal mining development and for everyday needs in different planning topics. He gave a description of the different methods and discussed their

experience in applying them at the following design-planning stages:

-- planning the development of the total coal mining industry,
-- feasibility studies,
-- detailed technical designs,
-- designers supervision of the designs realization at construction sites.

Moreover, Dr. Pazdiora added some salient facts concerning the economies achieved through the use of the presented methods in planning practice. For example, in line with mathematical models for a single horizon mine, the physical model of the XXX Anniversay Mine in the Rubnik Coal Region was established. The results of calculations permitted savings in capital expenditure of the order of 60 million zloties.

Dr. V.P. Moskvin, in his paper on "Some Problems of Management and Production Engineering in the Coal Industry of the USSR," described some work undertaken on planning problems in the USSR coal industry. They were concerned particularly with the improvement of analytical techniques for identifying production potential and apply more comprehensive planned management. This analysis comprised the following:

(a) reliable quantitative assessment of effects of geological, technological and production engineering factors on production efficiency indices, such as productivity, cost of production and profitability;

(b) sound assessment of production capacity of an enterprise as a whole or of separate technological units at a given enterprise;

(c) development of a set of measures, primarily in the area of production engineering, intended to eliminate so-called "bottlenecks".

A comparative program of work has been carried out in the USSR coal industry with the aim of introducing computer methods into the practice of planning for planning activity. This work is accomplished in coordination with the development of economic methods of management, improvement of organization structures, instructions and other methodical materials for planning. Practically all main R&D Institutes in the USSR are engaged in solving this program.

Mr. Schächter of the FRG, devoted his presentation to one detailed problem arising from planning at the colliery level, and described the OR methods application for planning of the underground haulage system.

MANAGEMENT, ORGANIZATION AND COMPUTERS

The presentations and discussions on this subject focused on two main aspects:

-- general problems of organization and management in the coal mining industry, and
-- the exchange of results and experience on the use of computers for management.

Three papers dealt entirely with this area and one only partly.

Dr. Jan Stachowicz, in his presentation on "Organization and Management Problems in Polish Coal Mining: Present State of Investigation," stressed the importance of organizational problems in the coal mining industry as a subject of "Coal--Issues for the Eighties". In most countries there is a gap between the technological developments in the coal mining industry and the development of new operational solutions to the problems which technological change has introduced. This gap creates easily identifiable problems of organizational management in the industry, as well as some very specific problems in the field of computer applications at different management levels.

Very important problems exist, not only in the coal mining industry, connected with answers and questions:

-- how to create manager-oriented decision support systems?,
-- how to create a support for top level managers system?

The coal mining industries in the different countries have started to develop their own approaches to these problems. There is, therefore, much material for comparative study on methods of meeting management problems in the industry under technological change in different organizational climates. At the same time the evolution of new management approaches is still at an early enough stage of development for this exchange of knowledge and experience to be valuable. However, one must face up to the reality of the obstacles in the path of such studies, for example:

(a) The actual state of organization and management theory, as shown by the many different schools of thought and trends, which apart from the shortcomings reflecting the present underdevelopment of organization theory, accomplish quite often the apological and political goals.

(b) The lack of common concepts, categories and definitions in different countries is a serious obstacle to scientific cooperation in the field of organization and management science. It applies first of all to categories used in coupling the theory with practice.

(c) Differentiated legal-formal systems in various countries have a vital influence on detailed organization solutions.

(d) The basic nature of organization and computer science applications to organizational problems makes it difficult to obtain adequate measures of effectiveness that can be used for comparative purposes.

To avoid these problems, the following proposals were made, based on discussions previously held at IIASA:

1. To limit the considerations, at the preliminary stage, to the production activity and to the colliery level.

2. To develop the work plan in two separate parts, namely,
   (a) to explore ways and methods in which systems analysis can assist the theorists and practitioners concerned with the planning, design, and control of collieries in the face of technological and organizational change;
   (b) to study recent developments in relation to comprehensive planning systems and the development of microcomputers and to discuss their potential impact on organization and management.

Dr. Stachowicz then presented the results of Polish activities in these fields, particularly with regard to a study on management and organization systems in the coal mining industry. He described an approach which might be suitable after development, as a general approach to be used by other countries. This approach has originated in studies at IIASA in 1979.

The study on management and organization system investigation in the coal mining industry, which had been undertaken in Poland, had tackled several practice problems, in addition to the theoretical aims. These were:

-- how to design the management and organization system for new coal basins currently being developed;
-- how to modernize existing management and organizational systems on different management levels;
-- how to create a climate conducive to effective computer use within the mining industry;
-- how to improve the decision-making process in the coal mining industry.

Polish institutes cooperated with IIASA and have presented their successive results on this study. For example,

-- the results of an investigation into the relation between colliery size and the situational variables which form the management capability,
-- the results on the evaluation of the state and usage of computer systems implemented in Polish collieries within the, so-called, computerized management systems.

The results on computer application in the Polish coal mining industry were presented during the seminar. This work has confirmed the view which was supported by experts from the UK (see P.N. Thompson's paper) that it is necessary to create a client-oriented information system as a basis for a real decision support system. The next stage of the study was concerned with an investigation into the colliery's organization structure investigation. These investigations are carried out according to a special questionnaire which was presented and discussed during the seminar.

Dr. Petr Kobert, from the Managers Centre of Fuels and Energy Ministry in Czechoslovakia, discussed some general problems in the creation and application of a computer information system on different management levels in the Czechoslovakian coal mining industry. His recommendation and general conclusions were made on the basis of experience with a computer information system in the Coal Ostrava Kervina Region and from the investigations made for improving this system. It was stressed that of the problems that are needed to solve at a colliery using an information system, 20% could be handled from information generated at the colliery; the remaining 80% could only be solved if the colliery's information system was part of a higher management level system. For that reason the author suggests the information system for the enterprise should be designed on a "top-down" basis, i.e., from the higher levels of management to the lower ones. This conclusion was controversial since other participants, on the basis of their experience, suggested the "bottom-up" approach. This discussion needs to be extended and more thoroughly explored.

A very good example of the "bottom-up" approach came in the paper by P.N. Thompson, C.W. Teale, from the Operational Research Executive and R. Richardson, from Bentley Colliery, which presented the results of a study to develop a, so-called, Mine Operating System. This system assumed the main applications of mini-computers at collieries would be for such needs as: controlling the underground transport system and coal preparation plants, for monitoring the mine environment and face operations, etc.

The important feature of this work was the desire to create a client-oriented system taking into consideration a very important fact for practical success of such information systems, i.e., that individual managers have different styles and indeed all collieries are different to a greater or lesser degree. This necessitated the use of special methods for the information survey. In addition, the equipment used at Bentley Colliery (the colliery chosen for the exercise) was described. The results of this work greatly interested the Polish seminar participants because of their current efforts in creating similar systems in the Polish coal mining industry.

Dr. V.B. Moskvin, in his presentation, in addition to the problems presented before, gave some salient facts concerning the application of computers for management in the USSR coal industry. For example, at present in the USSR within the so-called coal industry automated system of management, nearly 200 complexes of problems are being solved, including the calculation of target figures of annual output for coal production units, optimum distribution of coal output for collieries, analysis of fulfilling coal output plans and introduction of productive capacities.

An important part of the industry-wide automated system of management in the USSR is the subsystem of operational accounting and process control which ensures the solution of a complex of problems, the results of which provide for making operational managing decisions prior to the expiration of plan periods (month, quarter, etc.).

Parallel to accounting problems, the subsystems ensure the control of timely reproduction of the total coal face length, efficient utilization of mechanized complexes, operation of mine ventilation networks, etc., are applied in the USSR's coal mining.

Dr. A. Madejski and Dr. E. Pawełczyk, from the Computer Institute of the Mining Industry in Poland, presented the results of work on "The Model of Computerized System Management in the Polish Coal Mining Industry". The model consists of three groups of "analytical-accounting" information systems, and three groups of "planning" systems. Each group plays a clearly defined role in the managerial processes. The "analytical-accounting" systems aid in record keeping and also evaluate the effectiveness of current operations. The "planning" systems are made to forecase the effectiveness of planned activities and to select optimal planning strategies.

ENVIRONMENTAL PROBLEMS

As a background to the workshop, discussions on future program directions, over 15 technical papers on related topics were presented and are being published as IIASA reports. Approximately one-half of these papers dealt specifically with environmental issues such as management of air pollutant effects from coal use, groundwater depletion and other effects from coal extraction, environmental aspects of advanced coal utilization technologies, and comprehensive coal/environment planning approaches in selected countries.

The workshop participants identified the following six areas of concern as potential topics for future study in the environmental component of the study:

1. Exchange of information on characteristics of advanced coal utilization and conversion technologies, with an emphasis on environmental aspects and technology costs.

2. Analysis of transboundary air pollution issues related to future coal developments.

3. Groundwater hydrology and water quality issues related to coal mining.

4. Subsidence and other land use conflicts related to coal mining.

5. Disposal of mine wastes.

6. Planning and architectural design for new coal mining communities.

The first two topics in the above list were subsequently selected largely on the basis of the level of previous joint efforts in this direction between IIASA and the US and also because of the interest being expressed in these issues by a broad range of groups, including the UN Economic Commission for Europe, the Organization for Economic and Community Development, and other individual NMO countries. Furthermore, these two topics are closely related and would provide input and support for each other.

WHERE DO WE GO FROM HERE?

The participants felt that the seminar had been successful from two points-of-view. Firstly, it had provided the opportunity for the exchange of experience and an insight into different methodological approaches to problems, that could not have been obtained in any other way. No other meeting currently catered for this need. Secondly, it had made it possible to identify the direction that future collaborative studies might take. Such studies need not in fact be narrowly related to the coal industry but could concern, for example, the role of coal mining in global industrial development, as more specific problems of management under uncertainty, computers/management interactions, innovation--all of which were topics for IIASA study.

Summing up the results of this seminar, Mr. Tomlinson, Area Chairman of the Management and Technology Area at IIASA, noted that the meeting had provided a general policy and plan for the future. It was not possible to tackle too many topics at one time, and it would probably need two years to cover a topic adequately--with e.g., a planning workshop one year and a conference in the next year. One might thus manage one new topic each year, no more. The topics would be chosen to link in with other research undertaken at IIASA. The first topic might be an exception to this rule, since it would be concerned with planning for planning and it might be possible to get a task force of experts particularly concerned with new mine planning to meet in 1981. Much would depend on obtaining the cooperation of the countries concerned and in time IIASA would not be undertaking any research in this field themselves, since only the

industry had the necessary expertise. The output might be in the form of a summary paper, or a collection of individual papers.

The second meeting, to take place in 1981, would be a conference on organization, computers and management--possibly to be held in Poland. This would have to be planned in 1980. Plans beyond that time would need further consideration.

Mr. Tomlinson concluded by saying that such a plan of work was realistic in view of the resources available. It would be helpful to achieve as much collaboration as possible, and the expression of interest from Dr. Wegrzyk as Chairman of the Coal Committee of the ECE was particularly valuable.

APPENDIX A

LIST OF PARTICIPANTS

AUSTRIA

Dipl.-Ing. Dr. Gernot Staudinger
Vorstand des Instituts fuer Apparatebau
und Mechanische Verfahrenstechnik
Technischen Universitaet Graz
Krenngasse 37
A-8010 Graz

CECHOSLOVAKIA

Dr. Petr Kobert
Federalmi Vzdelavaci Stredisko
FMPE
Svazacha 1
73601 Havirov Podlesi

FEDERAL REPUBLIC OF GERMANY

Dipl.-Ing. N. Schaechter
Institut fuer Bergbaukunde und
Bergwirtschaftslehre
Erzstrasse 20
D-3392 Clausthal-Zellerfeld

Dipl.-Ing. D. Wiegand
Bergbauforschung GmbH
Franz-Fischer-Weg 61
D-4300 Essen 13

HUNGARY

Dr. Laszlo Lengyel
Hungarian Coal Trust
Varsanyi u.44
H-1027 Budapest

ITALY

Dr. Vanni Badino
Instituto di Arte Mineraria-Politecnico
Corso duca degli abruzzi 24
10129 Torino

Dr. E. Runka
Centro Scientifico IBM Italia
via del Giorgione 129
I-00147 Roma

POLAND

Prof. Dr. Hab. Alojzy Melich
President
Silesian Branch of the Polish Academy of Sciences
40-039 Katowice

Dr.-Ing. Zygmunt Węgrzyk
President of the European Committee and
Vice Director of Main Office for Mining Studies and Design
40-127 Katowice

Dr. Wojciech Łakomy
Director
Department of New Technology of the Mining Industry
ul. Powstancow 30
40-039 Katowice

Dr.-Ing. Andrzej Mazurek
Vice Director for Studies and Research Activity
Main Office for Mining Studies and Design
40-127 Katowice

Dr.-Ing. Aledsander Karge
Main Office for Mining Studies and Design
40-127 Katowice

Prof. Dr. Hab.-Ing. Tadeusz Gawłowski
Dean of the Architecture Facility
Silesian Technical University

Dr. Hab.-Ing. Bronisław Skinderowicz
Main Mining Institute, Katowice

Dr.-Ing. Eugeniusz Pawełczyk
Computer Centre of the Mining Industry
100 Mikołowska str.
40-065 Katowice

POLAND (continued)

Dr.-Ing. Antoni Madejski
Computer Centre of the Mining Industry
100 Mikołowska str.
40-065 Katowice

Dr. Hab.-Ing. Andrzej Matczewski
Director
Institute for Organization & Management Problems
of the Polish Academy of Sciences
pl. Kościuszki 9
41-902 Bytom

Dr. Hab.-Ing. Jan Stachowicz
Vice Director for Scientific Activity
Institute for Organization & Management Problems
of the Polish Academy of Sciences
pl. Kościuszki 9
41-902 Bytom

Dr.-Ing. Jozef Bendkowski
Director
Computer Centre of the Mining Industry
100 Mikołowska str.
40-065 Katowice

Prof. Dr. Hab.-Ing. Andrzej Straszak
Systems Research Institute
Polish Academy of Sciences
Newelska 6
01-447 Warsaw

UNITED KINGDOM

Mr. W. Hancock
Operational Research Executive
National Coal Board
Coleorton Hosue
Coleorton
Leicestershire

Mr. Hugh Lee
IEA Coal Research
Economic Assessment Service
14/15 Lower Grosvenor Place
London SW1W 0EX

Mr. Eric Levitt
National Coal Board
Hobart House
Grosvenor Place
London SW1

UNITED KINGDOM (continued)

Dr. W.J. Phillips
Department of the Environment
2 Marsham Street
London SW1 P3EB

Mr. Ian Turner
Operational Research Executive
National Coal Board
Doncaster
Yorkshire

UNITED STATES OF AMERICA

Dr. Steve Ballou
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Ill. 60439

Dr. Loren Habegger
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Ill. 60439

Dr. Vernon E. Adler
Counselor of Embassy for Scientific & Technological Affairs
American Embassy
Warsaw

USSR

Dr. V.B. Moskvin
Chief of Laboratory for Technical and Economic Analysis
Central Research Institute of Economics & Scientific and
Technical Information for the Coal Industry of the USSR
Sapunova 4/5
Moscow

Dipl.-Ing. G. Souetine
Chief of Section of Statistical Analysis
Central Research Institute of Economics & Scientific and
Technical Information for the Coal Industry of the USSR
Sapunova 4/5
Moscow

IIASA

Dr. L. Petras
Mr. R. Tomlinson
Dr. N. Vorontsov
Dr. K.-H. Zwirnmann
Mr. A. Gruebler

APPENDIX B

AGENDA

TUESDAY, 6 November

10.00 Inauguration

-- Welcome and talk "Main Direction of the Polish Mining Industry" by Dr. Wojciech Łakomy, Director of the Department of New Technology of the Mining Industry

-- Welcome and talk by Dr.-Ing. Zygmunt Węgrzyk, Manager, Main Study and Design Office for the Mining Industry

-- Welcome and talk on "Aims of the IIASA Coal Industry Study" by Mr. Rolfe Tomlinson, Management and Technology Area Chairman, IIASA

11.00 Chairman: Dr. Alojzy Melich

- "New Mine Planning", Mr. W. Hancock, National Coal Board, UK
- "Groundwater Impacts of Extraction", Dr. K.-H. Zwirnmann, IIASA
- "A Framework for Integrating Regional Environmental Goals into Coal Production and Utilization Strategies", Dr. Loren Habegger, IIASA and Argonne National Laboratory, USA

13.00 Lunch

TUESDAY, 6 November (continued)

16.00 Chairman: Dr. Andrzej Straszak

-- Welcome by Prof. Dr. Alojzy Melich, President of Katowice Branch of Polish Academh of Sciences

o "Energy/Environmental Programs at IIASA", Dr. Loren Habegger, IIASA

o "Some Problems of Management and Production Engineering in the Coal Industry of the USSR", Dr. V.B. Moskvin, Chief of the Laboratory for Technical and Economic Analysis, and Dipl.-Ing. G. Souetine, Chief of Section of Statistical Analysis, both of Central Research Institute of Economics & Scientific and Technical Information for the Coal Industry of the USSR

o "Research into the Likely Effects of Introducing LHD Equipment into Coal Mines", Mr. N. Schaechter, Institut fuer Bergbaukunde und Bergwirtschaftslehre, FRG

o "Computerized Coal Mine Design Methods", Dr.-Ing. Zygmunt Wegrzyk, Manager, Main Study and Design Office for Mining Industry

19.00 Dinner

WEDNESDAY, 7 November

7.00 -- Breakfast

7.20 -- Departure

8.30 -- "Manifest Lipcowy Colliery

11.00 -- Departure for Pszczyna

12.00 -- Lunch at Pszczyna

14.00 -- Departure for Oswiecim (Auschwitz)

17.30 -- Dinner at Jeleśnia

THURSDAY, 8 November

9.30 Chairman: Dr. Zygmunt Węgrzyk

o "Information for Production Planning", Mr. Ian Turner, National Coal Board, UK

o "Organization and Management Problems in Coal Mining Industry. Statement of Investigations", Dr. Jan Stachowicz, Institute of Organization and Management Problems, Bytom

o "Management Information Systems in the Mining Industry" Dr. Petr Kobert, FMPE, CSSR

THURSDAY, 8 November (continued)

- o "Model of Computerized System Management in the Mining Industry with Special Emphasis on Production Planning", Dr.-Ing. Antoni Madejski, Computer Institute of the Mining Industry

12.30 Lunch

14.30 Chairman: Dr. Nikolai Vorontsov

- o "Environmental Protection Problems in Coal Regions", Dr. Bronisław Skinderowicz, Computer Institute of the Mining Industry
- o "Energy/Environmental Assessments in the US", Dr. Steve Ballou, Argonne National Laboratory, USA
- o "Coal Use and Air Quality Planning", Dr. E. Runka, IBM, Italy
- o "Effluents from Different Gasification Processes", Dipl.-Ing. Dr. Gernot Staudinger, Technical University of Graz, Austria
- o "Coal Conversion Technologies and Costs", Mr. Hugh Lee, IEA Coal Research, Economic Assessment Service, UK

19.00 Banquet

FRIDAY, 9 November

9.00 Plenary Session

- -- Future Research
- -- Future Collaboration

12.00 Official Closure

APPENDIX C

LIST OF PAPERS

"New Mine Planning", Mr. W. Hancock, National Coal Board, UK

"Groundwater Impacts of Extraction", Dr. K.-H. Zwirnmann, IIASA

"A Framework for Integrating Regional Environmental Goals into Coal Production and Utilization Strategies", Dr. Loren Habegger, IIASA and Argonne National Laboratory, USA

"Energy/Environmental Programs at IIASA", Dr. Loren Habegger, IIASA

"Some Problems of Management and Production Engineering in the Coal Industry of the USSR", Dr. V.B. Moskvin and Dr. G. Souetine Central Research Institute of Economics & Scientific and Technical Information for the Coal Industry of the USSR

"Research Into the Likely Effects of Introducing LHD Equipment Into Coal Mines", Mr. N. Schaechter, Institut fuer Bergbaukunde und Bergwirtschaftslehre, FRG

"Computerized Coal Mine Design Methods", Dr.-Ing. Zygmunt Węgrzyk, Main Study and Design Office for the Mining Industry, Poland

"Information for Production Planning", Mr. Ian Turner, National Coal Board, UK

"Organization and Management Problems in the Coal Mining Industry. Statement of Investigations", Dr. Jan Stachowicz, Institute of Organization and Management Problems, Poland

"Management Information Systems in the Mining Industry" Dr. Petr Kobert, FMPE, CSSR, Lubomir Petras, IIASA

"Model of Computerized System Management in the Mining Industry With Special Emphasis on Production Planning", Dr. Antoni Madejski, Computer Institute of the Mining Industry, Poland

"Environmental Protection Problems in Coal Regions", Dr. Bronisław Skinderowicz, Computer Institute of the Mining Industry, Poland

"Energy/Environmental Assessments in the US", Dr. Steve Ballou, Argonne National Laboratory, USA

"Coal Use and Air Quality Planning", Dr. E. Runka, IBM, Italy

"Effluents from Different Gasification Processes", Dr. Gernot Staudinger, Technical University of Graz, Austria

"Coal Conversion Technologies and Costs", Mr. Hugh Lee, IEA Coal Research, Economic Assessment Service, UK