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FINAL REPORT

ASEAN Coal Course
Economic, Environmental and Technological Aspects
of
Coal Development and Utilization
January 31 – March 26, 1983

presented at

Argonne National Laboratory
Division of Educational Programs
Argonne, Illinois

report prepared by

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1.0 Background

An eight-week course "Economic, Environmental and Technological Aspects of Coal Development and Utilization" was held at Argonne National Laboratory, January 31 - March 25, 1983 for twenty-eight participants from the Association of Southeast Asian Nations (ASEAN).

The target audience for the course was middle and senior level staff who are responsible for planning and/or implementation of coal technology programs in their home country. They were selected from government agencies, industry, research and development organizations, universities and utilities. It was required that they have a university degree in economics, engineering, environmental science, management, or sociology, with at least three years of experience in a coal technology field. In addition, conversational English skills and good health were a prerequisite. The course was presented by the Division of Educational Programs (DEP), at Argonne National Laboratory (ANL), Argonne, Illinois, under a Participating Agency Service Agreement (PASA) between the U.S. Agency for International Development and the U.S. Department of Energy.

Follow-up training for two to six month periods was provided for 14 of the course participants.

The purpose of the course and follow-up training was to provide the participants with pertinent information on the economic, environmental, and technology issues associated with the development and/or utilization of coal resources in their respective countries. The course was structured to emphasize currently available techniques and technologies rather than research and development activities. The participants gained enough technologies to immediately apply the knowledge obtained during the course in any ongoing or near-term coal technology programs that may exist in their countries.

The course director was Dr. W. Kenneth Derickson, Division of Educational Programs, ANL. Course co-leaders were Mr. J. L. Gillette, Energy and Environmental Systems Division, ANL, for economics; Dr. W. Charles Redman, Energy and Environmental Program, ANL, for technology; and Dr. W. "Bill" S. White, Environmental Impact Studies Division, ANL, for environmental aspects. The U.S. AID program manager was Robert F. Ichord, ASEAN TR, Washington, D.C.

2.0 The Participants

Of the 28 participants, 18 represented government and 10 private industry. On the other hand, 13 can be said to have come from planning organizations, 4 from production organizations, 5 from R&D organizations, 2 from utilities, and the remaining 4 from universities. Appendix I is the list of participants.

2.1 Indonesia

Indonesia has recognized hard and soft coal reserves. Coal production before World War II had obtained a level of two million tons per day of which one third was exported. Production fell to about 5% of that level by 1983. However, the government is now vigorously pursuing the increase in production and indigenous utilization. Indonesia sent five participants to the course representing areas of conventional coal utilization. They are listed below with organizations and their indicated area of interest:

Y. Basyuni, Mineral Technology Development Center
(Chemical Analyses and Utilization)
B. Maliki, P. N. Batubara, Ombilin Coal Mine
(Exploration and Transportation)
M. S. Pawito, Bandung Institute of Technology
(Research and Combustion)
G. Widodo, Mineral Technology Development Center
(Preparation)
A. F. Yoesoef, Mineral Technology Development Center
(Mining and Open Pit)

2.2 Malaysia

Malaysia has rather low cool reserves of poor quality. Until recently the country had little interest in exploration, in

Malaysia (Cont'd)

production or utilization. However with the 1972 oil crisis, government interest has risen. The six participants from Malaysia with mainly exploratory interests were:

Z. Abidin, Ministry of Science Technology & Environment
(No special interest indicated)

S. L. Chin, Ministry of Energy, Telecommunications & Posts
(Economics and Fuel Substitution)

C. C. Ho, National Electricity Board
(Environmental Engineering)

C. M. Lee, Ministry of Science, Technology & Environment
(Environmental Engineering)

M. I. Thani, Ministry of Science, Technology & Environment
(Environmental Engineering)

K. K. Wong, Ministry of Primary Industries
(Coal Development)

2.3 Philippines

The Philippines has substantive coal reserves and produces approximately 350 million tons per year. Utilization has been primarily industrial, particularly in the production of cement. Present plans call for increasing the consumption of coal for electric generation and in the improvement of the coal distribution infrastructure in the country. There were seven participants in the course. They were:

G. T. Francisco, National Science & Technical Authority
(Energy Policy and Economics)

A. E. Labios, Ministry of Energy, Bureau of Energy Development
(Environmental Engineering)

J. P. Lozano, Ministry of Energy, Environmental Unit
(Environmental Engineering)

Philippines (Cont'd)

W. S. Mediavillo, National Oil & Coal Corp.
(Coal Utilization and Quality Control)
R. C. Solitario, National Oil & Coal Corp.
(Coal Handling and Preparation)
M.L. Soriano, Ministry of Energy, Bureau of Energy Utilization
(Coal Utilization Policy and Fuel Substitution)
R. D. Villacorta, National Oil & Coal Corp.
(Exploration, Supervision and Training)

2.4 Singapore

Singapore has no coal reserve and its main interest is in the investigation of substitution of coal for oil to be used primarily in the field of electric power generation. There was one participant.

H. M. Lim, Public Utilities
(Environmental Engineering)

2.5 Thailand

Thailand has known deposits of lignite that are in need of exploration and development. The activity has been increased in recent years and attention is being given to the use of imported hard coals for electric power generation. The seven participants represented a wide spectrum of interest as might be expected from a country which is exploring the possibilities of coal utilization with the knowledge that it does have available reserves. The participants with organizations and their area of interest were:

S. Chantern, National Environmental Board
(Environmental Assessment)
A. Chiewwattakee, National Energy Administration
(Economics Development Utilization)

Thailand (Cont'd)

A. Inkatanuwat, Electricity Generating Authority of Thailand
(Utilization and Economics)

T. Pitakarnnap, Ministry of University Affairs
(Research, Mining and Economics)

A. Prasertwitayakit, Chiang Mai University
(Natural Convective Heat Transfer and Utilization of Lignite)

S. Rojanasaroj, King Mongkut's Institute of Technology
(Research and Utilization)

T. Vatanatham, Prince of Songkla University
(Research and Conversion)

3.0 The Course

The course was designed to present material relevant to the needs of the five ASEAN nations: Indonesia, Malaysia, Philippines, Singapore, and Thailand.

In the development of the course content, the director visited the appropriate authorities in all five ASEAN nations to determine their interests in coal technology. During this time, he also interviewed prospective nominees for course participation and made recommendations as to the appropriateness of their nomination.

3.1 Course Content

The course was divided into the following eleven modules:

1.1 Orientation
1.2 Background
1.3 Mining
1.4 Transportation
1.5 Beneficiation
1.6 Combustion

1.7 Carbonization/Gasification
1.8 Fuel Substitution
1.9 Siting
1.10 Electric Power Generation
1.11 Industrial Applications

The full course outline is attached as Appendix II.

The course can be said to have concentrated its content in three areas: mining technology, including beneficiation; utilization with emphasis on electric power generation; and siting and environmental impacts, including transportation. This emphasis was consistent with the desires expressed by other ASEAN program leaders. It also reflected the interests of the participants as expressed to the course leaders after the course had begun.

The course was given on a five-day week. Each day was divided into six fifty minute periods from 9:00 a.m. to 4:40 p.m. The detailed schedule is attached as Appendix III. One hundred thirty-four periods were devoted to lectures. Because the course emphasized practical applications and was also intended to highlight the involvement of private sector experts, the majority of these lectures (77 or 57%) was given by experts from the private sector. Forty lectures (30%) were given by members of the Argonne staff, 14 lectures (10%) were given by experts from other governmental organizations and 3 lectures (3%) were presented by university faculty members. A total of slightly less than half of the course time was devoted to lectures (49%).

A very important portion of the course (20%) was devoted to work sessions dealing with practical case studies. Four scenarios were developed in each of the following areas: mining, transportation, beneficiation, siting, and plant applications. The scenarios were drawn to illustrate a range of possible situations. The participants were divided into four teams, chosen to reflect diverse backgrounds and interests of the participants. Each team would then evaluate the technological, economic, and environmental problems and possible solutions associated with one of the scenarios. The teams were changed for each area. The teams were given

approximately two days to develop solutions for each scenario. They provided crude written reports and then made oral presentations, which were critiqued by the rest of the class and the staff. The scenarios and some representative studies (19%) are attached as Appendix IV.

A portion of the course (19%) was devoted to site visits that included underground and surface mines, coal handling facilities, electric power plants, industrial, research and manufacturing facilities, and conversion (gasification) facilities. Many of the visits were carried out on one-day trips from Argonne with the exception of a two-day trip to southern Illinois and a three-day trip to Pennsylvania and Ohio. Below are the organizations visited and the nature of the facilities.

ANL, Materials Science Division
(corrosion and dry scrubber facilities)
Allis-Chalmers, Southern Illinois
(Kiln Gas facility)
Cora Dock Company
(Cora coal terminal)
Freeman United Coal Co. and Central Illinois Public Company
(coal preparation, underground mine and mine-mouth plant)
Institute of Gas Technology
(IGT facilities and gasification plants)
Commonwealth Edison
(Will County coal-fired plant barge operations)
Commonwealth Edison
(Joliet Power Plant and Unit Train Operation)
Lonestar Industries Cement Plant
(industrial applications and cement production)
Pittsburgh Energy Technology Center
(PETC facilities)
Consolidated Coal Co.
(observe strip mining, coal slurry, and pipeline)
Ohio State University
(research facilities)

The remainder of the course (12%) was devoted to presentations by the participants of the coal programs in each of the countries and to reports of the case studies. The former presentations were carried out to make the staff more familiar with the interests of the participating countries in order that minor changes in the curriculum could be made. They also had the additional effect of stimulating interactions between the participants from different countries.

3.2 Participation from ANL

The ANL participation included (1) work by the course director and his co-leaders in the preparation of the course, in the contracting of other speakers, and in the writing of the scenarios; (2) their work in the leading of lecture work sessions and subsequent question periods, and in the assistance to the teams in the case study solutions; and (3) also presentation of lectures by the co-leaders and by other Argonne staff members. A list of the Argonne lecturers is given in Appendix V. Fifteen Argonne staff members other than the course leaders participated in the lecture portion of the course. The course leaders were responsible for the overview lecture in each module. In addition, they and the other Argonne lecturers made substantial contributions in technical lectures in the background, transportation, combustion, carbonization and siting modules.

3.3 Participation Outside ANL

Twenty private sector organizations participated in the course providing lectures, tours, or on-the-job training. Many provided all three. Two universities, two research institutes and government laboratories also participated. The private sector representation was as follows:

Mining 9
Engineer Consultants 9
Equipment Vender 4
Electric Utilities 2
Industrial Users 1

As was pointed out, the largest fraction of the lectures was given by experts from the private sector who were also very helpful in the formulation of the course and who contributed liberally in their lectures. They were often leaders in their organizations and their presentations showed the results of extensive preparation.

In general, they were given an honorarium of $250.00 per day at Argonne, plus travel expenses, which consisted of airfare, actual hotel, local travel, and a per diem of $24.00 a day in lieu of other expenses (standard ANL travel policy). It should be recognized that such an honorarium is a small payment for preparation time at home, presentation of lectures, additional time spent at ANL in discussions with the participants, assistance with the case studies, and miscellaneous interactions with participants. It should be recognized that many of the experts are persons who have normal billing rates of $500.00 per day or more.

What should not be neglected is the contribution from other governmental institutions, particularly from the Pittsburgh Energy Technology Center. Because it is also a US/DOE facility, it was not possible to reimburse those experts for expenses or provide an honorarium. Future courses should probably recognize this problem in advance and make some provision in the PASA for reimbursement of their expenses.

The participating organizations are given below. Full addresses and details of their contribution to the course are in Appendix VI.

Allis Chalmers
Argonne National Laboratory
Arthur D. Little, Inc.
Basic Resources, Inc.
Bechtel Group, Inc.
C-E Power Systems
Central Illinois Public Service Co.
Chambers & Associates
Commonwealth Edison
Consolidation Coal Company
Cora Coal Transfer Terminal
Dames & Moore
Electric Power Research Institute
Fluor Mining & Metals, Inc.
Freeman United Coal Co.
General Electric
Information Design and Delivery
Institute of Gas Technology
Lonestar Industries
MITRE Corporation
Northwestern University
Ohio State University
Pittsburgh Energy Technology Ctr.
Roberts and Schaefer
Sargent and Lundy
Stone & Webster
Utah International, Inc.
Wheelabrator-Frye, Inc.

4.0 Evaluations

Participants were asked to complete an evaluation form, attached as Appendix VII. The form was signed and returned by all of the participants and an open discussion of results was held on the final day of the course. The evaluation dealt largely with course length and content. The conclusion was that the length was about right and several suggestions were made for future courses. The responses as to the time allocation for various subjects and activities indicated a distribution which is relevant to the participants' interests. About 70% of the responses indicated satisfaction with the overview nature of the course areas, the remaining 30% requested more emphasis in particular fields (those in which the respondent had an overwhelming interest). This is a result which was expected with the idea that the particular interest of the participants could be enhanced through the provision of on-the-job training. A representative sample of the remarks is attached as Appendix VIII.

No formal evaluation of the participants was made. It can be said that the overwhelming majority, with only one or two exceptions, demonstrated total involvement in the course during their eight-week stay at ANL. As can be seen from Appendix IX, the participants were very enthusiastic about the organization and conduct of the course and staff.

5.0 On the Job Training

Fourteen of the participants were approved by their government to follow the course with on-the-job training (OJT) from assignments. Because of the pre-course time constraint, the nature and length of on-the-job training assignment appropriate to each participant's interest was determined during the second week of the course, leaving only six weeks to locate an OJT assignment. Financial constraints limited the length of assignments and foreclosed the payment of a training fee to host organizations. Nevertheless, appropriate assignments were located for all fourteen. Technically, eight of the assignments met the participant's objectives very well, four fairly well, and two had serious deficiencies. Logistically two were deficient in that adequate housing and transportation was beyond the stipend provided. Details on OJT assignments are given in Appendix X.

5.1 The Host Organizations

The eleven organizations which hosted OJT participants follows:

Acker Drill Company
Allis Chalmer
Argonne National Laboratory
Bechtel Group, Inc.
Combustion Engineering
Longyear Company
NL Industries
Pittsburgh Energy Technology Center
San Juan Coal Company
Utah International Inc.
U.S. DOE

Bechtel Group, Inc., hosted three participants. Training plans were developed to best meet participants' objectives within the limitations of time and ongoing work. Two received useful detailed information on Bechtel methodology in siting and environment, but since there was no ongoing work on coal, the hands-on exposure was lacking. The third did an excellent study on ASEAN Coal Policies, although it was not in the subject area of her major interest.

Pittsburgh Energy Technology Center hosted three participants: two did hands-on work in coal-liquid combustion and the third received a series of short assignments in subjects of interest.

Combustion Engineering hosted two participants, each of whom worked in ongoing projects: one in calculation of boiler efficiencies and the other in fluidized bed experiments and calculation.

Argonne National Laboratory hosted two participants. They were assigned hands-on work in ongoing FBC projects.

Allis Chalmer Co., hosted one participant in a short assignment to gather information on establishing research and development priorities for coal. He completed his OJT at U.S. DOE headquarters in a survey of energy policy and planning.

The Longyear Co. hosted one participant. This assignment was one of the more successful OJT in the group. It arranged a program in exploratory drilling which included not only a stay in its headquarters, but also at Acker and NL Industries.

San Juan Coal Co. hosted one participant at a modern operating mine. This was also very successful.

Utah International Co. hosted one participant. He completed two studies directly applicable to his home country environmental policies.

5.2 Summary

Although the OJT portion of the coal training was seen to be important and reasonably successful it would have been more beneficial to the trainees if the organizers had longer lead time to find assignments more appropriate to the participants' interests and had the ability to finance longer assignments and increase stipends for some of the locations.

6.0 Facilities

The course was conducted in the facilities of the Division of Educational Programs, ANL. A lecture room, three work rooms with desks for each participant, lounge, and offices for course staff and visiting lecturers were provided. All lecture sessions were recorded on audio tape for distribution to interested participants as an aid to those having language difficulties. (Rather minimal use was made of this facility because of the rather good English demonstrated by the participants). In addition, written copies of material appropriate to each lecture was distributed (in advance of the lecture where possible) as an aid to participants' understanding of the material. In some cases this was an actual lecture; in others, appropriate material covering the same subject; and in still others, sample copies of viewgraphs and other visuals. Two textbooks were furnished to each participant: "Coal Utilization, Technology, Economic Policy" by L. Grainger and J. Gibson and "Fossil Power Systems" by Combustion Engineering.

Visits were made to Argonne's Coal Corrosion Laboratories and its fluidized bed combustion facility.

The participants were housed on the ANL site in apartments consisting of three bedrooms, two baths, and a combination kitchen/living room. In addition, a lounge was provided with pocketbillards and table tennis.

Bus transportation was provided three times a week either to a nearby village for shopping or into Chicago for sightseeing and other social activities. Fourteen social functions and organized tours were arranged during the eight-week period.

7.0 Administration

The participants were furnished a stipend of $30.00 a day for lodging and living expenses during the first month of the course and $35.00 a day during the remainder. Stipends of $35.00 a day were also provided to the trainees during their on-the-job training. Although this was seen to be adequate considering the type of living that was provided, there were dissatisfactions, especially in those cases where participants could have received a higher stipend from their home organizations.

Participants were also provided travel to and from their home base as well as to and from the sites of on-the-job training. Because of the short time and the necessity for obtaining low-cost fares, participants were unable to make other travel either in the United States or to intermediate destinations coming to or from the course. For future courses, an arrangement with local travel agencies in home countries might be a better arrangement. Books were also provided where needed.

8.0 Recommendations

8.1 Courses with content similar to that given here are useful and should be considered for presentation for other USAID regions and for repeat presentation to the ASEAN.

8.2 Although there is an interest in preparing the text material for use by others, it is recommended that this not be done until one or more additional presentations of this course are made.

8.3 Better arrangements for reimbursement of travel would be needed for future courses.

8.4 If such a course is again done by ANL, a small PASA should be executed for the Energy Technology Centers in order to encourage greater participation in future courses.

8.5 Consideration should be given to a presentation of more specialized courses in coal technology, such as exploration, development, production, and beneficiation; siting and environment, including transportation; and electric power generation.

8.6 Participants should be notified in advance of stipend levels and travel provisions.

8.7 Arrangements should be made for more lecturers to work with the participants in evaluating the results and conclusions of the case studies.

Appendix I - List of Participants

USAID ASEAN Energy II
Coal Training Program
January 31 - March 25, 1983

Name & Country	Affiliation	Title	Degree	Age
Zainudin Bin Zainal Abidin (Malaysia)	Ministry of Science Tech. & Environment	Admin. & Diplomatic Officer	B.S. Env. Science	27
Yuyun Basyuni (Indonesia)	Mineral Technology Development Center	Chemist	B.S. Chemistry	39
Sermak Chantem (Thailand)	National Environmental Board	Environmental Technologist	M.A. Indust. Engr.	30
Atthaya Chiewwattakee (Thailand)	National Energy Administration	Economist	M.A. Energy Economists	34
Shih Loon Chin (Malaysia)	Ministry of Energy, Telecommunications & Posts	Administrative Officer	B.S. Biology	28
Gil. T. Francisco (Philippines)	National Science & Tech. Authority	Chief Science Res. Specialist	M.S. Engineering	26
Chee Cheong Ho (Malaysia)	National Electricity Board	Planning Engineer	M.S. Engineering	28
Arch Inkatanuwat (Thailand)	Electricity Generating Authority of Thailand	Engineer	M.S. Engineering	31
Antonio E. Labios (Philippines)	Ministry of Energy - Bur. of Energy Devel.	Mining Engineer	B.S. Mining Eng.	30
Choong Min Lee (Malaysia)	Ministry of Science Tech. & Environment	Envir. Control Officer	B.E. Mech. Eng.	29
Hui-Meng Lim (Singapore)	Public Utilities	Senior Engineer	B.S. Physics	38
Jose P. Lozano IV (Philippines)	Ministry of Energy - Environmental Unit	Envir. Planning Engineer	B.S. Chem. Eng.	24
Basuni Maliki (Indonesia)	P.N. Batubara - Ombilin Coal Mine	Superintendent	B.S. Engineering	46
Wilfrido S. Mediavillo (Philippines)	Philippines National Oil & Coal Corp.	Technical Services	B.S. Coal Tech.	38
Erlinda Napitupulu (Indonesia)	National Institute for Metallurgy	Staff Researcher	B.S. Metallurgy	26

Name & Country	Affiliation	Title	Degree	Age
Pawito (Indonesia)	Bandung Institute of Technology	Lecturer	B.S. Engineering	32
Tassana Pitakarnnop (Thailand)	Ministry of University Affairs	Lecturer	M.S. Mining	34
Arwudt Prasertwitayakij (Thailand)	Chiang Mai University	Lecturer	Ph.D. Engineering	38
Sawitri Rojanasaroj (Thailand)	King Mongkut's Inst. of Technology	Instructor	M.A. Chem. Eng.	27
Rodolfo C. Solitario (Philippines)	Philippines Nat. Oil & Coal Corp.	Term. Operations Manager	B.S. Elect. Eng.	36
Manuel L. Soriano (Philippines)	Ministry of Energy - Bur of Energy Util.	Sr. Industrial Engineer	B.S. Engineering	25
Hariyanto Soetjijo (Indonesia)	Nat. Institute of Geology and Mining	Mining Engineer	M.A. Engineering	32
Mohamed Ishak Bin Thani (Malaysia)	Ministry of Science Tech. & Envir.	Envir. Control Officer	B.E. Engineering	30
Terdthai Vatanatham (Thailand)	Prince of Songkla Univ.	Lecturer	Ph.D. Chem. Eng.	34
Rodrito D. Villacorta (Philippines)	Philippines Nat. Oil & Coal Corp.	Gen. Drilling Supervisor	B.S. Engineering	34
Gerard Widodo (Indonesia)	Mineral Technology Development Center	Researcher	M.S. Science	34
Kee Kuong Wong (Malaysia)	Ministry of Primary Industries	Deputy Director	B.S. Engineering	39
A. Fatah Yoesoef (Indonesia)	Mineral Technology Development Center	Res. & Project Administrator	M.A. Engineering	39

Originator: WKD,JLG
WCR,WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.1.0 Orientation

A. Lectures		Lecturer
1.1.1	USAID's Energy Development Assistance Programs o Technical Assistance o Institutional Development o Expert Studies and Reports	Robert Ichord Charles Bliss USAID Washington, DC
1.1.2	Argonne's Fossil Energy Programs o Advanced Coal Technologies o Materials Science and Instrumentation o Environmental Studies o Chemical and and Physical Analyses	Michael Petrick Fossil Energy Programs Argonne Nat'l Lab Argonne, IL
1.1.3	Overview of Coal Studies at PETC o Coal Analyses o Coal Combustion o Coal Preparation o Emissions Control	Sun Chun Director Pitts. Energy Tech. Center Pittsburgh, PA
1.1.4	Argonne's International Energy Development Programs o National Energy Planning o Technology Assessments o Impact Assessments	Richard Cirillo Energy & Env. Sys. Argonne Nat'l Lab Argonne, IL

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Originator: WKD, JLG
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ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.2.0 Background

A. Lectures		Lecturer
1.2.1	Origin, Quality and Quantity of Coal o Formation o Variations o Analysis	Randy Winans Chemistry Argonne Nat'l Lab Argonne, IL
1.2.2	Chemical and Physical Properties of Coal o Pertinent chemical characteristics o Physical properties affecting applications o Blending	Randy Winans Chemistry Argonne Nat'l Lab Argonne, IL
1.2.3	General Principles of Engineering Economics o Time value of money o Interest formulas o Escalation and inflation o Discount rate o Depreciation	Jim Peerenboom Energy & Env. Systems Argonne Nat'l Lab Argonne, IL
1.2.4	Types of Engineering Costs o Capital investment o Fuel o Operation and maintenance o Comparison of generating system costs	Jim Peerenboom Energy & Env. Systems Argonne Nat'l Lab Argonne, IL
1.2.5	Uncertainties in Engineering Costs o Sources of uncertainty o Effects on cost comparisons o Methods of analysis	Jerry Gillette Energy & Env. Systems Argonne Nat'l Lab Argonne, IL
1.2.6	Reliability Effects on Costs o Effects on capital charges o Replacement energy costs o Balances and tradeoffs	Jerry Gillette Energy & Env. Systems Argonne Nat'l Lab Argonne, IL
1.2.7	General Environmental Consideration - Aquatic o Physical properties of aquatic resources o Biological properties of aquatic resources o Identifying major aquatic issues	Libby Stull Env. Impact Studies Argonne, Nat'l Lab Argonne, IL

1.2.8	General Environmental Considerations - Terrestrial o Components of the terrestrial system o Resource uses and effect of coal utilization on terrestrial systems o Responses of terrestrial systems to perturbation	Lars Soholt Env. Impact Studies Argonne Nat'l Lab Argonne, IL
1.2.9	General Health and Safety Considerations o Occupational health and safety effects of the coal fuel cycle o Health and safety impacts to the public o Example of a health and safety analysis	Bill Pfanenstiel Env. Impact Studies Argonne Nat'l Lab Argonne, IL
1.2.10	Advanced Coal Technologies o Coal liquefaction potentials	Abu Talib MITRE Corp. McLean, VA
1.2.11	Gasification Technology Options for ASEAN Countries o Methodology for establishing selection criteria o Critical issues o Biomass gasification	A. Talib MITRE Corp. McLean, VA
1.2.12	Coal Analyses o Equipment and facilities o Methodologies o Quality control	Herb. Retcofsky Process Technology Pitts. Energy Tech. Center Pittsburgh, PA
1.2.13	Energy Database Management o Accessing existing energy databases o Establishing energy databases o Facilitating information flow	Susan Emerson Consultant Columbus, OH

B. Work Session

1.2.a Team Assignments and Review of Work Session Formats

C. Discussion Session

1.2.i Mining in ASEAN Countries -I

1.2.ii Mining in ASEAN Countries -II

1.2.iii Indonesia's Coal Programs -I

1.2.iv Indonesia's Caol Programs II

1.2.v Malaysia's Coal Programs - 1

1.2.vi Malaysia's Coal Programs -II

1.2.vii Philippines' Coal Programs -I

1.2.viii Philippines' Coal Programs -II

1.2.ix Singapore's Coal Programs

1.2.x Thailand's Coal Programs -I

1.2.xi Thailand's Coal Programs -II

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ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.3.0 Mining

A. Lectures

		Lecturer
1.3.1	Mining Overview o Preview of ecomonic,environmental and technological aspects	Course Staff
1.3.2	Exploration Techniques o Geographical distribution o Standard procedures o Advanced technology	Jean Bogner Energy & Env. Systems Argonne Nat'l Lab Argonne, IL
1.3.3	Surface Mining Methods o Strip o Pit o Comparisons	Stephen Gartshore Consolidation Coal Pittsburgh, PA
1.3.4	Underground Mining Methods o Room and pillar o Long wall o Comparisons	B. D. Singh Consolidation Coal Pittsburgh, PA
1.3.5	Omitted	
1.3.6	Reclamation Practices o Recreate conditions suitable to restore land to previous use o Creat conditions for a new and different use of the mine site o Treatment after filling, contouring, topsoiling, and seeding	Mike Hatfield Utah Int'l, Inc San Francisco, CA
1.3.7	Mining Impacts - I o Geographical and locational factors o Potential impact to property, crops and livestock o Nuisance and loss of amenity in the environment	J. LeRoy Balzer Utah Int., Inc. San Francisco, CA

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1.3.8	Mining Impacts - II o Nature and effects of water pollutants o Specific pollution problems o Control of water pollution and water standards	J. LeRoy Balzer Utah Int., Inc. San Francisco, CA
1.3.9	General Mining Economics o Costs for different types of mining o Cost relationship to mine capacity o Cost of reclamation techniques	Jerry Gillette Energy & Env. Systems Argonne Nat'l Lab Argonne, IL
1.3.10	Mine Development -I o Evaluation of deposits o Role of transportation o Role of Coal preparation o Selection of mining methods	Milton Harrell Freeman United Coal Co. Mount Vernon, IL
1.3.11	Mine Development -II o Environmental considerations o Role of permits o Marketing considerations o Story of the Crown III Mine	Milton Harrell Freeman United Coal Co. Mount Vernon, IL
1.3.12	Mining Feasibility Studies o Classes of Feasibility Studies o Critical Aspects of Banking Feasibilty Study o Accuracy and Validation of Data	Chris Recny Fluor Mining & Metals Redwood City, CA
1.3.13	Financing Mining Projects o Financing Methodologies o Role of third-party advisors o Capital sources	William Trammel Fluor Corporation Irving, CA

B. Work Sessions

1.3.a 'ining Scenarios - I

1.3.b Mining Scenarios -- II

1.3.c Mining Scenarios - III

1.3.d Mining Scenarios - IV

1.3.e Mining Scenarios - V

1.3.f Mining Scenarios - VI

1.3.g Mining Scenarios - VII

1.3.h Mining Scenarios - VIII

1.3.i Mining Scenarios -ix

1.3.j Mining Scenarios -x

1.3.k Mining Scenarios - Report Preparation

C. Discussion Sessions

1.3.i Mining Scenarios - Results I

1.3.ii Mining Scenarios - Results II

1.3.iii Mining Scenarios - Results - I

1.3.iv Mining Scenarios - Results - II

39B8

Originator: WKD, JLG
WCR, WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.4.0 Transportation

A. Lectures

		Lecturer
1.4.1	Transportation and Storage - Overview o Preview of economic, environmental, and technological aspects	Course Staff
1.4.2	Transportation - Barge and Ship - I o Transfer from truck and rail o Movement of material o Unloading	Ramesh Gandhi Bechtel Group, Inc. San Francisco, CA
1.4.3	Transportation - Barge and Ship - II o Continuation of Lecture 1.4.2	Ramesh Gandhi Bechtel Group, Inc. San Francisco, CA
1.4.4	Transportation - Pipelines o Slurry properties o Pipeline experience o Improved techniques	Ramesh Gandhi Bechtel Group, Inc. San Francisco, CA
1.4.5	Transportation - Rail and Terminal Operations o Handling at mines o Coal car design and movement o Unloading operations	Charles Roman Earl Antonson Roberts & Schaefer Chicago, IL
1.4.6	Transportation - Air Pollution and Land Use Conflicts o Preemption of land from other uses o Runoff from storage areas o Air pollution factors	Peter Campbell Dames & Moore Park Ridge, IL
1.4.7	Storage - Land Use Conflicts and Protection o Preemption of land from other uses o Fire prevention measures	Peter Campbell Dames & Moore Park Ridge, IL
1.4.8	Transportation - Cost of Alternatives o Cost of alternative modes o Cost - distance relationships o Cost - quantity relationships	William Stevens Bechtel Group, Inc. San Francisco, CA

1.4.9	Transportation - Effect of Multiple Sources and End Users on Costs o Effect of several mines o Effect of several end-users o Effect of different types of end-users	William Stevens Bechtel Group, Inc. San Francisco, CA
1.4.10	OMITTED	
1.4.11	Storage and Inventory Strategy - I o Identification of costs o Inventory costs versus shortage costs o Role of spot purchases	Stephen Chapel EPRI Palo Alto, CA
1.4.12	Storage and Inventory Strategy - II o Role of power sales and purchases o Development of overall strategy	Stephen Chapel EPRI Palo Alto, CA
1.4.13	Storage - Water Pollution o Types of impacts associated with coal storage o Runoff from coal storage areas o Methods used to prevent water pollution	Bill White Env. Impact Studies Argonne Nat'l Lab Argonne, IL

B. Work Sessions

1.4.a Transportation and Storage Scenarios - I

1.4.b Transportation and Storage Scenarios - II

1.4.c Transportation and Storage Scenarios - III

1.4.d Transportation and Storage Scenarios - IV

1.4.e Transportation and Storage Scenarios - V

1.4.f Transportation and Storage Scenarios VI

1.4.g Transportation and Storage Scenarios Reports Due

C. Discussion Sessions

1.4.i Transportation and Storage Results - 1

1.4.ii Transportation and Storage Results - II

1.4.iii Transportation and Storage Results - III

39B11

Originator: WKD, JLG
WCR, WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.5.0 Beneficiation

A. Lectures

		Lecturer
1.5.1	Beneficiation - Overview o Preview of economic, environmental and technical aspects	Course Staff
1.5.2	Beneficiation - Preparation o Pulverizing o Classification	Albert Deurbrouck Pitts Energy Tech. Center Pittsburgh, PA
1.5.3	Beneficiation - Separation o Density - based methods o Techniques involving surface effects o Chemical processes	Albert Deurbrouck Pitts Energy Tech. Center Pittsburgh, PA
1.5.4	Beneficiation - Recovery o Dewatering o Drying and sizing o Pelletizing	Albert Deurbrouck Pitts Energy Tech. Center Pittsburgh, PA
1.5.5	Beneficiation - Water Pollution and Solid Waste o Land use, seepage, and coal refuse disposal o Types of refuse and effluents produced during beneficiation	Bill White Env. Impact Studies Argonne Nat'l Lab Argonne, IL
1.5.6	Beneficiation - Cost of Technologies o Costs of alternative technologies o Effect of beneficiation level o Effect of quantity	Mel Laurila Arthur D. Little, Inc. Cambridge, MA
1.5.7	Beneficiation - Effect on End-Use Costs o Increased fuel costs o Decreased emissions control costs o Effect on plant availability	Mel Laurila Arthur D. Little, Inc. Cambridge, MA

1.5.8 Beneficiation - Trade-Offs

Mel Laurila
Arthur D. Little, Inc.
Cambridge, MA

- o Levels of beneficiation
- o Location of facility

B. Work Sessions

1.5.a Beneficiation Scenarios - I

1.5.b Beneficiation Scenarios - II

1.5.c Beneficiation Scenarios - III

1.5.d Beneficiation Scenarios - IV

1.5.e Beneficiation Scenarios - V

1.5.f Beneficiation Scenarios - Reports Due

C. Discussion Sessions

1.5.i Beneficiation Scenarios - Results - I

1.5.ii Beneficiation Scenarios - Results - II

1.5.iii Beneficiation Scenarios - Results - III

39B13

Originator: WKD,JLG
WCR,WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.6.0 Combustion

A. Lectures

		Lecturer
1.6.1	Combustion - Fundamentals o Chemical reactions o Contaminants o Conditions - temperature, time, turbulence	Kwan Im Engineering Argonne Nat'l Lab Argonne, IL
1.6.2	Combustion - Fluidized Bed - I o Atmospheric systems o Experience to date o Pressurized systems	Walt Podolski Chem. Eng. & Tech. Argonne Nat'l Lab Argonne, IL
1.6.3	Combustion - Fluidized Bed - II o Materials handling o Sulfur removal o Comparison with conventional systems	Walt Podolski Chem. Eng. & Tech. Argonne Nat'l Lab Argonne, IL
1.6.4	Combustion - Fixed Bed o Physical structure o Feed systems o Ash removal	John Regan Combustion Engineering Winsdor, CT
1.6.5	Combustion - Suspension Firing o Furnace geometries o Mixing o Materials flow	John Regan Combustion Engineering Windsor, CT
1.6.6	Combustion Performance - Fouling o Deposition of slag o Effect on heat transfer o Surface cleaning	John Regan Combustion Engineering Windsor, CT
1.6.7	Combustion Performance - Corrosion and Erosion o Materials requirements o Performance testing o Durability and reliability	Bill Ellingson Materials Sci. Tech. Argonne Nat'l Lab Argonne, IL

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Originator: WKD,JLG
WCR,WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.7.0 Carbonization/Gasification

A. Lectures		Lecturer
1.7.1	Basic Gasification Processes o Chemical reactions o Producer gas o Syngas o Gas shifting	Suresh Babu Inst. of Gas Tech. Chicago, IL
1.7.2	Established Gasification Techniques o Wellman o Koppers - Totzek o Winkler o Lurgi	Suresh Babu Inst. of Gas Tech. Chicago, IL
1.7.3	Omitted	
1.7.4	Omitted	
1.7.5	Improved Gasification Processes - I o High pressure Koppers - Totzek o Slagging Lurgi o Texaco partial oxidation o Westinghouse	Suresh Babu Inst. of Gas Tech. Chicago, IL
1.7.6	Improved Gasification Processes - II o Shifting and methanation o Hydrogasification	Suresh Babu Inst. of Gas Tech. Chicago, IL
1.7.7	In-Situ Gasification o Basic concepts o Influential factors (location, rank, product) o Technology status	John Young Chem. Eng. & Tech. Argonne Nat'l Lab Argonne, IL
1.7.8	Gasification Cost of Processes - I o Costs of in-situ gasification	John Young Chem. Eng. & Tech. Argonne Nat'l Lab Argonne, IL

1.7.9 Gasification Cost of Processes - II

- o Costs of alternative processes
- o Effects of coal type
- o Effects of quantity

William Chambers
Chambers & Assoc.
Glen Ellyn, IL

1.7.10 In-Situ Gasification Demonstrations

- o Fairfield Texas Study
- o Tennessee Colony Study
- o Environmental Findings

Joe Grant
Basic Resources, Inc.
Dallas, TX

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Originator: WKD, JLG
WCR, WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.8.0 Fuel Substitution

A. Lectures

		Lecturer
1.8.1	Fuel Substitution - Plant Modifications o Feed systems o Emissions control o Operation	Thomas Breuer Arthur D. Little, Inc Cambridge, MA
1.8.2	Fuel Substitution - Economic Considerations o Capital investment costs o Operation and maintenance changes o Plant derating	Thomas Breuer Arthur D. Little, Inc Cambridge, MA
1.8.3	Fuel Substitution - Coal/Oil & Coal/Water Mixes o Properties o Experience to date o New developments	James Joubert Pitts. Energy Tech. Center Pittsburgh, PA

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Originator: WKD, JLG
WCR, WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.9.0 Siting

A. Lectures		Lecturer
1.9.1	Siting - Overview o Preview of economic, environmental, and technological aspects	Course Staff
1.9.2	Siting - Technology Cost Effects o Effects on plant design o Effects on plant costs	Thomas Breuer Arthur D. Little, Inc Cambridge, MA
1.9.3	Siting - Fuel Supply o Effects on fuel supply options o Effects on fuel supply costs o Effects on fuel supply reliability	Thomas Breuer Arthur D. Little, Inc Cambridge, MA
1.9.4	Siting - Product Distribution Costs o Effects on distribution costs o Effects on distribution reliability	Thomas Breuer Arthur D. Little, Inc Cambridge, MA
1.9.5	Siting - Environmental Cost Effects o Effects on environmental control requirements o Effects on environ. control costs o Effects on waste disposal costs	Thomas Breuer Arthur D. Little, Inc. Cambridge, MA
1.9.6	Siting - Environmental Considerations - I o Comparison of alternative sites o Evaluation and ranking of potential sites o Selection of a site	Aziz Metwally Bechtel Group, Inc. San Francisco, CA
1.9.7	Siting - Environmental Considerations - II o Atmospheric environment and air quality o Land use and biological environment o Proximity to transportation routes and highways	Aziz Metwally Bechtel Group, Inc. San Francisco, CA

1.9.8	Siting - Environmental Considerations - III o Critical habitats and protected species o Proportion of water source required o Water quality and water uses o Waste disposal	Aziz Metwally Bechtel Group, Inc San Francisco, CA
1.9.9	Heat Dissipation Systems - I o Basic Considerations o Once-through cooling o Cooling ponds	Fred Emmett Sargent & Lundy Chicago, IL
1.9.10	Heat Dissipation Systems - II o Wet cooling towers o Dry cooling towers o Water quality control	Fred Emmett Sargent & Lundy Chicago, IL
1.9.11	Siting - Mitigation of Environmental Impacts - I o Improved design of facilities o Flexibility to use new methods o Ability to develop new techniques	Peter Campbell Dames & Moore Park Ridge, IL
1.9.12	Siting - Mitigation of Environmental Impacts - II o Application of air, terrestrial, and water control technologies o Remove or prevent release of effluents o Use proper coal preparation methods	Peter Campbell Dames & Moore Park Ridge, IL
1.9.13	Siting - Decision Analysis - I o Basic principles o Selection of attributes	Bill Buehring Energy & Env. Sys. Argonne Nat'l Lab Argonne, IL
1.9.14	Siting - Decision Analysis - II o Analysis techniques	B. Buehring Energy & Env. Sys. Argonne Nat'l Lab Argonne, IL

B. Work Sessions

1.9.a Siting Scenarios - I

1.9.b Siting Scenarios - II

1.9.c Siting Scenarios - III

1.9.d Siting Scenarios - IV

1.9.e Siting Scenarios - V

1.9.f Siting Scenarios - VI

1.9.g Siting Scenarios - VII

1.9.h Siting Scenarios - Reports Due

C. Discussion Sessions

1.9.i Siting Scenarios Results - I

1.9.ii Siting Scenarios Results - II

1.9.iii Siting Scenarios Results - III

39B20

Originator: WKD, JLC
WCR, WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.10.0 Electric Power Generation

A. Lectures

		Lecturer
1.10.1	Electric Power Generation - Overview o Preview of economic, environmental and technological aspects	Course Staff
1.10.2	Electric Power Generation - Power Production Components - I o Pulverized coal plant overview o Feed systems o Combustors	Richard Fujii Sargent & Lundy Chicago, IL
1.10.3	Electric Power Generation - Power Production Components - II o Boiler o Turbine - generator o Ancillary components	Richard Fujii Sargent & Lundy Chicago, IL
1.10.4	Electric Power Generation - Instrumentation and Control o Quality control o Fuel feed systems o Fuel Composition	Richard Fuji Sargent & Lundy Chicago, IL
1.10.5	Electric Power Generation - Cost of Application for New Plants o Capital cost estimates o Operation and maintenance costs o Performance estimates	Edward Fox Oak Ridge Nat'l Lab Oak Ridge, TN
1.10.6	Electric Power Generation - Basics of Emission Controls o Options for NO_x, SO_x, and particulates o Integrated system viewpoint o Developing technology	Paul Farber Energy & Env. Sys. Argonne Nat'l Lab Argonne, IL

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1.10.7	Electric Power Generation - Particulates Emission Controls o Electrostatic precipitators o Fabric filters o Cyclones	Heinz Engelbrecht Wheelabrator-Frye, Inc. Pittsburgh, PA
1.10.8	Electric Power Generation - Sulfur Emission Controls - I o Wet scrubbers o Dry Scrubbers o Proven and prospective systems	Vladimir Boscak General Electric Lebanon, PA
1.10.9	Electric Power Generation - Sulfur Emission Controls - II o Continuation of Lecture 1.10.9	Vladimir Boscak General Electric Lebanon, PA
1.10.10	Electric Power Generation - PFBC's o Steam-cooled combustion plants o Air-cooled combustion plants o Technical issues	Win Bezella Chemical Eng. & Tech. Argonne Nat'l Lab Argonne, IL
1.10.11	Electric Power Generation - Environmental Considerations - I o Raw materials required for power plants o Water availability, land use and waste disposal o Airborne effluents, terrestrial and aquatic ecosystems	Barbara Lewis Northwestern Univ. Evanston, IL
1.10.12	Electric Power Generation - Environmental Considerations - II o Features of power stations that pose potential impacts o Impacts of power stations on fish and wildlife o Impacts to vegetation (native species, crops, and lower plants)	Barbara Lewis Northwestern Univ. Evanston, IL
1.10.13	Electric Power Generation - Environmental Considerations - III o Impacts of acid precipitation o Measures to mitigate impacts o Conversion of oil-or gas-fired power stations	Barbara Lewis Northwestern Univ. Evanston, IL

1.10.14	Electric Power Generation - Combined Cycle o Choice of gasification systems o Operating experience o Technical issues	Vern Hruza Allis-Chalmers Milwaukee, WI
1.10.15	Electric Power Generation - Fuel Cells o Gas stream requirements o Demonstration units o Improved cells	Glenn Cook Chemical Eng. & Tech. Argonne Nat'l Lab Argonne, IL
1.10.16	Electric Power Generation - Optimization Trade-offs o Effect of design and performance options o Effect of modularity o Effect of redundancy	Edward Fox Oak Ridge Nat'l Lab Oak Ridge, TN
1.10.17	Omitted	
1.10.18	Omitted	
1.10.19	Electric Power Generation - Training Staff - I o Benefits of in-house training o Levels of Training o Requirements for training	Loyd Guidry Basic Resources, Inc. Dallas, TX
1.10.20	Electric Power Generation - Training Staff - II o Specific training programs - Mining o Specific training programs - Plant operations	Loyd Guidry Basic Resources, Inc. Dallas, TX
1.10.21	Electric Power Generation - The Lakhra Coal Facility Study - I o Background information o Design criteria and database o Selecting coal production facilities o Selecting power generation facilities	Conrad Anderson Stone & Webster Eng. Boston, MA
1.10.22	Electric Power Generation - The Lakhra Coal Facility Study - II o Economic analyses o Financial analyses o Implementation	Conrad Anderson Stone & Webster Eng. Boston, MA

1.10.23 Electric Power Distribution - I — Suhell Haddad, Sargent & Lundy, Chicago, IL

- o Historical overview
- o The power system
- o Generation planning

1.10.24 Electric Power Distribution - II — Suhell Haddad, Sargent & Lundy, Chicago, IL

- o Transmission planning
- o Specific cases

B. Work Sessions

1.10.a Plant Applications Scenarios - I

1.10.b Plant Applications Scenarios - II

1.10.c Plant Applications Scenarios - III

1.10.d Plant Applications Scenarios - IV

1.10.e Plant Applications Scenarios - V

1.10.f Plant Applications Scenarios - VI

1.10.g Plant Applications Scenarios - VII

1.10.h Plant Applications Scenarios - VII

1.10.i Plant Applications Scenarios - IX

1.10.j Plant Applications Scenarios - X

1.10.k Plant Applications Scenarios - XI

1.10.l Plant Applications Scenarios - Reports Due

C. Discussion Sessions

1.10.i Plant Applications Results - I

1.10.ii Plant Applications Results - II

1.10.iii Plant Applications Results - III

1.10.iv Plant Applications Results - IV

39B24

Originator: WKD, JLG
WCR, WSW
Date: 11 April 1983

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

Module: 1.11.0 Industrial Applications

A. Lectures

		Lecturer
1.11.1	Industrial Applications - Cement o Plant operational history o Process description o Plant efficiency	Robert Johnson Lonestar Industries Oglesby, IL
1.11.2	Industrial Applications - Steel Production & Coking o Process description o Basics of Coking	Chuck Redman Fossil Energy Programs Argonne Nat'l Lab Argonne, IL

Appendix III - Course Schedule

ORIGINATORS: WKD,JLG,WCR,WSW

WEEK: 1
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Orientation (1.1.0)
Background (1.2.0)
Mining (1.3.0)
SITE VISIT: Argonne National Laboratory

* DAY * TIME *	MONDAY January 31	TUESDAY February 1	WEDNESDAY February 2	THURSDAY February 3	FRIDAY February 4
9:00 - 9:50	COURSE ADMINISTRATION ANL Staff	LECTURE 1.2.1 Origin, Quality and Quantity of Coal R. Winans	LECTURE 1.2.8 General Environ. Consid. - Terres. L. Soholt	LECTURE 1.3.2 Exploration Techniques J. Bogner	LECTURE 1.3.7 Mining Impacts - I J. L. Balzer
10:10 - 11:00	Con't	LECTURE 1.2.2 Chemical and Physical Properties of Coal R. Winans	LECTURE 1.2.9 General Health and Safety Consid. B. Pfanenstiel	LECTURE 1.3.3 Surface Mining Methods S. Gartshore	LECTURE 1.3.8 Mining Impacts - II J. L. Balzer
11:20 - 12:10	Introductions and Course Overview ANL Staff	LECTURE 1.2.5 Uncertainties in Engineering Costs J. Gillette	LECTURE 1.3.1 Mining Overview Derickson/ Gillette/Redman	LECTURE 1.3.4 Underground Mining Methods B. D. Singh	LECTURE 1.3.6 Reclamation Practices M. Hatfield
1:30 - 2:20	Shopping	LECTURE 1.2.3 General Principles of Engineering Economics J. Peerenboom	WORK SESS. 1.2.a Assignments and Background	LECTURE 1.3.4 Con't	LECTURE 1.2.7 General Environ. Consid. - Aquatic L. Stull
2:40 - 3:30	Shopping	LECTURE 1.2.4 Types of Engineering Costs J. Peerenboom	SITE VISIT A.1 Tour of Argonne ANL Staff	DISC. SESS. 1.2.i Mining in ASEAN Region - I	WORK SESS. 1.3.a Mining Scenarios I
3:50 - 4:40	Shopping	LECTURE 1.2.6 Reliability Effects on Costs J. Gillette	SITE VISIT A.2	DISC. SESS. 1.2.ii Mining in ASEAN Region - II	WORK SESS. 1.3.b Mining Scenarios II
EVENING			BUFFET		SAT. - PARTY SUN. - Tour of Chicago and Museum of Science and Industry

ORIGINATORS: WKD,JLG,WCR,WSW

WEEK: 2
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Mining (1.3.0)
Transportation (1.4.0)
SITE VISIT:Southern Illinois/KILn Gas Facility/Cora Coal Terminal/Coal Preparation, Underground Mine and Mine-Mouth Plant

* DAY * TIME *	MONDAY February 7	TUESDAY February 8	WEDNESDAY February 9	THURSDAY February 10	FRIDAY February 11
9:00 - 9:50	WORK SESS. 1.3.c Mining Scenarios - III	LECTURE 1.4.1 Transport./Storage Overview Redman/Gillette/White	LECTURE 1.4.2 Transportation - Barge & Ship R. Gandhi	LECTURE 1.4.5 Transportation - Rail E. Antonson/C. Roman	SITE VISIT B.4 KILn Gas Facility T. Soriano
10:10 - 11:00	WORK SESS. 1.3.d Mining Scenarios - IV	Con't	LECTURE 1.4.3 Transportation - Pipelines R. Gandhi	LECTURE 1.4.6 Transport./Storage Air Poll./Land Use Con. P. Campbell	SITE VISIT B.5
11:20 - 12:10	WORK SESS. 1.3.e Mining Scenarios - V	WORK SESS. 1.3.h Mining Scenarios - VIII	LECTURE 1.4.4 Terminal Operations R. Gandhi	LECTURE 1.4.7 Storage - Land Use Conflicts P. Campbell	SITE VISIT B.6
1:30 - 2:20	LECTURE 1.3.9 Mining Economics J. Gillette	WORK SESS. 1.3.i Mining Scenarios - IX	DISC. SESS. 1.3.iii Mining Scenarios Results - I	SITE VISIT B.1 Leave for Southern Illinois	SITE VISIT B.7
2:40 - 3:30	WORK SESS. 1.3.f Mining Scenarios - VI	WORK SESS. 1.3.j Mining Scenarios - X	Attend ANL Directors Colloquium	SITE VISIT B.2	SITE VISIT B.8 Cora Coal Handling Terminal J. O'Toole
3:50 - 4:40	WORK SESS. 1.3.g Mining Scenarios - VII	WORK SESS. 1.3.k Mining Scenarios Reports Due	DISC. SESS. 1.3.iv Mining Scenarios Results II	SITE VISIT B.3	SITE VISIT B.9
EVENING		Shopping			SAT. - SITE VISIT B.10 Coal Preparation Underground mine Mine-Mouth Plant

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ORIGINATORS: WKD,JLG,WCR,WSW

WEEK: 3
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Mining (1.3.0)
Transportation (1.4.0)
Beneficiation (1.5.0)

SITE VISIT: None

* DAY * TIME *	MONDAY February 14	TUESDAY February 15	WEDNESDAY February 16	THURSDAY February 17	FRIDAY February 18
9:00 - 9:50	LECTURE 1.4.8 Transportation Cost of Alternatives B. Stevens	LECTURE 1.4.11 Storage & Inventory Strategy - I S. Chapel	LECTURE 1.3.10 Strip-mine Development M. Harrell	DISC. SESS. 1.2.v Malaysia's Coal Programs - I	LECTURE 1.5.2 Beneficiation - Preparation Al Deurbrouck
10:10 - 11:00	LECTURE 1.4.9 Transportation - Effect of Multiple Sources and End Users on Costs B. Stevens	LECTURE 1.4.12 Storage & Inventory Strategy - II S. Chapel	LECTURE 1.3.11 Underground Mine Development M. Harrell	DISC. SESS. 1.2.vi Malaysia's Coal Programs - II	LECTURE 1.5.3 Beneficiation - Separation Al Deurbrouck
11:20 - 12:10	WORK SESS. 1.4.a Transportation and Storage Scenarios I	WORK SESS. 1.4.c Transportation and Storage Scenarios III	LECTURE 1.4.13 Storage - Water Pollution B. White	WORK SESS. 1.4.g Trans. and Storage Reports Due	LECTURE 1.5.4 Beneficiation - Recovery Al Deurbrouck
1:30 - 2:20	WORK SESS. 1.4.b Transportation and Storage Scenarios II	WORK SESS. 1.4.d Transportation and Storage Scenarios IV	LECTURE 1.5.5 Beneficiation - Water Pollution & Solid Waste B. White	LECTURE 1.3.12 Mining Feasibility Studies C. Recny	WORK SESS. 1.5.a Beneficiation Scenarios - I
2:40 - 3:30	DISC. SESS. 1.3.v Mining Scenarios Results - III	DISC. SESS. 1.2.iii Indonesia's Coal Programs - I	WORK SESS. 1.4.e Transportation and Storage Scenarios - V	LECTURE 1.3.13 Financing Mining Projects W. Trammel	DISC. SESS. 1.4.i Transportation and Storage Results - I
3:50 - 4:40	DISC. SESS. 1.3.vi Mining Scenarios Results - IV	DISC. SESS. 1.2.iv Indonesia's Coal Programs - II	WORK SESS. 1.4.f Transportation and Storage Scenarios - VI	LECTURE 1.5.1 Beneficiation - Overview Redman/Gillette/White	DISC. SESS. 1.4.ii Transportation and Storage Results - II
EVENING		Shopping			SAT.- Shopping PARTY

ORIGINATORS: WKD,JLG,WCR,WSW

WEEK: 4
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Beneficiation (1.5.0)
Combustion (1.6.0)
Carbonization/Gasification (1.7.0)
SITE VISIT: IGT Facilities

* DAY * TIME *	MONDAY February 21	TUESDAY February 22	WEDNESDAY February 23	THURSDAY February 24	FRIDAY February 25
9:00 - 9:50	LECTURE 1.5.6 Beneficiation - Cost of Technologies M. Laurila	LECTURE 1.6.1 Combustion - Fundamentals Kwan Im	LECTURE 1.6.4 Combustion - Fixed bed J. Regan	LECTURE 1.6.7 Combustion Performance Corrosion & Erosion B. Ellingson	LECTURE 1.7.5 Improved Gasification Processes - I S. Babu
10:10 - 11:00	LECTURE 1.5.7 Beneficiation -Effect on End-Use Costs M. Laurila	LECTURE 1.7.10 Coal Liquefaction Processes - I N. Reddy	LECTURE 1.6.5 Combustion - Suspension Firing J. Regan	LECTURE 1.7.1 Basic Gasification Processes S. Babu	LECTURE 1.7.6 Improved Gasification Processes - II S. Babu
11:20 - 12:10	LECTURE 1.5.8 Beneficiation - Trade-Offs M. Laurila	LECTURE 1.7.11 Coal Liquefaction Processes - I N. Reddy	LECTURE 1.6.6 Combustion Performance - Fouling J. Regan	LECTURE 1.7.2 Established Gasification Tech. S. Babu	SITE VISIT C.1 IGT Facilities & Gasification Plants
1:30 - 2:20	WORK SESS. I.5.a Beneficiation Scenarios -I	WORK SESS. 1.5.c Beneficiation Scenarios - III	WORK SESS. 1.5.f Beneficiation Scenarios Reports Due	DISC. SESS. 1.5.iii Beneficiation Scenarios Results - III	SITE VISIT C.2
2:40 - 3:30	WORK SESS. 1.5.b Beneficiation Scenarios - II	WORK SESS. 1.5.d Beneficiation Scenarios - IV	DISC. SESS. 1.5.i Beneficiation Scenarios Results - I	DISC. SESS. 1.2.vii Philippines' Coal Programs - I	SITE VISIT C.3
3:50 - 4:40	DISC. SESS. 1.4.iii Transportation Results - III	WORK SESS. 1.5.e Beneficiation Scenarios - V	DISC. SESS. 1.5.ii Beneficiation Scenarios Results - II	DISC. SESS. 1.2.viii Philippines' Coal Programs - II	SITE VISIT C.4
EVENING		Shopping	SOCIAL		SAT.- Shopping PARTY

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ORIGINATORS: WKD,JLG,WCR,WSW

WEEK: 5
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Carbonization/Gasification (1.7.0)
Fuel Substitution (1.8.0)
Siting (1.9.0)
Electric Power Generation (1.10.0)
SITE VISIT: Will County Power Plant and Argonne Corrosion Study Facilities

* DAY * TIME *	MONDAY February 28	TUESDAY March 1	WEDNESDAY March 2	THURSDAY March 3	FRIDAY March 4
9:00 - 9:50	LECTURE 1.7.7 In-Situ Gasification J. Young	LECTURE 1.8.1 Fuel Substitution Plant Modifications T. Breuer	LECTURE 1.9.2 Siting - Technology Cost Effects T. Breuer	LECTURE 1.9.6 Siting - Environmental Considerations - I A. Metwally	LECTURE 1.9.9 Heat Dissipation Systems - I F. Emmett
10:10 - 11:00	LECTURE 1.7.8 Gasification Cost of Processes - I J. Young/W.Chambers	LECTURE 1.8.2 Fuel Substitution Economic Considerations T. Breuer	LECTURE 1.9.3 Siting - Fuel Supply T. Breuer	LECTURE 1.9.7 Siting - Environmental Considerations - II A. Metwally	LECTURE 1.9.10 Heat Dissipation Systems - II F. Emmett
11:20 - 12:10	LECTURE 1.7.9 Gasification Cost of Processes - II W. Chambers	LECTURE 1.9.1 Siting Overview Redman/Gillette/White	LECTURE 1.9.4 Siting - Product Distribution Costs T. Breuer	LECTURE 1.9.8 Siting - Environmental Considerations - III A. Metwally	LECTURE 1.9.11 Siting -Mitigation Env. Impacts - I P. Campbell
1:30 - 2:20	LECTURE 1.10.21 The Lahkra Coal Facility Study - I C. Anderson	DISC. SESS. 1.2.ix Singapore's Coal Programs	LECTURE 1.9.5 Siting - Environmental Cost Effects T. Breuer	SITE VISIT D.1 Will County Pow. Plant & Barging Operations	LECTURE 1.9.12 Siting -Mitigation Env. Impacts - II K. Stimpfl
2:40 - 3:30	LECTURE 1.10.22 The Lahkra Coal Facility Study - II C. Anderson	DISC. SESS. 1.2.x Thailand's Coal Programs - I	LECTURE 1.6.2 Combustion - Fluidized Bed I W. Podolski	SITE VISIT D.2	WORK SESS. 1.9.a Siting Scenarios - I
3:50 - 4:40	SITE VISIT A.3 Tour of Argonne's Corrosion Study Facil. Greenberg/Singh	DISC. SESS. 1.2.xi Thailand's Coal Programs - II	LECTURE 1.6.3 Combustion - Fluidized Bed II W. Podolski	SITE VISIT D.3	WORK SESS. 1.9.b Siting Scenarios - II
EVENING		Shopping	Pingpong and Billiards Tournament		SATURDAY - Chicago Auto Show SUNDAY - Shopping

ORIGINATORS: WKD,JLG,WCR,WSH

WEEK: 6
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Siting (1.9.0)
Electric Power Generation (1.10.0)
Industrial Application (1.11.0)
SITE VISIT: Lonestar Industries Cement Plant and Joliet Coal-Fired Plant

* DAY * TIME *	MONDAY March 7	TUESDAY March 8	WEDNESDAY March 9	THURSDAY March 10	FRIDAY March 11
9:00 - 9:50	LECTURE 1.9.13 Siting - Decision Analysis - I B. Buehring	LECTURE 1.10.2 Electric Power Gen. Power Prod. Comp. - I R. Fujii	SITE VISIT F.1 Joliet Coal-Fired Plant & Unit Train Commonwealth Edison	LECTURE 1.10.6 Electric Power Gen. Emis. Contr. - Basics P.Farber	LECTURE 1.10.7 Electric Power Gen. Emis. Contr. - Part. H. Engelbrecht
10:10 - 11:00	LECTURE 1.9.14 Siting - Decision Analysis - II B. Buehring	LECTURE 1.10.3 Electric Power Gen. Power Prod. Comp. - II R. Fujii	SITE VISIT F.2	LECTURE 1.10.23 Electric Power Distribution - I S. Haddad	LECTURE 1.10.8 Electric Power Gen. Emis. Cont. - Part. H. Engelbrecht
11:20 - 12:10	LECTURE 1.10.1 Electric Power Gen. Overview Redman/Gillette/White	LECTURE 1.10.4 Electric Power Gen. Instr. & Control R. Fujii	SITE VISIT F.3	LECTURE 1.10.24 Electric Power Distribution - II S. Haddad	LECTURE 1.10.9 Electric Power Gen. Emis. Contr. - SOx V. Boschak
1:30 - 2:20	WORK SESS. 1.9.c Siting Scenarios - III	WORK SESS. 1.9.f Siting Scenarios - VI	SITE VISIT F.4 (LECTURE 1.11.2) Industrial Applications Cement Production Lonestar Industries	DISC SESS 1.9.i Siting Scenarios Results - I	Con't
2:40 - 3:30	WORK SESS. 1.9.d Siting Scenarios - IV	WORK SESS. 1.9.g Siting Scenarios - VII	SITE VISIT F.5	DISC SESS 1.9.ii Siting Scenarios Results - II	WORK SESS. 1.10.a Plant Application Scenarios - I
3:50 - 4:40	WORK SESS. 1.9.e Siting Scenarios - V	WORK SESS. 1.9.h Siting Scenarios Reports Due	SITE VISIT F.6	DISC. SESS. 1.9.iii Siting Scenarios Results - III	WORK SESS. 1.10.b Plant Application Scenarios - II
EVENING		Shopping	Dinner Party in Chicago		FRI. - Rush Street SAT. - Party at Derickson's SUNDAY Leave for Pittsburgh

ORIGINATORS: WKD,JLG,WCR,WSW

WEEK: 7
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Fuel Substitution (1.8.0)
Electric Power Generation (1.10.0)
Orientation (1.1.0)
SITE VISIT: Pittsburgh Energy Technology Center, Consolidation Coal Facilities and Ohio State University

* DAY * TIME *	MONDAY March 14	TUESDAY March 15	WEDNESDAY March 16	THURSDAY March 17	FRIDAY March 18
9:00 - 9:50	LECTURE 1.1.3/1.2.12 Overview of PETC/ Analyzing Coal S. Chun/H. Retcofsky	SITE VISIT G.4 Tour of Consol Coal Research Facilities W. Corder/J. Sudbury	SITE VISIT G.10 Ohio State Univ. Research Facilities R. Bailey	LECTURE 1.10.10 Electric Power Gen. PFBC'S W. Bezella	LECTURE 1.10.14 Electric Power Gen. Combined Cycle V. Hruza
10:10 - 11:00	LECTURE 1.8.3 Fuel Subs. - Coal/ Oil & Coal/Water Mixes J. Joubert	SITE VISIT G.5	SITE VISIT G.11	LECTURE 1.10.11 Electric Power Gen. Environ. Consid. - I B. Lewis	LECTURE 1.10.15 Electric Power Gen. Fuel Cells G. Cook
11:20 - 12:10	LECTURE 1.7.12 Flue-gas Studies - SOx and NOx J. Strakey	SITE VISIT G.6 Travel to Columbus, OH Observe Strip Mining Enroute Consol Coal/W. Corder	SITE VISIT G.12	LECTURE 1.10.12 Electric Power Gen. Environ. Consid. - II B. Lewis	LECTURE 1.10.5 Elect. Pow. Gen. - Cost of Appl. New Plants E. Fox
1:30 - 2:20	SITE VISIT G.1 Tour of PETC Facilities	SITE VISIT G.7	SITE VISIT G.13 Leave for Argonne	LECTURE 1.10.13 Electric Power Gen. Environ. Consid. - III B. Lewis	LECTURE 1.10.16 Electric Power Gen. Optimization Tradeoffs E. Fox
2:40 - 3:30	SITE VISIT G.2	SITE VISIT G.8	SITE VISIT G.14	LECTURE 1.1.1 USAID's Energy Assist. Programs/Coal Study R. Ichord/C. Bliss	DISC. SESS. 1.1.i Informal Meetings with USAID Program Manager R. Ichord
3:50 - 4:40	SITE VISIT G.3	SITE VISIT G.9	SITE VISIT G.15	WORK SESS. 1.10.c Plant Application Scenarios - III	WORK SESS. 1.10.d Plant Application Scenarios - IV
EVENING		Arrive Columbus	Arrive at Argonne	Social with USAID Program Manager	SATURDAY International Dinner SUNDAY - Shopping

ORIGINATORS: WKD,JLG,WCR,WSW

WEEK: 8
FINAL

ASEAN COAL COURSE
ECONOMIC, ENVIRONMENTAL AND TECHNOLOGICAL ASPECTS
OF COAL DEVELOPMENT AND UTILIZATION

MODULES: Orientation (1.1.0)
Background (1.2.0)
Electrical Power Generation (1.10.)
Industrial Applications (1.11.0)
SITE VISITS: Argonne's Dry Scrubber Facility

* DAY * TIME *	MONDAY March 21	TUESDAY March 22	WEDNESDAY March 23	THURSDAY March 24	FRIDAY March 25
9:00 - 9:50	LECTURE 1.11.1 Coal's Role in Steel Production C. Redman	LECTURE 1.10.19 Electric Power Gen. Training Staff - I L. Guidry	WORK SESS. 1.10.h Plant Applications Scenarios - VIII	LECTURE 1.2.10 Advanced Coal Technologies A. Talib	COURSE EVALUATION - I
10:10 - 11:00	SITE VISIT A.4 Argonne's Dry Scrubber Facility P. Farber	LECTURE 1.10.20 Electric Power Gen. Training Staff - II L. Guidry	WORK SESS. 1.10.i Plant Applications Scenarios - IX	LECTURE 1.2.11 Gas. Tech. Options for ASEAN Countries A. Talib	COURSE EVALUATION - II
11:20 - 12:10	FREE TIME	LECTURE 1.7.10 In-Situ Gasification Demonstrations J. Grant	WORK SESS. 1.10.j Plant Applications Scenarios - X	LECTURE 1.1.2 Argonne's Fossil Energy Programs M. Petrick	CLOSING CEREMONY
1:30 - 2:20	FREE TIME	WORK SESS. 1.10.e Plant Application Scenarios - V	WORK SESS. 1.10.k Plant Applications Scenarios - XI	DISC. SESS. 1.10.i Plant Applications Results - I	
2:40 - 3:30	FREE TIME	WORK SESS. 1.10.f Plant Application Scenarios - VI	WORK SESS. 1.10.l Plant Applications Reports Due	DISC. SESS. 1.10.ii Plant Applications Results - II	
3:50 - 4:40	FREE TIME	WORK SESS. 1.10.g Plant Applications Scenarios - VII	Lecture 1.1.4 Argonne's Int'l Energy Development Programs R. Cirillo	DISC. SESS. 1.10.iii Plant Applications Results - III	
EVENING			LECTURE 1.2.14 Energy Database Management S. Emerson/B. Bailey		End of Course Party

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Appendix IV - Scenarios and Representative Solution

MINING WORK SESSION
1.3.a - h
February 4 - 9, 1983

General Instructions

As a team, you are to consider, discuss, and determine the following items:

1. The type of mining operation to be established.

2. Production considerations, such as equipment required and its availability, energy requirements and its availability, work force, areas needed for waste and spoil piles, movement of materials and personnel, water-related problems, societal factors, etc.

3. Regulation, such as government policies and permits, inspections.

4. Schedule for development of the mining operation and its expected lifetime.

5. Provision for worker safety, such as ventilation, support of roof, dust control, anf fire prevention and control.

6. Environmental factors, such as temporary storage of material removed from the mine, effects of weather (for example, erosion, silting of streams, leaching of acids from waste piles), effects of blasting, and reclamation of the land.

In your evaluation, you may assume reasonable values for any parameters required as a basis for a decision. However, you should be able to justify and explain your choices in follow-on discussions with members of the teams assigned to other scenarios in the working sessions for mining. Be aware that there are no predetermined or unique solutions for the scenarios presented.

TRANSPORTATION WORK SESSION
1.4.a - d
February 14 - 16, 1983

General Instructions

Each team will be given a description (scenario) of a transportation problem to be evaluated. The type and quantity of coal to be handled, the location of the mine, the location of the end use facility, and the terrain between the mine and the facility will be included in the problem description. Each team is to determine the mode of transportation to be used, to evaluate the requirements (equipment, facilities, labor, power, etc.) for this mode of transportation, identify the particular problems (e.g., economic, operational, environmental, safety, etc.) that are likey to arise, and to identify possible means of mitigating these problems. You are encouraged to supplement the course material with your own experiments in addressing these problems.

SITING WORK SESSION
1.9.a - g
March 4 - 8, 1983

General Instructions

The following description is a hypothetical task that has been designed to help you apply the topics discussed in your lectures over the past few weeks.

By now you realize there is no one "correct" answer, instead your team should approach the topic using the combined knowledge of all members of your team. Your task is to suggest a solution to the problem posed to you. You should feel free to interpret the physical setting in as much detail as you wish in the problem, just remain within the boundaries that are prescribed below. Your major task will be to give reasons for all of your environmental decisions in regard to siting an electric seneration plant.

The siting factors that you are asked to consider are given below. You are asked to assign priorities to the siting factors as you make decisions on your new plant site. A matrix is included (Table 3) to aid you in making decision about your siting factors.

1. Water availability for the cooling system you choose for your plant.

2. Land use (e.g. ability to support agriculture, aquaculture, forests, etc.)

3. Atmospheric effluents (e.g. health problems, SO_2, etc.)

4. Terrestrial ecosystems (e.g. loss of critical habitat, changes in animal populations, changes in water level and quality, etc.)

5. Aquatic ecosystems (natural lakes, estuaries, rivers, artificial lakes, proportion of water source requried, water quality, important habitat, etc.)

6. Transmission facilities (e.g. rights-of-way, stream and wash crossings, proximity of population centers, etc.)

7. Waste disposal (e.g. depth to water table, flooding hazard, soil limitations, etc.)

8. Disruptions that occur during construction, as opposed to operational problems that are related to actual operation of the plant, should be discussed.

COMBUSTION WORK SESSION
1.6.a - j
February 23 - March 2, 1983

General Instructions

Each team will be provided with a specific scenario of coal combustion. The type of coal available, the type of combustor to be used, and the temperature and quantity of combustion gases required for the intended end use will be given. A flow chart for the processing of the materials involved must be established, a mass and energy balance must be determined for the system, and the type and size of the components must be stated.

Each team will decide how much preparation of the "as-received" mineral-free coal is appropriate, and what measures are realistic in terms of reducing the fouling of the components, extracting the solid and liquid wastes and controlling the release of noxious gases. Chemical and physical data needed for the energy and mass flow balancing within the plant will be either given or available from lecture notes, handbookds, etc. A selection of literature from manufacturers of required components will be provided.

Use only air as the oxidant. Preheating (separate firing or extraction of heat from slag) may be necessary to achieve some conditions. In others, dilution of the combustion gases may be appropriate.

PLANT APPLICATION WORK SESSION
1.10.a - h
March 11 - 24, 1983

General Instructions

In these work sessions you are to apply the principles given in the lectures and in the earlier work sessions. Each team will be given a generalized description of a plant application for coal use. Given this information, you are to determine the input requirements for this facility (fuel, water, labor, etc.) and to generally describe its physical requirements (e.g. fuel supply system, waste handling, land requirements, etc.). You are to determine the coal best suited to your application and the level of benefication that is optimum for your application. You are to determine the waste products from your plant and to describe what abatement techniques are needed to meet the given standards. You are to determine the transportation mode for providing fuel to your plant. You are to select one of the possible end use sites for the facility and provide reasons for your selection. You are to estimate the cost of fuel and the capital investment necessary for your application. You may assume that sufficient capital is available to construct each facility but you are expected to optimize these expenditures.

General Conditions that Apply to All Scenarios

- o Particulate emission limits: 0.5 lb/106 Btu
- o SO_2 emission limits:
  - a) 1.2 lb/106 Btu within 30 km of city
  - b) none if site is more than 30 km from city
- o Adecuate water supply at all possible sites
- o Possible levels of preparation
  - 1) Screening and crushing
  - 2) Screening, crushing, removal of 25% of ash and 10% of sulfur
  - 3) Screening, crushing, removal of 50% of ash and 20% of sulfur

Representive Solution

Transportation Work Session

Scenario No. 3

General Instructions

Each team will be given a description (scenario) of a transportation problem to be evaluated. The type and quantity of coal to be handled, the location of the mine, the location of the end use facility, and the terrain between the mine and the facility will be included in the problem description. Each team is to determine the mode of transportation to be used, to evaluate the requirements (equipment, facilities, labor, power, etc.) for this mode of transportation, identify the particular problems (e.g., economic, operational, environmental, safety, etc.) that are likely to arise, and to identify possible means of mitigating these problems. You are encouraged to supplement the course material with your own experiences in addressing these problems.

Scenario Number 3

You are to supply 100 tons of peat per day to a number of kilns located in an industrial part of a large city. The peat mine is in a coastal swamp. The city is about 100 KM inland and is located along a navigable river. A water route between the mine and the city would be about 300 KM long. A land route would be about 150 KM long and would pass through moderately hilly terrain. There are no modes of land transportation in the immediate vicinity of the mine but a road is about 20 KM away and a railroad is about 40 KM away.

I. Description of Problem

1. A peat mine located in a coastal swamp area.

2. The city is located along a navigable river.

3. Multiusers in an industrial part of the city:

   total peat requirement = 100 tonnes/day

4. Existing transportation route:

   - water route: distance = 300 km
   - road: distance = 150 km, 20 km away from the mine
   - rail: 40 km away from the mine

5. No modes of land transportation in the vicinity of the mine.

II. Mode of Transportation

Criteria

- low capital cost
- short installation time
- compatibility: existing facilities
- high reliability
- low environmental impact
- low operating costs

(and also consider distances and capacity)

⟹ 1. Pipeline: Although it satisfies most of the criteria but due to the distances and capacity to be transported are low and also high capital cost ⟹ OUT

2. Conveyor: It is ruled out because of distance but may find combined use with other main transportation.

Assumptions

- Distance from the mine to river = 1 km
- Distance from the mine to the city by rail = 190 km
- The city port has facilities for loading and unloading coal
- Existing roads from the mine to the river and to the main road (highway)

  (Rail transport is out due to high capital cost to construct railway from the mine to connect with the main line [40 km?]).

⇒ Preliminary Selection

From the above considerations, we are left with two modes of transportation:

- Barges
- Truck

III. Equipments

A. Barges

1. Mine-River

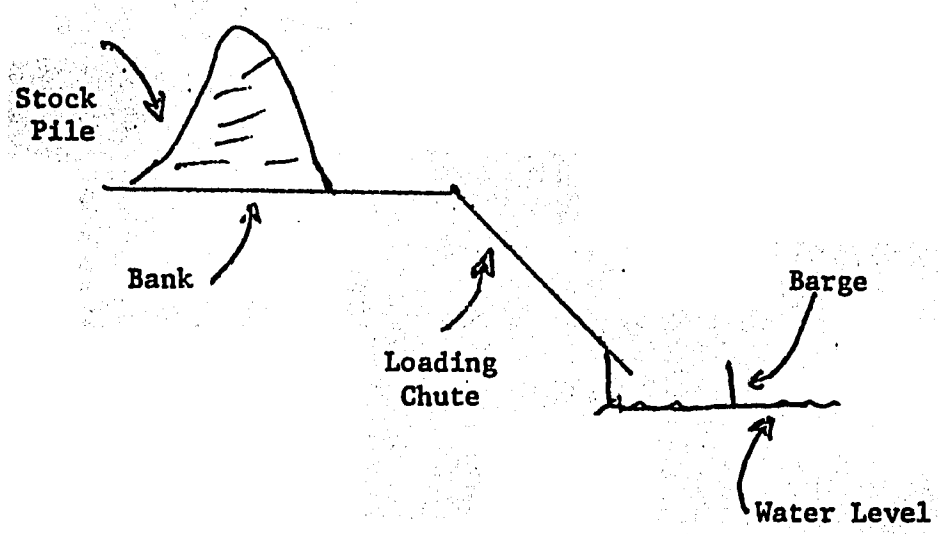
- 2 x 5 tons dump trucks
-

2. River-Port (city)

- 1500 tons Barge
- Tow boat
- Loading chute
- Front end loader

3. Port-Consumers

- 2 x 15 tons dump trucks



B. Trucks

- 8 x 15 tons dump trucks

IV. Cost Comparison

A. Capital Cost

1. Transportation by Barge

Equipment	Number	Cost per Unit	Total (as $)
1. 15 tons Dump Truck	2	30,000	60,000
2. 5 tons Dump Truck	2	21,000	42,000
3. 1500 tons Barge	1	300,000	300,000
4. Tow Boat	1	4,000,000	4,000,000
5. Front End Loader	1	130,000	130,000
6. Loading Chute	1	40,000	40,000
	Total		4,572,000

2. Transportation by Trucks

- 8 x 15 tons dump tructs 240,000

B. Comparison on Yearly Basis

Assumed

- 300 working day/year
- salary = 150/month
- life time of truck

long distance 5 years

short distance 10 years

- life time of front end loader = 7 years
- life time of loading chute = 10 years
- life time of the barge and tow boat = 20 years
- linear depreciation rate
- fuel = 0.40 ₯/l

Cost	Barge	Truck
1. Capital		
Trucks	10,200	48,000
Front end loader	18,600	-
Loading chute	4,000	-
Barge and tow boat	215,000	-
	247,800	48,000
2. Maintenance		
Trucks (15%)	1,500	7,200
Front end loader (15%)	2,800	-
Barge and tow boat (10%)	21,500	-
	25,800	7,200
3. Labor	10,800	14,400
4. Fuel	190,000	151,200
5. Others	~	~
Total	473,600	220,800

Final Selection

⟹ TRUCK

Appendix V - ANL Participation

Argonne Lecturers that Contributed to the
ASEAN Energy Coal Course
January 31 - March 25, 1983

Name and Division	Lecture and Titles
Win Bezella Chemical Engineering and Technology	1.10.10 Electric Power Generation - PFBC'S
Bill Buehring Energy & Environmental Systems Division	1.9.13 Siting - Decision Analysis - I 1.9.14 Siting - Decision Analysis - II
Jean Bogner Energy & Environmental Systems Division	1.3.2 Exploration Techniques
Richard Cirillo Energy & Environmental Systems Division	1.1.4 Argonne's International Energy Development Programs
Glenn Cook Chemical Engineering and Technology	1.10.15 Electric Power Generation - Fuel Cells
Bill Ellingson Materials Science and Technology	1.6.7 Combustion Performance - Corrosion and Erosion
Paul Farber Energy & Environmental Systems Division	1.10.6 Electric Power Generation - Basics of Emission Controls
Jerry Gillette Energy & Environmental Systems Division	1.2.5 Uncertainties in Engineering Costs 1.2.6 Reliability Effects on Costs 1.3.1 Mining Overview 1.3.9 General Mining Economics 1.4.1 Transportation and Storage - Overview 1.5.1 Beneficiation - Overview 1.9.1 Siting - Overview 1.10.1 Electric Power Generation - Overview

Name and Division	Lecture and Titles	
Kwan Im Engineering	1.6.1	Combustion - Fundamentals
Chuck Redman Fossil Energy Program	1.3.1	Mining Overview
	1.4.1	Transportation and Storage Overview
	1.5.1	Beneficiation - Overview
	1.9.1	Siting - Overview
	1.10.1	Electric Power Generation - Overview
	1.11.2	Industrial Applications - Steel Production & Coking
Jim Peerenboom Energy & Environmental Systems Division	1.2.3	General Principles of Egineering Economics
	1.2.4	Types of Engineering Costs
Bill Pfanenstiel Environmental Impact Studies	1.2.9	General Health and Safety Considerations
Walt Podolski Chemical Engineering & Technology	1.6.2	Combustion - Fluidized Bed - I
	1.6.3	Combustion - Fluidized Bed - II
Libby Stull Environmental Impact Studies	1.2.7	General Environmental Consideration - Aquatic
Bill White Environmental Impact Studies	1.3.1	Mining Overview
	1.4.1	Transportation and Storage - Overview
	1.4.13	Storage - Water Pollution
	1.5.1	Beneficiation - Overview
	1.5.5	Beneficiation - Water Pollution and Solid Waste
	1.9.1	Siting - Overview
	1.10.1	Electric Power Generation - Overview
Randy Winans Chemistry	1.2.1	Origin, Quality and Quantity of Coal
	1.2.2	Chemical and Physical Properties of Coal
John Young Chemical Engineering & Technology	1.7.7	In-Situ Gasification
	1.7.8	Gasificaton Cost of Processes - I

Appendix VI - Outside Participation

LIST OF ORGANIZATIONS THAT CONTRIBUTED TO THE
ASEAN ENERGY II COAL COURSE
January 31 - March 25, 1983

Company	Principal Contract	Contributions & Personnel Involved
Allis-Chalmers Coal Gasification Systems Operation Milwaukee, WI 53201 414/475-2690	Antonio V. Soriano Manager Market Planning & Analysis	1 Lecture on KILn Gas Technology 1 Lecture on Combined Cycle Power Plants Tour of KILn Gas Facility LaVern Hruza
Argonne National Laboratory Division of Educational Programs 9700 S. Cass Avenue Argonne, IL 60439 312/972-3380	Dr. W. Kenneth Derickson Program Coordinator Non-Nuclear International Training	32 Lectures on Various Coal Technologies 4 Tours of Various Facilities
Arthur D. Little, Inc. 20 Acorn Park Cambridge, MA 02140 617/864-5770	Dr. Thomas Breuer Engineer	3 Lectures on Beneficiation Benefits/Costs 2 Lectures on Economics of Coal Substitution 4 Lectures on Siting Costs and Distribution Considerations Mel Laurilla T. Breuer
Basic Resources, Inc. 717 N. Harwood Suite 1420 Dallas, TX 75201 214/741-2110	Dr. Charles Biggs	2 Lectures on Training Staff for Mining and Power Plant Operations 1 Lecture on In-Situ Gasification Demonstration Lloyd Guidry Joe Grant

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LIST OF ORGANIZATIONS (Cont'd)

Company	Principal Contract	Contributions & Personnel Involved
Bechtel Group, Inc. Fifty Beale Street P.O. Box 3965 San Francisco, CA 94119 415/768-6108	Dr. W. Scott Gray Executive Engineer Research Engineering	3 Lectures on Coal Transportation Technologies & 3 Lectures on Coal Transportation Costs and 3 Lectures on Environmental Aspects of Siting William Stevens Ramesh Gardhi Aziz Metwally
C-E Power Systems Combustion Engineering, Inc. 1000 Prospect Hill Road Windsor, CT 06095 203/683-4993	Ronald W. Gauslow Director Business Development & Sales	3 Lectures on Coal Combustion Systems John Regan
Central Illinois Public Service Co. 607 East Adams Street Springfield, IL 62701 217/492-4486	Robert Lane Vice President Power Production	Tour of Coffeen Mine-Mouth Plant
Chambers & Asssociates 565 Lee Street Glen Ellyn, IL 60137 312/469-5787	William Chambers Consultant	2 Lectures on Cost of Gasification Processes W. Chambers
Commonwealth Edison One First National Plaza P.O. Box 767 Chicago, IL 60690 312/294-4321	Wallace Benke, Jr. Vice Chairman	Tours of Coal-Fired Power Plants, Unit Train Operations and Barging Operations

LIST OF ORGANIZATIONS (Cont'd)

Company	Principal Contract	Contributions & Personnel Involved
Consolidation Coal Company Consol Plaza Pittsburgh, PA 15241 412/831-4601	William C. Corder Assistant Vice President Technical Marketing Services	2 Lectures on Mining Technologies Tour of Technology Center Tour of Surface Mine B.D. Singh Stephen Gartshore
Cora Coal Transfer Terminal Route 1, Box 125 Rockwood, IL 62280 618/723-4798	Joseph C. O'Toole Terminal Manager	Tour of Coal Handling Facility
Dames & Moore 1550 Northwest Highway Park Ridge, IL 60068 312/297-6120	Peter Campbell Managing Principal in Charge Chicago Office	2 Lectures on Coal Transportation/Storage Impacts 2 Lectures on Siting/Mitigation Strategies Ken Stimpfl
Electric Power Research Institute P.O. Box 10412 Palo Alto, CA 94303 415/855-2000	Stephen Chapel Project Manager	2 Lectures on Coal Storage and Inventory Strategies B. Chapel
Fluor Mining & Metals, Inc. 437 Madison Avenue New York, NY 10022 212/826-0130	David E. Kincaid Vice President	1 Lecture on Mine Feasibility 1 Lecture on Project Financing Studies William Trammel Chris Reeny
Freeman United Coal Co. 123 South 10th Street Mount Vernon, IL 62864 618/244-5252	Milton V. Harrel Senior Vice President Operations	2 Lectures on Mine Development Tour of Underground Mine and Coal Preparation Facility Milton Harrell

LIST OF ORGANIZATIONS (Cont'd)

Company	Principal Contract	Contributions & Personnel Involved
General Electric Environmental Services Inc. 200 N. 7th Street Lebanon, PA 17042 717/274-7000	Dr. Vladimir Boscak Manager Research and Development	2 Lectures on SO /NO Emission Controls V. Boscak
Information Design and Delivery 2214 Jervis Road Columbus, OH 43221 614/486-8243	Dr. Susan Emerson Consultant	2 Lectures on Energy Database and Information Systems Susan Anderson
Institute of Gas Technology 3424 S. State Street IIT Center Chicago, IL 60616 312/567-5758	Dr. Suresh Babu Assistant Director Process Development	4 Lectures on Gasification Technologies Tour of Gasification Facilities S. Babu
Lonestar Industries Portland Avenue P.O. Box 130 Olgesby, IL 61348 815/883-8431	Robert M. Johnson Manager	Tour of Cement Plant R. Johnson
MITRE Corporation 1820 Dolly Madison Blvd. McLean, VA 22102 703/827-6901	Dr. Abu Talib Chemical Engineer	2 Lectures on Feasibility of Advanced Coal Technologies in ASEAN Region A. Talib
Northwestern University Department of Civil Engineering Evanston, IL 60201 312/492-7550	Dr. Barbara-Ann Lewis Associate Professor	3 Lectures on Environmental Impacts of Power Plants B.A. Lewis

LIST OF ORGANIZATIONS (Cont'd)

Company	Principal Contract	Contributions & Personnel Involved
Oak Ridge National Laborator P.O. Box Y, Bldg. 9108 Oak Ridge, TN 37830 615/576-0374	Edward C. Fox Group Leader Systems Analysis Dept.	2 Lectures on Costs of Electricity Generation E. Fox
Ohio State University Program for Energy Research, Education and Public Service 1712 Neil Avenue Columbus, OH 43210 614/422-5485	Dr. Robert E. Bailey Director	1 Lecture on OCRLA Coal Programs Tours of OSU Coal Research Labs R. Bailey
Pittsburgh Energy Technology Center Department of Energy P.O. Box 10940 Pittsburgh, PA 15236 412/675-6125	Dr. Joseph Strakey Director Process Technology Division	3 Lectures on Coal Preparation 1 Lecture on Coal Analyses 1 Lecture on and NO /SO Removal 1 Lecture on Coal-Oil and Coal-Water Combustion Tour of R&D Facilities James Joubert Joseph Strakey Herbert Retcofsky A. Deurbrouck
Roberts & Schaefer 120 South Riverside Plaza Chicago, IL 60606 312/266-7292	Charles L. Roman Director of Marketing Power Systems Division	2 Lectures on Coal Transportation/Handling Earl Antonson
Sargent and Lundy 55 East Monroe Street Chicago, IL 60603 312/269-2000	William Chittenden Director Engineering	2 Lectures on Heat Dissipation Systems 3 Lectures on Power Plant Power Production Components 2 Lectures on Electrical Transmission Richard Fujii Fred Emmett Suhcil Haddad

LIST OF ORGANIZATIONS (Cont'd)

Company	Principal Contract	Contributions & Personnel Involved
Stone & Webster 245 Summer Street P.O. Box 2325 Boston, MA 02107 617/589-6728	Conrad Anderson Engineer Studies Group	2 Lectures on Pakistan Coal Feasibility Study Stuart Felde Adam Redell C. Anderson
Utah International, Inc. 550 California Street San Francisco, CA 94104 415/774-2180	Dr. LeRoy Balzer Director Environmental Quality	2 Lectures on Mining Impacts 1 Lecture on Reclamation Practices Mike Hatfield J. LeRoy Balzer
Wheelabrator-Frye, Inc. Air Pollution Control Division 600 Grant Street Pittsburgh, PA 15219 412/288-7354	Heinz Engelbrecht Director Technical Services	2 Lectures on Particulate Emission Controls H. Engelbrecht

Appendix VII - Evaluation Form

ASEAN COAL COURSE
EVALUATION FORM

COURSE LENGTH AND SCHEDULE

1. Was the length of the course too short, too long, or about right?

2. What suggestions for lectures, discussions, and work sessions could you make for future courses?

COURSE CONTENT

1. What aspects of the course did you find most beneficial?

2. What suggestions do you have in regard to the time allotment and emphasis given to the various modules of the course. Please indicate which category ("more time", "less time", or "about right") applies to each lecture, work session, or discussion session.

	More Time	Less Time	About Right
Module 1.1.0 Orientation	____	____	____
Module 1.1.2 Information Meetings with USAID Program Manager	____	____	____
Module 1.2.0 Background	____	____	____
Module 1.2.i-ii Discussion Mining in ASEAN Region	____	____	____
Module 1.2.iii-iv Discussion Indonesia's Coal Programs	____	____	____
Module 1.2.v-vi Discussion Indonesia's Coal Programs	____	____	____

Module 1.2.vii-viii Discussion
Philippine's Coal Programs

Module 1.2.ix Discussion
Singapore's Coal Programs

Module 1.2.x-xi Discussion
Thailand's Coal Programs

Module 1.3.0 Mining

Module 1.3.a-k Mining Work Session

Module 1.3.iii-vi Discussion
Mining Work Session

Module 1.4.0 Transportation

Module 1.4.a-f Transportation and Storage
Work Session

Module 1.4.i-iii Discussion
Transportation and Storage
Work Session

Module 1.5.0 Beneficiation

Module 1.5.a-f Beneficiation Work Session

Module 1.5.i-iii Discussion
Beneficiation Work Session

Module 1.6.0 Combustion

Module 1.7.0 Carbonization/Gasification

Module 1.8.0 Fuel Substitution

Module 1.9.0 Siting	_____	_____	_____
Module 1.9.a-h Siting Work Session	_____	_____	_____
Module 1.9.i-iii Discussion Siting Work Session	_____	_____	_____
Module 1.10.0 Electric Power Generation	_____	_____	_____
Module 1.10.a-1 Plant Application Work Session	_____	_____	_____
Module 1.10.i-iv Discussion Plant Applications Work Session	_____	_____	_____
Module 1.11.0 Industrial Application	_____	_____	_____
Special Lectures	_____	_____	_____

3. Were any topics omitted that you would have wished to be included?

4. Were there any topics that should not have been included?

5. Please indicate those lectures that were most useful to your areas of interest?

6. The course included a number of site visits. Please assist us in evaluating this part of the course be answering the following questions (check one for each visit).

	Very Useful	Somewhat Useful	Not Useful
KILN Gas Facility	_____	_____	_____

Cora Coal Handling Facility	_____	_____	_____
Freeman United Mine	_____	_____	_____
CIPSCO Mine-Mouth Plant	_____	_____	_____
Argonne FEUL Laboratory	_____	_____	_____
Corrosion Studies Laboratory	_____	_____	_____
Argonne Dry Scrubber Facility	_____	_____	_____
Lonestar Power Plant and Unit Train Operation	_____	_____	_____

Operations

Pittsburgh Energy Technoloy Center	_____	_____	_____
Consol Coal Technology Center	_____	_____	_____
Consol Coal Strip Mine	_____	_____	_____
Ohio State University Combustion Laboratory	_____	_____	_____

7. How will your training in this course be used in your country's coal program?

8. To what extent do you expect to use the course materials in doing your work? (Underline One)

Great Extent Some Extent Not al All

9. Please make any additional comments or suggestions that you feel may be of use in the planning of future courses.

NAME: _____

COUNTRY: _____

Appendix VIII - Sample of Evaluation Remarks

SAMPLE OF EVALUATION RESPONSES

Question: What suggestions for lectures, discussions, and work sessions could you make for future courses?

Responses: "Would be divided in special subject, according to speciality of participant."

"Typical answer should be provided for each scenario of the work session to make it more effective,"

"Include more lectures in other applications."

"Lectures and discussions is OK, the work sessions should be eval-
uated by the expert then show mistakes and show the best way to do it."

"It would be better if work sessions have a lecturer as a leader."

Question: How will your training in this course be used in your country's coal program

Responses: Can be used as improvement in giving lectures in my university"

"In view of fact that our country is going to establish coal-fired power station sometime in 1986, and further the locality is only about 25 miles from Kuala Lumpur, ie., still within the Kuala Lumpur valley, it is foreseeable that numerous environmental impacts might be expected. Thus, this training, in my opinion, has given me great exposure on methodology and technical know-how in controlling the impacts. Subsequently, I hope I could write this knowledge in the course of carrying on my work."

"To join the program of coal utilization of my faculty"

"I'll be used for designing small scale coal, mining, and also developing existing coal mines."

"The subjects gained would be dessiminated to everybody who is interested in and would be used for our next program in the coal utilization."

"The training has given a broader knowledge about several aspects of the coal industry; hence, it will give a better critical outlook and a broader understanding towards the coal research activities and the development of the coal industry."

"Use relevant information in planning coal development program and study if modern techniques and methods could be applied to some coal aspects of the country."

"Evaluate current programs based on what we learned and recommend necessary improvements, modifications to attain a cost-effective system. Assist other groups in coming up with better coal mining and beneficiation programs utilizing up to base technologies. Recommend other oil-consuming industries for inverting into coal-fired to higher management based on available information and technologies."

"In conducting and planning our next research experiments."

"The information and knowledge gained in this course will be disseminated in my division and would be quite useful in the division's work program. It was unfortunate that the environmental aspects and considerations presented in this course were not so well emphasized."

"Dissemination of information to industrial and utility sector of the country. Since my division acts as consultant on matters regarding the efficient use of energy (oil, coal, biomass, geothermal, etc.), training in this course will be very useful."

"Lecturing material for university students. Some topic will discuss in Thai mining engineer society and pass the comment to DMR office to set up the program or policy."

"Evaluation of feasibility studies and other proposals submitted by consultants and contractors. An overall view of coal related industries. Procurement of information and relevant technical data, seeking out relevant aspects and consults for future projects, sorting out the right kind of plants and equipment. The training provides me an overview of the coal industry and helps me in future planning."

"Can evaluate the right technology and method which is suitable to our policy and national need."

"The course training will serve as an instrument in the suggestion of new mining methods and cost design technologies to help alleviate existing needs that in one way or another our country will develop more ideas on cost scheme needs as a replacement of imported oil."

"Teaching engineering students and participating in energy research and planning of the country."

"The advance coal technologies in ESP coal gasification, fluidized bed combustion and so_x. No_x removal will be followed closely after the training course. These technologies will reduce the atmospheric pollution significantly. The atmospheric pollution is our main concern in the planning of a coal-fired power station. Any technology breakthrough in the above-mentioned flue gas cleaning process will accelerate our coal program decision."

"My country is in the early stages of coal utilization program, as modified by the government, and with my present position, my knwoedge, training and systems gained in the training can be impacted to the different sectors involved in coal utilization. Materials and notes gather will be used in training of technical personnel. Speakers can be contacted in the future for any request of assistance or exchange of information."

"Through national counterpart in the ASEAN Coal Development Programme and as the project coordinator of the ASEAN Coal Information Center."

"Preparing the EIS for lignite mine is my job; after my training, I can bring what I get about the environmental viewpoint and mining and apply this to my job."

"Assessment of mines, transportation links and formation of strategic stockpile quantity. Technical and economic of coal as a future option for development in electricity generation and to recognize the implications to the environment of increased coal utilization. Siting studies for coal-fired power stations."

"Siting considerations and control of pollutants for coal utilizing facilities is my major field of concern. With the knowledge enhanced from this course, it will enable me to do a better job."

"I'm not aware of coal technologies and have an insight on possible coal energy research that will serve the country's needs and problems, particularly in adopting foreign technology to suit our conditions. This will greatly assist in coal energy R&D planning, infrastructure and manpower development required to meet targets and policies set."

Appendix IX - Letter of Appreciation from Participants

Chemistry Department
Faculty of Science
ChiangMai University
ChiangMai, Thailand

April 8, 1983

Dr.Robert W.Springer, Director
Division of Educational Programs
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, IL 60439

Dear Dr. Springer :

On behalf of the ASEAN Energy II Course Participants, we wish to express our deep appreciation and sincere gratitude to the DEP Staff, for organizing, coordinating, moderating and supervising the coal training course, and also attending to our personal needs.

We are one in saying that Dr.Derickson, the Course Director, did an excellent job in preparing an acceptable course module and worked hard so that the program was directed to the best interest of each participant. Some of which we take the opportunity to mention:

* Overall supervision of the training program.
* Selecting excellent speakers who are experts in their respective fields from different government and private institutions
* Availability of lecture and reference materials.
* Arranging cultural programs to the extent of inviting participants to his home for dinner with his family.
* Providing transportantion for weekly shopping and sightseeing activities.

We also wish to thank Dr.Chuck Redman for moderating the lectures, providing overview of the different topics covered and in assisting us during field trips.

Messrs, Jerry Gillette and Bill White who worked hard in supporting Dr.Derickson during the conduct of the course.

Mr.Richard Roman for arranging the trip to Pittsburgh, Columbus and Southern Illinois. We found the field trip highly educational and also enjoyed ourselves during the bus trip back to Argonne.

Last but not least we wish to express our deepest gratitude to Ms.Anita Bakke and Ms.Noreen Czyz for the hard work exerted during the course of the program and efficient secretarial duties. They were also very helpful and understanding in attending to our personal needs.

We take this opportunity also to express our thanks to the various Argonne National Laboratory staff and employees who in one way or the other contributed to the success of the program.

In passing, rest assured that the expertise and knowledge we gained from this course will go a long way in contributing to the energy programs of our countries.

Very truly yours,

ARWUDT PRASERTWITAYAKIJ, Ph.D.
Lecturer
Chiang Mai University
(For Thai Participants)

cc: Robert Ichord
Walter E.Massey
W.Kenneth Derickson
Richard Roman
Chuck Redman
Michael Petrick
Jerry Gillette
Tom Wolsko
Bill White
Bill Hallett
Anita Bakke
Noreen Czyz

Appendix X - On-the-job Training

ASEAN Energy-II Coal Training Program
On-the-Job Training Locations

Participant	Company Location	Comments
ATTHAYA CHIEWWATTAKEE (Thailand) 4 months Coal Energy Policy Analyses	Bechtel Corporation 50 Beale Street P.O. Box 3965 San Francisco, CA 94119 (415) 768-3124	Training went very well. She had more work than she could really complete, but knew she did not have to complete it all. She and Bechtel were very pleased with the training program. There were no major problems.
CHOONG MIN LEE (Malaysia) 2 months Environmental Impact Technologies	Bechtel Corporation 50 Beale Street P.O. Box 3965 San Francisco, CA 94119 (415) 768-2157	Lee's program was moderately successful since there was only limited project work available. Both Lee and Bechtel believe the experience was useful, however, lodging costs were a problem.
ERLINDA NAPITUPULU (Indonesia) 2 months Coal Combustion Technologies	Pittsburgh Energy Technology Center Process Technology Div. Department of Energy P.O. Box 10940 Pittsburgh, PA 16236	It was very difficult finding a place for Linda's follow-up training because of her interest in coking. PETC agreed to let her work on some of their coal combustion and slurry work. Her program was useful, however, somewhat limited due to delays in placing her. No major problems or complaints from either her or PETC.

ON-THE-JOB TRAINING LOCATIONS (Cont'd)

Participant	Company Location	Comments
GERARD WIDODO (Indonesia) 4 months Coal Preparation and Briquetting	Pittsburgh Energy Technology Center Process Technology Div Department of Energy P.O. Box 10940 Pittsburgh, PA 16236 (412) 675-6297	Gerard and PERC were very pleased with the training program. Gerard was quite productive and worked on an on-going coal preparation project. There were no major problems.
GIL T. FRANCISCO (Philippines) 4 months Establishing Coal R&D Priorities	Allis Chalmers Corp. % A. V. Soriano 1126 South 70th Room 569A Milwaukee, WI 53201 (414) 475-2690	Gil had a moderately successful training program at Allis-Chalmers but quickly ran out things to do. He was more satisfied with his new program at DOE and progressed well. There were no major problems.
JOSE (J.J.) P. LOZANO (Philippines) 4 months Environmental Impact Technologies	Bechtel Corporation 50 Beale Street P.O. Box 3965 San Francisco, CA 94110 (415) 768-2401	JJ was the least satisfied with his training experience. Unfortunately, Bechtel had no additional work that was relevant to his needs. His supervisor was contacted for assistance in finding training in the environmental impact statement process.

ON-THE-JOB TRAINING LOCATIONS (Cont'd)

Participant	Company Location	Comments
MANUEL (NOEL) L. SORIANO (Philippines) 4 months Coal-oil and Coal-water Combustion Technologies	Combustion Egineering Generating Systems Devel. Dept. #9002-228 1000 Prospect Hill Road Windsor, CT 06095 (203) 688-1911 Ext. 2770	Noel was pleased with his training at C-E. He completed the project work he was assigned and the only other work available in his area was proprietary. They kept him busy, however, reviewing appropriate combustion documents and standards. Overall he did quite well and there were no major problems.
PAWITO (Indonesia) 3 months Coal Slurry Technologies	Pittsburgh Energy Technology Center Process Technology Div. P.o. Box 10940 Pittsburgh, PA 16236 (412) 675-6297	Pawito was pleased with his training. He did project work and had no complaints. He left on June 15, 1983 because of stomach problems.
ROD VILLACORTA (Philippines) 3 months Drilling and Mudding Techniques	Longyear Company 925 Delaware St. S.E. Minneapolis, MN 55414 ATTN: Leslie Anderson (612) 331-1331	Rod had a very productive training experience through Longyear Company and Baroid. He participated in various drilling programs throughout the U.S. and a 1 week course in drilling techniques; there were no main problems.

ON-THE-JOB TRAINING LOCATIONS (Cont'd)

Participant	Company Location	Comments
MOHAMMED ISHAK BIN THANI (Malaysia) 3 months Pollution Control Technologies	Argonne National Laboratory 9700 S. Cass Avenue Bldg. 223 Argonne, IL 60439 (312) 972-8093	Ishak participated in on-going studies of ANL's Dry Scrubber facility. Both he and his supervisor felt he had a very productive training experience.
SAM CHANTEM (Thailand) 2 months Coal Mining Impact Assessment	Utah International, Inc. 550 California Street San Francisco, CA 94104 ATTN: J. L. Balzer, Director Environmental Quality (415) 744-2180	Sam and Utah Inter. both agreed that his training program was very productive because he was able to work on a specific project. Lodging costs were a problem.
SAWITRI (LEK) ROJANASAROJ (Thailand) 2 months Fluidized Bed Combustion Modeling	Argonne National Laboratory 9700 S. Cass Avenue Bldg. 223 Argonne, IL 60439 (312) 972-3386	A moderately successful training program. Her interest were quite nonspecific, and she needed considerable attention due to this being her first trip abroad. It was decided to keep her at ANL and let her do some literature review in FBC scale-up: She did a reasonable job of this, but would have preferred sharing some actual research. This was not really available in her area, although she did have the opportunity to observe some FBC work.

ON-THE-JOB TRAINING LOCATIONS (Cont'd)

Participant	Company Location	Comments
TASSANA PITAKARNNOP (Thailand) 2 months Coal Mining Procedures and Economics	San Juan Coal Co. P.O. Box 561 Waterflow, NM 87421 ATTN: Manager, John Sittner (505) 598-5871	Tassana had a very productive program at San Juan Co. He learned a great deal and actually participated in the day-to-day routine. Living in Farmington, N.M. was somewhat inconvenient in terms of eating, getting to work and socializing. San Juan Coal Co. staff helped as much as they could.
YUYUN BASYUNI (Indonesia) 2 months Fluidized Bed Combustion Technologies	Combustion Engineering Fluidized Bed Department Depart. #9002-228 1000 Prospect Hill Road Windsor, CT 06095 (203) 688-1911 Ext. 2770	A very productive program at C-E. He was able to work on a specific FBC project and was pleased with the cooperation and support he received. The C-E people were also quite pleased with his input.