FUEL GAS DEMONSTRATION PLANT PROGRAM

SMALL-SCALE INDUSTRIAL PROJECT

NOTICE

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States nor any agency thereof, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for any third party's use or the results of such use of any information, apparatus, product or process disclosed in this report, or represents that its use by such third party would not infringe privately owned rights.

ERIE MINING COMPANY
PICKANDS MATHER & COMPANY, MANAGING AGENT
1100 SUPERIOR AVENUE
CLEVELAND, OHIO 44114

PREPARED FOR THE
U. S. DEPARTMENT OF ENERGY
ASSISTANT SECRETARY FOR ENERGY TECHNOLOGY
OFFICE OF FOSSIL FUELS

UNDER CONTRACT EW-78-C-02-5066
(FORMERLY CONTRACT ET-78-C-01-2578)

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

DOE AND MAJOR CONTRACTOR RECOMMENDATIONS FOR
DISPOSITION OF SCIENTIFIC AND TECHNICAL DOCUMENT

See Instructions on Reverse Side

1. DOE Report No. DOE/EW/05066-	2. Contract No. ET-78-C-01-2578 (Former) EW-78-C-02-5066	3. Subject Category No. UC-89
---	---	---

4. Title
Final Report - Phase I

5. Type of Document ("x" one)
☒ a. Scientific and technical report
☐ b. Conference paper: Title of conference _____
Date of conference _____
Exact location of conference _____ Sponsoring organization _____
☐ c. Other (Specify Thesis, Translations, etc.) _____

6. Copies Transmitted ("x" one or more)
☐ a. Copies being transmitted for standard distribution by DOE-TIC.
☐ b. Copies being transmitted for special distribution per attached complete address list.
☒ c. Two completely legible, reproducible copies being transmitted to DOE-TIC.
☐ d. Twenty-seven copies being transmitted to DOE-TIC for TIC processing and NTIS sales.

7. Recommended Distribution ("x" one)
☒ a. Normal handling (after patent clearance): no restraints on distribution except as may be required by the security classification.
Make available only ☐ b. to U.S. Government agencies and their contractors. ☐ c. within DOE and to DOE contractors.
☐ d. within DOE. ☐ e. to those listed in item 13 below.
☐ f. Other (Specify) _____

8. Recommended Announcement ("x" one)
☒ a. Normal procedure may be followed. ☐ b. Recommend the following announcement limitations:

9. Reason for Restrictions Recommended in 7 or 8 above.
☐ a. Preliminary information. ☐ b. Prepared primarily for internal use. ☐ c. Other (Explain) _____

10. Patent Clearance
Does this information product disclose any new equipment, process or material? ☐ Yes ☒ No
Has an invention disclosure been submitted to DOE covering any aspect of this information product? If so, identify the DOE (or other) disclosure number and to whom the disclosure was submitted. ☐ Yes ☒ No
Are there any patent related objections to the release of this information product? If so, state these objections.
("x" one) ☒ a. DOE patent clearance has been granted by responsible DOE patent group.
☐ b. Document has been sent to responsible DOE patent group for clearance.

11. National Security Information (For classified document only; "x" one)
Document ☐ a. does ☒ b. does not contain national security information other than restricted data.

12. Copy Reproduction and Distribution
Total number of copies reproduced _____ Number of copies distributed outside originating organization _____

13. Additional Information or Remarks (Continue on separate sheet, if necessary)

14. Submitted by (Name and Position) (Please print or type)
Robert W. Laza, Director, Project Management Division
Organization
Department of Energy, Chicago Operations Office
Signature *Robert W Laza* Date 4-14-80

Pickands Mather & Co.

1100 Superior Avenue

Cleveland, Ohio 44114

April 17, 1979

NOTICE
PORTIONS OF THIS REPORT ARE ILLEGIBLE. It
has been reproduced from the best available
copy to permit the broadest possible avail-
ability.

NOTICE

PORTIONS OF THIS REPORT ARE ILLEGIBLE. It
has been reproduced from the best available
copy to permit the broadest possible avail-
ability.

Mr. R. W. Laza
Contracting Officer
U.S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

SUBJECT: Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
McKee Contract 4814A
REF: ERDA-388

Dear Mr. Laza:

The scope of work for Phase I of our contract did not provide for a final report until 90 days after the completion of Phase III.

In accordance with the agreed upon reduced scope of activities, Erie has provided a final report of Phase I activities per DOE's request. The attached report was compiled to provide:

1. An overview, review and status of Phase I activities.
2. Erie's assessment of project viability.
3. A final update of capital and operating cost for both the Commercial and Demonstration Plant.
4. A final summary of Phase I costs and projected costs for Phase II and III.

MSR

P.C.D.
hyc/pts.
SP/179

Mr. R. W. Laza
April 17, 1979
Page 2

Detail substantiating or clarifying analysis and summarizations have been referenced to Phase I deliverables where appropriate.

Twenty bound copies of this final report are provided for your perusal, record and distribution.

Very truly yours,

ERIE MINING COMPANY
PICKANDS MATHER & CO.,
MANAGING AGENT

A handwritten signature in dark ink, appearing to read "J. H. Fatum", is written over the typed name.

J. H. Fatum
Project Director

JHF/mh

FINAL REPORT

COAL GASIFICATION PROJECT

DOE CONTRACT EW-78-C-02-5066

FORMERLY (ET-78-C-01-2578)

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

ERIE MINING COMPANY

PICKANDS MATHER & CO., MANAGING AGENT

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

CONTENTS

1. PICTORIAL REVIEW

I. INTRODUCTION

II. SCOPE OF WORK

III. PROJECT REVIEW

IV. COMPLETION STATUS

- A. Deliverable Report
- B. Cost Variance Report

V. OVERVIEW ASSESSMENT

- A1. Environmental Project Description
- A2. Environmental Risk Analysis
- B1. Technical Process
- B2. Technical Risk
- B3. Detailed Engineering Review
- C. Economic Assessment

VI. COST SUMMARY

- A. Capital Cost
- B. Operating Cost
- C. Contract Pricing Phases I, II, III

VII. RECOMMENDATION

SCALE 1" = 100' 0"

**FUEL GAS
DEMONSTRATION
PLANT**

DEPARTMENT OF ENERGY
SMALL SCALE INDUSTRIAL PROJECT
FOR
ENR WINING COMPANY
HOYT LAKES, MINNESOTA
PREPARED BY
M-H2O
ENGINEERS AND CONSTRUCTORS
CLEVELAND, OHIO
CONTRACT
ET 76 C 01 2028

COAL GASIFICATION PLANT LAYOUT

80311

A horizontal scale bar with alternating black and white segments. The number '0' is at the left end and '500' is at the right end. Below the bar, the word 'FEET' is centered.

COAL GASIFICATION PROCESS LAYOUT

2 STAGE COAL GASIFICATION SYSTEM

G SIFICATION COAL HANDLING AT PLANTSITE

COAL GASIFICATION UTILITIES TIE-IN

COAL GASIFICATION WATER SOURCES

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

I. INTRODUCTION

Shortly following the Arab oil embargo in 1973, Erie began an energy conservation program and initiated a preliminary review of alternate fuels.

In 1976, Erie began to experience serious curtailment of its primary pelletizing fuel - natural gas. Erie switched to No. 2 oil at that time. By January 1977, with full gas curtailment in all the taconite operations in Minnesota, the supplies of No. 2 oil fell to almost shortage levels and the Minnesota Energy Agency declared an "energy emergency." Erie, following a "crash" refurbishment program, converted to No. 6 oil. Essentially, curtailment has continued since that time on an intermittent basis.

In order to maintain maximum flexibility, Erie continued an alternate fuels program, which included coal gasification.

During the internal review in 1976, the ERDA RFP for small scale demonstration plants was released and Erie responded.

The basis of the contract proposal included design, construction and operation of a Demonstration Plant, which could be expanded to a full-sized industrial plant. The government specifically required the ability to handle Eastern - high-caking, high sulfur coal. Erie's proposal was to utilize as low-caking - low sulfur coals with the Eastern coals optional.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Following contract negotiations, it was mutually agreed that each type of coal, Eastern-Western, would be used for a one-year test period for a total of two years of Demonstration Plant operation. The Demonstration Plant was designed to handle both Eastern and Western coal.

McKee Engineers & Contractors was selected to act as Architect-Engineer and participated in preparing our proposal. On October 19, 1977, our contract was approved and McKee began design and procurement activity. Some precontract work was authorized by DOE prior to contract finalization in order to meet the project schedule which was based on an August 1977 finalization of the Erie/DOE Contract.

Phase I activity included selection of a gasifier and bids were solicited in October, 1977. Babcock Contractors, Inc. was selected in February 1978, based on price and technical evaluation of the gasifiers.

Similarly, bids were solicited for a system to remove sulfur from the gas and Ralph M. Parsons was selected to supply the Stretford Process in March 1978.

Some delay was experienced in selection activity due to late bids and clarification of bid proposals. Preliminary project design on these two major parts of the design began in April, 1978, while McKee continued on design of site and plant utilities.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Prior to selection activities, Erie, McKee and DOE participated in a gasifier inspection trip, visiting 11 plants in South Africa, Italy and Czechoslovakia. The operations, maintenance and designs included by the solicited vendors were evaluated and compared with site observations.

To summarize the selection trip, the gasification plants viewed were producing "gas" economically in the 1.50 to 2.00/ $\bar{M}$ BTU range. However, it was readily apparent that we would be unable to similarly produce such low cost fuels because they had several operating advantages: Minimal environmental cleanup, sized coal available, inexpensive labor, minimal governmental regulation and warm climate.

Knowledge gained from the trip was used to evaluate the gasifiers and initiated various trade-off studies to resolve questionable areas.

As design work progressed, delays were incurred with subcontractors due to late funding, delayed contractual approvals and disputes arising from DOE patent and proprietary data requirements.

As activities progressed, it became apparent that additional funding would be required to complete environmental work (as defined early in Phase I), perform some additional engineering and cover cost extensions due to delays in subcontract and funding approvals.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

This final report is provided as a recapitulation and overall assessment of Phase I activities as performed in accordance with the Erie/DOE Contract and the agreed upon scope of work.

Preliminary review of cost data in October 1978 resulted in Erie recommending and DOE agreeing to a reduced scope of work as project costs were projected to be considerably above the economic goals of the project.

Phase I activities were reduced to a minimum and specifically limited to those essential in making a decision to proceed to Phase II.

Activities were again reviewed by Erie and DOE in a Cost Review Meeting January 19, 1979. A further reduction in activities was made at that time in anticipation of a mutual termination of the project due to economics.

Erie has completed and delivered to DOE the contract deliverables as per the reduced scope of work and recommends that Erie and DOE mutually terminate the project.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

II. SCOPE OF WORK

The contract arrangement between the Department of Energy and Erie Mining Company provided mutually advantageous opportunity and means for:

- Employing coal gasification technology and equipment which is now commercially available for production, and use of low BTU gas in an industrial environment under actual operating conditions.
- Identifying, defining and resolving problems and operational unknowns that have heretofore retarded industrial use of synthetic gas.
- Establishing parameters for retrofitting existing industrial furnaces for use of low BTU gas.
- Determining and demonstrating the technical and economic feasibility of the proposed scheme.
- Assessing environmental requirements and costs for utilization of low BTU gas.

The Demonstration Plant was designed as the initial module of a Commercial Plant sized to supply the entire energy requirement of the Pellet Plant. Expansion of the Demonstration Plant to the ultimately desired capacity will require only the installation of additional processing units. Detail design of the full-scale Commercial Plant is not a part of the present contract.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

The Demonstration Plant Program was divided into three phases:

- Phase I - Program Development and Conceptual Design

This phase included selection of a gasifier process to be used, development of the conceptual design for both a Commercial scale plant and a Demonstration Plant.

The Demonstration Plant design was carried to the point of completion corresponding to the "front end design package" suitable for use in the detailed engineering of Phase II.

NOTE: Preliminary engineering and "in house McKee estimates" were used for the sulfur removal system, whereas a subcontract could not be finalized with the Stretford vendor.

Both plants were designed to operate with high-sulfur, high-caking coals as well as low-sulfur, low-caking coals.

- Phase II - Demonstration Plant Final Design, Procurement and Construction

This phase would include all the detailed engineering, procurement and construction of the Demonstration Plant.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

- Phase III - Demonstration Plant Operation

This phase covers the operating portion of the program and included training of personnel, shakedown testing with both low-sulfur, non-caking coal and high-sulfur, high-caking coal and testing of various practices and optimization schemes.

Phase I - Program Development and Conceptual Design

This phase was totally funded by the government and included the following tasks:

- Task I Conceptual design and evaluation of a commercial plant.
- Task II Demonstration Plant process and mechanical conceptual design.
- Task III Phases II and III current working estimate.
- Task IV Demonstration Plant site evaluation and selection.
- Task V Demonstration Plant environmental analysis.
- Task VI Materials agreements and licenses, plans for Demonstration Plant.
- Task VII Proposed methods and plans for Phase II and Phase III accomplishment.
- Task VIII Economic reassessment.
- Task IX Technical support.
- Task X Project Management.

It should be noted that no detail environmental work was included in Phase I activities. Therefore, no provisions were made for developing these details in the original contract cost estimates. As it became necessary to include certain phases of the environmental requirements in order to meet project schedules, additional work was necessary.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Phase II - Final Design, Procurement and Construction

This phase was planned to be jointly funded by the contractor and the government. The contractor's share of costs is expected to be approximately fifty percent (50%). This phase would include the following tasks:

- Task I Site acquisition and finalization of agreements.
- Task II Demonstration Plant engineering and design.
- Task III Bid review, approval and award for subcontractor(s) and vendor(s).
- Task IV Demonstration Plant construction.
- Task V Check-out and acceptance by contractor.
- Task VI Plant operational training.
- Task VII Technical support.
- Task VIII Commercial Plant reassessment and design criteria.
- Task IX Project management.

Phase III - Demonstration Plant Operation

This phase was planned to be jointly funded by the contractor and the government with the contractor's share expected to be approximately fifty percent (50%). This phase would include the following tasks:

- Task I Training.
- Task II Shake down testing with coal.
- Task III Plant operation and evaluation.
- Task IV Technical support.
- Task V Commercial Plant reassessment and design criteria.
- Task VI Project management.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

The proposed work schedule was:

Phase I 15 Months - commencing October, 1977

Phase II 24 Months

Phase III 27 Months

The scope of work for Phase I was reduced by mutual agreement during the Cost-Management Review Meeting held on October 26, 1978. During that meeting, preliminary plant costs and contract costs were reviewed. It was decided that, due to high projected costs, activities for Phase I would be reduced to a minimum. Activities were reduced to only those essential in making a decision to proceed with Phase II. Erie reviewed contract Phase I activities and responded with a letter to DOE. (See ERDA #302)

Activities were reviewed again during the Cost-Management Review Meeting held on January 19, 1979. This resulted in the final reduced scope of work, as outlined in ERDA Letter 351. In addition, contract modification A-006 was initiated. This modification extended the Phase I completion date of January 19, 1979 to April 19, 1979. The modification allowed sufficient time to complete activities under the reduced scope of work.

NOTE: Further minor deletions and some additional work was mutually agreed to by Erie and DOE during the extended period. (Ref. Sec. III, Status 2 APR 1978 - ERDA 386)

Pickands, Mather & Co.

1100 Superior Avenue

Cleveland, Ohio 44114

October 27, 1978

Mr. R. W. Laza
Contracting Officer
U. S. Department of Energy
9800 South Cass Avenue
Argonne, Illinois 60439

SUBJECT: Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
McKee Contract 4814A

REF: ERDA-302

Dear Mr. Laza:

Attached please find our summary of the Phase I activities which are necessary for completion of a first case cost estimate and the capital and operating cost reduction assessment of the Commercial and Demonstration Gasification Plants.

These activities were jointly resolved by DOE, Erie and McKee as being essential to the cost estimate. All other non-essential activities would be held in order to minimize Phase I project costs.

We would anticipate giving McKee official notice (15 days per our contract) effective November 1 and direct them to reduce activities accordingly. Assuming receipt of your concurrence and re-direction today, we will proceed in the above manner to reduce the level of Phase I activities, within 15 days.

Your earliest response is requested.

Very truly yours,

ERIE MINING COMPANY
PICKANDS MATHER & CO.,
MANAGING AGENT

J. H. Fatum
Project Director

JHF:na
Attachment

cc: P. L. Rader
I. H. Hess
C. A. Stiles

E. L. Wilkins
G. A. Peterson

INTER-OFFICE COMMUNICATION

Date October 27, 1978

To

J. H. Fatum

From

G. A. Peterson

Subject: PHASE I ACTIVITY ASSESSMENT MEETING October 25, 1978

A meeting was held in the Erie Mining Company Office - Cleveland between Erie and the DOE Project Management Personnel for the purpose of discussing minimal activities necessary for completion of a 1st case cost estimate to be delivered by December 15, 1978 and also for the purpose of minimizing Phase I project costs. Mutual consent was given to perform the following activities:

Task 1

1. Process Engineering Design - Commercial Plant
2. Project Engineering Design - Commercial Plant
3. Cost Estimate - Commercial Plant
4. Demonstration Plant recommendations

Task 2

1. Process Engineering Design - Demonstration Plant
2. Preliminary Engineering and Layouts

Task 3

1. Detailed current working estimate Phase II
2. Detailed current working estimate Phase III.

Task 5

1. Project Description for Environmental Analysis
2. Demo Plant Environment Report
3. Report of Significance of Project Operation with respect to the Environment
4. Mitigation Measures Report
5. Report of adverse environmental effects which cannot be avoided
6. Report of relationship between local short-term uses of the environment and long-term productivity.
7. Report of irreversible and irretrievable commitments of resources
8. Report of alternatives to proposed action
9. Environment Impact Assessment Report
10. Environmental Data

NOTE: Items 1 - 10 to be completed in draft form only as included in draft Environmental Assessment Statement.

Task 6

1. Plan for obtaining coal
2. Report of Proprietary Process Licenses
3. Plans for acquiring permits and licenses
4. Certificate of Need - draft only

INTER-OFFICE COMMUNICATION

- 2 -

Date October 26, 1978

To

J. H. Fatum

From

G. A. Peterson

Subject: PHASE I ACTIVITY ASSESSMENT MEETING October 25, 1978

Task 7

1. Construction Plan - Demonstration Plant
2. Operation Plan - Demonstration Plant

Task 8

1. Economic re-assessment of Commercial Plant
2. Economic re-assessment of Demonstration Plant

Task 9

1. Technical support plan

Task 10

1. Monthly Report
2. Oral Monthly Report
3. Other activities only as approved

Attendees:

C. Stiles
F. Settimi
E. Wilkins
J. Fatum
E. Trescott
P. Rader
G. Peterson

GAP:na

January 25, 1979

Mr. R. W. Laza
Contracting Officer
U.S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

SUBJECT: Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
McKee Contract 4314A
REF: ERDA-351
List of Phase I activities
to be completed. (Ref. Meeting
Minutes, ERDA-349)

Dear Mr. Laza:

The attached list of activities will be finalized in accordance with the agreed upon reduced scope of activities.

Contract deliverables and related activities are anticipated to be completed on the dates indicated. This estimate assumes completion of subcontractor activities as follows:

1. BCI complete by February 16, 1979.
2. McKee issuance of Volumes 1 and 2 of the Design Manuals for the Demonstration and Commercial Plants as scheduled February 16, 1979.
3. Resolution of Parsons activity and issue of the Parsons data (as received) by McKee before March 2, 1979.
4. McKee activity finalized by March 16 and further activity held (no cost--all personnel released).
5. Reduced scope of activities be removed from "suspension" status and the Erie/DOE contract be suitably "amended".
6. ERT contract extension (10-1500) and rework of the Environmental Draft will be completed by February 16, 1979.

Mr. R. W. Laza
January 25, 1979
Page 2

The completion dates and cost estimates indicated are our best "estimate" at this time. Delay in subcontractor activities will result in additional costs and schedule slippage. (Resolution of the Parsons issue by February 15 is probably unreasonably optimistic.)

If you have any comments on the attached schedule (additions, or deletions), please so indicate with your concurrence of the activities shheduled as outlined.

Very truly yours,

ERIE MINING COMPANY
PICKANDS MATHER & CO.,
MANAGING AGENT

G. A. Peterson
Project Manager

GAP/mh
Attachment

cc: J. H. Fatum
C. A. Stiles
E. L. Wilkins
P. L. Rader
F. L. Hartman

	<u>ACTIVITY</u>	<u>MANHOURS</u>	<u>COST</u>	<u>DATE OF COMPLETION</u>
1.	Design Manual - Commercial			
	Volume 1 Conceptual Design	150	\$ 6,000.00	2-16-79
	Volume 2 Conceptual Design	included above		
	Volume 3 Gasifier Details	25	1,000.00	2-15-79
	Volume 4 Stretford Details	40	1,500.00	3- 2-79
2.	Design Manual - Demonstration			
	Volume 1 Conceptual Design	150	6,000.00	2-16-79
	Volume 2 Conceptual Design	included above		
	Volume 3 Gasifier Details	25	1,000.00	2-15-79
	Volume 4 Stretford Details	40	1,500.00	3- 2-79
3.	Environmental Assessment	225	15,000.00	2-16-79
4.	Parson's Negotiations	125	150,000.00	2-15-79
5.	Parson's Cost Estimate	200	8,000.00	3-15-79
6.	Technical Report No. 7 - Stirrer Design Material		1,000.00	1-29-79
7.	Technical Report No. 8 - Preliminary Briquetting Review		1,000.00	1-29-79
8.	Contract Deliverable Report	150	6,000.00	2-23-79
9.	Monthly Reports, Dec.-Apr.	200	8,000.00	4-19-79
10.	Quarterly Report, 4th quarter, 1978	40	1,500.00	2- 1-79
11.	Annual Report, 1978	40	1,500.00	2- 1-79
12.	Final Report	950	38,000.00	4-19-79
	Erie Economic Evaluation			
	Technical Summary			
	Economic Summary			
	Environmental Summary			
13.	Contract Administration	600	24,000.00	4-19-79
14.	Contract Close-Out	1,500	60,000.00	4-19-79
15.	Design Review Meeting	140	5,600.00	Tentative
16.	Stirrer Review Meeting	56	3,000.00	2- 1-79
17.	Parson's Review Meeting	96	5,000.00	Tentative
18.	Erie-DOE Cost Review Meeting	40	2,000.00	Tentative
19.	Miscellaneous		32,000.00

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

III. PROJECT REVIEW

Executive summaries from monthly, quarterly and annual reports have been included in this report for review.

If more detail is required for a specific event, than reference should be made to the complete report for that reporting period.

Pickands Mather & Co.

*1100 Superior Avenue
Cleveland, Ohio 44114*

April 2, 1979

Mr. R. W. Laza
Contracting Officer
U.S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

SUBJECT: Erie Mining Company
Cpal Gasification Project
DOE Contract EW-78-C-02-5066
McKee Contract 4814A
REF: ERDA-386
Deliverable Status

Dear Mr. Laza:

Attached is a status report for the project for April 2, 1979.

All major deliverables have been completed and distribution is in progress. All tasks except Task 10, Project Management, have been closed out by Erie anticipating no further activities will be required. Allowances have been made to re-open activities should DOE so require.

Final acceptance of deliverables by DOE is required by April 4 to allow close out of subcontracts by April 19, 1979.

We would appreciate at least ten days notice of your requirements for the final Design Meeting, to allow Erie adequate time for preparation of a suitable presentation. Please specify time, date, location and extent of review required.

Mr. R. W. Laza
April 2, 1979
Page 2

Your earliest response would be appreciated.

Very truly yours,

ERIE MINING COMPANY
PICKANDS MATHER & CO.,
MANAGING AGENT

J. H. Fatum
Project Director

JHF/mh
Attachment

cc: H. P. Whaley
C. A. Stiles
G. A. Peterson
E. L. Wilkins

STATUS April 2, 1979

<u>Deliverables Due DOE</u>	<u>Estimated Cost</u>	<u>January 19 Scheduled Date</u>	<u>Current Status</u>	<u>Comment</u>
9.b. Monthly Report - March		4-19-79	4-19-79	
12. Final Report (from Phase III)	38,000.00	4-19-79	4-19-79	Proceeding as scheduled **(Item 8 included)
13. Contract Administration	24,000.00	4-19-79	4-19-79	Subcontract audits completed
14. Contract Close-Out (subcontractors)	60,000.00	4-19-79	4-19-79	Proceeding as scheduled
15. Design Review Meeting	5,600.00		To be Scheduled	Waiting DOE schedule
19. Miscellaneous	32,000.00		As Incurred	Reviewing potential patent areas
20. Low sulfur - low caking coal estimate of capital and operating cost. Request for costs to perform	21,600.00	New	?	Cost estimate and schedule submitted to DOE
21. Technical Report #9 - Coal Procurement Papers	2,000.00	New	4-19-79	Requested following files review by DOE

Items Completed:

February 14 - 28

Technical Report #7
 Technical Report #8
 December Monthly Report

 Quarterly Report, 1978
 Annual Report, 1978
 Stirrer Review Meeting

February 28 - March 21

1. Volumes 1, 2 Design Manual - Commercial
 2. Volumes 1, 2 Design Manual - Demonstration
 3. Environmental Assessment
 9. January Monthly Report

March 21 - April 1

1. Design Manuals, Volume 3
 2. Design Manuals, Volume 3
 9. Monthly Report, February
 22. Contract Files

Items Removed from Schedule*

1. Volume 4
2. Volume 4
4. Parsons Negotiations
5. Parsons Estimate
17. Parsons Review Meeting
18. Erie/DOE Cost Review Meeting

*Per DOE instructions March 7, 1979, March 26, 1979

NOTE: Close out of Parsons activities may require negotiations with Parsons and review of Parsons deliverables.

Item 8

**Matrix now will be included in Final Report. Erie will complete work started by Mound.

Monthly Report
January 1979
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Monthly Report No. 15
Period: January 1, 1979 -
January 31, 1979

EXECUTIVE SUMMARY

A. Project Schedule

Activities were concentrated on reviewing the plant design and economic evaluation and completing deliverables as outlined in the reduced scope of work.

An Erie-DOE Management Review Meeting was held on January 19, 1979. During that meeting, a contract amendment for extending the contract three months was delivered to Erie for execution. The contract amendment will allow completion of Phase I activities per the reduced scope of work as mutually agreed upon at the November and December Cost Review Meetings. This extended the original Phase I completion date of January 19, 1979 to a new completion date of April 19, 1979.

The environmental draft was reviewed and commented on by DOE. ERT will rework the document and issue it on February 16, 1979.

BCI continued work for the completion of the Phase I front-end engineering package. Completion is expected by February 16, 1979. A Design Review Meeting was scheduled for February 1, 1979, to discuss the stirrer design.

The Stretford subcontract status remained unchanged in the month of January. The project schedule will proceed without the inclusion of Parson's data for sulfur removal.

The McKee activities as outlined in the reduced scope of work are scheduled for completion on March 16, 1979.

B. Cost Comments

Project costs have not changed from those estimated in contract cost Amendment A-005.

Monthly Report
January 1979
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

C. Major Activities

1. An Erie-DOE Project Management Review Meeting was held on January 19, 1979. Erie stated that the plant based on current contractual conditions results in the project being uneconomical and that it would be in the best interest of the Government and Erie to mutually terminate the contract unless the Government wished to propose conditions which would make the plant practicable to Erie owners. Environmental and technical risk areas need to be resolved to Erie's and DOE's satisfaction.

After a somewhat lengthy discussion it was agreed that

- a. Phase I activities (as reduced) would be completed without any additional requirements by Erie or DOE.
 - b. DOE and Erie would review final documents and jointly explore the conditions under which either party would proceed. A meeting to discuss alternatives would be scheduled shortly following the finalization of Phase I deliverables.
 - c. Phase I activities would be limited to those provisions of the contract concerning "final inspections" and "wrap-up activities." In the event Erie and the Government cannot establish a mutually agreeable basis to proceed the Erie/DOE contract would be terminated in accordance with contractual provisions.
 - d. It was mutually agreed that under the present design criteria called for in our contract proceeding with Phase II is not practicable.
2. BCI continues work on the preliminary engineering for the gasifier front-end engineering package. Due to a change in material philosophy, the stirrer design has not been completed. A stirrer Design Review Meeting has been scheduled for February 1, 1979, to discuss this change in design. The new completion date for the front-end engineering package is February 16, 1979.
 3. McKee issuance of Volumes I and II of the Design Manuals for the demonstration and commercial plants was scheduled for completion by February 16, 1979.

Monthly Report
January 1979
Erie Mining Company
Coal Gasification Project
DOE Contract EW 78-C-02-5066

4. ERT will rework the environmental draft. They will include comments as received from DOE. This activity is scheduled for completion by February 16, 1979.
5. Certificate of Need was issued on January 17, 1979.
6. Engineering Design Specifications Manual was issued on January 17, 1979.
7. Technical Report No. 7, Stirrer Material Study was issued on January 18, 1979. This was research work performed by BCI in selecting the materials of construction for the gasifier stirrer.
8. Technical Report No. 8, Briquetting Studies, was issued on January 19, 1979. This report included preliminary research information that had been gathered throughout the project regarding briquetting. It should serve as useful information in developing a briquetting study.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

Monthly Report
December, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Monthly Report No. 14
Period: December 1, 1978 -
December 31, 1978

EXECUTIVE SUMMARY

A. Project Schedule

All major activity concentrated on the effort to establish the cost estimate and economic evaluations for the Demonstration and Commercial Gasification Plants. Essential activities, as defined in the reduced scope of work, were maximized in order to realize the contract completion date of January 19, 1979 and avoid further contractual delays and unnecessary Phase I costs. The gasifier front end engineering contractor continues to complete and periodically submit sections of the preliminary front end engineering package for the gasifier and auxiliary equipment. Scheduled completion date is January 19, 1979. This material will be submitted to the DOE for review.

Erie will include BCI design material in the Design Manuals to be issued in January with the stipulation that a detailed review will be necessary before Phase II Engineering proceeds.

The Stretford subcontract negotiation status remained unchanged in the month of December. The economic evaluations for the Demonstration and Commercial Plants included only the data received from Parsons in the original bid proposal response.

The scheduled contract deliverables will not include any proprietary information. The project schedule will proceed without the inclusion of Parsons data for sulfur removal.

The Demonstration and Commercial Economic Evaluations were issued by McKee on December 8, 1978.

Erie's review of the economic evaluations was initiated and the presentation of plant costs to the DOE are scheduled for January 19, 1979.

Phase I completion of the Erie/DOE contract is tentatively projected for January 31, 1979 with completion of all contract deliverables by Erie and the subsequent acceptance by the DOE.

Monthly Report
December, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

B. Cost Comments

1. Notice was received by Erie from McKee that allocated dollars in the amount of \$2,704,096 were committed for expenditures by McKee in December, and in order to continue on the project schedule per the revised scope of work, additional funds were required.

An Erie/McKee contract modification in the amount of \$96,844 was effected December 7, 1978 (PM-283) allocating total funds to McKee in the amount of \$2,800,940.

C. Major Activities

1. Gasifier Front End Engineering

BCI has completed preliminary engineering designs on the gasifier retort and stirrer arrangements including auxiliary equipment with subsequent issue to McKee/Erie expected to be during the week of January 14, 1979.

2. An Erie-DOE Contract Cost Review meeting was held December 12, 1978 to review Phase I costs.
3. An Erie-DOE Project Management Review meeting was held December 13, 1978 to review project status.
4. The Environmental Assessment Statement draft was issued by Erie for a concurrent Erie/DOE review. A final document will be issued by Erie for the purpose of inclusion into public record of the gasification project. A tentative distribution date is January 31, 1979. The document will not include data considered as proprietary.
5. Activity was initiated on final design manuals incorporating all preliminary engineering data on the Demonstration and Commercial Plant designs. These documents are to be issued during January for inclusion into the public record of the gasification project. No data considered proprietary will be included in these manuals.
6. Completion of the Engineering Design Specification Manuals is scheduled for the week of January 7, 1979. These manuals are scheduled for DOE inclusion into the project records. These manuals will not include any data considered as proprietary.

Monthly Report
December, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

D. Materials, Licenses and Agreements

1. Stretford engineering contract negotiations with Ralph M. Parsons concerning the McKee subcontract and the Parsons-Erie sublicense agreement were not finalized. Further negotiations have been cancelled pending agreement to proceed to Phase II of the Erie/DOE contract.
2. The Minnesota Certificate of Need is being prepared for inclusion into the public record of the gasification project and will be issued for review the week of January 14, 1979.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

Monthly Report
November 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Monthly Report No. 13
Period: November 1, 1978
through November 30, 1978

EXECUTIVE SUMMARY

A. Project Schedule

During the month of November, it was jointly agreed by DOE and Erie Project Management that Phase I activities would be limited to the essential activities required to re-define Phase I deliverables and establish schedule and cost estimates to provide the necessary data for Erie's economic assessment of project goals. The activities as re-defined would include the determination and evaluation of potential capital and operating cost reductions, and efforts maximizing the activities necessary to complete essential deliverables in order to minimize further contractual delays and unnecessary Phase I costs.

Subsequent to the completion of the McKee/BCI contract negotiations, activities have been intensified with the BCI front end engineering design in order to effect completion of the gasifier engineering package. Projected delivery of all BCI subcontract deliverables is scheduled for the week of January 29, 1979.

McKee issued a schedule for the cost estimates and economic data, which were originally scheduled for October 1, 1978, reflecting delivery on December 1, 1978. The cost estimate and economic data delivered at that time will not include a definitive estimate from Parsons but will include McKee's "best estimate" of Stretford capital and operating costs for sulfur removal.

The McKee/Parsons subcontract negotiations have not been completed resulting in the continuance of the Parsons stop work order. The project activities have been continued with the realization Parsons deliverables will not be included until contract negotiations are finalized.

B. Major Activities

1. Gasifier Front End Engineering. BCI forwarded partial deliverables to McKee for the front end engineering of the gasifier. A process, P & ID and layout review was held at BCI on November 21-22, 1978. A stirrer design presentation was given to Erie-McKee on November 28, 1978. Erie review of the gasifier design data to be included in the cost estimate and submitted for preliminary design approval is being evaluated.

Monthly Report
November 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

2. Stretford Front End Engineering. The Stretford subcontract remains under the stop work status due to subcontract negotiation difficulties. No deliverables have been received during the month of November.
3. The scale plant model was completed in November.
4. The site model was completed in November.
5. The following reports were issued in November:

October Monthly
Third Quarter
Fiscal Year 1978 Reports

6. The Environmental Assessment report was distributed for review on November 28, 1978.

C. Materials, Licenses and Agreements

1. Stretford Engineering Contract with Ralph M. Parsons and the Parsons-Erie Sublicense Agreements are proceeding very slowly. Parsons issued a stop work notice on August 16, 1978. Patent, proprietary data and the sublicense are the areas of major disagreement. Engineering deliverables have not been released since the stop work notification. Schedule delays have resulted from Subcontract negotiation and approval delays.
2. The Minnesota Certificate of Need is in final review. Completion of the draft is expected the week of December 11, 1978. The presentation of a final certificate to the Minnesota Energy Agency is contingent upon the decision by Erie and the DOE to proceed to Phase II of the project.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:na

Monthly Report
October, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Monthly Report No. 12
Period: October 1, 1978
through October 31, 1978

EXECUTIVE SUMMARY

A. Project Schedule

The project schedule experienced major delays in contract deliverables in the month of August due to Subcontract negotiation difficulties. Stop work notices from the Gasifier and Stretford Front End Engineering subcontractors continue to result in schedule delays for October. The extent of schedule delay will depend on the length of delays incurred because of the contractual problems and approval delays of major subcontractors.

The Gasifier front end engineering subcontract with BCI was finalized on October 27, 1978. August deliverables should be obtained the week of November 6 for McKee, Erie assessment.

B. Cost Comments

An Erie/DOE Cost Review was held at Erie Cleveland on October 25, 1978 for the purpose of assessing the economic goals of the Coal Gasification Project. Erie submitted communication ERDA-288, dated October 6, 1978, reflecting Erie's concern with increasing project costs due to engineering and cost estimating delays. Project viability was questioned based on current cost trending reports and projected project delays.

Based on ERDA-288 and discussions at the Cost Review Meeting, Erie recommended that Phase I activities be limited to completing front end engineering subcontracts and finalizing a preliminary cost estimate for the week of December 11, 1978.

A work suspension notice will notify McKee of the Erie/DOE intention of maximizing effort toward the cost estimate and minimizing Phase I expenses to the Government.

The Stretford cost amendment in the amount of \$139,400 and the miscellaneous cost amendment in the amount of \$545,148, including the Schedule Extension (\$315,813), Overhead and Fringe (\$114,764) and the Coal Fines Handling (\$114,571), were submitted for DOE approval.

Monthly Report
October, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Erie/McKee subcontract amendment numbers 500-M-02, 03, 04 allocating funds to McKee for the total amount of \$2,704,096 were completed. Amendment number 500-M-02 for the amount of \$526,248 and amendment number 500-M-03 for \$99,961, including the General Environmental (\$84,961), Clean Air Act (\$12,500) and the Certificate of Need (\$2,500) were issued. Amendment number 500-M-04 included the schedule extension to October 31, 1978 costs (\$186,390) and the coal fines handling study costs (\$65,470).

C. Major Activities

1) Front End Engineering

Erie continues to review and comment on engineering materials released by McKee but major activities have been slowed down due to the work stoppages of the Gasifier and Stretford sub-contractors. Project deliverables have not been received and as a result, engineering designs have been delayed which will result in cost estimating delays and ultimately project schedule delays.

- 2) Modeling activity on the plant design model approached completion during the month of October.
- 3) Site model update activity was initiated to convert the inset to the expected commercial plant design.
- 4) Foster Wheeler performed the gasifier testing of Rosebud coal. A coal and bottom pan ash sample were sent to the Southwest Research for analysis. The gasifier testing of 15 tons of coal did not produce enough tar and oil for sample analysis.
- 5) The United States Environmental Protection Agency changed the non-attainment status of Erie Mining Company to attainment with notice in the Federal Register Volume 43 Number 194 on Thursday, October 5, 1978, pages 45997, 45998.
- 6) Technical Report #6, Pot Grate - Low BTU Gas Firing Tests, was issued confirming the combustion of low BTU gas would have minimal metallurgical effects on pellet induration.

Monthly Report
October, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

D. Materials, Licenses and Agreements

- 1) Stretford Engineering Contract with Ralph M. Parsons and the Parsons-Erie Sublicense Agreements are proceeding very slowly. Parsons issued a stop work notice on August 16, 1978. Patent, proprietary data and the sublicense are the areas of major disagreement. Engineering deliverables have not been released since the stop work notification. Schedule delays have resulted from Subcontract negotiation and approval delays.

- 2) Gasifier Engineering Contract

The BCI-McKee Subcontract continued to be delayed throughout the month of October until negotiations were completed and the contract was finalized on October 27, 1978. With the signing of the contract, it is expected that contract deliverables will be released for review immediately.

- 3) The Minnesota Certificate of Need is in final review. Notice has been received from the State of Minnesota that a delay is imminent because of delays expected from the Hearing Office. Presentation of the CON is now expected to be in November, 1978.
- 4) The release of the Environmental Assessment Report is not expected until December, 1978. Draft sections will be released for internal review the week of November 13, 1978.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:na

Monthly Report - September, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Monthly Report No. 11
Period: September 1, 1978
through September 30, 1978

EXECUTIVE SUMMARY

A. Project Schedule

The project schedule experienced major delays in contract deliverables in the preceeding month of August due to Subcontract negotiation difficulties. Stop work notices from the Gasifier and Stretford Front End Engineering subcontractors continue to result in schedule delays for September. The extent of schedule delay will depend on the length of delays incurred because of the contractual problems and approval delays of major subcontracts. The schedule delays will be assessed when subcontract negotiations are finalized.

B. Cost Comments

Approval of funds allotted in Phase I were received September 1, 1978 from DOE in the amount of \$681,600 increasing the total Erie/DOE contract commitment to \$3,136,800. The \$681,600 were received as uncommitted funds to be allocated for the project. Further approvals on September 28 1978 of funds in the amount of \$518,858 and \$344,323 increase the total contract commitment to \$3,999,981. To be included in the \$518,858 is the approval of the General Environmental - Product and By-Product Cost Pricing Amendment (\$247,858) and an uncommitted amount of \$271,000. Approval of the Clean Air Act and Certificate of Need Cost Pricing Amendments for the additional \$344,323 is funding for final environmental approvals which is fully reimburseable to the contractor by the DOE.

C. Major Activities

1) Front End Engineering

Erie continues to review and comment on engineering materials released by McKee but major activities have been slowed down due to the work stoppages of the gasifier and Stretford subcontractors. Project deliverables have not been received and as a result engineering designs have been delayed which will result in cost estimating delays and ultimately project schedule delays.

- 2) The Coal Handling Trade Off Study was issued September 20, 1978. The results, conclusions and recommendations pertaining to coal and coal fines handling are presented to the DOE for review and comment.

Monthly Report - September, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

- 3) An environmental progress meeting was held with DOE, McKee, Southwest Research Institute, Ecology Consultants Inc. (ERT) and Erie at the DOE facility - Chicago on September 12, 1978 for the purpose of assessing environmental progress and finalizing the schedule of environmental activities.
- 4) Modeling activity on the plant design model was initiated in September.
- 5) Cost estimating activity on the data to be presented McKee for Erie Mining Company's participation in Phases II and III was prepared for review.
- 6) Preliminary activities were initiated for Work Breakdown Structure - Phases II and III and Reporting Procedures - Phases II and III. Major activity on these items is expected in October, November 1978.
- 7) Engineering and Socio-economic related information was gathered for the Environmental Assessment Report. Activity is expected to continue throughout October. A preliminary draft is expected to be released December 1978 for concurrent reviews.
- 8) Foster Wheeler continues a delay in coal-oil-tar-ash sampling. Foster Wheeler notified Erie Mining Company that the condition of the Rosebud coal to be used for gasifier startup and testing had deteriorated appreciably. Erie agreed to arrange for a new supply of sized Rosebud coal to be delivered to Foster Wheeler (at Foster Wheeler's expense) for startup. Coal delivery is expected the week of October 2, 1978.
- 9) Formal approval of the change from non-attainment to attainment status has not been received from the Federal EPA. Verbal approval has been received, publication in the Federal Register is expected in October.
- 10) A Coal Gasification Progress Meeting was held in the Chicago facilities of the DOE on September 13, 1978. Participants included DOE personnel.- Chicago and Washington Operations Offices and Erie Mining Company.
- 11) Briquetting Study Work Definition was prepared for DOE review to assess the scope of work necessary to validate a Coal Fines Agglomeration Study. The outline was presented to DOE at the September Monthly Oral, September 26, 1978.

Monthly Report - September, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

D. Materials, Licenses and Agreements

- 1) Stretford Engineering Contract with Ralph M. Parsons and the Parsons-Erie Sublicense Agreements are proceeding very slowly. Parsons issued a stop work notice on August 16, 1978. Patent, proprietary data and the sublicense are the areas of major disagreement. Engineering deliverables have not been released since the stop work notification. Schedule delays have resulted from Subcontract negotiation and approval delays.
- 2) Gasifier Engineering Contract. The BCI-McKee Subcontract continues to be delayed due to new proprietary data requirements by DOE. The July 14 stop work notice continues to be in effect and August deliverables have not been received. Schedule delays have resulted from Subcontract negotiation and approval delays.
- 3) The Minnesota Certificate of Need is in final review. Notice has been received from the State of Minnesota that a delay is imminent because of delays expected from the Hearing Office. Presentation of the CON is now expected to be in November, 1978.
- 4) The release of the Environmental Assessment Report is not expected until December, 1978. Report sections will be released for internal review as completed.
- 5) The Stretford and Miscellaneous Cost Amendments are being prepared and are expected to be sent to the DOE for approval and review during October, 1978.
- 6) DOE approval of the Clean Air Act, MEA Amendment - Certificate of Need and the General Environmental - Product and By-Product Amendment was received by Erie in September. DOE approval has been requested of other outstanding items and is expected in October.

E. Coal Procurement and Handling

- 1) Work is proceeding on establishing suppliers of sized coal for both Eastern and Western coal.
- 2) Erie presented a proposal to replace a "Western" low sulfur non-caking coal with an "Eastern" low sulfur, low caking coal for operational purposes in coal gasification in September. DOE approval is requested.

Monthly Report - September, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

F. New Requirements

- 1) The 10 Code of Federal Regulations, Section 711, which concerns the release of proprietary data to the public continues to be reviewed and evaluated. Erie's recommendation will be available when the Government has completed and submitted its review for comment. The current new contractual language being developed for the Parsons and BCI subcontracts will require close coordination with these new requirements.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:na

Monthly Report, August 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Monthly Report No. 10
Period: August 1 through
August 31, 1978

EXECUTIVE SUMMARY

A. Project Schedule

The project schedule experienced major delays in contract deliverables in August due to the July 14 stop work notice received from BCI and an August 16 stop work notice received from Parsons. It is not known what affect these delays will have on the entire project schedule. The extent of the schedule delay will depend on the length of the delays incurred because of the contractual problems and approval delays of major subcontracts. The assessment of schedule delays will continue until the major subcontracts are finalized.

B. COST COMMENTS

Approval was received in August for an additional \$255,200. The approval of these funds increases the total contract commitment to \$2,455,200.

The Gasifier, Clean Air Act, Certificate of Need, and the General Environmental amendments are still awaiting DOE approval. Approval of these amendments is necessary for the project to continue to meet the environmental requirements of the gasification project and to continue to meet the overall project schedule.

C. Major Activities

1) Erie continues to review and comment on engineering materials released by McKee but major activities have been slowed down due to the work stoppages of the gasifier and Stretford subcontractors. Project deliverables have not been received and as a result engineering designs have been delayed which will result in cost estimating delays and ultimately project schedule delays.

2) Coal Handling Study Preliminary Report was issued for internal review. Formal issue is expected the week of September 11, 1978.

3) An Environmental Review Meeting was held August 18, 1978, in Fort Collins, Colorado, at the facilities of Ecology Consultants Inc. for the purpose of discussing all outstanding environmental matters. The environmental schedule was set with data and reporting responsibilities outlined. A progress meeting is scheduled for September 12 in the DOE Chicago Operations Office.

Monthly Report, August 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

- 4) The Waste Water Treatment Report was issued in August comparing the capital and operating costs of a biological treatment system with an oxidative incineration treatment system.
- 5) Justification work continues on the miscellaneous cost amendments. Approval is necessary for work to continue and contractual requirements to be completed.
- 6) Delays were experienced in the Foster Wheeler coal-oil-tar-ash sampling project. Foster Wheeler has set a testing period to begin the week of September 25, 1978. Delays were due to equipment complications, vacation delays and personnel changes. Foster Wheeler remains reluctant to test the high swelling coal.
- 7) The second Design Review Meeting was held August 29-30 at the offices of the DOE Cleveland. The purpose of the meeting was for project technical review. Comments were solicited from participants on the technical presentation handout.
- 8) Formal approval of the change from non-attainment to attainment status has not been received from the Federal EPA.

D. Materials, Licenses and Agreements

- 1) Stretford Engineering Contract with Ralph M. Parsons and the Parsons-Erie Sublicense Agreements are proceeding very slowly. Parsons issued a stop work notice on August 16, 1978. Patent, proprietary data and the sublicense are the areas of major disagreement. Engineering deliverables have not been released since the stop work notification.
- 2) Gasifier Engineering Contract. The BCI-McKee subcontract continues to be delayed due to new proprietary data requirements by DOE. The July 14 stop work notice continues to be in effect and August deliverables have not been received.
- 3) The Minnesota Certificate of Need is in final review. Notice has been received from the State of Minnesota that a delay is imminent because of delays expected from the Hearing Office. Presentation of the CON is now expected to be in October, 1978.
- 4) The release of the Environmental Assessment Report is not expected until December, 1978. Report sections will be released for internal review as completed.
- 5) The Stretford and Miscellaneous Cost Amendments are being prepared and are expected to be sent to the DOE for approval and review during September, 1978.

Monthly Report, August 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

E. Coal Procurement and Handling

1) Work is proceeding on establishing suppliers of sized coal for both Eastern and Western coal. The Coal Handling Study was reviewed at the Design Review Meeting in August.

F. New Requirements

1) The 10 Code of Federal Regulations, Section 711, which concerns the release of proprietary data to the public continues to be reviewed and evaluated. Erie's recommendation will be available when the Government has completed and submitted its review for comment. The current new contractual language being developed for the Parsons and BCI subcontracts will require close coordination with these new requirements.

J. H. Fatum
Program Director for
Erie Mining Company

Monthly Report, July 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Monthly Report No. 9
Period July 1 through
July 31, 1978

A. Project Schedule

The project continued on the revised schedule for the month of July. A change-over from the DOE-Washington, D.C., office to the Chicago Operations Office-DOE of contracting and funding functions may cause delays in project schedule. Erie placed a two week "hold" on subcontracts Air Dispersion II, Soil Boring II, Noise Survey, Coal Tar, Oil and Ash Testing and MEA Printing due to the lack of funds in allocated monies. On July 14 McKee was notified of a work stoppage by BCI which stated BCI was no longer willing to work "at risk." BCI deliverables due on July 31 have been given to McKee, however, no retraction of the work stoppage has occurred. It is predicted if the work stoppage continues a two week to one month delay in the project schedule could occur. Documents provided to McKee were very preliminary.

B. Cost Comments

Following a review meeting with DOE-Cleveland and DOE-Chicago procurement personnel and in accordance with requests from the Chicago Operations Office, revised cost pricing proposal amendments of the Clean Air Act, Certificate of Need and the General Environmental were issued on July 20. The Gasifier Cost Pricing Proposal Amendment was submitted to the DOE on July 25. Until these cost amendments are approved and the cost plan revised, the monthly comparison reports will show considerable variations from the original budget.

The amount of funds committed to the project totaled the allocated project funds of \$2.2 million the week of July 24, 1978. Unless additional funding is approved in July, a work suspension order to Erie subcontractors would be issued July 28, 1978.

C. Major Activities

1) Gasifier front end engineering proceeded at the contractors risk until July 14, when a work stoppage was issued by BCI to McKee. BCI did present July deliverables to McKee but stated that no other deliverables would be issued until suitable financial arrangements could be made. DOE approval of the BCI subcontract and outstanding contract amendments are necessary for the payment of BCI invoices. A BCI Preliminary Design Review Meeting was held on July 12-13, 1978 in Pittsburgh. However, documents were not released for detailed review until July 31.

Monthly Report, July 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

- 2) A BCI Onsite Familiarization Trip was held at Erie Mining Company on July 10.
- 3) The Stretford front end engineering proceeded on schedule in July with a final Design Review Meeting held on July 6 in Pasadena, California. All drawings were reviewed for cost estimating purposes.
- 4) Foster Wheeler has indicated a delay due to equipment commissioning and vacation in the test for procuring coal, tar, oil and ash samples. This delay could cause a delay in the environmental schedule. Foster Wheeler is reluctant to test the high swelling coal. Firm dates have not been resolved at this time.
- 5) Written approval was received on the ERT contract from the DOE. Environmental work has proceeded on that basis. A final Environmental Review Meeting is scheduled for August 18, 1978, in Fort Collins, Colorado.
- 6) The formal approval of the change in status from Non-attainment to Attainment has not been received from the Federal EPA.
- 7) Clean Air Act. Erie will require a combustion gas analysis to present to the DOE-EPA for discussion of the BACT-NSPS requirement pertaining to the effects of the coal gasification plant on the existing plant emissions.
- 8) Environmental Cost Amendments. Revised cost amendments have been submitted for DOE approval. It is expected that if approval is not given before the week of August 21, 1978, work suspension notices must be issued to Erie subcontractors.
- 9) The Site Boring Report was issued in July. McKee is basing cost estimates on report results. The Soil Boring II contract will be issued in August for the additional work required in the ash-sulfur disposal area.
- 10) The Coal Handling Study was completed with the preliminary report to be issued the week of August 14, 1978. The study set the design basis for western coal at 1400 TN/DY with the assumption that all western coals will be briquetted and the design basis for eastern coal will be sized coal received at the plant-site allowing 1187 TN/DY + 12% for fines generation.

D. Materials, Licenses and Agreements

- 1) Minnesota Certificate of Need. The preliminary draft was received by Erie Mining Company in July. Comments are being incorporated and the final draft is expected to be finished in August.
- 2) Stretford Engineering Contract. Contract finalization is proceeding very slowly. The letter of authorization for time extension was approved to August 10, 1978. Difficulties in agreeing on patent and proprietary information are the major items of negotiation. Patent search and verification activity was initiated.
- 3) Gasifier Engineering Contract. The BCI-McKee subcontract was submitted to the DOE in July in conjunction with the Gasifier Cost Price Proposal Amendment. DOE approval is expected the week of August 12, 1978.

Monthly Report, July 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

4) Erie-DOE Procurement Procedure. Chicago operations office-DOE requested copies of the Erie-DOE Procurement Procedure previously submitted to Washington. Copies were re-submitted and DOE-Chicago approval was requested.

E. Coal Procurement and Handling

Work is proceeding on establishing a supplier of sized coal with both Eastern and Western coal suppliers. Formal presentation of the coal handling study is expected at the next Design Review Meeting scheduled for August 29-30, 1978.

F. New Requirements

We were verbally notified that DOE has under consideration amendments to 10 Code of Federal Regulations, Section 711. A very preliminary review indicates that there may be a significant impact on the content and structure of project deliverables with regard to the possibility of proprietary information being made public in contradiction to our contract provisions. Our recommendation will be available in August following receipt and evaluation of the proposed requirements.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:ljb

Monthly Report June 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No. 8
Period June 1 through
June 30, 1978

A. Project Schedule

During June, the project was essentially on the revised schedule. Sub-contract approvals continued to be delayed in June; however, minimal work slippage was incurred in the project schedule as major sub-contractors reluctantly agreed to proceed on the pre-contract arrangements.

DOE approval of the environmental contract late in June allowed the environmental work to proceed. (ERT had in writing indicated that they would "stop work" and would not extend the "at risk" pre-contract expense agreement.)

B. Cost Comments

Requests for cost amendments have been or are in the process of being submitted for DOE approval. Work continues on the gasifier front end engineering costs and the gasifier and Stretford cost amendments. Erie and McKee project coordinators updated and revised the cost and manpower estimates and a Contract Pricing Review meeting was held in Washington, D.C. on June 29, 1978 presenting the updated cost and manpower requirements including all cost amendment status. Cost reductions, deferred expense and Phase I - Phase II overlaps were items of discussion. Until these cost amendments are approved and the cost plan revised, the monthly cost comparison reports will show considerable variations from the original budget. We are currently utilizing previously allocated funds but expect that unless additional funding is approved, a delay in the project schedule and a reduction of activity will occur until amendments are approved.

C. Major Activities

- 1) Gasifier engineering has proceeded at the contractors risk. Contract negotiations continue with the final contract expected to be presented the week of July 17, 1978. A BCI Design Review meeting was held in the BCI office to review preliminary gasifier design. The final Design Review meeting was scheduled for July 12-13, 1978.

Monthly Report June 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

- 2) Stretford engineering proceeded on schedule under a letter contract agreement. A final Design Review meeting is scheduled July 6, 1978.
- 3) Foster Wheeler Energy Corporation submitted a Scope of Gasification Tests and Table of Inspection concerning the coal test - coal tar, ash samples. Work is expected to start in August which is past the starting date originally presented and may delay the environmental schedule. Foster Wheeler is reluctant to process the high swelling design basis coal.
- 4) Environmental Contract. Verbal approval was received on the ERT contract with a commitment that written approval will be received the week of July 3, 1978. The contractor agreed to proceed on the environmental services on that basis.
- 5) Attainment status has been granted by the Minnesota Pollution Control Board. A formal request from the State of Minnesota to the EPA has been submitted and approval is awaited.
- 6) Clean Air Act Amendments. Erie is reviewing the DOE interpretation of the NSPS requirement affecting the present operating regulations as pertaining to the construction of the coal gasification plant. Erie will request further interpretation of this standard from DOE.
- 7) Environmental Cost Amendments. Contract cost amendments have been submitted to the DOE for approval. It is anticipated that approval can be received before the end of July. Allocated money will have been spent and a possible delay in the project schedule could occur.
- 8) Site Boring Contract. Soil Testing Services of Minnesota, Inc. completed the soil boring work underlined in the contract. Additional work is needed in the ash-sulfur disposal area. These new requirements are being defined.

D. Materials, Licenses and Agreements

- 1) Minnesota Certificate of Need. Work was completed on the drafting of the document and the review of the application is proceeding. Final printing and submission to the Minnesota Energy Agency is tentatively scheduled for August 24.
- 2) Stretford Engineering Contract. Negotiations are proceeding slowly, the letter contract extension to July 31, 1978 for \$145,000 was

Monthly Report June 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

approved by the DOE. An additional time extension to the letter contract to August 31, 1978 is awaiting DOE approval. McKee is estimating that the Stretford contract will not be approved and signed before August 31, 1978.

- 3) Gasifier Engineering Contract. Contract negotiations are proceeding slowly with the contractor very reluctantly agreeing to work "at risk" until June 30, 1978. It is expected a contract will be submitted for approval the week of July 17, 1978.

D. Coal Procurement

Initial procurement requisitions were prepared and quotations requested for coal prices for the various coals required by the project. Work on establishing a supplier of sized coal is proceeding with both Eastern and Western coal suppliers. Formal presentation of the coal study is expected at the next Design Review Meeting tentatively scheduled for August 4, 1978.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:na

Monthly Report, May 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

MONTHLY REPORT NO. 7
PERIOD: MAY 1 THROUGH
MAY 31, 1978

A. Project Schedule

During May the project was essentially on the revised schedule. Approvals for sub-contracts, although delayed, did not affect schedule performance in May as pre-contract arrangements with major sub-contractors allowed project work to proceed.

We anticipate that unless the outstanding environmental contract is approved by DOE during the first week of June, some slippage of environmental work will be incurred as the vendor has not been willing to extend the "at risk" pre-contract award agreement past that time.

B. Cost Comments

A request for cost amendment for general environmental product and by-product analysis was submitted for DOE approval.

Work continues on definition of the gasifier and Stretford front end engineering and miscellaneous cost amendments.

Erie has requested that McKee and Erie project coordinators review and update cost and manpower estimates for DOE review in June. Design decisions and all project requirements are being reviewed for cost reductions and deferred expense.

We are continuing to utilize previously allocated funds until contract amendments can be processed by DOE, however, we estimate that additional funding will be required in early July to allow project commitments to be met and ensure that project schedule can be maintained.

C. Major Activities

1. Front End Engineering

Parsons and BCI are proceeding satisfactorily with design and engineering activities.

General plant layout, process flowsheets and process parameters are being developed according to schedule.

2. Environmental Contract

Re-negotiation of fee delayed execution of the contract for environmental services. DOE consent has been verbally received and the contractor has agreed to proceed until the formal consent is received from DOE during the first week of June.

Monthly Report, May 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

3. Re-designation of "Non-attainment" Status

On May 31 the Minnesota Pollution Control Board unanimously voted in favor of Erie's request for re-designation of the Erie plant site area.

Minnesota's formal request to the EPA is expected to be prepared early in June for submittal to the Governor of Minnesota for his signature and forwarding to the EPA.

4. Clean Air Act Amendments

The question remaining to be resolved is whether construction of the coal gasification plant will cause EPA or the State to apply a different set of regulations to the existing facilities at Erie, other than those which presently apply.

We are currently assessing the effluents anticipated for review by DOE to determine whether we will exceed the 100 ton per year limitations.

5. Environmental Cost Amendments

Request for contract amendments were finalized for environmental and product, by-product analysis. Submission of a request for contract amendment was made.

As the environmental uncertainties are resolved, it is appropriate that the cost amendments for environmental activities be processed and the contract amended.

A special cost meeting has been scheduled for June 15 to discuss updating the cost and manpower plans to reflect current conditions.

D. Materials, Licenses and Agreements

1. Minnesota Certificate of Need (CON)

Work continued on definition and drafting of the application for CON. A status and progress update report was submitted for DOE review and comment.

Concurrent review of the preliminary draft application is scheduled for June 30, 1978. Final printing and submission to the Minnesota Energy Agency is tentatively scheduled for August 24 (no change at this time).

2. Stretford Engineering Contract

Negotiations are proceeding slowly and extension of the letter contract with Parsons was requested by McKee and submitted to DOE for approval. The existing letter contract expired on May 19, 1978, however, Parsons has continued work on the project pending DOE approval.

3. Gasifier Engineering

Contract negotiations are proceeding slowly, however, work continued under the "at risk" pre-contract expense agreement with BCI. McKee requested and was granted approval to extend the "at risk" agreement until June 30, 1978.

Monthly Report, May 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

E. Coal Procurement

Initial procurement requisitions were prepared and quotations requested for coal prices for the various coals required by the project.

Work on establishing a supplier of sized coal is proceeding with both Eastern and Western coal suppliers.

Design comparisons for sized and unsized coal are proceeding and a preliminary report on the scope of studies was provided at the scheduled Design Review Meeting. Finalization of this study is tentatively scheduled for the end of June. Formal presentation of the coal study will be made at the July Design Review Meeting.

F. Plan for Obtaining Materials, Licenses and Agreements

Deliverable Items I-F-1 to 5 were submitted for DOE review May 31, 1978, as provided for in the contract schedule. Plan for obtaining coal, water, power, chemicals and plans for use and disposition of products scheduled for July 31, 1978, were submitted early. Erie considers these deliverables complete as submitted.

Although deliverables have been completed, monies for coal procurement and development of the Certificate of Need application will continue to be incurred as planned in requested cost amendments (which are being added to the cost and manpower plan).

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:ljb

Monthly Report - April, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No. 6
Period April 1 through
April 30, 1978

EXECUTIVE SUMMARY

A. PROJECT SCHEDULE

Rescheduling of activities in March and finalized in April resulted in extension of parts of most tasks, as shown in the attached schedule.

During April the project was essentially on the revised schedule. Approvals for front-end engineering and other contracts continued to affect schedule performance, but delays were minimized by the pre-contract arrangements made with the major sub-contractors work on the gasifier. Stretford and environmental sub-contracts proceeded.

B. COST COMMENTS

We continue to be concerned that significant costs are being incurred based on escalation of engineering cost, new requirements being imposed by State and Federal agencies, new environmental requirements and design and coal procurement activity related to coal fines handling and disposal.

Requests for cost amendments have been submitted or are in the process of being submitted for DOE approval.

Until these cost amendments are approved and the cost plan revised, the monthly cost comparison reports will show considerable variance from original budget. We are currently utilizing funds previously allocated and proceeding with the necessary project work until our contract can be amended as instructed.

We estimate that seventy five percent of allocated funds will be expended during June with the finalization of the Stretford and Gasifier contracts.

C. MAJOR ACTIVITIES

1. Gasifier Engineering has proceeded at the contractors risk. Contract negotiations continued. We anticipate that final drafts of the McKee/BCI contract will be available for review early in May.

2. Stretford Engineering. Parsons agreed to entering into a limited pre-contract expense arrangement to cover the first two weeks of engineering until a letter contract could be initiated. A letter contract was submitted to DOE for approval April 20, 1978. DOE approval is expected in early May. The letter contract covers activity from April 12, 1978, to May 19, 1978, (maximum \$80,000) at which time a "definitized" contract is expected to be completed.

Monthly Report - April, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

3. Environmental Contract. A contract with "environmental research" was prepared and submitted to DOE for approval and consent.

The vendor continued to provide limited services at their own risk during April, but has indicated that they will be unable to proceed much farther unless a contract can be approved.

4. Re-designation of "Non-attainment Area" and Environmental Uncertainties. Erie's contractor completed the Air Dispersion Study I, and Erie submitted an application to the PCA for re-designation of the Erie site. Hearing of our request originally scheduled for April 26 has been delayed by the PCA until May 30, 1978. We continue to feel confident that the results of our study and the data produced will provide the PCA with grounds to request the EPA to re-designate the Erie site to an "attainment area."

DOE was requested to provide clarification of the uncertainties raised by the Clean Air Act Amendments. The question remaining to be resolved is whether construction of the coal gasification plant will cause EPA or the State to apply a different set of regulations to the existing facilities at Erie other than those which presently apply.

5. Environmental Cost Amendments. Request for contract amendment of \$170,000 to comply with Clean Air Act Amendments was submitted mid-month for DOE final approval.

General environmental and by-product analysis amendments are being finalized and are expected to be submitted for DOE approval in May.

D. MATERIALS, LICENSES AND AGREEMENTS

1. Minnesota Certificate of Need (CON). Work continued on definition and drafting of the application for CON. Erie participated in hearings in St. Paul, Minnesota, and offered testimony relative to several suggestions/questions which were raised during our review of the certificate detail.

Completion of a draft document for review is scheduled for June 30, 1978, with final printing and submission to the Minnesota Energy Agency tentatively set for August 24 (when the rules become effective).

2. Air Dispersion Study I. This contract was initiated, work completed and report issued during the period.

Monthly Report - April, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

E. COAL PROCUREMENT

Preliminary plans for acquiring coal and sampling requirements were issued as Technical Report #4 on April 28, 1978.

We are continuing to evaluate the various coals referenced in this report for market availability and cost comparisons.

Gasifier and coal handling design work has been significantly increased by the lack of available sized coal at commercially attractive prices.

Design comparisons are proceeding for sized and unsized coal. We expect a preliminary report of our studies at the scheduled Design Review Meeting in mid-May.

J. H. Fatum

Program Director for
Erie Mining Company

JHF:na

Monthly Report - March, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No. 5
Period: March 1 through
March 31, 1978

EXECUTIVE SUMMARY

A. PROJECT SCHEDULE

Considerable effort was expended reviewing and rescheduling activities which have been delayed due to our inability to proceed with subcontracts for Front End Engineering. Re-scheduling of some parts of Tasks I, II, III, and V is required. Time seeking approvals, additional environmental review and subcontractor reluctance to proceed at their own risk until a contract has been definitized were the principle reasons why these activities were delayed.

B. COST COMMENTS

We are concerned that significant cost increases in Phase I will be incurred due to escalation of engineering costs and new requirements being imposed by both Federal and State agencies. Continual changing and addition of new environmental requirements have contributed to possible delays in project schedule and necessitated considerable design changes. Review of new requirements has been a continual task, since the commencement of Phase I, and was never anticipated prior and during our contract negotiations.

As a result, we are currently projecting that Phase I expenses could be increased from \$2.2 million to \$3.8 million, an increase of approximately \$1.6 million unless measures can be taken to halt changes and firm up the environmental guidelines and other regulations.

During January, February and March of this year, as the project progressed, DOE was notified of projected cost increases in the following areas:

Gasifier Front End Engineering (ERDA-65)	\$ 446,912
Stretford Front End Engineering (ERDA-82)	25,000
MEA Certificate of Need (ERDA-83)	175,000

These estimates have been further updated since that time and are currently estimated at \$855,000. Reductions in work definition have already been made to maintain the current costs estimated.

Review of new environmental requirements and regulatory agency actions which were promulgated since contract inception were also reviewed during this period.

Definitive estimates, however, were not, and are not at this date finalized. We have not been able, with certainty, to establish the environmental steps the project must take.

Monthly Report - March, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

As we currently understand the requirements, we expect that an additional \$401,000 will be required to complete the Federal Environmental Assessment, and the Minnesota Environmental Worksheet.

C. MAJOR ACTIVITIES

1. Gasifier Selection: Woodall-Duckham/BCI agreed to proceed with the Front End Engineering at their own risk until a contract could be finalized. Several weeks were required to negotiate the precontract letter.
2. Stretford selection was finalized and approvals received from DOE. Negotiations with Parsons were initiated. Parsons at month-end was hesitant to enter into a precontract arrangement at their own expense.
3. New environmental requirements continued to be outlined, and integrated into the design basis.

Although we have reviewed these new regulatory requirements which were promulgated since contract inception, we have not been able to provide a definitive estimate. Review of new requirements has been a continual task since the commencement of Phase I and was never anticipated to be so extensive. We have not been able, with certainty, to establish the environmental route the project must take.

As we currently understand The Clean Air Act, we expect an additional \$170,000 will be required to produce the Federal and State Environmental Worksheets and Assessments called for in our contract. The above estimate assumes that we will be successful in getting EPA to revise its designation of the area as a "non-attainment area" for total suspended particulates. We have requested the MPCA to recommend to EPA redesignation of the area to attainment status and are proceeding with the necessary applications and hearings. If we are unsuccessful in this regard, we may be faced with serious economic problems.

At the present time, Erie is in compliance with all environmental emission regulations. We have always intended that the design of the coal gasification plant would be such that the Erie plant would be able to meet existing environmental emission standards. The Clean Air Act Amendments of 1977 creates uncertainty with respect to DOE requirements of our contract and EPA policies.

The amendments have created uncertainties which have not been resolved by EPA and we find it impossible to define with any degree of certainty what the applicable regulations might be.

Monthly Report - March, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

The question to be resolved is whether the construction of the coal gasification plant will cause EPA or the State to apply a different set of regulations to the existing facilities at Erie other than those which presently apply. Economics would indicate that if this were to occur, and such an interpretation were to be upheld, proceeding with this project, or any other retrofit project, would not be justified at this time. Before Erie can safely proceed with Phase II and meet its contractual agreements, DOE should obtain a ruling from EPA resolving this question.

We are planning to request that our contract be amended to include the costs estimated and that DOE resolve the uncertainty with respect to DOE requirements and EPA policies.

Erie in the interim will continue implementing the new requirements as previously instructed to minimize any impacts on project schedule. We are currently utilizing funds previously allocated and proceeding with necessary project work until our contract can be amended.

D. MATERIALS, LICENSES, AND AGREEMENTS

1. Minnesota Certificate of Need

Submission of Form 60's for contract amendment of \$170,000 were submitted for DOE approval and action. In order to minimize the impact of these MEA requirements on project schedule, we are utilizing funds presently allocated and proceeding with definition and necessary project work until our contract can be amended. Erie anticipates that the draft document will be completed during June 1978 for review.

2. Erie/McKee Contract

DOE approval of the McKee contract was obtained.

3. Financial Agreements

Payments were made successfully during March for expenses from August, 1977 to February, 1978.

J. H. Fatum

Program Director for
Erie Mining Company

Monthly Report - February, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No. 4
Period: January 30 through
February 28, 1978

EXECUTIVE SUMMARY

A. Contract Deliverables

DOE was notified February 13 of Erie's selection of gasifier vendor. The selection report was issued the following week. Woodall-Duckham was notified February 24th (immediately following DOE approval) that they were selected. Selection was scheduled for February 3.

The preliminary draft of Environmental Deliverables, E1, E2, E3 were submitted February 28, as scheduled. Several sections were incomplete as data could not be obtained from the gasifier vendor until the selection of a vendor was officially announced.

B. Project Schedule

The project continued during the period to be essentially on schedule except for those tasks related to the selection activity. Some delay and re-scheduling of some parts of Task I (commercial plant design), Task II (demonstration plant design) and Task V-Environmental is required; however, the project completion date of December 31, 1978 is not anticipated to be delayed.

A. G. McKee has been asked to re-schedule the above activities. A revised schedule is to be prepared for review early in March.

C. Cost Comments

The project continues to be operating under the level budgeted in the cost plan.

The principle reasons for under expenditure are related to the selection activity being delayed and the time required to obtain approvals for the Erie/McKee contract.

McKee has not been able to proceed with letting sub-contracts until the Erie/McKee contract is released by DOE and Erie. The existing schedule did not anticipate accurately the time required to allow both Erie and DOE evaluations and approvals. Both Erie and DOE evaluated and approved the gasifier selection on an accelerated basis, well under the maximum times allowed by the contract.

As a result of the aforementioned problems, monies for several sub-contracts were not expended as originally planned.

Monthly Report - February, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

D. Major Activities

1. Gasifier Selection:

Following gasifier selection, McKee held an initial planning meeting with Woodall-Duckham to discuss commencing work on the project under a pre-contract expense arrangement similar to the arrangement Erie entered into with DOE during negotiation of the Erie/DOE contract.

2. Stretford Selection:

The bid conditioning meetings deemed necessary in February were held and evaluations were continued. On February 13, McKee notified Erie of its recommended selection. Back-up data was submitted to Erie as it became available during the following ten days. During the review of McKee's selection, the Erie Engineering group requested that vendor plant site visits be organized to resolve several questions concerning environmental, process and contractual matters. In addition, the evaluation committee requested that McKee provide responses to, (or request the bidders to provide), a list of questions pertaining to McKee's recommendation.

Although several weeks will be required to complete Erie's evaluation, the Erie Management Committee determined that adequate evaluation is required prior to Erie's selection or approval of McKee's recommendation.

We anticipate that Erie will be able to make its selection by March 24, 1978.

3. Demonstration Plant Design:

Process studies continued on coal handling, waste heat recovery, site location, water treatment, and retrofit activities were outlined.

4. New Environmental Requirements:

Definition of new environmental requirements continued. Impacts on the Front Engineering Package and other design work were determined and integrated into the design basis.

Sampling and monitoring requirements for both State and Federal assessments were distributed for DOE review. Qualitative data requirements were defined for feedstock, plant products and solid/liquid effluents.

Monthly Report - February, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Solid waste disposal plans were outlined and engineering commenced on evaluating various alternatives.

A review meeting is scheduled in early March in Washington to review current progress and data requirements.

E. Materials, Licenses and Agreements

1. Minnesota Certificate of Need

Definition of State requirements continued. Manpower and Cost Estimates were prepared. We expect completion of Form 60's and support data will be submitted early in March.

2. Erie/McKee Contract

Following resolution of patent and cost/price proposals, McKee signature was obtained in early February. DOE approval is pending.

3. Financial Agreement

"Draw Down" documents were received in the last week of February due to delays in the mail (possibly due to weather disruption of mail services). McKee has not been paid due to this delay. It is expected that Erie will be able to pay its contractors in early March.

F. Project Management

1. Communication and Approvals

It appears that some tasks as scheduled do not allow for adequate time for review and approvals. Both the ERIE/DOE and Erie/McKee contracts allow review periods which are not reflected in the project task scheduling. Although we do not foresee delays in approvals extending the project completion date of December 31, 1978 at this time, we have extended several activities. We expect the extent of re-scheduling required will not be completely known until late March when the gasifier and Stretford Front End Engineering timetable will be known.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

Monthly Report - January, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No. 3
Period: January 1 through
January 29, 1978

EXECUTIVE SUMMARY

A. Contract Deliverables

Quarterly and Annual reports for 1977 were delivered and the project manual was issued to all project personnel.

B. Project Schedule

The project continued during the period to be essentially on schedule. Milestone #4, Site Data Collection and Evaluation was completed as scheduled. Major blizzards and emergency conditions resulted in disruptions of communications and caused delay in preparation of monthly, annual and quarterly reports. Selection activities were similarly affected.

In order to minimize slippage in the tasks related to the selection of the gasifier, Erie reviewed and evaluated the vendor proposals on an accelerated basis.

Selection Timetable

<u>Activity</u>	<u>Schedule Data</u>	
	<u>Original</u>	<u>Actual*</u>
1. Selection Package Preparation	Sep. 5 - 30	Oct. 3 - 28
2. Inspection Trip	Sep. 26 - Oct. 21	Oct. 27 - Nov. 19
3. Inquiries sent to vendors	Sep. 26	Nov. 4
4. Vendor inquiry meetings	Early Nov.	Early Dec.
5. Responses from vendors	Dec. 6	Jan. 6, 1978
6. Vendor response meetings	Early Dec.	Jan. 23, 24, 25
7. Gasifier selection	Feb. 3	Feb. 13

Selection was made February 13, considerably ahead of our previously estimated selection date of February 28 (January Oral Meeting).

Monthly Report - January, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

C. Cost Comments

The project continues to be operating under the level budgeted in the Cost Plan.

As in December, storms, blizzards and emergency conditions resulted in disruptions to planned activities. Over four full working days were lost during the period.

The resulting delays in communications, etc. retarded Accounting and prevented work from being completed at the levels budgeted.

During February, we expect to "catch up" these activities and costs.

Due to problems in "Billing" and ticketing from the gasifier selection trip in November, all charges have not been submitted. We expect to have these travel charges booked in February.

D. Major Activities

Work continued on the major tasks scheduled for the period including:

Task I. Conceptual Design

a. Gasifier Selection.

Inquiry responses were received, from the gasifier suppliers January 6th; however, were not completely submitted until January 20. Meetings were held with each vendor following review of their proposals to clarify or request information which was incomplete. Responses were received up to the end of the month. In order to minimize possible delays, Erie, McKee and DOE reviews were simultaneous.

b. Stretford Selection.

Selection of the Sulfur Removal System continued and quotations were received and bid analysis started. As with the gasifier proposals, "Bid conditioning" meetings were deemed necessary and scheduled for early February.

Monthly Report - January, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Task II. Demonstration Plant Design

Process studies continued on coal handling, waste heat recovery, compressor sizing and site location. Some initial work on waste water treatment was started. The use of the existing Erie burner was evaluated and a preliminary draft of the burner test program issued for comment.

Task IV. Site Evaluation

The plant site - subsurface exploration bid tabulation and procurement package was submitted to DOE for approval.

Task V. Environmental Analysis

During January, preliminary drafts for environmental assessment work for Section 3 (Existing Environmental Setting) were distributed for review and comment.

Data collection continued during the report period and preliminary drafts of the process and related sections were further refined. The Ambient Noise Survey was finalized and bids sent out for quotation.

New Environmental Requirements

The timing and costs which might be incurred with some of the impacts of the new Federal and related State requirements were reviewed and defined.

There are several issues which could affect the project but have not been defined or quantified, particularly whether Erie is not in a "non-attainment area" and the detail level of data required to indicate that the gasification plant will comply with the prevention of significant deterioration rules. Definition of these areas continues.

Gasifier Front End Package Specifications were modified to include our current understanding of the potential impacts of these new requirements. Items such as a "dispersion modelling study", coal, and plant product analysis requirements have been evaluated and defined.

We expect our preliminary review and recommendations to DOE will be available by late February.

Monthly Report - January, 1978
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Task VI. Materials Licenses and Agreements

a. Minnesota Certificate of Need.

The new requirements were evaluated and submitted to DOE with our recommendations. DOE approval was received, and we are proceeding with preparations for the Certificate of Need and contract modifications.

- b. The Erie/McKee contract was delayed due to interpretation of patent provisions. The contract was not signed as anticipated. Erie has given an extension of funds on the current letter agreement to cover McKee's activities until the end of February, anticipating contract approval at that time. We expect the contract to be signed in mid-February.

c. Financial Agreements

The banking agreement was finalized by all parties; however, the documents to allow use of the special account have not been received. No "Draw Down" has yet been effected.

Task X. Project Management

a. Early Report Dates

A review meeting was held in Washington to discuss DOE requirements. Erie requested clarification of DOE requirements at that time.

b. Procurement Procedures

A procurement package containing our interpretation of contract requirements was submitted by DOE for review. Approval requirements were discussed at a meeting held in Washington, and preparation of a draft approval cycle for all contracts was outlined. We expect to formalize this procedure next month.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

Monthly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No. 2
Period November 21 through
December 31, 1977

EXECUTIVE SUMMARY

A. Contract Deliverables

The Consolidated Management Plan, Employee Health and Safety Plan, and associated correspondence were prepared for delivery January 4, 1978 per the deliverable schedule.

B. Project Schedule

The project continued, during the reporting period, to be essentially on schedule. Costs were slightly lower than anticipated due to the Holiday period and vacations. Snow storms, preventing travel and resulting in some staff absences further affected costs. These problems did not affect our ability to prepare the required deliverables and work continued on the major tasks scheduled for the period including:

- Task 1. Conceptual Design
- Task 2. Demonstration Plant Design
- Task 4. Site evaluation
- Task 5. Environment Analysis
- Task 6. Materials Licenses and Agreements
- Task 10. Project Management

C. Major Activities

1. Task 1. - Conceptual Design

a. Selection activities

Following issuance of inquiries to the gasifier and Stretford vendors, basic process definition continued. Anticipating questions from the vendors on the inquiries, meetings were scheduled with each vendor to discuss and define subjects which could require further elaboration. Meetings were held and responses to all vendor questions were formally returned to all competitors.

2. Task 2 - Demonstration Plant Design

Process trade-off studies continued on coal handling, heat recuperation, compressor sizing, site location. Preliminary drafts of the studies will be available for review early next month.

Monthly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Definition of coal requirements and preparation of the detailed design basis for the plant commenced.

The "Site Model" was completed except for the "legends" and gasification section insert. The model will be used in its current form, for environmental presentations and public hearings for obtaining a Minnesota Certificate of Need.

3. Task 4 - Site Evaluation

The preliminary plant site - surface exploration bids were received late in the month, and evaluation is expected to be completed early in January. It is likely that this will be the first sub-contract which will require DOE approval.

4. Task 5 - Environmental Analysis

a. Environmental data collection continued during the report period and preparation of rough draft copies of the existing environmental setting commenced. Evaluation and scheduling of the process related information was completed anticipating submissions by the gasifier and Stretford suppliers early in January. Initial reports received on indigenous flora and fauna (endangered species) indicate that there are no unusual environmental problems in the site area.

b. New Environmental Requirements

As requested by DOE last month, we have commenced analysis of the impact of new federal requirements.

- Hazardous waste
- Clean air act amendment

In addition, the Minnesota Pollution Control Agency has indicated verbally their intent to require more detailed evaluations in the following areas:

1. Ash disposal (leaching, etc.)
2. Sulfur disposal
3. Coal transport - within State boundaries
4. Coal selection - impact on air quality
5. Fines - impacts on shipment
6. Coal storage runoff

Monthly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

7. Heavy metals distribution

It is our understanding that these requirements are possibly more stringent than Federal requirements and will increase the scope and cost of this task significantly.

The MPCA has on December 28 also declared the Iron Range a non-attainment area. The construction of the Gasification Plant could require the total Erie operation to comply as a "new source emission."

If the MPCA persists, we expect considerable additional costs for compliance studies to meet the new set of ground rules.

We will, in January, complete review and evaluation of these new requirements as they become known; however, it is apparent that additional costs could exceed \$500,000 should we be required to comply with all the new requirements.

5. Task 6 - Materials Licenses and Agreements

a. Minnesota Certificate of Need: New Requirements

Preliminary discussions were held with agency personnel concerning the proposed Certificate of Need. We are primarily concerned with the impact on the project schedule should the proceeding run its maximum time limits. Permits for construction could be delayed until June 1979 effectively delaying Phase II by six months.

We are and will, in January, pursue early filing and/or faster processing of Certificate of Need with the Minnesota Energy Agency.

b. The McKee/ Erie contract has been agreed to "in principle" and final revisions submitted to DOE for approval.

Erie has given an extension of funds, on the current letter agreement to cover activities until the end of January, 1978, anticipating contract approval and execution prior to that time.

c. Financial Arrangements

The Banking Agreement was finalized and distributed to the Bank for execution. We will be submitting executed (Erie/Bank) copies to DOE for final processing early in January.

Monthly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

First payments under the contract and reimbursement to Erie will follow shortly.

6. Task 10 - Project Management

a. Early Report Dates

Initial comments from McKee and Erie site locations were prepared. Initial evaluations indicate that deterioration of cost control would result and significant change of both Erie and McKee procedures is required. Due to the possible complex interactions with cost control and audit procedures, we have been unable to complete our evaluation in December. Definitive costs will be provided in January.

J. H. Fatum

Program Director for
Erie Mining Company

JHF:1jb

Monthly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No.1

Part A. Period August 17, 1977 through
October 19, 1977.

Part B. Period October 20, 1977 through
November 20, 1977.

EXECUTIVE SUMMARY

A. Contract Initialization

The contract between Erie Mining Company and the Department of Energy was finalized October 19, 1977. As we have operated under a letter agreement with DOE since August 17, 1977, while awaiting contract finalization, we have prepared this first report to cover the period between August 17 and October 19 (Part A) and the period October 20 to November 20 (Part B) as separate sections.

At the conclusion of the December monthly cut-off date, we shall be returning to the normal accounting system schedules as were proposed and reflected in our contract.

B. Project Schedule

In general, the project is on schedule within cost estimates, and we feel proceeding in an acceptable manner. Despite some delay in contract signing, preventing enquiries to gasifier supplies being issued, we hope to remain within the projected schedule, provided vendor response to our inquiries will provide the necessary data for environmental studies.

Current major activities during the period included:

1. Gasifier Selection
2. Selection Inspection Trip
3. Various Process and Trade-Off Studies
4. Environmental Assessment
5. Project Organization

Despite the fact that Erie has been on strike since August 1 we were able to attain union consent to allow site visits and preliminary site evaluation studies are either completed or well underway. Initial meetings have been held with both State and local agencies and reactions appear very positive. Our ability to begin environmental work in August under letter approval from DOE, has avoided considerable delay in data gathering which would have otherwise been delayed until mid 1978 due to weather conditions.

C. Major Activities

1. Gasifier Selection

Preliminary gasifier definition and selection activities centered on issuance of inquiries to the various gasifier and Stretford suppliers. This activity was planned to be completed prior to the gasifica-

Monthly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Monthly Report No. 1

Part A. Period August 17, 1977 through
October 19, 1977.

Part B. Period October 20, 1977 through
November 20, 1977.

tion trip to allow vendor response preparation while the process team were involved in the Gasifier Selection Trip.

Inquiries were issued the first week of November.

Utilizing the information McKee and PM had previously developed, the vendor inquiry responses, and the detailed information gathered on the inspection trip in South Africa, we should be able to make our selection of gasifier system in late February or early March as planned.

2. Selection Inspection Trip

Starting in South Africa, 9 gas plants and various test and research facilities were visited. The reception was excellent and the various industrial hosts were exceptionally cooperative in providing operating data, technical problem information which included samples of various products and effluents, and waste, for our perusal. The information we gathered has already helped us to improve our basic design concept and will provide invaluable assistance in evaluating the responses from our vendor inquiries, and avoiding potential environmental problems.

3. Process Trade-Off Studies

While the process inspection team was overseas, process trade-off studies continued according to plan. Progress on coal handling gas clean-up, site location, and various materials handling studies were made.

4. Environmental Assessment

Data collection, and environmental reviews are well underway. The project team has established the guidelines and standards that are to be used for Phase I activities, reflecting State, local and Federal requirements as well as ensuring that the standards of the Erie multiple use environmental systems are not upset.

5. Project Organization

Overall project management structure was finalized and project staffing is being undertaken as the preliminary cost and manpower management plans indicate.

Monthly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578
December 21, 1977

Page 4

Estimated Costs:

Fee to State: maximum \$50,000

Cost to Prepare: \$50-150,000*

* "Ball park estimate - subject to changes or revisions of rules by MEA prior to issue."

F. Deliverables

The attached reports constitute the deliverables for the period ending November 20, 1977 as itemized in the contract schedule.

J. H. Fatum
Program Director for
Erie Mining Company
Pickands Mather and Co.,
Managing Agent

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Fourth Quarter
Period: October 1, 1978 -
December 31, 1978

EXECUTIVE SUMMARY

A. Contract Deliverables

The following contract deliverables were completed during the fourth quarter, 1978:

1. Plant Scale Model
2. Plant Site Model
3. Environmental Assessment Statement - Draft
4. McKee/BCI Subcontract
5. Technical Report #6, Pot Grate - Low BTU Gas Firing Tests
6. Monthly Oral - September and October
7. Monthly Reports - September, October, November
8. Quarterly Report - Third Quarter
9. Fiscal Year 1978 Report
10. Erie/DOE Contract Cost Review Meeting - December 12, 1978
11. Erie/DOE Project Management Meeting - December 13, 1978
12. Gasifier Front End Engineering Preliminary Design per revised contract schedules
13. Initial Risk Analysis Evaluation
14. First Issue - Engineering Flow Diagrams
15. Second Issue - Engineering Flow Diagrams
16. Demonstration Plant Design and Economic Evaluation - Phase I
17. Commercial Plant Design and Economic Evaluation - Phase I

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

3. Project Schedule

The project schedule experienced major delays in contract deliverables in the month of August due to Subcontract negotiation difficulties. Stop work notices from the Gasifier and Stretford Front End Engineering subcontractors continued to result in schedule delays for October.

The Gasifier front end engineering subcontract with BCI was finalized on October 27, 1978. August deliverables were obtained the week of November 6 for McKee, Erie assessment.

During the month of November, it was jointly agreed by DOE and Erie Project Management that Phase I activities would be limited to the essential activities required to re-define Phase I deliverables and establish schedule and cost estimates to provide the necessary data for Erie's economic assessment of project goals. The activities as re-defined would include the determination and evaluation of potential capital and operating cost reductions, and efforts maximizing the activities necessary to complete essential deliverables in order to minimize further contractual delays and unnecessary Phase I costs.

Subsequent to the completion of the McKee/BCI contract negotiations, activities have been intensified with the BCI front end engineering design in order to effect completion of the gasifier engineering package. Projected delivery of all BCI subcontract deliverables is scheduled for the week of January 19, 1979.

McKee issued a schedule for the cost estimates and economic data, which were originally scheduled for October 1, 1978, reflecting delivery on December 1, 1978. The cost estimate and economic data which delivered at that time, will not include a definitive estimate from Parsons but will include McKee's "best estimate" of Stretford capital and operating costs for sulfur removal.

The McKee/Parsons subcontract negotiations have not been completed resulting in the continuance of the Parsons stop work order. The project activities have been continued with the realization that Parsons deliverables will not be included until contract negotiations are finalized.

McKee issued a schedule for completion of the Design Manuals on January 29, 1979. The gasification front end engineering, as included in the design manuals will be reviewed in detail before Phase II engineering proceeds. The design manuals will not include any Stretford materials precluding arrival at an acceptable subcontract with Parsons.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Erie review of the Demonstration and Commercial Plant Economic Evaluations was initiated after McKee distributed the documents on December 8, 1978. An economic presentation of the plant design to the DOE is scheduled for January 19, 1979.

C. Cost Comments

An Erie/DOE Review was held at Erie-Cleveland on October 25, 1978 for the purpose of assessing the economic goals of the Coal Gasification Project. Erie submitted communication ERDA-288, dated October 6, 1978, reflecting Erie's concern with increasing project costs due to engineering and cost estimating delays. Project viability was questioned based on current cost trending reports and projected project delays.

Based on ERDA-288 and discussion at the Cost Review Meeting, Erie recommended that Phase I activities be limited to completing front end engineering subcontracts and finalizing a preliminary cost estimate for the week of December 11, 1978.

A work suspension notice will notify McKee of the Erie/DOE intention of maximizing effort toward the cost estimate and minimizing Phase I expenses to the Government.

The Stretford cost amendment in the amount of \$139,400 and the Miscellaneous cost amendment in the amount of \$545,148, including the Schedule Extension (\$315,813), Overhead and Fringe (\$114,764) and the Coal Fines Handling (\$114,571), were submitted for DOE approval.

Approval was received by Erie Mining Company for allocated funds in the amount of \$3,999,981 for expenditures as requested in the Erie/DOE contract cost amendments and as authorized by the DOE. Subsequent Erie/McKee contract modifications were issued allocating a total of \$2,800,940 for projected McKee expenditures and costs for Phase I.

The Erie/McKee contract modifications include the following:

1. 500-ME-01 \$60,000 withdrawal to Erie for subcontract revisions.
2. 500 ME-02 \$526,248 Gasifier Front End Engineering.
3. 500-ME-03 \$99,961 General Environmental; Certificate of Need, Clean Air Act.
4. 500-ME-04 \$251,860 Schedule Extension to October 31, 1978 and Coal Fines Handling.
5. 500-ME-05 \$96,844 Salary rate revision and overhead rate revision.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Subsequent to the approval and notification of the revised scope of activities, developed on October 25, 1978 by Erie and DOE for Phase I, an Erie/DOE Cost Review meeting was held at Erie-Cleveland on December 12, 1978 for the purpose of reassessing project economic goals and related activities.

Under the terms of the present contract as revised, project funding is adequate and is projected to be within budget.

D. Major Activities

1. Gasifier Front End Engineering.

In October Erie continued to review and comment on engineering materials released by McKee but major activities were slowed down due to the work stoppages of the Gasifier and Stretford subcontractors. Project deliverables were not received and as a result, engineering designs have been delayed which will result in cost estimating delays and ultimately project schedule delays.

In November BCI forwarded partial deliverables to McKee for the front end engineering of the gasifier. A process, P & ID and layout review was held at BCI on November 21-22, 1978. A stirrer design presentation was given to Erie-McKee on November 28, 1978. Erie review of the gasifier design data to be included in the cost estimate and submitted for preliminary design approval is being evaluated.

The gasifier front end engineering preliminary design package is projected for completion January 19, 1979.

2. Foster Wheeler performed the gasifier testing of Rosebud coal. A coal and bottom pan ash sample were sent to the Southwest Research for analysis. The gasifier testing of 15 tons of coal did not produce enough tar and oil for sample analysis.
3. The United States Environmental Protection Agency changed the non-attainment status of Erie Mining Company to attainment with notice in the Federal Register Volume 43 Number 194 on Thursday, October 5, 1978, pages 45997, 45998.
4. Technical Report #6, Pot Grate - Low BTU Gas Firing Tests, was issued confirming the combustion of low BTU gas would have minimal metallurgical effects on pellet induration.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

5. Project goals relative to management, technical and economic activities were discussed at an Erie/DOE Project Management meeting December 13, 1978. Activities are scheduled to maximize efforts to realize the engineering, technical and economic information necessary to assemble and complete a design package for evaluation.
6. Environmental activities have concentrated on the Environmental Assessment Statement Draft which was issued for DOE review November 28, 1978.
7. Activities continued on the Design Manuals for the Demonstration and Commercial Plants as well as the Engineering Specification book. These documents are scheduled for completion and distribution on January 19, 1979.
8. The McKee Economic Evaluations for the Demonstration and Commercial Plants were distributed and reviewed in December. Formal presentation is scheduled on January 19, 1979.

E. Materials, Licenses and Agreements

1. McKee/BCI Subcontract - Gasifier Front End Engineering

Negotiations were completed in October and the contract was approved by the DOE and Erie.

2. McKee/Parsons Subcontract - Stretford Front End Engineering

Negotiations with Ralph M. Parsons concerning the McKee subcontract and the Erie/Parsons sublicense agreement were not finalized. Further negotiations have been cancelled pending agreement to proceed to Phase II of the Erie/DOE Contract.

3. The Minnesota Certificate of Need is scheduled for distribution the week of January 14, 1979 for DOE review. The presentation of a final Certificate to the Minnesota Energy Agency is contingent upon the decision by Erie and the DOE to proceed to Phase II of the contract.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

4. Status of Phase I Subcontracts

<u>Contract Number</u>	<u>Item</u>	<u>Status</u>
004	Site Exploration I	Complete
008	Noise Survey	Complete
001	Fauna Survey	Complete
002	Flora Survey	Complete
003	Air Dispersion I	Complete
007	Air Dispersion II	Cancelled
010	Printing Services	In Progress
001.2	Front End Engineering/ McKee	In Progress
005	Environmental Research	In Progress
006	Coal Oils-FWEC	Complete
011	Site Exploration II	Cancelled

F. Project Management

1. Procurement Procedures. The McKee Proposed Procurement Procedures were issued in June for Erie-DOE approval. The document is currently under review and approval is requested. Erie Procurement Procedures were submitted to DOE early in the second quarter and have not been approved. Erie cannot finalize its approval of the McKee procedures until such approval is received. Project, Subcontract, Equipment and Materials Procurement Procedures will be included in the Project Manual approved.

G. New Requirements

1. The 10 Code of Federal Regulations, Section 711, which concerns the release of proprietary data to the public continues to be reviewed and evaluated. Erie's recommendation will be available when the Government has completed and submitted its review for comment. The current new contractual language being developed for the Parsons and BCI subcontracts will require close coordination with these new requirements.
2. The Best Available Control Technology - New Source Pollution Standard decision on the regulations applicable to the existing plantsite will require a combustion gas stack analysis from the current operation to present to the DOE-EPA for discussion of the effects of the coal gasification plant on the existing plant emissions.

J. H. Fatum

J. H. Fatum
PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Quarterly Report
Period: July 1 - September 30, 1978

EXECUTIVE SUMMARY

A. Contract Deliverables

The following were completed during the third quarter, July 1 - September 30, 1978:

- 1) Gasifier - Preliminary Front End Engineering Design, July 31, 1978.
- 2) Stretford - Preliminary Front End Engineering Design, July 6, 1978.
- 3) Site Boring Report I, July 1978.
- 4) Waste Water Treatment Report, August 1978.
- 5) Design Review Meeting - Third Quarter, August 1978
- 6) Coal Handling Trade Off Study, September 1978.
- 7) Monthly Oral Meetings, July, August, September.
- 8) Monthly Report, July, August, September.
- 9) Quarterly Report - Second Quarter, July.

B. Project Schedule

The project continued on the revised schedule in the month of July. A changeover in contract and funding responsibilities from the Washington, D.C. Operations Office to the Chicago Operations Office resulted in a two week hold on Air Dispersion II, Soil Boring II, Coal oil-tar-ash sampling, and MEA printing until responsibilities were defined and assigned by the DOE. McKee was notified on July 14, 1978 by BCI of a work stoppage which stated BCI was no longer willing to work "at risk". Gasifier Front End Engineering preliminary design was issued to McKee July 31, 1978 but no retraction of the work stoppage has occurred.

Parsons notified McKee on August 16, 1978 of a work stoppage resulting from approval delays of the Parsons/McKee Subcontract by Erie/DOE. The project schedule experienced major delays in contract deliverables due to the BCI, Parsons stop work notices.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Subcontract negotiations and approvals are not finalized as of this writing. The extent of the schedule delay will depend on the length of the engineering delays incurred. The assessment of schedule delays will continue until the major subcontracts are finalized.

Listed below are major deliverables not complete as of scheduled date September 29, 1978:

- 1) Cost Estimate
- 2) Demonstration Plant Recommendations
- 3) Demonstration Plant Process Description and Rationale
- 4) Phases II and III Current Working Estimates
- 5) Demonstration Plant Environmental Analysis
- 6) Economic Re-assessment of Demonstration Plant
- 7) Economic Re-assessment of Commercial Plant
- 8) Procurement Schedule of Long Lead Items.

C. Cost Comments

Following a review meeting with DOE-Cleveland and DOE-Chicago Procurement personnel and in accordance with requests from the Chicago Operations Office, revised cost pricing proposal amendments of the Clean Air Act, Certificate of Need and the General Environmental were issued on July 20. The Gasifier Cost Pricing Proposal Amendment was submitted to the DOE on July 25.

The amount of funds committed to the project totaled the allocated project funds of \$2.2 million the week of July 24, 1978.

Approval was received in August for an additional \$255,200. The approval of these funds increased the total contract commitment to \$2,455,200.

Approval of funds allotted in Phase I were received September 1, 1978 from DOE in the amount of \$681,600 increasing the total Erie/DOE contract commitment to \$3,136,800. The \$681,600 were received as uncommitted funds to be allocated for the project. Further approvals on September 28, 1978 of funds in the amount of \$518,858 and \$344,323

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

increase the total contract commitment to \$3,991,981. To be included in the \$518,858 is the approval of the General Environmental - Product and By-Product Cost Pricing Amendment (\$247,858) and an uncommitted amount of \$271,000. Approval of the Clean Air Act and Certificate of Need Cost Pricing Amendments for the additional \$344,323 is funding for final environmental approvals which is fully reimburseable to the contractor by the DOE.

Erie Mining Company continues to be concerned that significant cost increases are being incurred due to escalation of engineering costs, new requirements being imposed by Federal and State regulatory agencies, new environmental requirements, design, coal procurement activity related to coal fines handling and disposal, and schedule extension resulting from subcontract procurement and funding delays.

D. Major Activities

- 1) Gasifier front end engineering proceeded at the contractors risk until July 14, when a work stoppage was issued by BCI to McKee. BCI did present July deliverables to McKee but stated that no other deliverables would be issued until suitable financial arrangements could be made. DOE approval of the BCI subcontract and outstanding contract amendments are necessary for the payment of BCI invoices. A BCI Preliminary Design Review Meeting was held on July 12-13, 1978 in Pittsburgh. However, documents were not released for detailed review until July 31.
- 2) Stretford front end engineering proceeded on schedule until the August 16 work stoppage notice. The Parsons subcontract letter agreement was extended to August 10, 1978 by DOE approval. A Parsons Design Review Meeting was held July 6 in the Pasadena office for review of the Stretford design for cost estimating purposes.
- 3) DOE approval of the Environmental Research Technology contract was received in July.
- 4) An Environmental Review Meeting was held August 18, 1978, in Fort Collins, Colorado, at the facilities of Ecology Consultants, Inc. for the purpose of discussing all outstanding environmental matters. The environmental schedule was set with data and reporting responsibilities outlined.
- 5) An Environmental Progress Meeting was held with DOE, McKee, Southwest Research Institute, Ecology Consultants Inc. (ERT)

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

and Erie at the DOE facility - Chicago on September 12, 1978 for the purpose of assessing environmental progress and finalizing the schedule of environmental activities.

- 6) Engineering and Socio-economic related information was gathered for the Environmental Assessment Report. Activity is expected to continue throughout October. A preliminary draft is expected to be released December 1978 for concurrent reviews.
- 7) Delays were experienced in the Foster Wheeler coal-oil-tar-ash sampling program scheduled for third quarter completion. Delays were attributed to equipment commissioning problems, vacation schedules and personnel changes in August. In September, Foster Wheeler notified Erie Mining Company that the condition of the Rosebud coal to be used for gasifier startup and testing had deteriorated appreciably. Erie agreed to arrange for a new supply of sized Rosebud coal to be delivered to Foster Wheeler (at Foster Wheeler's expense) for startup. Coal delivery is expected the week of October 2, 1978.
- 8) The Soil Boring Report I was issued in July. McKee is basing cost estimates on report results. The Soil Boring II Contract for additional site work at the sulfur and ash waste disposal area is expected to be released in October.
- 9) The Waste Water Treatment Report was issued in August comparing the capital and operating costs of a biological treatment system with an oxidative incineration treatment system.
- 10) The second Design Review Meeting was held August 29-30 at the offices of the DOE Cleveland. The purpose of the meeting was for project technical review. Comments were solicited from participants on the technical presentation handout.
- 11) The Coal Handling Trade Off Study was issued September 20, 1978. The results, conclusions and recommendations pertaining to coal and coal fines handling are presented to the DOE for review and comment.

The study set the design basis for western coal at 1400 TN/DY with the assumption that all western coals will be briquetted and the design basis for eastern coal will be sized coal received at the plantsite allowing 1187 TN/DY + 12% for fines generation.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

- 12) A BCI Onsite Familiarization Tour was conducted at Erie Mining Company July 10.
- 13) A DOE Onsite Familiarization Tour was conducted at Erie Mining Company August 15, 1978.
- 14) Formal approval of the change from non-attainment to attainment status has not been received from the Federal EPA. Verbal approval has been received, publication in the Federal Register is expected in October.
- 15) A Coal Gasification Progress Meeting was held in the Chicago facilities of the DOE on September 13, 1978. Participants included DOE personnel - Chicago and Washington Operations offices and Erie Mining Company.
- 16) Briquetting Study Work Definition was prepared for DOE review to assess the scope of work necessary to validate a Coal Fines Agglomeration Study. The outline was presented to DOE at the September Monthly Oral, September 26, 1978.
- 17) Modeling activity on the plant design model was initiated in September.
- 18) Cost estimating activity on the data to be presented McKee for Erie Mining Company's participation in Phases II and III was prepared for review.
- 19) Preliminary activities were initiated for Work Breakdown Structure - Phases II and III and Reporting Procedures - Phases II and III. Major activity on these items is expected in October, November 1978.
- 20) The Stretford and Miscellaneous Cost Amendments were prepared for issue to DOE in October for review and approval.
- 21) Air Dispersion II contract arrangements have been finalized with the contract to be released in October.

E. Materials, Licenses and Agreements

- 1) Stretford Engineering Contract with Ralph M. Parsons and the Parsons-Erie Sublicense Agreements are proceeding very slowly. Parsons issued a stop work notice on August 16, 1978. Patent, proprietary data and the sublicense are the areas of major disagreement. Engineering deliverables have not been released

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

since the stop work notification. Schedule delays have resulted from Subcontract negotiation and approval delays. Patent search and verification activities were initiated.

- 2) Gasifier Engineering Contract. The BCI-McKee Subcontract continues to be delayed due to new proprietary data requirements by DOE. The July 14 stop work notice continues to be in effect and August deliverables have not been received. Schedule delays have resulted from Subcontract negotiation and approval delays.
- 3) The Minnesota Certificate of Need is in final review. Notice has been received from the State of Minnesota that a delay is imminent because of delays expected from the Hearing Office. Presentation of the CON is now expected to be in November, 1978.
- 4) DOE approval of the Clean Air Act, MEA Amendment - Certificate of Need and the General Environmental - Product and By-Product Amendment was received by Erie in September. DOE approval has been requested of other outstanding items and is expected in October.

F. Coal Procurement and Handling

- 1) Work is proceeding on establishing suppliers of sized coal for both Eastern and Western coal.
- 2) Erie presented a proposal to replace a "Western" low sulfur non-caking coal with an "Eastern" low sulfur, low caking coal for operational purposes in coal gasification in September. DOE approval is requested.

G. Project Management

- 1) Procurement Procedures. The McKee Proposed Procurement Procedures were issued in June for Erie-DOE approval. The document is currently under review and approval is requested. Erie Procurement Procedures were submitted to DOE early in the second quarter and have not been approved. Erie cannot finalize its approval of the McKee procedures until such approval is received. Project, Subcontract, Equipment and Materials Procurement Procedures will be included in the Project Manual when approved.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

H. New Requirements

- 1) The 10 Code of Federal Regulations, Section 711, which concerns the release of proprietary data to the public continues to be reviewed and evaluated. Erie's recommendation will be available when the Government has completed and submitted its review for comment. The current new contractual language being developed for the Parsons and BCI subcontracts will require close coordination with these new requirements.
- 2) The Best Available Control Technology - New Source Pollution Standard decision on the regulations applicable to the existing plantsite will require a combustion gas stack analysis from the current operation to present to the DOE-EPA for discussion of the effects of the coal gasification plant on the existing plant emissions. Data gathering for submittal is expected for completion in the fourth quarter.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:na

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Quarterly Report
Period Ending June 30, 1978

EXECUTIVE SUMMARY

A. Contract Deliverables

The following were completed during the second quarter:

- 1) The Plan for Obtaining Coal, Water, Power and Chemicals.
- 2) The Plan for Use and Disposition of Products.
- 3) The Report of Proprietary Process Licenses.
- 4) The Report of Applicable Construction Codes and Ordinances.
- 5) The Plans for Acquiring Permits and Licenses.

The Monthly Oral and the Monthly Reports were issued as scheduled. The first Design Review meeting was held on May 18, 1978. The second Design Review meeting is scheduled for the third quarter.

B. Project Schedule

During March and April, a re-scheduling of activities resulted in an extension of most tasks. The project remained essentially on the revised schedule throughout the months of April, May and June. Sub-contract approvals were delayed but work continued as major subcontractors agreed to proceed on the basis of precontract arrangements. The June approval of the environmental contract allowed the environmental work to proceed without schedule delays. (ERT had previously given written notice that they would not proceed further "at risk").

C. Cost Comments

We continue to be concerned that significant costs are being incurred based on escalation of engineering cost; new requirements being imposed by State and Federal agencies, new environmental requirements and design and coal procurement activity related to coal fines handling and disposal.

Requests for cost amendments have been submitted or are in the process of being submitted for DOE approval.

Until these cost amendments are approved and the cost plan revised, the cost comparison reports will show considerable variance from original budget. We are currently utilizing funds previously allocated and proceeding with the necessary project work until our contract can be amended as instructed.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Erie and McKee project coordinators updated and revised the cost and manpower estimates and a Contract Pricing Review meeting was held in Washington, D.C. on June 29, 1978 presenting the updated cost and manpower requirements including the status of all cost amendments.

During the first quarter of 1978 as work progressed, DOE was notified of projected cost increases. These cost increases have been updated and currently are:

Gasifier Front End Engineering	\$526,248
Stretford Front End Engineering	\$139,000
MEA Certificate of Need	\$175,000
General Environmental	\$247,000
Other Environmental	\$306,000
Clean Air Act	\$170,000

As a result we are currently projecting that Phase I expenses could be increased from \$2.2 million to \$3.8 million, an increase of \$1.6 million.

D. Major Activities

- 1) Gasifier engineering has proceeded at the contractors risk. Contract negotiations continue with the final contract expected to be presented the week of July 17, 1978. A BCI design review meeting was held in the BCI office to review preliminary gasifier design. The final design review meeting was scheduled for July 12-13, 1978.
- 2) Stretford Engineering. Parsons agreed to entering into a limited pre-contract expense arrangement to cover the first two weeks of engineering until a letter contract could be initiated. A letter contract was submitted to DOE for approval April 20, 1978. Design and engineering activities proceeded on schedule for the quarter with general plant layout, process flowsheets and process parameters being developed. A final design review meeting is scheduled for July 6, 1978. The Parsons subcontract letter was extended May 19. Further extension is expected in July.
- 3) Environmental Contract. A contract with Environmental Research & Technology Inc. was prepared and submitted for DOE approval. DOE approval was delayed, however. Verbal approval was received on the ERT contract with a commitment that written approval will be received the week of July 3, 1978. The contractor agreed to proceed on the environmental services on that basis and withdrew his stop-work notice.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

- 4) Coal Tar and Ash Samples. Foster Wheeler Energy Corporation submitted Scope of Gasification Tests and Table of Inspection concerning the coal test - coal tar and ash samples. Work is expected to start in August which is past the starting date originally presented and may delay the environmental schedule. FWEC has not agreed to testing the high caking coal.
- 5) Re-designation of "Non-Attainment Status". Attainment status was granted by the Minnesota Pollution Control Board. A formal request from the State of Minnesota to the EPA has been submitted and approval is expected during July.
- 6) Environmental Cost Amendments. Contract cost amendments have been submitted for DOE approval as outlined in Section C. A special cost meeting was held on June 15, 1978 to update and review these costs. A Contract Pricing Review meeting was held with DOE on June 29 in Washington, D.C. to review the results of the June 15 meeting. Second Quarter work has proceeded with the presently allocated funds. However, it is expected that if additional funding has not been approved by the end of July, a possible delay in the project schedule may occur.
- 7) Clean Air Act Amendment. The question remaining to be resolved is whether construction of the coal gasification plant will cause EPA or the State to apply a different set of regulations to the existing facilities at Erie, other than those which presently apply. Erie is reviewing the DOE interpretation of the NSPS requirement affecting the present operating regulations as pertaining to the construction of the coal gasification plant.
- 8) Site Boring Contract. Soil Testing Services of Minnesota, Inc. completed the soil boring work underlined in the contract. Additional work is needed in the ash-sulfur disposal area due to ground conditions. Definition of the new requirements is expected to be complete in July.

E. Materials, Licenses and Agreements

- 1) Minnesota Certificate of Need. Work was completed on the rough drafting of the document and the review of the application is proceeding. Final printing and submission to the Minnesota Energy Agency is tentatively scheduled for August 24.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

- 2) Stretford Engineering Contract. Negotiations are proceeding slowly, the letter contract extension to June 30, 1978, for \$145,000 was approved by the DOE. An additional time extension to the letter contract to July 31, 1978, was submitted and is awaiting DOE approval. It is expected that the Stretford contract will be approved and signed before July 31, 1978.
- 3) Gasifier Engineering Contract. Contract negotiations are proceeding slowly with the contractor agreeing to work "at risk" until June 30, 1978. It is expected a contract will be submitted for approval the week of July 17, 1978.
- 4) Air Dispersion Study I. This contract was initiated, work completed and the report was issued during the quarter.

F. Coal Procurement

Preliminary plans for acquiring coal and sampling requirements were issued as Technical Report #4 on April 28, 1978.

We are continuing to evaluate the various coals referenced in this report for market availability and cost comparisons.

Gasifier and coal handling design work has been significantly increased by the lack of available sized coal at commercially attractive prices.

Initial procurement requisitions were prepared and quotations requested for coal prices for the various coals required by the project. Work on establishing a supplier of sized coal is proceeding with both Eastern and Western coal suppliers. Formal presentation of the coal study is expected at the next Design Review Meeting tentatively scheduled for August 4, 1978.

G. Project Management

- 1) Procurement Procedures. The McKee Proposed Procurement Procedures were issued in June for Erie-DOE approval. The document is currently under review and is expected to be approved in August. Project, Sub-contract, Equipment and Materials Procurement Procedures will be included in the Project Manual when approved.

Erie procedures issued early in the quarter for DOE approval have not been approved. Erie cannot finalize its approval of the McKee

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

procedures until such approval is received. (The McKee Procedure is based on the Erie submission.)

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

JHF:na

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Quarterly Report
Period Ending March 31, 1978

EXECUTIVE SUMMARY

A. CONTRACT DELIVERABLES

DOE was notified February 13 of Erie's selection of gasifier vendor. The selection report was issued the following week. Woodall-Duckham was notified February 24th (immediately following DOE approval) that they were selected. Selection was scheduled for February 3.

The preliminary draft of Environmental Deliverables, E1, E2, E3 were submitted February 28, as scheduled. Several sections were incomplete as data could not be obtained from the gasifier vendor until the selection of a vendor was officially announced.

Quarterly and Annual reports for 1977 were delivered and the project manual was issued to all project personnel.

B. PROJECT SCHEDULE

The project continued during the period to be essentially on schedule. Milestone #4, Site Data Collection and Evaluation was completed as scheduled. Major blizzards and emergency conditions resulted in disruptions of communications and caused delay in preparation of monthly, annual and quarterly reports. Selection activities were similarly affected.

In order to minimize slippage in the tasks related to the selection of the gasifier, Erie reviewed and evaluated the vendor proposals on an accelerated basis.

Some delay and re-scheduling of some parts of Task I (commercial plant design), Task II (demonstration plant design) and Task V - Environmental is required; however, the project completion date of December 31, 1978 is not anticipated to be delayed.

A. G. McKee has been asked to re-schedule the above activities, and current estimates are included on the attached milestone reports.

C. COST COMMENTS

The project continues to be operating under the level budgeted in the cost plan.

The principle reasons for under expenditure are related to the selection activity being delayed and the time required to obtain approvals for the Erie/McKee contract.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

McKee was not able to proceed with letting sub-contracts until the Erie/McKee contract was released by DOE and Erie. The existing schedule did not anticipate accurately the time required to allow both Erie and DOE evaluations and approvals. Both Erie and DOE evaluated and approved the gasifier selection on an accelerated basis, well under the maximum times allowed by the contract.

As a result of the aforementioned problems, monies for several sub-contracts were not expended as originally planned.

In addition, storms, blizzards and emergency conditions resulted in disruptions to planned activities. Over four full working days were lost during the period.

The resulting delays in communications, etc. retarded Accounting and prevented work from being completed at the levels budgeted.

Due to problems in "Billing" and ticketing from the gasifier selection trip in November, all charges have not been submitted. We expect to have these travel charges booked in April.

Although Quarterly costs are below budget, we anticipate considerable cost in addition to that currently budgeted.

We are concerned that significant cost increases in Phase I will be incurred due to escalation of engineering costs and new requirements being imposed by both Federal and State agencies. Continual changing and addition of new environmental requirements have contributed to possible delays in project schedule and necessitated considerable design changes. Review of new requirements has been a continual task, since the commencement of Phase I, and was never anticipated prior and during our contract negotiations.

As a result, we are currently projecting that Phase I expenses could be increased from \$2.2 million to \$3.8 million, an increase of approximately \$1.6 million unless measures can be taken to halt changes and firm up the environmental guidelines and other regulations.

During January, February and March of this year, as the project progressed, DOE was notified of projected cost increases in the following areas:

Gasifier Front End Engineering (ERDA-65)	\$ 446,912
Stretford Front End Engineering (ERDA-82)	25,000
MEA Certificate of Need (ERDA-83)	175,000

These estimates have been further updated since that time and are currently estimated at \$855,000. Reductions in work definition have already been made to maintain the current costs estimated.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Review of new environmental requirements and regulatory agency actions which were promulgated since contract inception were also reviewed during this period.

Definitive estimates, however, were not, and are not at this date finalized. We have not been able, with certainty, to establish the environmental steps the project must take.

As we currently understand the requirements, we expect that an additional \$401,000 will be required to complete the Federal Environmental Assessment, and the Minnesota Environmental Worksheet.

D. MAJOR ACTIVITIES

Work continued on the major tasks scheduled for the period including:

Task I. Conceptual Design

a. Gasifier Selection

Inquiry responses were received, from the gasifier suppliers January 6th; however, were not completely submitted until January 20. Meetings were held with each vendor following review of their proposals to clarify or request information which was incomplete. Responses were received up to the end of the month. In order to minimize possible delays, Erie, McKee and DOE reviews were simultaneous.

Following gasifier selection, McKee held initial planning meetings with Woodall-Duckham to discuss commencing work on the project under a pre-contract expense arrangement similar to the arrangement Erie entered into with DOE during negotiation of the Erie/DOE contract.

During the last week in March, Woodall-Duckham/BCI agreed to proceed with the Front End Engineering at their own risk until a contract could be finalized. Several weeks were required to negotiate the precontract letter.

b. Stretford Selection

Selection of the Sulfur Removal System continued in January and quotations were received and bid analysis started. As with the gasifier proposals, "Bid conditioning" meetings were deemed necessary and scheduled for early February.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

The bid conditioning meetings deemed necessary in February were held and evaluations were continued. On February 13, McKee notified Erie of its recommended selection. Back-up data was submitted to Erie as it became available during the following ten days. During the review of McKee's selection, the Erie Engineering group requested that vendor plant site visits be organized to resolve several questions concerning environmental, process and contractual matters. In addition, the evaluation committee requested that McKee provide responses to, (or request the bidders to provide), a list of questions pertaining to McKee's recommendation.

Although several weeks will be required to complete Erie's evaluation, the Erie Management Committee determined that adequate evaluation is required prior to Erie's selection or approval of McKee's recommendation.

Erie submitted its selection to DOE on March 24, 1978.

E. DEMONSTRATION PLANT DESIGN

Process studies continued on coal handling, waste heat recovery, compressor sizing and site locations. Some initial work on waste water treatment was started. The use of the existing Erie burner was evaluated and a preliminary draft of the burner test program issued for comment.

F. MATERIALS, LICENSES AND AGREEMENTS

1. Minnesota Certificate of Need

Definition of State requirements continued during the period. The new requirements were evaluated and submitted to DOE with our recommendations. DOE approval was received, and we are proceeding with preparations for the Certificate of Need and contract modifications.

2. Erie/McKee Contract

Following resolution of patent and cost/price proposals, McKee signature was obtained in early February. The contract was not signed as anticipated. Erie gave an extension of funds on the letter agreement to cover McKee's activities until the end of February, anticipating contract approval at that time. The contract was approved by DOE in March.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

3. Financial Agreements

The banking agreement was finalized by all parties in January; however, the documents to allow use of the special account were not received until February. Contractors were not paid until March due to these delays.

G. ENVIRONMENTAL ACTIVITIES

Task V. Environmental Analysis

During January, preliminary drafts for environmental assessment work for Section 3 (Existing Environmental Setting) were distributed for review and comment.

Data collection continued during the report period and preliminary drafts of the process and related sections were further refined. The Ambient Noise Survey was finalized and bids sent out for quotation.

Sampling and monitoring requirements for both State and Federal assessments were distributed for DOE review. Qualitative data requirements were defined for feedstock, plant products and solid/liquid effluents.

Solid waste disposal plans were outlined and engineering commenced on evaluating various alternatives.

New Environmental Requirements

The timing and costs which might be incurred with some of the impacts of the new Federal and related State requirements were reviewed and defined.

Gasifier Front End Package Specifications were modified to include our current understanding of the potential impacts of these new requirements. Items such as a "dispersion modelling study", coal, and plant product analysis requirements have been evaluated and defined.

Although we have reviewed these new regulatory requirements which were promulgated since contract inception, we have not been able to provide a definitive estimate. Review of new requirements has been a continual task since the commencement of Phase I and was never anticipated to be so extensive. We have not been able, with certainty, to establish the environmental route the project must take.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

As we currently understand The Clean Air Act, we expect an additional \$170,000 will be required to produce the Federal and State Environmental Worksheets and Assessments called for in our contract. The above estimate assumes that we will be successful in getting EPA to revise its designation of the area as a "non-attainment area" for total suspended particulates. We have requested the MPCA to recommend to EPA redesignation of the area to attainment status and are proceeding with the necessary applications and hearings. If we are unsuccessful in this regard, we may be faced with serious economic problems.

At the present time, Erie is in compliance with all environmental emission regulations. We have always intended that the design of the coal gasification plant would be such that the Erie plant would be able to meet existing environmental emission standards. The Clean Air Act Amendments of 1977 creates uncertainty with respect to DOE requirements of our contract and EPA policies.

The amendments have created uncertainties which have not been resolved by EPA, and we find it impossible to define with any degree of certainty what the applicable regulations might be.

The question to be resolved is whether the construction of the coal gasification plant will cause EPA or the State to apply a different set of regulations to the existing facilities at Erie other than those which presently apply. Economics would indicate that if this were to occur, and such an interpretation were to be upheld, proceeding with this project, or any other retrofit project, would not be justified at this time. Before Erie can safely proceed with Phase II and meet its contractual agreements, DOE should obtain a ruling from EPA resolving this question.

We are planning to request that our contract be amended to include the costs estimated and that DOE resolve the uncertainty with respect to DOE requirements and EPA policies.

Erie in the interim will continue implementing the new requirements as previously instructed to minimize any impacts on project schedule. We are currently utilizing funds previously allocated and proceeding with necessary project work until our contract can be amended.

H. PROJECT MANAGEMENT

a. Early Report Dates

A review meeting was held in Washington to discuss DOE requirements. Erie requested clarification of DOE requirements at that time.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

b. Procurement Procedures

A procurement package containing our interpretation of contract requirements was submitted by DOE for review. Approval requirements were discussed at a meeting held in Washington, and preparation of a draft approval cycle for all contracts was outlined. We expect to formalize this procedure next month.

c. Communication and Approvals

It appears that some tasks as scheduled do not allow for adequate time for review and approvals. Both the Erie/DOE and Erie/McKee contracts allow review periods which are not reflected in the project task scheduling. Although we do not foresee delays in approvals extending the project completion date of December 31, 1978 at this time, we have extended several activities. We expect the extent of re-scheduling required will not be completely known until late April when the gasifier and Stretford Front End Engineering timetable will be known.

J. H. Fatum

Program Director for
Erie Mining Company

JHF:na

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Quarterly Report
Period Ending December 31, 1977

EXECUTIVE SUMMARY

A. Contract Initialization

The contract between Erie Mining Company and the Department of Energy was finalized October 19, 1977. As we have operated under a letter agreement with DOE since August 17, 1977, while awaiting contract finalization, we have prepared this first report to cover the period between August 17 and December 31.

B. Contract Deliverables

The Consolidated Management Plan, Employee Health and Safety Plan, and associated correspondence were prepared for delivery January 4, 1978, per the deliverable schedule.

C. Project Schedule

In general, the project is on schedule within cost estimates, and we feel proceeding in an acceptable manner. Despite some delay in contract signing, preventing enquiries to gasifier supplies being issued, we hope to remain within the projected schedule, provided vendor response to our inquiries will provide the necessary data for environmental studies.

Current major activities during the period included:

1. Gasifier Selection
2. Selection Inspection Trip
3. Various Process and Trade-Off Studies
4. Environmental Assessment
5. Project Organization

Despite the fact that Erie was on strike between August 1 and mid-December, we were able to attain union consent to allow site visits and preliminary site evaluation studies are either completed or well underway. Initial meetings have been held with both State and local agencies and reactions appear very positive. Our ability to begin environmental work in August under letter approval from DOE, has avoided considerable delay in data gathering which would have otherwise been delayed until mid 1978 due to weather conditions.

Costs were slightly lower than anticipated due to the Holiday period and vacations. Snow storms, preventing travel and resulting in some staff absences further affected costs. These problems did not affect our ability to prepare the required deliverables and work continued on the major tasks scheduled.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

D. Major Activities

1. Gasifier Selection

Preliminary gasifier definition and selection activities centered on issuance of inquiries to the various gasifier and Stretford suppliers. This activity was planned to be completed prior to the gasification inspection trip to allow vendor response preparation while the process team were involved in the Gasifier Selection Trip.

Inquiries were issued the first week of November.

Following issuance of inquiries to the gasifier and Stretford vendors, basic process definition continued. Anticipating questions from the vendors on the inquiries, meetings were scheduled with each vendor to discuss and define subjects which could require further elaboration. Meetings were held and responses to all vendor questions were formally returned to all competitors.

Utilizing the information McKee and PM had previously developed, the vendor inquiry responses, and the detailed information gathered on the inspection trip in South Africa, we should be able to make our selection of gasifier system in February provided the vendors are able to respond satisfactorily.

2. Selection Inspection Trip

Starting in South Africa, 9 gas plants and various test and research facilities were visited. The reception was excellent and the various industrial hosts were exceptionally cooperative in providing operating data, technical problem information which included samples of various products and effluents, and waste, for our perusal. The information we gathered has already helped us to improve our basic design concept and will provide invaluable assistance in evaluating the responses from our vendor inquiries, and avoiding potential environmental problems.

3. Process Trade-Off Studies - Demonstration Plant Design

While the process inspection team was overseas, process trade-off studies continued according to plan. Progress on coal handling gas clean-up, site location, and various materials handling studies were made.

Definition of coal requirements and preparation of the detailed design basis for the plant commenced.

The "Site Model" was completed except for the "legends" and gasification section insert. The model will be used in its current form, for environmental presentations and public hearings for obtaining a Minnesota Certificate of Need.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

4. Environmental Assessment

Data collection, and environmental reviews are well underway. The project team has established the guidelines and standards that are to be used for Phase I activities, reflecting State, local and Federal requirements as well as ensuring that the standards of the Erie multiple use environmental systems are not upset.

The preliminary plant site - subsurface exploration bids were received late in December, and evaluation is expected to be completed early in January. It is likely that this will be the first sub-contract which will require DOE approval.

Environmental data collection and preparation of rough draft copies of the existing environmental setting commenced. Evaluation and scheduling of the process related information was completed anticipating submissions by the gasifier and Stretford suppliers early in January. Initial reports received on indigenous flora and fauna (endangered species) indicate that there are no unusual environmental problems in the site area.

E. Financial Arrangements - Agreements

1. In collaboration with the DOE, Erie, and the Chemical Bank of New York, arrangements were made to provide the agreements necessary to fund the Modified Letter of Credit for Phase I. Draft agreements have been submitted for DOE approval.

2. The McKee/ Erie contract has been agreed to "in principle" and final revisions submitted to DOE for approval.

Erie has given an extension of funds, on the current letter agreement to cover McKee activities until the end of January, 1978, anticipating contract approval and execution prior to that time.

F. Non -Scheduled Events

1. Early Report Dates: Per DOE request we are reviewing the cost, reorganization requirements, and effect on management and control procedures to produce monthly deliverables by the tenth of each month.

Initial comments from McKee and Erie site locations were completed in December. It appears that the added cost will be significant, and require contract amendment should DOE wish to proceed in this manner.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Our evaluations indicate that deterioration of cost control would result and significant change of both Erie and McKee procedures is required. Due to the possible complex interactions with cost control and audit procedures, we have been unable to complete our evaluation prior to year end, however, definitive costs will be provided in January.

2. Environmental Monitoring: Per letter request from DOE, we are reviewing the impact of new Federal requirements for special testing of ash, sulphur, and coal oil products. Initial perusal of these requirements indicates that the testing suggested is considerably more complex, and voluminous than we anticipated when project costs were estimated. The impact on cost and project schedule is being reviewed.

In addition, the Minnesota Pollution Control Agency has indicated verbally their intent to require more detailed evaluations in the following areas:

1. Ash disposal (leaching, etc.)
2. Sulfur disposal
3. Coal transport - within State boundaries
4. Coal selection - impact on air quality
5. Fines - impacts on shipment
6. Coal storage runoff
7. Heavy metals distribution

It is our understanding that these requirements are possibly more stringent than Federal requirements and will increase the scope and cost of this task significantly.

The MPCA has on December 28 also declared the Iron Range a non-attainment area. The construction of the Gasification Plant could require the total Erie operation to comply as a "new source emission."

If the MPCA persists, we expect considerable additional costs for compliance studies to meet the new set of ground rules.

We will, in January, complete review and evaluation of these new requirements as they become known; however, it is apparent that additional costs could exceed \$500,000 should we be required to comply with all the new requirements.

3. Minnesota-Certificate of Need: The Minnesota Energy Agency in early December promulgated rules governing contents of applications for Certificate of Need for fuel conversion facilities. The agency has not finalized requirements at this date. Copies of the proposed regulations have been transmitted to DOE personnel for their review.

Quarterly Report
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Costs of the "Certificate of Need," although allowable in Phase I were not included in the cost estimates of the contract, as they were unknown at that time.

Preliminary discussions were held with agency personnel concerning the proposed Certificate of Need. We are primarily concerned with the impact on the project schedule should the proceeding run its maximum time limits. Permits for construction could be delayed until June 1979 effectively delaying Phase II by six months.

We will, in January, pursue early filing and/or faster processing of Certificate of Need with the Minnesota Energy Agency, in an effort to alleviate any possible project delay.

G. Project Management

1. Project Organization

Overall project management structure was finalized and project staffing is being undertaken as the attached cost and manpower management plans indicate.

In addition to the formal reporting requirements of the DOE/Erie contract, we have initiated weekly meetings to provide management coordination as well as the forum for brainstorming, evaluation, or eliminating potential problems before they occur. Major activity group leaders are present. DOE representatives have attended all such meetings and input directly to the decision and planning process. This approach has eliminated considerable loss of time in communication, and reduced paper work considerably. Project control and "Problem--Bottle-neck" monitoring can be, will be, and have been handled in this manner.

J. H. Fatum

Program Director for
Erie Mining Company

JHF:ljb

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Annual Report 1978
Period: January 1, 1978 -
December 31, 1978

EXECUTIVE SUMMARY

A. Contract Initiation

The contract between Erie Mining Company and the Department of Energy was finalized October 19, 1977.

B. Contract Deliverables in 1978

1. Period January 1, 1978 - March 31, 1978

- a) Gasifier Vendor Selection
- b) Environmental Deliverables E1, E2, E3
- c) Monthly Reports
- d) Quarterly Report
- e) Annual Report 1977
- f) Milestone #4 Site Data Collection and Evaluation
- g) Stretford Vendor Selection
- h) Erie/McKee Subcontract

2. Period April 1, 1978 - June 30, 1978

- a) The Plan for Obtaining Coal, Water, Power and Chemicals
- b) The Plan for Use and Disposition of Products
- c) The Report of Proprietary Process Licenses
- d) The Report of Applicable Construction Codes and Ordinances
- e) The Plans for Acquiring Permits and Licenses
- f) Monthly Reports
- g) Quarterly Report
- h) Design Review Meeting #1 - May 18, 1978
- i) Environmental Contract with Environmental Research and Technology Inc. (ECI)
- j) Clean Air Act Request for Amendment
- k) Certificate of Need Request for Amendment
- l) General Environmental Request for Amendment
- m) Soil Boring Contract I with Soils Testing Services of Minnesota, Inc.
- n) Air Dispersion I Contract with Interpoll, Inc.
- o) Flora Study
- p) Fauna Study

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

3. Period July 1, 1978 - September 30, 1978

- a) Gasifier - Preliminary Front End Engineering Design, July 31, 1978
- b) Stretford - Preliminary Front End Engineering Design, July 6, 1978
- c) Site Boring Report I, July 1978
- d) Waste Water Treatment Report, August 1978
- e) Design Review Meeting #2 - Third Quarter, August 1978
- f) Coal Handling Trade Off Study, September 1978
- g) Monthly Oral Meetings, July, August, September
- h) Monthly Report, July, August, September
- i) Quarterly Report - Second Quarter, July

4. Period October 1, 1978 - December 31, 1978

- a) Plant Scale Model
- b) Plant Site Model
- c) Environmental Assessment Statement - Draft
- d) McKee/BCI Subcontract
- e) Technical Report #6, Pot Grate - Low BTU Gas Firing Tests
- f) Monthly Oral - September and October
- g) Monthly Reports, September, October, November
- h) Quarterly Report, Third Quarter
- i) Fiscal Year 1978 Report
- j) Erie/DOE Contract Cost Review Meeting - December 12, 1978
- k) Erie/DOE Project Management Meeting - December 13, 1978
- l) Gasifier Front End Engineering Preliminary Design per revised contract schedules
- m) Initial Risk Analysis Evaluation
- n) First Issue - Engineering Flow Diagrams
- o) Second Issue - Engineering Flow Diagrams
- p) Demonstration Plant Design and Economic Evaluation - Phase I
- q) Commercial Plant Design and Economic Evaluation - Phase I

C. Project Schedule

Contract negotiations began with DOE in August with an initial issue of a letter agreement on August 17, 1977. Some delays in the contract finalization developed with the contract being approved and signed October 19, 1977.

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Erie/McKee Subcontract negotiations were not finalized until April 4, 1978. Gasifier vendor selection was delayed three weeks in February, and the Stretford vendor selection was similarly delayed in March. Due to the delays of gasifier and Stretford vendor selections, rescheduling of portions of Tasks I, II and V was required in March. The project schedule was not anticipated to be changed by the rescheduling of these tasks. However, it was noted in the First Quarterly Report, 1978, that the existing project schedule did not anticipate correctly the time required to allow Erie and DOE evaluation and approval time for major subcontracts.

The project remained essentially on the revised schedule throughout the months of April, May and June. Subcontract approvals continued to be delayed but work continued as the Gasifier subcontractor worked "at risk" and the Stretford subcontractor proceeded under the letter contract issued by Erie/DOE. The July approval of the environmental contract allowed the environmental work to proceed without schedule delays. (ERT/ECI had previously given written notice of a work stoppage.) The project continued on the revised schedule in the month of July. A changeover in contract and funding responsibilities from the Washington, D. C. Operations Office to the Chicago Operations Office resulted in a two week hold on Air Dispersion II, Soil Boring II, Coal-oil-tar-ash sampling, and MEA printing until responsibilities were defined and assigned by the DOE. McKee was notified on July 14, 1978 by BCI of a work stoppage which stated BCI was no longer willing to work "at risk". Gasifier Front End Engineering preliminary design was issued to McKee July 31, 1978, but no retraction of the work stoppage occurred.

Parsons notified McKee on August 16, 1978 of a work stoppage resulting from approval delays of the Parsons/McKee Subcontract by Erie/DOE. The project schedule experienced major delays in contract deliverables in the month of August due to Subcontract negotiation difficulties. Stop work notices from the Gasifier and Stretford Front End Engineering subcontractors continued to result in schedule delays for October.

The Gasifier front end engineering subcontract with BCI was finalized on October 27, 1978. August deliverables were obtained the week of November 6 for McKee, Erie assessment.

During the month of November, it was jointly agreed by DOE and Erie Project Management that Phase I activities would be limited to the essential activities required to re-define Phase I deliverables and establish schedule and cost estimates to provide the necessary data for Erie's economic assessment of project goals. The activities as re-defined would include the determination and evaluation of potential capital and operating cost reductions, and efforts maximizing the activities necessary to complete essential deliverables in order to minimize further contractual delays and unnecessary Phase I costs.

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Subsequent to the completion of the McKee/BCI contract negotiations, activities have been intensified with the BCI front end engineering design in order to effect completion of the gasifier engineering package. Projected delivery of all BCI subcontract deliverables is scheduled for the week of January 19, 1979.

McKee issued a schedule for the cost estimates and economic data, which were originally scheduled for October 1, 1978, reflecting delivery on December 1, 1978. The cost estimate and economic data delivered at that time will not include a definitive estimate from Parsons but will include McKee's "best estimate" of Stretford capital and operating costs for sulfur removal.

The McKee/Parsons subcontract negotiations have not been completed resulting in the continuance of the Parsons stop work order. The project activities have been continued with the realization Parsons deliverables will not be included until contract negotiations are finalized.

McKee issued a schedule for completion of the Design manuals on January 29, 1979. The gasification front end engineering as included in the Design manuals will be reviewed in detail before Phase II engineering proceeds. The Design manuals will not include any Stretford materials precluding arrival at an acceptable subcontract with Parsons.

Erie review of the Demonstration and Commercial Plant Economic Evaluations was initiated after McKee distributed the documents on December 8, 1978. An economic presentation of the plant design to the DOE is scheduled for January 19, 1979.

D. Cost Comments

The DOE, Erie and the Chemical Bank of New York negotiated arrangements to provide the agreements necessary to fund the Modified Letter of Credit for Phase I. The banking agreement was finalized by all parties in January; however, the documents to allow use of the special account were not received until February. Contract modifications through January 9, 1978 brought contract funding to \$2,200,000. Contract commitments through the first quarter of 1978 were under expenditure as reported in the Monthly Reports. The principal reasons for the under expenditure were related to activity delays because of subcontract approval delays and gasifier and Stretford vendor selection delays.

During the first quarter 1978, Erie Mining Company became aware that significant cost increases could be incurred in scheduled activities. Notification was given to the DOE of predicted cost increases due to escalation of engineering costs and new environmental requirements being imposed by Federal and State regulatory agencies. New requirements and environmental changes were predicted to affect project schedules and necessitate engineering design changes. The effect of the program modifications was expected to total \$1.6 million. Second

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Quarter 1978 increasing cost concerns were reiterated by Erie Mining.

Additional environmental requirements were added to the gasification program, and other additional costs related to coal procurement activities and engineering design for coal fines handling and disposal were expected. Three cost pricing requests for contract amendment were submitted to the DOE in April, May and June for approval to cover the additional costs incurred in the Coal Gasification Project. The cost pricing proposals for additional environmental requirements included the Clean Air Act, General Environmental and the Certificate of Need for a total of \$592,181.

Following a review meeting with DOE-Cleveland and DOE-Chicago Procurement personnel, and in accordance with requests from the Chicago Operations Office, revised cost pricing proposal amendments of the Clean Air Act, Certificate of Need and the General Environmental were issued on July 20. The Gasifier Cost Pricing Proposal Amendment was submitted to the DOE on July 25.

The amount of funds committed to the project totaled the allocated project funds of \$2.2 million the week of July 24, 1978.

As a result of a changeover of the Contracting and Procurement Operations from Washington, D.C. to Chicago and previous procurement delays and funding approvals, continued procurement problems were experienced. It was necessary for Erie Mining Company to issue ERDA 206 - Hot Line Report #6 advising DOE that unless additional funding was received Subcontractor work suspension notices would be issued August 11, 1978.

Approval was received August 4, 1978 for an additional \$255,200. The approval of these funds increased the total contract commitment to \$2,455,200.

Approval of additional funds allotted in Phase I were received September 1, 1978 from DOE in the amount of \$681,600 increasing the total Erie/DOE contract commitment to \$3,136,800. The \$681,600 were received as uncommitted funds to be allocated for the project. Further approvals on September 28, 1978 of funds in the amount of \$518,858 and \$344,323 increase the total contract commitment to \$3,999,981. To be included in the \$518,858 is the approval of the General Environmental - Product and By-Product Cost Pricing Amendment (\$247,858) and an uncommitted amount of \$271,000. Approval of the Clean Air Act and Certificate of Need Cost Pricing Amendments for the additional \$344,323 is funding for final environmental approvals which is fully reimbursable to the contractor by the DOE.

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Erie Mining Company continues to be concerned that significant cost increases are being incurred due to escalation of engineering costs, new requirements being imposed by Federal and State regulatory agencies, new environmental requirements, design coal procurement activity related to coal fines handling and disposal, and schedule extension resulting from subcontract procurement and funding delays.

An Erie/DOE Cost Review was held at Erie-Cleveland on October 25, 1978 for the purpose of assessing the economic goals of the Coal Gasification Project. Erie submitted communication ERDA-288, dated October 6, 1978, reflecting Erie's concern with increasing project costs due to engineering and cost estimating delays. Project viability was questioned based on current cost trending reports and projected project delays.

Based on ERDA-288 and discussions at the Cost Review Meeting, Erie recommended that Phase I activities be limited to completing front end engineering subcontracts and finalizing a preliminary cost estimate for the week of December 11, 1978.

A work suspension notice notified McKee of the Erie/DOE intention of maximizing effort toward the cost estimate and minimizing Phase I expenses to the Government. (Reference: PM 270, November 2, 1978)

The Stretford cost amendment in the amount of \$139,400 and the Miscellaneous cost amendment in the amount of \$545,148, including the Schedule Extension (\$315,813), Overhead and Fringe (\$114,764) and the Coal Fines Handling (\$114,571), were submitted for DOE approval.

When approval was received by Erie Mining Company for allocated funds in the amount of \$3,999,981 for expenditures as requested in the Erie/DOE contract cost amendments and as authorized by the DOE, subsequent Erie/McKee contract modifications were issued allocating a total of \$2,800,940 for projected McKee expenditures and costs for Phase I.

The Erie/McKee contract modifications included the following:

1. 500-ME-01 \$60,000 withdrawal to Erie for subcontract revisions
2. 500-ME-02 \$526,248 Gasifier Front End Engineering
3. 500-ME-03 \$99,961 General Environmental; Certificate of Need, Clean Air Act
4. 500-ME-04 \$251,860 Schedule Extension to October 31, 1978 and Coal Fines Handling
5. 500-ME-05 \$96,844 Salary rate revision and overhead rate revision.

Subsequent to the approval and notification of the revised scope of activities, developed on October 25, 1978 by Erie and DOE for Phase I, an Erie/DOE Cost Review meeting was held at Erie-Cleveland on December 12, 1978 for the purpose of reassessing project economic goals and related activities.

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

Under the terms of the present contract, as revised, project funding is adequate and is projected to be within budget.

E. Major Activities

1. Gasifier Selection and Front End Engineering. Preliminary Gasifier definition and selection activities centered on issuance of inquiries to various gasifier vendors in November 1977. Inquiry responses were received and vendor meetings were conducted for the purpose of clarifying proposals or completing responses during the month of January 1978. DOE was notified of Woodall-Duckham/Babcock Contractors, Inc. selection as gasifier vendor in February 1978.

Following gasifier selection, McKee held initial planning meetings with Woodall-Duckham to discuss commencing work on the project under a pre-contract expense arrangement similar to the arrangement Erie entered into with DOE during negotiation of the Erie/DOE contract.

During the last week of March, Woodall-Duckham/BCI agreed to proceed with the Front End Engineering at their own risk until a contract could be finalized.

Gasifier front end engineering proceeded at the contractor's risk until July 14, when a work stoppage was issued by BCI to McKee. BCI did present July deliverables to McKee but stated that no other deliverables would be issued until suitable financial arrangements could be made. DOE approval of the BCI subcontract and outstanding contract amendments are necessary for the payment of BCI invoices. A BCI Preliminary Design Review Meeting was held June 20-21 with a second meeting held on July 12-13, 1978 in Pittsburgh. However, documents were not released for detailed review until July 31.

2. A Coal Gasification Selection Inspection trip whereby nine gasification plants, test and research facilities throughout Eurasia, the United Kingdom and South Africa were visited by representatives of the DOE, Erie and McKee. The Inspection Trip Report was issued June 1978.
3. Stretford Selection and Front End Engineering. Definition of various sulfur removal systems and selection of the Stretford process resulted in the issuance of inquiries to various Stretford system licensees in January. Inquiry responses were received and vendor meetings were conducted for the purpose of clarifying bid proposals or completing inquiry responses. Stretford site visits were conducted to operating units for each vendor response. With due evaluation, the DOE was notified of Erie's vendor selection for the Stretford Sulfur Removal unit on March 24, 1978.

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

The Stretford Front End Engineer, the Ralph M. Parsons Company, agreed to enter into a limited pre-contract expense arrangement to cover the first two weeks of engineering until a letter contract could be initiated. A letter contract was submitted to DOE for approval April 20, 1978. Design and engineering activities proceeded on schedule for the quarter with general plant layout, process flowsheets and process parameters being developed.

The Parsons letter contract was approved and extended, authorizing the expenditure of \$145,000 until August 10, 1978. Stretford Front End Engineering proceeded on schedule with Preliminary Design Review meetings held May 21, June 6 and July 7 for the purposes of design review and finalizing design for cost estimating.

Stretford engineering proceeded into August until subcontract negotiations stalled over patents and proprietary data and Parsons issued a stop work notice August 16, 1978. August scheduled deliverables were not received from Parsons and Project schedule delays are being incurred.

4. Various process trade off studies were conducted testing the technical and economic feasibilities of the following:
 - a) Coal Handling
 - b) Waste Heat Treatment
 - c) Gas Clean-up
 - d) Site Location
 - e) Waste Material Handling
 - f) Compressor Sizing
 - g) Waste Water Treatment
 - h) Indurating Furnace Burner Testing and Retrofit
5. Environmental Activities included data collection for established guidelines on the Minnesota Environmental Worksheet and the Environmental Assessment Statement. The Minnesota Pollution Control Agency indicated verbally their intent to require more detailed evaluations in the following areas:
 - a) Ash disposal (leaching, etc.)
 - b) Sulfur disposal
 - c) Coal transport - within State boundaries
 - d) Coal selection - impact on air quality
 - e) Fines - impact on shipment
 - f) Coal storage runoff
 - g) Heavy metals distribution

Sampling and monitoring requirements for both State and Federal assessments were distributed for DOE review. Qualitative data requirements were defined for feedstock, plant products and solid/liquid effluents.

Solid waste disposal plans were outlined and engineering commenced on evaluating various alternatives.

6. The Minnesota Pollution Control Agency on December 28, 1977 declared the Minnesota Iron Range a Federally designated non-attainment area. If upheld, the construction of the Gasification Plant would cause Erie Mining Company to be considered a new source emission. The question to be resolved is whether the construction of the coal gasification plant will cause EPA or the State to apply a different set of regulations to the existing facilities at Erie other than those which presently apply.

As a result of the ensuing complications, Erie Mining Company applied for, and received approval from the MPCA, a change in status from a non-attainment area to an attainment area.

The United States Environmental Protection Agency changed the non-attainment status of Erie Mining Company to attainment with notice in the Federal Register Volume 43 Number 194 on Thursday, October 5, 1978, pages 45997, 45998.

7. A contract with Environmental Research and Technology, Inc. (ERT/ECI) was prepared and submitted to DOE for approval. DOE approval was granted in July. ERT is responsible for preparation of the Environmental Assessment and the Minnesota Environmental Worksheet.
8. An Environmental Review Meeting was held August 18, 1978, in Fort Collins, Colorado, at the facilities of Environmental Research and Technology, Inc. for the purpose of discussing all outstanding environmental matters. The environmental schedule was set with data and reporting responsibilities outlined.
9. An Environmental Progress Meeting was held with DOE, McKee, Southwest Research Institute, Ecology Consultants, Inc. (ERT) and Erie at the DOE facility - Chicago, on September 12, 1978 for the purpose of assessing environmental progress and finalizing the schedule of environmental activities.
10. Engineering and Socio-economic related information was gathered for the Environmental Assessment Report. A preliminary draft was released December 1978 for concurrent reviews.
11. Coal, Tar and Ash Samples: Foster Wheeler Energy Corporation was retained for the purpose of obtaining oil-tar-ash samples from a two-stage gasifier for environmental chemical and physical analysis. Delays were experienced in the Foster Wheeler coal-oil-tar-ash sampling program scheduled for third quarter completion. Delays were attributed to equipment commissioning problems, vacation schedules and personnel changes in August. In September, Foster Wheeler notified Erie Mining Company that the condition of the Rosebud coal

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

to be used for gasifier startup and testing had deteriorated appreciably. Erie agreed to arrange for a new supply of sized Rosebud coal to be delivered to Foster Wheeler (at Foster Wheeler's expense) for startup.

Foster Wheeler performed the gasifier testing of Rosebud coal in October. A coal and bottom pan ash sample were sent to the Southwest Research for analysis. The gasifier testing of 15 tons of coal did not produce enough tar and oil for sample analysis.

12. Soil Boring I Contract by Soils Testing Services of Minnesota, Inc. for soil boring work at the site was released and completed. The report was issued in July with McKee basing the cost estimate on report results. Soil Boring II Contract was placed on hold pending Phase II continuation.
13. Air Dispersion I Contract was issued first quarter 1978, work was completed and the report distributed. Air Dispersion II Contract was placed on hold pending Phase II continuation.
14. A Cost Review meeting was conducted with DOE June 15 for the purpose of updating and reviewing contract cost amendments.
15. A Contract Pricing Review meeting was held at DOE-Washington Operations Office June 29 presenting and discussing costs with DOE administrative personnel.
16. The Waste Water Treatment Report was issued in August comparing the capital and operating costs of a biological treatment system with an oxidative incineration treatment system.
17. The Coal Handling Trade Off Study was issued September 20, 1978. The results, conclusions and recommendations pertaining to coal and coal fines handling are presented to the DOE for review and comment. The study set the design basis for western coal at 1400 TN/DY with the assumption that all western coals will be briquetted and the design basis for eastern coal will be sized coal received at the plantsite allowing 1187 TN/DY + 12% for fines generation.
18. A BCI Onsite Familiarization Tour was conducted at Erie Mining Company July 10.
19. A DOE Onsite Familiarization Tour was conducted at Erie Mining Company August 15, 1978 for DOE Environmental Personnel.
20. A Coal Gasification Progress Meeting was held in the Chicago facilities of the DOE on September 13, 1978. Participants included DOE personnel - Chicago and Washington Operations offices and Erie Mining Company.

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

21. Briquetting Study Work Definition was prepared for DOE review to assess the scope of work necessary to validate a Coal Fines Agglomeration Study. The outline was presented to DOE at the September Monthly Oral, September 26, 1978.
22. Modeling activity on the plant design model was initiated in September.
23. Cost estimating activity on the data to be presented to McKee for Erie Mining Company's participation in Phases II and III was prepared for review.
24. Preliminary activities were initiated for Work Breakdown Structure - Phases II and III and Reporting Procedures - Phases II and III. Major activity on these items was reviewed in October, November, 1978.
25. The Stretford and Miscellaneous Cost Amendments were prepared for issue to DOE in October for review and approval.
26. In October Erie continued to review and comment on engineering materials released by McKee but major activities were slowed down due to the work stoppages of the Gasifier and Stretford subcontractors. Project deliverables were not received and as a result, engineering designs have been delayed which will result in cost estimating delays and ultimately project schedule delays.
27. In November BCI forwarded partial deliverables to McKee for the front end engineering of the gasifier. A process, P & ID and layout review was held at BCI on November 21-22, 1978. A stirrer design presentation was given to Erie-McKee on November 28, 1978. Erie review of the gasifier design data to be included in the cost estimate and submitted for preliminary design approval is being evaluated.

The gasifier front end engineering preliminary design package is projected for completion January 19, 1979.
28. Technical Report #6, Pot Grate - Low BTU Gas Firing Tests, was issued confirming the combustion of low BTU gas would have minimal metallurgical effects on pellet induration.
29. Project goals relative to management, technical and economic activities were discussed at an Erie/DOE Project Management meeting December 13, 1978. Activities are scheduled to maximize efforts to realize the engineering, technical and economic information necessary to assemble and complete a design package for evaluation.

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

30. Environmental Activities have concentrated on the Environmental Assessment Statement Draft which was issued for DOE review November 28, 1978.
31. Activities continued on the Design Manuals for the Demonstration and Commercial Plants as well as the Engineering Specifications book. These documents are scheduled for completion and distribution on January 19, 1979.
32. The McKee Economic Evaluations for the Demonstration and Commercial Plants were distributed and reviewed in December. Formal presentation to the DOE is scheduled on January 19, 1979.

F. Materials, Licenses and Agreements

1. Minnesota Energy Agency - Certificate of Need. Rules were promulgated in early December 1977 governing the contents of applications for a "Certificate of Need" for fuel conversion facilities to be constructed in Minnesota. The Minnesota Certificate of Need is scheduled for distribution the week of January 14, 1979 for DOE review. The presentation of a final Certificate to the Minnesota Energy Agency is contingent upon the decision by Erie and the DOE to proceed to Phase II of the contract.
2. Stretford Engineering Contract with Ralph M. Parsons and the Parsons-Erie Sublicense Agreements are proceeding very slowly. Parsons issued a stop work notice on August 16, 1978. Patent, proprietary data and the sublicense are the areas of major disagreement. Engineering deliverables have not been released since the stop work notification. Schedule delays have resulted from Subcontract negotiation and approval delays. Patent search and verification activities were initiated.

Negotiations with Ralph M. Parsons concerning the McKee Subcontract and the Erie/Parsons Sublicense agreement were not finalized in 1978. Further negotiations have been cancelled pending agreement to proceed to Phase II of the Erie/DOE Contract.

3. The Gasifier Front End Engineering Contract with BCI was completed in October with approvals given by the DOE and Erie in November.
4. DOE approval of the Clean Air Act, MEA Amendment - Certificate of Need and the General Environmental - Product and By-Product Amendment was received by Erie in September.
5. Procurement Procedures. A procurement package containing our interpretation of contract requirements was submitted to DOE for review. Approval requirements were discussed at a meeting held in Washington, and preparation of a draft approval cycle for all contracts was outlined. The McKee Proposed Procurement Procedures

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

were issued in June for Erie-DOE approval. The document is currently under review and approval is requested. Erie Procurement Procedures were submitted to DOE early in the second quarter and have not been approved. Erie cannot finalize its approval of the McKee procedures until such approval is received. Project, Subcontract, Equipment and Materials Procurement Procedures will be included in the Project Manual when approved.

6. Phase I Subcontracts were issued for miscellaneous engineering and environmental items. A final status of these subcontracts is as follows:

<u>Contract Number</u>	<u>Item</u>	<u>Status</u>
004	Site Exploration I	Complete
008	Noise Survey	Complete
001	Fauna Survey	Complete
002	Flora Survey	Complete
003	Air Dispersion I	Complete
007	Air Dispersion II	Cancelled
010	Printing Services	In Progress
001.2	Front End Engineering/ McKee	In Progress
005	Environmental Research	In Progress
006	Coal Oils - FWEC	Complete
011	Site Exploration II	Cancelled

G. Coal Procurement

1. Preliminary plans for acquiring coal and sampling requirements were issued as Technical Report #4 on April 28, 1978. Gasifier and coal handling design work has been significantly increased by the lack of available sized coal at commercially attractive prices and the realization of the magnitude of degeneration of Western coals into fines. Activity continues on establishing suppliers of both Eastern and Western coals.
2. Erie presented a proposal to replace a "Western" low sulfur non-caking coal with an "Eastern" low sulfur, low caking coal for operational purposes in coal gasification in September. DOE approval was denied.
3. Erie Mining Company obtained 80 ton carload samples of Rosebud coal (May 2, 1978), Clarion Washed Coal (May 4, 1978), and Clarion-Brookville-Kittanning Mixed Coal (May 12, 1978). The coal samples were received at Erie Mining Company, unloaded and stored on specially prepared pads for sample observation and analysis purposes. At the time of coal receipt, size and moisture analysis was performed. Visual observations approximately 6 weeks later determined an appreciable change in the Western Rosebud coal. Physical analysis

Annual Report 1978
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066

was performed on the Rosebud coal at that time. Results indicated size degeneration to 80% fines. On August 13, 1978, the Rosebud Coal ignited under spontaneous combustion conditions and the pile was destroyed. The Eastern Coal samples remain essentially unchanged.

H. Project Management

1. Overall project management structure was finalized with project staffing being organized early in the project. In addition to the reporting requirements of the DOE/Erie contract, various meetings have been scheduled for management coordination, cost review, design review and evaluation on a regularly scheduled basis. As the project matures, and changes to fit the needs of the project occur, management and coordination plans are revised to insure project viability at all levels.

It is expected that improved methods and plans for project management will be incorporated into Phases II and III planning procedures.

2. Procurement Procedures. The McKee Proposed Procurement Procedures were issued in June for Erie-DOE approval. The document is currently under review and approval is requested. Erie Procurement Procedures were submitted to DOE early in the second quarter and have not been approved. Erie cannot finalize its approval of the McKee procedures until such approval is received. Project, Subcontract, Equipment and Materials Procurement Procedures will be included in the Project Manual when approved.

I. New Requirements

1. The 10 Code of Federal Regulations, Section 711, which concerns the release of proprietary data to the public continues to be reviewed and evaluated. Erie's recommendation will be available when the Government has completed and submitted its review for comment. The current new contractual language being developed for the Parsons and BCI subcontracts will require close coordination with these new requirements.
2. The Best Available Control Technology - New Source Pollution Standard decision on the regulations applicable to the existing plantsite will require a combustion gas stack analysis from the current operation to present to the DOE-EPA for discussion of the effects of the coal gasification plant on the existing plant emissions.

J. H. Fatum

PROGRAM DIRECTOR FOR
ERIE MINING COMPANY

Annual Report 1977
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Annual Report 1977
Period Ending December 31, 1977

EXECUTIVE SUMMARY

A. Contract Initialization

The contract between Erie Mining Company and the Department of Energy was finalized October 19, 1977. As we have operated under a letter agreement with DOE since August 17, 1977, while awaiting contract finalization, we have prepared this first report to cover the period between August 17 and December 31.

B. Contract Deliverables

The Consolidated Management Plan, Employee Health and Safety Plan, and associated correspondence were prepared for delivery January 4, 1978, per the deliverable schedule.

C. Project Schedule

In general, the project is on schedule within cost estimates, and we feel proceeding in an acceptable manner. Despite some delay in contract signing, preventing enquiries to gasifier supplies being issued, we hope to remain within the projected schedule, provided vendor response to our inquiries will provide the necessary data for environmental studies.

Current major activities during the period included:

1. Gasifier Selection
2. Selection Inspection Trip
3. Various Process and Trade-Off Studies
4. Environmental Assessment
5. Project Organization

Despite the fact that Erie was on strike between August 1 and mid-December, we were able to attain union consent to allow site visits and preliminary site evaluation studies are either completed or well underway. Initial meetings have been held with both State and local agencies and reactions appear very positive. Our ability to begin environmental work in August under letter approval from DOE, has avoided considerable delay in data gathering which would have otherwise been delayed until mid 1978 due to weather conditions.

Costs were slightly lower than anticipated due to the Holiday period and vacations. Snow storms, preventing travel and resulting in some staff absences further affected costs. These problems did not affect our ability to prepare the required deliverables and work continued on the major tasks scheduled.

Annual Report 1977
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

D. Major Activities

1. Gasifier Selection

Preliminary gasifier definition and selection activities centered on issuance of inquiries to the various gasifier and Stretford suppliers. This activity was planned to be completed prior to the gasification inspection trip to allow vendor response preparation while the process team were involved in the Gasifier Selection Trip.

Inquiries were issued the first week of November.

Following issuance of inquiries to the gasifier and Stretford vendors, basic process definition continued. Anticipating questions from the vendors on the inquiries, meetings were scheduled with each vendor to discuss and define subjects which could require further elaboration. Meetings were held and responses to all vendor questions were formally returned to all competitors.

Utilizing the information McKee and PM had previously developed, the vendor inquiry responses, and the detailed information gathered on the inspection trip in South Africa, we should be able to make our selection of gasifier system in February provided the vendors are able to respond satisfactorily.

2. Selection Inspection Trip

Starting in South Africa, 9 gas plants and various test and research facilities were visited. The reception was excellent and the various industrial hosts were exceptionally cooperative in providing operating data, technical problem information which included samples of various products and effluents, and waste, for our perusal. The information we gathered has already helped us to improve our basic design concept and will provide invaluable assistance in evaluating the responses from our vendor inquiries, and avoiding potential environmental problems.

3. Process Trade-Off Studies - Demonstration Plant Design

While the process inspection team was overseas, process trade-off studies continued according to plan. Progress on coal handling gas clean-up, site location, and various materials handling studies were made.

Definition of coal requirements and preparation of the detailed design basis for the plant commenced.

The "Site Model" was completed except for the "legends" and gasification section insert. The model will be used in its current form, for environmental presentations and public hearings for obtaining a Minnesota Certificate of Need.

Annual Report 1977
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

4. Environmental Assessment

Data collection, and environmental reviews are well underway. The project team has established the guidelines and standards that are to be used for Phase I activities, reflecting State, local and Federal requirements as well as ensuring that the standards of the Erie multiple use environmental systems are not upset.

The preliminary plant site - subsurface exploration bids were received late in December, and evaluation is expected to be completed early in January. It is likely that this will be the first sub-contract which will require DOE approval.

Environmental data collection and preparation of rough draft copies of the existing environmental setting commenced. Evaluation and scheduling of the process related information was completed anticipating submissions by the gasifier and Stretford suppliers early in January. Initial reports received on indigenous flora and fauna (endangered species) indicate that there are no unusual environmental problems in the site area.

E. Financial Arrangements - Agreements

1. In collaboration with the DOE, Erie, and the Chemical Bank of New York, arrangements were made to provide the agreements necessary to fund the Modified Letter of Credit for Phase I. Draft agreements have been submitted for DOE approval.

2. The McKee/ Erie contract has been agreed to "in principle" and final revisions submitted to DOE for approval.

Erie has given an extension of funds, on the current letter agreement to cover McKee activities until the end of January, 1978, anticipating contract approval and execution prior to that time.

F. Non -Scheduled Events

1. Early Report Dates: Per DOE request we are reviewing the cost, reorganization requirements, and effect on management and control procedures to produce monthly deliverables by the tenth of each month.

Initial comments from McKee and Erie site locations were completed in December. It appears that the added cost will be significant, and require contract amendment should DOE wish to proceed in this manner.

Annual Report 1977
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Our evaluations indicate that deterioration of cost control would result and significant change of both Erie and McKee procedures is required. Due to the possible complex interactions with cost control and audit procedures, we have been unable to complete our evaluation prior to year end, however, definitive costs will be provided in January.

2. Environmental Monitoring: Per letter request from DOE, we are reviewing the impact of new Federal requirements for special testing of ash, sulphur, and coal oil products. Initial perusal of these requirements indicates that the testing suggested is considerably more complex, and voluminous than we anticipated when project costs were estimated. The impact on cost and project schedule is being reviewed.

In addition, the Minnesota Pollution Control Agency has indicated verbally their intent to require more detailed evaluations in the following areas:

1. Ash disposal (leaching, etc.)
2. Sulfur disposal
3. Coal transport - within State boundaries
4. Coal selection - impact on air quality
5. Fines - impacts on shipment
6. Coal storage runoff
7. Heavy metals distribution

It is our understanding that these requirements are possibly more stringent than Federal requirements and will increase the scope and cost of this task significantly.

The MPCA has on December 28 also declared the Iron Range a non-attainment area. The construction of the Gasification Plant could require the total Erie operation to comply as a "new source emission."

If the MPCA persists, we expect considerable additional costs for compliance studies to meet the new set of ground rules.

We will, in January, complete review and evaluation of these new requirements as they become known; however, it is apparent that additional costs could exceed \$500,000 should we be required to comply with all the new requirements.

3. Minnesota-Certificate of Need: The Minnesota Energy Agency in early December promulgated rules governing contents of applications for Certificate of Need for fuel conversion facilities. The agency has not finalized requirements at this date. Copies of the proposed regulations have been transmitted to DOE personnel for their review.

Annual Report 1977
Erie Mining Company
Coal Gasification Project
DOE Contract ET-78-C-01-2578

Costs of the "Certificate of Need," although allowable in Phase I were not included in the cost estimates of the contract, as they were unknown at that time.

Preliminary discussions were held with agency personnel concerning the proposed Certificate of Need. We are primarily concerned with the impact on the project schedule should the proceeding run its maximum time limits. Permits for construction could be delayed until June 1979 effectively delaying Phase II by six months.

We will, in January, pursue early filing and/or faster processing of Certificate of Need with the Minnesota Energy Agency, in an effort to alleviate any possible project delay.

G. Project Management

1. Project Organization

Overall project management structure was finalized and project staffing is being undertaken as the attached cost and manpower management plans indicate.

In addition to the formal reporting requirements of the DOE/Erie contract, we have initiated weekly meetings to provide management coordination as well as the forum for brainstorming, evaluation, or eliminating potential problems before they occur. Major activity group leaders are present. DOE representatives have attended all such meetings and input directly to the decision and planning process. This approach has eliminated considerable loss of time in communication, and reduced paper work considerably. Project control and "Problem--Bottle-neck" monitoring can be, will be, and have been handled in this manner.

J. H. Fatum

Program Director for
Erie Mining Company

JHF:1jb

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

IV. COMPLETION STATUS

Contract Status

Following is the Contract Deliverable Report and the Cost Variance Summary:

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
A. CONTRACT DELIVERABLE REPORT

LEGEND

- I. DESIGN MANUAL
 - A. Demonstration Plant
 - B. Commercial Plant
- II. SPECIFICATIONS
- III. INSPECTION TRIP
- IV. PROJECT MANUAL
- V. SUBCONTRACTS
 - A. Erie-McKee
 - B. McKee-BCI
 - C. McKee-Parsons
 - D. Erie (Flora)
 - E. Erie (Fauna)
 - F. Erie-Interpol
Air Dispersion 1
 - G. Erie-Soil Testing Service
Soil Boring 1
 - H. Erie-Environmental Research Technology
 - I. Erie-Foster Wheeler (Correspondence)
Coal - Oil - Tar
 - J. Erie-Noise Survey
- VI. TECHNICAL REPORTS
 - A. Gasifier Selection
 - B. Environmental Impact
 - C. Stretford Selection
 - D. Plan for Obtaining Coal
 - E. Coal Handling Study
 - F. Pot Grate Study
 - G. Stirrer Material Study
 - H. Briquetting Study
- VII. ECONOMIC ASSESSMENT
 - A. Demonstration Plant
 - B. Commercial Plant

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

VIII. TRADE-OFF STUDIES

- A. Waste Heat Study
- B. Compressor Sizing
- C. Waste Water Treatment
- D. Sized Vs. Unsized Coal
- E. Furnace Retrofit
- F. Ash Disposal Study
- G. Sulfur Disposal Study

IX. ERDA CORRESPONDENCE (By Number)

X. OTHER

- A. Environmental Assessment
- B. Certificate of Need
- C. Plan for Obtaining Materials, Licenses and Agreements

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
<u>PART 1</u> <u>SCOPE OF WORK</u>										
1. Shall provide necessary personnel, facilities, equipment, materials, travel and other services			3	4					38	
2. Gas shall be used at Hoyt Lakes, MN	1A,B					6F	7A	8E		10B,C
3. Shall utilize and test fuel gas from various coals	1A					6D	7A	8F,G	158	10C
4. Demonstration experience shall be utilized to forecast plant requirements	PHASE III ACTIVITY									
=====										
<u>PART 2</u> <u>GENERAL DESIGN BASIS</u>										
I. <u>Demonstration Plant Basis</u>										
5. Demonstration plant shall have nominal throughput of 500 ton/day	1A						7A			10A
6. Shall select a gasifier and Stretford unit				3		6A,C			76,82,65	
7. Demonstration plant is to be located on Erie Mining plantsite	1A					6F	7A	8F,G	57	10A,B
8. Shall utilize best technology to minimize energy consumption	1A	2		4		6A-F	7A	8A,B,C,D, F,G		

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
II. <u>Coal Specification</u>										
9. Shall have ability to process coals of at least 2.5% sulfur (MAF) with an FSI of at least 5.0	1A				5A, B, C	6A	7A	8F, G	110	10A
10. Shall process Brookville, Clarion, Davis-Dekovan or Kittaning seam coal or Government approved equivalent	1A				5A, B, C	6A, C, D, E	7A	8F, G	110, 112, 325, 158, 175	10A
11. Shall process Rosebud or McKay seam coal or Government approved alternate (above choices to be made during Phase I)	1A				5A, B, C	6A, C, D, E	7A	8F, G	110, 112, 325, 158, 175	10A
III. <u>End Product Characteristics</u>										
12. Fuel gas produced shall have nominal heating value of 160-180 Btu/cu ft.	1A				5A, B, C	6A, C	7A	8A		10A
13. Demonstration plant fuel gas shall have a nominal value of 7.4 x 10 Btu/day	1A				5A, B, C	6A, C	7A	8A		10A
IV. <u>Demonstration Plant Operation and Fuel Gas Use</u>										
14. Phase III demonstration operations shall include 12 months shakedown period					5A, B, C	6E				
15. Plus 12 months sustained operation					5A, B, C	6E				

ERIE/DOE CONTRACT
EW-78-C-02-5066

[illegible]

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
23. Commercial plant shall incorporate the demonstration plant	1A,B				5D,E,F,G J,H	6A,C,D E	7A,B	8A,B,C,D E,F,G		10A,B,
<u>PART 3 WORK BREAKDOWN</u>										
<u>I. Phase I - Program Development and Conceptual Design</u>										
<u>A. Task I - Conceptual Design and Evaluation of Commercial Plant</u>										
<u>1. Gasification Technology Selection</u>										
24. Shall perform gasifier process tradeoff studies			3		5A	6A		8F,G	65	10A
<u>2. Process Engineering Design</u>										
25. Shall prepare detailed heat and material balances	1B		3			6E,F	7B	8A,F,G	76,82	10A,B
26. Shall accomplish the following:										
a. prepare PFD;	1B	2				6E	7B	8A,B,C,D E,F,G		10A,C
b. prepare P&ID's;	1B	2				6E	7B	8A,B,C,D E,F,G		10A,C
c. write process description;	1B	2		4		6E	7B	8A,B,C,D E,F,G		10A,C
d. prepare process duty specifications;	1B	2				6E	7B	8A,B,C,D E,F,G		10A,C
e. identify product and by-product yield;	1B	2				6B,E	7B	8A,B,C,D E,F,G		10A,B C

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
f. identify effluent stream yield;	1B	2				6B,E	7B	8A,B,C,D E,F,G		10A,B, C
g. determine requirements for raw materials, utilities, transportation for construction and operation of the commercial plant;	1B	2				6E	7B	8A,B,C,D E,F,G	158,325 175	10A,B, C
h. define storage requirements;	1B	2				6E	7B	8A,B,C,D E,F,G		10A,C
i. design test burner		2				6F		8E,B	33,209 320	
3. <u>Risk Analysis</u>										
27. Shall prepare in-depth technical and economic evaluation			3		5J,I,G,F, H	6A,C,E,F		8A,B,C,D, F,G		10C
28. Shall identify potential process problems			3		5I,F,G,H, J	6A,C,E,F		8A,B,C,D E,F,G	262,287	10B
29. Identify and analyze high-risk areas	1B	2				6E	7B	8A,B,C,D E,F,G	320	10A,C
4. <u>Project Engineering Design</u>										
30. Shall define mechanical, structural, electrical and civil engineering requirements to determine technical feasibility	1B	2	3		5F,G,H,I, J	6A,C,F	7B	8A,B,C,D E,F,G		10C
31. Shall provide specifications to determine investment and operating cost factors		2			5A,B,C	6D,E	7A,B			10C

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

32. Shall include the following:
a. preparation of key plot plan

process unit battery limits
roads and railroad layouts
buildings
waste disposal areas
utility areas
receiving and storage areas

- b. preparation of equipment list
for major equipment showing

description
operating temperature and
pressure
size parameters
materials of construction
performance requirement
major spares

1	2	3	4	5	6	7	8	9	10
DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
1B				5A, B, C, G, D, E, F, H, J	6B, C	7B	8F, G		10A, B, C
1B	2			5A, B, C	6E, F	7B	8E		
1B	2			5A, B, C	6E	7B	8A, B, C, E, F, G		10A, C

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
c. performance of tradeoff comparisons										
coal sizing and handling	1B		3		5A, B, C	6D, E	7B	8D		10C
waste disposal	1B		3		5A, B, C, D, E F, H, G, I, J	6B, E		8A, C, F, G		10A, B,
by-product disposal	1B		3		5A, B, C, D, E F, H, I, J	6B, E	7B	8A, F, G		10A, C
equipment sizing	1B	2	3	4	5A, B, C, I	6A, C, E, F	7B	8A, B, C, D, E, F, G		10A, C
5. <u>Cost Estimate</u>										
33. Shall prepare + 20% budget cost estimate based on the equipment list	1B	2			5A, B, C, F, G H, I, J	6E, D	7B	8A, B, C, D, E, F, G		10C
34. Prepare a + cost estimate for the delivered and erected plant	1B	2			5A, B, C, D, E F, G, H, J	6E, F	7B	8A, B, C, D, E, F, G		10A, B,
35. + 20% budgetary operating cost estimate	1B			4	5A, B, C, H	6D, E	7B	8A, B, C, D, E, F, G		10A, C
36. Identify credits for products and by-products	1B				5A, B, C, H	6D, E	7B	8A, F, G	158	10A, C
6. <u>Economic Impact Analysis</u>										
37. Prepare an Economic Evaluation	1B				5A, B, C	6E	7B		24, 69	10A
38. Prepare an Impact Evaluation	1B				5A, B, C	6E	7B			
39. Calculate estimated fuel gas cost using 12% DCF					5A, B, C		7B			

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
40. Project inflation over the life of the plant					5A, B, C		7B			
41. Identify incentives					5A, B, C		7B			
7. <u>Environmental Impact Analyses</u>										
42. Prepare preliminary Environmental Impact Analysis			3	4	5A, B, C, D, E	6A, B, C			72	10A
43. Identify potential impact on air and water quality	1B		3	4	5A, B, C, D, E F, G, H, I, J	6A, B, C, D E, F		8A, C, F, G	117, 101, 135, 137	10A, B, C
44. Identify Federal, State, and local requirements		2		4	5A, B, C	6B			158	10A, B, C
45. Identify composition of all effluent streams	1B		3	4	5A, B, C, I	6A, B, C, D, E, F		8A, C, D, E, F, G		10A, B, C
46. Discuss effluent control technology	1B			4	5A, B, C	6B, C, E, F	7B	8A, F, G	72, 296	10A, C
8. <u>Demonstration Plant Recommendations</u>										
47. Use the design, economic and environmental impact evaluations to support demonstration plant recommendation	1A, B	2	3	4	5A-J	6A-H	7A, B	8A-G		10A-C
48. Demonstration plant to be an integral part of the commercial plant	1A, B				5A, B, C					

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
49. Demonstrate technical and economic performance of the plant	1A, B	2			5A, B, C	6A, C, D, E	7A, B	8A, B, C, D E, F, G		10A
50. Recommend detailed process and mechanical conceptual design	1B	2			5A, B, C					
B. <u>Task II - Demonstration Plant Process and Mechanical Design</u>										
51. Prepare a demonstration plant design approved by the Government	Government Approval Necessary After Issue Of Design Manual									
1. <u>Process Engineering Design</u>										
52. Prepare heating and material balances and PFD's	1A	2			5A, B, C	6E	7A	8A, B, C		10A
53. These diagrams to include reference numbers	1A	2			5A, B, C					
54. Prepare separate drawings for flare and emergency systems	1A	2			5A, B, C		7A			
2. <u>Process Description and Rationale</u>										
55. Prepare a report describing the process	1A				5A, B, C		7A			10A
56. Provide rationale for the selection of the processes			3		5A, B, C	6A, C, E		8A, B, C, D		10A
57. Demonstration plant process will be the same as commercial plant processes	1A, B	2			5A, B, C		7A, B			10A

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
58. Identify and explain process differences, if any	1A,B	2			5A,B,C		7A,B			10A
59. Review high-risk areas					5A,B,C				320,325, 287,175	
3. <u>Preliminary Engineering and Layouts</u>										
60. Prepare equipment lists and first issue of engineering flow diagrams					5A,B,C					
4. <u>Engineering and Equipment Specifications</u>										
61. Complete the engineering design and specifications to determine capital investment and prepare a second iteration of the engineering flow diagrams		2			5A,B,C					
62. Construct models										
a. site model									323	
b. scale plant model										
63. Prepare the following documents:										
a. standards for drawing preparation;		2			5A					
b. summary piping specifications;		2			5A					
c. engineering codes and standards applications;		2			5A					10C

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
d. major equipment specification sheets;	1A,B	2			5A,B,C		7A,B			
e. electrical one-line drawings;	1A,B				5A,B,C					
f. major in-line instrumentation specifications;	1A,B				5A,B,C					
g. building sketches and specifications including craft shops, control rooms, service buildings (i.e., locker rooms, plant offices and meeting rooms);	1A,B				5A,B,C	6E	7A,B			10A,D, E
h. site preparation drawings and specifications;	1A,B	2			5A,B,C	6E	7A,B			10A,D, E
i. preliminary utility layout;					5A					10D,E
j. storage layout;	1A,B				5A		7A,B			10A,B
k. underground sewage and drainage drawings and specifications;	1A,B	2			5A		7A,B			10A
l. flare, blowdown and emergency systems and flow diagrams;	1A,B			5A		7A,B				10A,B
m. preliminary piping layouts; and				5A						10D,E
n. firefighting system flow diagram.	1A,B			5A		7A,B				10A

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1 DESIGN MANUAL	2 SPEC.	3 INSP. TRIP	4 PROJECT MANUAL	5 SUB- CONTRACTS	6 TECH. REPORTS	7 ECON. ASSMT	8 TRADE-OFF STUDIES	9 ERDA CORRES.	10 OTHER
64. Conduct preliminary design review	1A,B				5A,B,C					
5. <u>Process Engineering Report</u>										
65. Prepare demonstration plant process and mechanical design report	1B	2			5A,B,C					10A
66. Report the basis for the above decisions	1B		3		5D,E,F,G, H,I,J	6A,B,C,D E,F	7A	8A,B,C,D, E,F,G	ALL	10A,C
6. <u>Preliminary Procurement Requisitions</u>										
67. Prepare preliminary procurement requisitions	1A,B				5A,B,C		7A,B		158	
C. <u>Task III - Phase II and III Current Working Estimate</u>										
1. <u>Detailed Current Working Estimate for Phase II</u>										
68. Prepare a + 15% definitive capital investment estimate					5A,B,C,G		7A			10A,B
69. Include mutually agreed upon escalation factors					5A		7A			10A
70. Prepare a material tradeoff, include vendor quotations	1A				5A,B,C	6D,E	7A			10A
71. Obtain labor availability rates					5A		7A			10A,F

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
72. Determine labor productivity for the area					5A		7A			10A, B
2. <u>Detailed Current Working Estimate for Phase III</u>										
73. Prepare a definitive operating cost estimate					5A, B, C	6D, E	7A			10A, B
74. Above estimate shall utilize project design data and staffing plan				4	5A, B, C	6D, E	7A			10A, B
75. Establish wage rates, overheads, benefits, etc.					5A, B, C	6E	7A			10C
76. Estimate startup and initial operation costs					5A, B, C	6E	7A			10C
77. Estimate fuel gas cost including by-products					5A, B, C		7A			
D. <u>Task IV - Site Evaluation and Agreements</u>										
1. <u>Site Data</u>										
78. Prepare soil survey, aerial photographs, and topographical maps					5A, B, C, G, H	6E			72	10A, C
79. Provide data and recommendations for foundations, roadways, etc.					5A, B, C, G, H	6E			72	10A, C

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
80. Provide information on water table, soil porosity and stability					5A,B,C,G, H	6E			72	10A,C
81. Provide basis for plant layout					5A,B,C,G, H	6E			72	10A,C
82. Plant location shall be tied to grid systems					5A,B,C,G, H	6E			72	10A,C
2. <u>Develop Site Agreement</u>										
83. Identify and develop site agreements									57	
E. <u>Task V - Demonstration Plant Environmental Analysis</u>										
84. Furnish data to assist Government in preparation of EIA and EIS				4	5A-J	6A-E		8C,D,F,G	72	10A,B, C
85. Provide data to insure compliance with Federal, State and local regulations				4	5A,B,C,D E,F,G,H I,J	6A,B,C, D,E		8C,D,F,G	72,158	10A,B, C
86. EIA and EIS prepared in accordance with 10 CFR, Part 711 and 40 CFR, Part 1500 (38 FR 20550)				4	5A-J	6A-E		8C,D,F,G	72	10A,B, C
87. Shall carry out the following tasks				4	5A-J	6A-E		8C,D,F,G	72	10A,B, C

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
88. Prepare a plant to accomplish the following:										
a. <u>Project Description for Environmental Analysis</u>				4	5A-J	6A-E		8C,D,F,G		10A,B,C
89. Describe location, purpose, and list operating upsets caused by equipment failure										
b. <u>Demonstration Plant Environment</u>				4	5A-J	6A-E		8C,D,F,G		10A,B,C
90. Describe the plantsite and surrounding area										
c. <u>Significance of Project Operation with Respect to the Environment</u>				4	5A-J	6A-E		8C,D,F,G		10A,B,C
91. Identify and evaluate beneficial and/or detrimental environmental effects				4	5A-J	6A-E		8C,D,F,G		10A,B,C
92. Examine key concerns regarding regulations and requirements				4	5A-J	6A-E		8C,D,F,G	158	10A,B,C
93. Prepare system analyses of detailed plant and site characteristics				4	5A-J	6A-E		8C,D,F,G		10A,B,C
d. <u>Mitigation Measures</u>										
94. Insure pollutant levels not exceeded				4	5A-J	6A-E		8C,D,F,G		10A,B,C

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
95. Describe process and equipment alternatives and logic				4	5A-J	6A-E		8C,D,F,G		10A,B, C
96. Describe safe guards and monitoring during plant construction and operation										
e. <u>Adverse Environmental Effects Which Cannot Be Avoided</u>				4	5A-J	6A-E		8C,D,F,G		10A,B, C
97. Identify detrimental aspects which cannot be eliminated or mitigated										
f. <u>Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity</u>				4	5A-J	6A-E		8C,D,F,G		10A,B, C
98. Assess cumulative and long-term impacts				4	5A-J	6A-E		8C,D,F,G		10A,B, C
99. Assess actions that will restrict beneficial uses of the environment or pose long-term risks				4	5A-J	6A-E		8C,D,F,G		10A,B, C
100. Weigh short-term gains against long-term implications										
g. <u>Irreversible and Irretrievable Commitments of Resources</u>				4	5A-J	6A-E		8C,D,F,G		10A,B, C
101. Discuss any irreversible or irretrievable commitments of resources				4	5A-J	6A-E		8C,D,F,G		10A,B, C

ERIE/DOE CONTRACT
EW-78-C-02-5066

[illegible]

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
F. <u>Task VI - Materials, Licenses and Agreements</u>										
1. <u>Plan for Obtaining Coal, Water, Power, Chemicals</u>	1A,B					6D,E		8D	112,158	10C
113. Perform the following:										
a. establish a supply of coal feed;						6D,E		8D	158	10C
b. develop plans for obtaining raw materials;									112,110 287	10C
c. develop plans for obtaining the water;	1A								310	10C
d. develop plans for acquiring all easements; and									325	
e. Develop plans to secure electricity.	1A								175	10C
114. Above plans to include draft agreements					5B,C	6D			57	10B,C
2. <u>Plans for Use and Disposition of Products</u>										
115. Develop plans to utilize products and by-products	1A				5A,B,C	6D,E,F	7A	8A,F,G	158	10C
116. Develop plans for disposing of nonusable by-products and waste streams					5A,B,C	6E		8F,G	158	10A, C

ERIE/DOE CONTRACT
EW-78-C-02-5066

[illegible]

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
123. Prepare plans and procedures for managing engineering, construction, and operation during Phases II and III				4					302,351	
124. Plans shall include the following:										
a. schedules and control;				4					89,139	
b. cost estimating and control;				4					89,139	
c. configuration management;				4					89,139	
d. change order control;				4					89,139	
e. engineering, construction, and operation staffing and management;				4					89,139	
f. equipment procurement;				4					89,139	
g. logistics planning;				4					89,139	
h. labor surveys and planning;				4					89,139	
i. safety and environmental programs;				4					89,139	
j. reports of work;				4					89,139	
k. operator training (including preliminary operation and maintenance manuals);				4					89,139	

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
1. startup and shakedown; and				4					9	
m. demonstration plant operation and evaluation.				4					9	
125. The above plans shall be complete enough to initiate Phase II and III without delay				4					158	
H. <u>Task VIII - Economic Reassessment</u>										
1. <u>Commercial Plant</u>										
126. Perform an economic reassessment and evaluation					5A, B, C		7B		232,288, 388	
2. <u>Demonstration Plant</u>										
127. Perform an economic reassessment and evaluation					5A, B, C		7A		232,288, 388	
128. Delineate and explain the differences in costs					5A, B, C		7A, B			
I. <u>Task IX - Technical Support</u>										
129. Identify and propose solutions for shortcomings critical to the de- sign, construction, and operation of the demonstration plant, includ- ing the test burner	1A				5A, B, C				62,209, 262,287	
130. Prepare detailed plans and cost estimates for each activity							7A		232,288, 388	

ERIE MINING COMPANY
COAL GASIFICATION PROJECT
CONTRACT DELIVERABLE REPORT

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHEI
J. <u>Task X - Project Management</u>										
131. Prepare management plan				4					45,40, 42	
132. Provide all necessary project management activities				4						
133. Update the above plan as required				4					69,46, 89,139	
134. Provide facilities in the A/E offices for Government representatives					5A					
135. Above facilities for at least 10 representatives and two secretaries					5A					
136. Facilities shall include furniture, supplies, typewriters, telephone service and access to reproduction facilities.					5A					
K. <u>Task XI - Long-Lead Items</u>										
1. <u>Procurement Schedule for Long-Lead Items</u>										
137. Develop and submit a procurement schedule for long-lead items	1A				5A, B, C		7A			
138. Determine when an item is required in the field and when purchase order should be placed	1A				5A, B, C		7A		158,89, 139	
139. Establish priorities for process and engineering design of equipment	1A				5A, B, C		7A			

ERIE/DOE CONTRACT
EW-78-C-02-5066

	1	2	3	4	5	6	7	8	9	10
	DESIGN MANUAL	SPEC.	INSP. TRIP	PROJECT MANUAL	SUB- CONTRACTS	TECH. REPORTS	ECON. ASSMT	TRADE-OFF STUDIES	ERDA CORRES.	OTHER
140. Obtain approval and authority from the Government to proceed with purchase of long-lead items			PHASE II ACTIVITY							
2. <u>Vendor's Quotations</u>										
141. Obtain quotations and warranties for all long-lead items	1A, B		NOT AVAILABLE AT THIS TIME							
<hr/>

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

B. COST VARIANCE SUMMARY

PHASE I

I. REPORTING PERIOD

October 19, 1977 - February 28, 1979

II. COST AMENDMENT

During the execution of the above contract, it became necessary to vary from the original contract estimate of \$2.2 million. This variance amounted to an additional \$1.8 million.

Additional costs were incurred due to expanding environmental requirements, rates and overhead charges, delays in approval of subcontracts and necessary engineering required to minimize technical risks. The following is a summary of the various requests for contract amendment that Erie Mining Company submitted for approval by DOE. Approval for cost extension was granted through Cost Amendments A-001 through A-005 for an amount of \$1,799,981. This amounted to an estimated total cost for Phase I activities of \$3,999,981.

Certificate of Need for Minnesota Energy Agency: \$175,196

Due to new requirements as imposed by the Minnesota Energy Agency, it became necessary to receive approval of a Certificate of Need for the commercial size gasification facility. This work was initiated in

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Phase I of the project to avoid approval delays required for the construction of the Demonstration size plant, expandable to the Commercial size plant.

Clean Air Act Amendments of 1977: \$169,127

The Clean Air Act Amendments of 1977 resulted in additional environmental requirements that were not anticipated at the time of the original contract estimate. This resulted in additional manpower and money being spent for air dispersion modeling, analyzing background data, reviews with the Minnesota Pollution Control Agency and Environmental Protection Agency regarding non-attainment designation and the PSD permit requirement.

General Environmental Assessment Product and By-Product Analysis: \$247,858

Considerable time and effort was expended to define new State and Federal requirements for product and by-product analysis. As a result, it became necessary to process samples of design basis coals and proceed with several detailed chemical and physical analyses of plantsite products and by-products. Production of coal ash and coal oil samples in a pilot plant gasifier became necessary to meet the new environmental data requirements.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Gasifier Front End Package: \$526,248

As research work developed on the project, it became apparent from preliminary process design, a site inspection trip, discussions and negotiations with the gasifier vendor, that additional work was required to meet all of the requirements of Phase I. Specific items that required additional work included a plant capable of handling the various size ranges of Western and Eastern coals, additional site details on the stirred reactor design in order to improve feasibility before proceeding with Phase II, and additional environmental data required from the gasifier vendor.

Miscellaneous Contract Price Estimates: \$545,148

Additional costs incurred:

1. Phase I Extension: \$315,813

This was due, in part, to delays incurred in major subcontract approvals.

2. Rates and Overhead Revisions: \$114,764

Additional costs incurred because of basic wage rates increases, overhead and fringe increases since the original contract estimate.

3. Coal Fines Handling Study: \$114,571

During the initial design and coal procurement activities, technical data indicated that gasification of Western coal would be a problem due to the large amount of fines created during mining, handling and storage. Therefore, to improve the technical risk of the

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

project and determine the economics or alternatives of handling coal supplies and coal fines, it was determined necessary to initiate a detailed review of the technical and economic aspects of Western and Eastern coal handling.

III. TASK VARIANCE (000 Omitted)

Task 1: Conceptual Design and Evaluation of Commercial Plant

CONTRACT ESTIMATE: \$243.1 Actual Expenditure: 454.4 VARIANCE: 62.3

Amendment \$149.0

\$392.1

Additional costs occurred in this task area due to an increased cost in development of a stirred gasifier. Also, additional expenditures were required for the evaluation of coal fines. The Coal Handling Trade-Off Study was a major portion of this increase. Some overlap of TASK V was incurred due to difficulty in separating detailed engineering work. Delays contributed to increased costs by reducing engineering design efficiency.

TASK 2: Demonstration Plant Process and Mechanical Design, Stretford

S/C by Parsons, Gasifier S/C by B.C.I.

CONTRACT ESTIMATE: \$ 896.6 Actual Expenditure: 1629.2 VARIANCE: 25.3
with Parsons

Amendment \$ 707.3 Actual Expenditure: 1339.8 VARIANCE: (264.1)
without Parsons

\$1603.9

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

As explained in the cost amendment required for the front end engineering packages, additional money was required for this task. Other specific areas requiring additional work include the coal fines handling, plant-site railroad layouts, utility tie-ins, environmental considerations and management review of technical plans.

NOTE: Task 1 and 2 should be combined as a single task because work, as performed, is indivisible.

NOTE: Parson's has been paid \$145,000 per the McKee letter of Subcontract.

TASK 3: Phase II and III Current Working Estimates

CONTRACT ESTIMATE: \$141.5 Actual Expenditure: 167.9 VARIANCE: 19.2
Amendment \$ 7.2
 \$148.7

The capital and operating costs exceeded the original estimate. Numerous reviews, meetings and cost estimate revisions were required to achieve the best possible design at the lowest expenditure. Additional work was required by McKee to estimate Stretford unit because subcontract for Stretford was not finalized.

TASK 4: Site Evaluation and Agreement

CONTRACT ESTIMATE: \$21.5 Actual Expenditure: 5.1 VARIANCE: (18.6)
Amendment \$ 2.2
 \$23.7

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

The actual expenditure was lower than anticipated. Only seven site borings were required to compile data sufficient for development of the cost estimate. Additional site work was held under reduced scope of work.

TASK 5: Demonstration Plant Environmental Analysis

CONTRACT ESTIMATE: \$ 73.1 Actual Expenditure: 212.5 VARIANCE: (260.1)

Amendment \$399.5

\$472.6

Cost amendments were required for the Clean Air Act Amendments of 1977 and General Environmental Assessment Product and By-Product Analysis. These environmental considerations became requirements after the Erie/DOE Contract was signed. Some environmental engineering was charged to Tasks 1 and 2 and work was reduced by mutual agreement.

TASK 6: Materials, Licenses and Agreements Report/Plan

CONTRACT ESTIMATE: \$ 38.8 Actual Expenditure: 91.4 VARIANCE: (101.9)

Amendment \$154.5

\$193.3

The Minnesota Energy Agency required a Certificate of Need after the contract was signed. Newly imposed environmental standards required additional work. Certificate of Need was drafted, printed and held under reduced scope of work. No hearings or permit activities were conducted.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

TASK 7: Proposed Methods and Plans for Phase II, III

CONTRACT ESTIMATE: \$49.6 Actual Expenditure: 9.8 VARIANCE: (41.2)

Amendment \$ 1.4

\$51.0

Activities in this area were planned for the latter part of Phase I.

In October 1978, a Reduced Scope of Work minimized activities in this task.

TASK 8: Economic Reassessment

CONTRACT ESTIMATE: \$30.4 Actual Expenditure: 21.3 VARIANCE: (10.4)

Amendment \$ 1.3

\$31.7

Preliminary work was started in this task; however, after cost estimates became excessive, activities were limited to those necessary to make a decision to proceed with Phase II.

TASK 9: Technical Support Plan

CONTRACT ESTIMATE: \$45.1 Actual Expenditure: 7.3 VARIANCE: (39.1)

Amendment \$ 1.3

\$46.4

Activities were limited in this area by the Reduced Scope of Work. The technical reports required under the Contract Phase I Scope of Work, were not finalized.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

TASK 10: Project Management

CONTRACT ESTIMATE: \$ 660.3 Actual Expenditure: 977.9 VARIANCE: (61.7)

Amendment \$ 379.3

\$1039.6

The relocation of the DOE Project Office to Chicago created additional expense and delay of work. The contract extension and the analysis for proceeding with Phase II resulted in additional management hours. Extensive Subcontract negotiations resulted in contract delays. The delays required additional Management activity. Design reviews, printing, selection trips, Cost Review Meetings, monthly, quarterly reviews are also included in this task.

IV. SUMMARY OF TOTAL CONTRACT COSTS

TOTAL ORIGINAL CONTRACT ESTIMATE: \$2,200,000

TOTAL OF COST AMENDMENTS: \$1,802,900

CONTRACT VALUE WITH AMENDMENTS: \$4,002,900

TOTAL ACTUAL EXPENDITURES TO

FEBRUARY 28, 1979: \$3,576,800

INCLUDING PARSONS (\$289,400)

Resolution of overheads and March through April 19 costs are expected to increase total actual Phase I costs to approximately \$3,700,000 (assuming \$145,000 payment to Parsons).

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

V. COST MANAGEMENT REPORT

Following is the current Cost Management Report:

1. Contract Identification		ERIE MINING COMPANY COAL GASIFICATION PROJECT				PHASE I		2. Reporting Period 2/1/79 through 2/28/79		3. Contract Number EW-78-C-02-5066	
4. Contractor (name and address)		ERIE MINING COMPANY PICKANDS MATHER & CO., MANAGING AGENT 1100 SUPERIOR AVENUE CLEVELAND, OHIO 44114				5. Cost Plan Date JANUARY 27, 1978				6. Contract Start Date October 19, 1977 7. Contract Completion Date January 19, 1979	
8. Government Funding		9. Contractor Funding		10. Number of Invoices Billed		11. Frequency		12. Number of Invoices Paid 15		13. Total Invoice Amounts Billed 3,324.7	
14. Total Payment Received 3,182.2											
15. Identification Number TASK	16. Reporting Category (e.g., contract line item or work breakdown structure element)	17. Accrued Costs				18. Estimated Accrued Costs			19. Total Contract Value	20. Variance	21. Unfilled Order Outstanding
		During Reporting Period		Cumulative to Date		a. Subsequent Reporting Period	b. Balance of Fiscal Year	c. Total Contract			
		a. Actual	b. Planned	c. Actual	d. Planned						
1	Conceptual Design and Evaluation of Commercial Plant	.5		454.4	243.1		8.4	479.0	550.1	71.1	
2	Demo Plant Process and Mechanical Design	5.9		539.8	896.6	1.0	37.5	646.9	512.6	(134.3)	-
	Stretford S/C by Parsons			289.4	incl. above			289.4	150.0	(139.4)	
	Gasifier S/C by BCI			800.0	incl. above		26.2	826.2	826.2		
3	Phases II and III Current Working Estimates	1.8		167.9	141.5	4.0	3.9	171.8	146.7	(25.1)	
4	Site Evaluation and Agreement			5.1	21.5		8.8	33.6	23.6	(10.0)	
5	Demonstration Plant Environmental Analysis	1.7		212.5	73.1		8.3	496.5	401.6	(94.9)	
6	Materials, Licenses and Agreements Report/Plan	.4		91.4	38.8	1.0	7.9	272.6	213.1	(59.5)	
7	Proposed Methods and Plans for Phase II, III			9.8	49.6		11.7	45.0	50.6	5.6	
8	Economic Reassessment	3.9		21.3	30.4	1.2	16.8	32.9	31.4	(1.5)	
9	Technical Support Plan			7.3	45.1		24.9	47.3	46.1	(1.2)	
10	Project Management	33.6		977.9	660.3	42.6	26.3	1,012.2	1,051.9	39.7	
Total		47.8		3,576.8	2,200.0	49.8	180.7	4,353.4	4,003.9	(349.5)	
23. Remarks										24. Dollars Expressed In: \$1,000 UNITS	
25. Signature of Contractor's Project Manager and Date 2/28/79				26. Signature of Contractor's Authorized Financial Representative and Date 3/30/79				27. Signature of Government Technical Representative and Date			

1. Contract Identification		ERIE MINING COMPANY COAL GASIFICATION PROJECT PHASE I				2. Reporting Period <u>2/1/79</u> through <u>2/28/79</u>		3. Contract Number <u>EW-78-C-02-5066</u>			
4. Contractor (name and address)		ERIE MINING COMPANY PICKANDS MATHER & CO., MANAGING AGENT 1100 SUPERIOR AVENUE CLEVELAND, OHIO 44114				5. Cost Plan Date JANUARY 27, 1979		6. Contract Start Date <u>October 19, 1977</u> 7. Contract Completion Date <u>January 19, 1979</u>			
8. Government Funding		9. Contractor Funding		10. Number of Invoices Billed		11. Frequency Monthly		12. Number of Invoices Paid 15			
						13. Total Invoice Amounts Billed 615,589.14		14. Total Payment Received 615,589.14			
15. Identification Number TASK	16. Reporting Category (e.g., contract line item or work breakdown structure element)	17. Accrued Costs				18. Estimated Accrued Costs			19. Total Contract Value	20. Variance	21. Unfilled Order Outstanding
		During Reporting Period		Cumulative to Date		a. Subsequent Reporting Period	b. Balance of Fiscal Year	c. Total Contract			
		a. Actual	b. Planned	c. Actual	d. Planned						
1	Conceptual Design and Evaluation of Commercial Plant	.5		90.0	25.5			106.2	164.9	58.7	
2	Demo Plant Process and Mechanical Design	1.9		95.1	28.2			163.7	77.3	(86.4)	
3	Phases II and III Current Working Estimates	1.8		12.3	16.2	4.0	3.9	16.2	16.2		
4	Site Evaluation and Agreement			2.6	12.4			22.3	12.4	(9.9)	
5	Demonstration Plant Environmental Analysis	1.7		137.6	32.6			413.3	296.0	(117.3)	
6	Materials, Licenses and Agreements Report/Plan	.4		89.2	32.4	1.0	1.0	263.5	205.1	(58.4)	
7	Proposed Methods and Plans for Phase II, III			1.8	25.3			25.3	25.3		
8	Economic Reassessment	3.9		13.1	8.9	1.2	1.0	8.9	8.9		
9	Technical Support Plan			7.3	22.4			22.4	22.4		
10	Project Management	10.6		224.4	110.1	22.0	22.5	234.3	374.5	140.2	
22.	Total	20.8		673.4	314.0	28.2	28.4	1,276.1	1,203.0	(73.1)	
23. Remarks										24. Dollars Expressed In: \$1,000 UNITS	
25. Signature of Contractor's Project Manager and Date [Signature] 2/1/79				26. Signature of Contractor's Authorized Financial Representative and Date Ralph E Meyer 3/30/79				27. Signature of Government Technical Representative and Date			

U.S. DEPARTMENT OF ENERGY
COST MANAGEMENT REPORT

PAGE OF

FORM DOE 533M
(1/78)

25-10722

1. Contract Identification ERIE MINING COMPANY COAL GASIFICATION PROJECT PHASE I						2. Reporting Period 1/27/79 through 2/23/79			3. Contract Number EW-78-C-02-5066 McKee C-4814A ET-78-C-01-2578				
4. Contractor (name and address) ARTHUR G. MCKEE & COMPANY 6200 OAK TREE BOULEVARD CLEVELAND, OHIO 44131						5. Cost Plan Date JANUARY 27, 1978			6. Contract Start Date October 19, 1977				
									7. Contract Completion Date January 19, 1979				
8. Government Funding		9. Contractor Funding		10. Number of Invoices Billed 46		11. Frequency		12. Number of Invoices Paid 26		13. Total Invoice Amounts Billed \$2709.1		14. Total Payment Received 2566.6	
15. Identification Number Task	16. Reporting Category (e.g., contract line item or work breakdown structure element)	17. Accrued Costs				18. Estimated Accrued Costs			19. Total Contract Value	20. Variance	21. Unfilled Orders Outstanding		
		During Reporting Period		Cumulative to Date		a. Subsequent Reporting Period	b. Balance of Fiscal Year	c. Total Contract					
		a. Actual	b. Planned	c. Actual	d. Planned								
1	Conceptual Design and Evaluation of Commercial Plant	-	-	364.4	217.6	-	8.4	372.8	385.2	12.4			
2	Demo Plant Process and Mechanical Design - by McKee	4.0	-	444.7	868.4	1.0	37.5	483.2	435.3	(47.9)			
	Stretford S/C by Parsons	-	-	289.4	inc. above	-	-	289.4	150.0	(139.4)			
	Gasifier S/C by BCI	-	-	800.0	inc. above	-	26.2	826.2	826.2	-			
3	Phases II and III Current Working Estimates	-	-	155.6	125.3	-	-	155.6	130.5	(25.1)			
4	Site Evaluation and Agreement	-	-	2.5	9.1	-	8.8	11.3	11.2	(.1)			
5	Demonstration Plant Environmental Analysis	-	-	74.9	40.5	-	8.3	83.2	105.6	22.4			
6	Materials, Licenses and Agreements Report/Plans	-	-	2.2	6.4	-	6.9	9.1	8.0	(1.1)			
7	Proposed Methods and Plans for Phases II and III	-	-	8.0	24.3	-	11.7	19.7	25.3	5.6			
8	Economic Reassessment	-	-	8.2	21.5	-	15.8	24.0	22.5	(1.5)			
9	Technical Support Plan	-	-	-	22.7	-	24.9	24.9	23.7	(1.2)			
10	Project Management	23.0	-	753.5	550.2	20.6	3.8	777.9	677.4	(100.5)			
22.	Total	27.0	-	2903.4	1886.0	21.6	152.3	3077.3	2800.9	(276.4)			
23. Remarks										24. Dollars Expressed In: \$1,000 units			
25. Signature of Contractor's Project Manager and Date I. H. Hess				26. Signature of Contractor's Authorized Financial Representative and Date T. Costigan				27. Signature of Government Technical Representative and Date E. B. Trescott P. L. Rader

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

V. OVERVIEW ASSESSMENT

A1. Environmental Project Description

Regulatory Requirements

Numerous Federal, State and Local regulations will have to be satisfied prior to final project approval. Sixteen Federal and 19 State or Local laws or regulations are applicable to the proposed project. Several of these regulations deal with engineering and environmental descriptions of the project and project area and assessment of environmental effects associated with the project. In most cases, such requirements are met by preparation of an environmental assessment that is accepted by review agencies. Other regulations, including permits necessary for construction or operational activities, are normally administered on State or Local levels and require the project to meet certain building standards or environmental health safeguards.

Plans for obtaining required permits were developed and issued during Phase I. (Ref. ERDA #158).

Demonstration and Commercial Operation

The Demonstration and Commercial Gasification Plants differ in size, emphasis and funding. The Demonstration Plant will consist of 5 gasifiers to feed 10 furnaces at the taconite processing plant while full commercial operation

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

will include 12 gasifiers feeding 27 furnaces. The Commercial Plant would be based on low sulfur coals and would not include a sulfur cleanup system.

Objectives of the Demonstration Plant include:

- A. Demonstrate the feasibility of first generation, commercially available technologies for using low-BTU coal gas in an industrial operation and in an environmentally acceptable manner.
- B. Assess performance and acceptability of unproven modifications of the Woodall-Duckham gasification process and the Stretford process for sulfur removal.
- C. Identify major physical/chemical, process flow, material balance, operational constraint and economic differences between high-sulfur Eastern and low-sulfur Western coals as well as between caking and non-caking coals.
- D. Develop final scenario for most efficient and economic coal gasification methodology for use in full commercial operations.

Detailed Project Description - Environmental

Three essential elements, carbon, hydrogen and oxygen are involved in the gasification process. Coal provides the carbon, steam (water vapor) provides most of the hydrogen and air provides the oxygen. Under the influence of heat and in proper combination, these three materials can be used to synthesize coal gas. Although considered an inadequate replacement for natural gas, low-BTU coal gas is considered a feasible fuel for certain industrial processes.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

During gasification, approximately 90% of the sulfur in the coal is converted to hydrogen sulfide, which can be chemically removed from the gas and converted to elemental sulfur.

Eastern coal would be shipped by vessel to Taconite Harbor at the North Shore of Lake Superior, while Western coal would be delivered directly to the plant by unit trains. Fines from Eastern coal would be used as fuel at the Taconite Harbor Power Plant. To economically utilize Western coals, it would be necessary to agglomerate the fines. Details and procedures for agglomeration have not yet been established. (Ref. ERDA 287)

The anticipated coal utilization rates for sized Eastern coal feedstocks are 493 tons per day for the Demonstration Plant and 1,187 tons per day for the Commercial Plant. Sized Western coal feedstock rates are anticipated to be 530 tons per day for the Demonstration Plant and 1,433 tons per day for the Commercial. The energy production rates for the Demonstration and Commercial Gasification Plants will be 7.4×10^9 BTU/day and 20×10^9 BTU/day, respectively.

The coal gasification unit consists of gasification, gas cleanup and gas cooling systems. Sized coal is introduced into the top of the two stage gasifier and gravitates through the gasifier in counter-flow with the rising gas. Air and steam are introduced into the bottom of the gasifier. The gasification reactions take place above the combustion zone and produce a mixture consisting mainly of carbon monoxide, carbon dioxide, hydrogen and

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

water vapor. To maintain maximum gasification efficiency, the coal in the gasifier is stirred. Ash is discharged from the bottom of the gasifier while volatile matter and moisture are slowly carried upward. Just above the gasification zone, clear gas exists from the side of the gasifier at a temperature in the range of 900°-1200°F. Top gas exists from the top of the gasifier at a temperature of about 250°F.

Top gas is passed through an electrostatic precipitator where tar is separated from the gas stream. After tar removal, the top gas is passed through a gas cooler (existing gas temperature is about 95°F) where water and oil are condensed from the gas. The clear gas, on the other hand, first passes through a dust cyclone where char (carbon and ash particulates) is removed from the gas. The clean gas then passes through a waste-heat boiler and boiler feedwater preheater where most of the sensible heat in the gas is recovered for steam production. The clear gas is then passed through a cooler (existing gas temperature is about 95°F) and combined with the top gas just downstream from the top gas cooler. The combined gas stream (at 95°F) is passed through an electrostatic precipitator that removes oil and water from the gas stream. When low-sulfur Western coals are being gasified, this cleaned and cooled gas is compressed and piped to the taconite processing plant where it is combusted in pellet furnaces. When high-sulfur Eastern coals are being gasified, hydrogen sulfide must be removed from the gas before it can be used in pellet furnaces.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

The Stretford process removes the hydrogen sulfide contained in gas produced from Eastern coals. The Stretford unit includes a gas scrubber, a reaction tank and a series of oxidizer tanks where hydrogen sulfide is chemically reduced to elemental sulfur. Chemicals used in the process are sodium carbonate, sodium hydroxide, sodium vanadate and anthraquinone disulfonic acid. The desulfurized gas, containing less than 50 ppm hydrogen sulfide, is piped to pellet furnaces.

If the gasifier is shut down, gas production will immediately drop to about 40% of operational production. Complete termination of gas production will occur in approximately one hour. Based on performance of existing gasifiers, an emergency shutdown situation could occur once every 2 to 3 years. Under an emergency shutdown procedure for a single gasifier, valves would direct gas to flares, block valves would isolate the gasifier from down stream gas cleanup systems, combustion air to the gasifier would be cut off and the vessel would be purged with inert gas. A complete emergency shutdown of the entire Gasification Plant would likely be caused only by a total power failure. If this should happen, the gas compressor would shut down and valves would close at both ends of the gas transmission lines, isolating gas between the downstream side of the compressor and the pellet furnaces.

Solid, liquid and gaseous by-products and wastes are generated during coal storage and processing, gasification and gas cleanup recovery systems have been designated to collect and utilize by-products. Wastes will be placed

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

in storage areas designed to prevent release of the materials to the environment. The Coal Gasification Plant, along with the solid waste disposal area, will occupy approximately 115 acres (15 acres for the gasification facility and 100 acres for landfill). (Ref. Pictorial 80307)

To prevent, to the fullest extent possible, degradation of ground water and surface water resources the coal stockpile, landfill, collection pond, settling basin and drainage ditches will be constructed to prevent the seepage of potential contaminants into ground water or the drainage of runoff into surface waters. If soil borings indicate that an impervious layer of soil or rock occurs just below a stockpile or waste storage area, this natural barrier will prevent seepage of materials into ground water. If such natural barriers do not exist, the base of the stockpile or waste storage area will be sealed with an impervious liner. Runoff will be controlled by diking and grading stockpiles and storage areas so that drainage will be routed toward ditches that drain into the collection pond or settling basin.

Boiler makeup is the primary water requirement of the project. Consumptive water use at the Demonstration Plant is estimated to be 130 gpm, while use at the Commercial Plant is estimated to be about 265 gpm. Erie Mining Company has authority under an existing permit to withdraw this water from Colby Lake. None of the water utilized in the Gasification Plant will be released into the area surface water system, but will be either recycled or directed into the settling basin. (Ref. Pictorial 80308)

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Tar and oil by-products will be employed as fuel in the package boiler, the incinerator and several of the pellet shaft furnaces. The degree to which sulfur in the coal will partition into these by-products is unknown. If a high-sulfur coal is utilized and high-sulfur tars and oils are produced, the subsequent combustion of these by-products could result in the release of quantities of sulfur dioxide which may be of environmental concern.

Environmental Monitoring

Because the potential environmental problems associated with coal gasification technologies are largely unknown, it is difficult to outline a detailed monitoring program. Due to the potential for ground water contamination by leachates from stockpile and waste storage areas, monitoring wells will be sampled and the water analyzed for a variety of contaminants, including several trace elements. The atmospheric monitoring program will initially evaluate the necessity of monitoring those pollutants (carbon monoxide, nitrogen dioxide, sulfur dioxide, particulates, hydrocarbons and ozone) for which air quality standards have been adopted. The necessity of monitoring the more exotic pollutants such as acid gases, trace elements, metal carbonyls and a multitude of organic compounds will be determined as the gasification facility becomes more of a reality and the latest literature and research developments can be surveyed to evaluate the emission rates, biological significance and monitoring techniques for these pollutants. A terrestrial monitoring program that focuses on vegetation stress analysis as an indicator of environmental impact and on elemental analysis of soil and vegetation as

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

an indicator of emission dispersion and accumulation is recommended if atmospheric emissions are found to be a potential environmental problem.

DESCRIPTION OF THE ENVIRONMENT

Physical Environment

The Hoyt Lakes area experiences a climate which is subject to extremes of temperature ranging from above 80°F in the summer to less than -40°F in the winter. Precipitation averages 28.33" per year including an average snowfall of 50.3". Snow cover typically exists from mid-November through late March. The growing season between spring and autumn frosts is normally 118 days.

Surface winds are characterized by a significant seasonal fluctuation being out of the northwest in the winter and the southeast in the summer. Vertical mixing heights in the atmosphere range from an average of 1,580' in the morning to 3,940' in the afternoon.

The data collected in the Regional Copper-Nickel Study present the best characterization of air quality in the Hoyt Lakes area. These data indicate that annual mean concentrations of sulfur dioxide, nitrogen dioxide and particulates are well below the regulatory limits.

The Minnesota Pollution Control Agency has designated the townships on the Iron Range a nonattainment area for particulates. Erie Mining Company, presenting air quality monitoring and modeling data, requested a redesign-

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

nation to attainment for the specific area around the proposed Coal Gasification Plantsite. On October 5, 1978, the Environmental Protection Agency officially changed the designation of the area to attainment based on the results of the study and the recommendation of the Minnesota Pollution Control Agency.

Site specific soil descriptions were developed from borings at the proposed plant area. Evidence of surface and subsurface fill was found. Beneath this fill was a stratum of organic material 2 to 9' thick. Beneath the organic layer was glacial outwash which extended to the bedrock located at depths of up to 36'.

Site specific information from the soil boring tests indicated that the depth to ground water was 10 to 16'. The ground-water hydraulic gradient slopes in a southeasterly direction across the site.

The Erie Mining Company site is within the Lake Superior drainage basin. First Creek, Second Creek and Wyman Creek are the immediate receiving waters for the site. These creeks are tributaries of the Partridge River which flows into the St. Louis River. The St. Louis River ultimately discharges into Lake Superior. Flow in the Partridge and St. Louis Rivers is regulated at times from the off-channel Partridge Reservoir.

Water quality monitoring has been conducted in the Second Creek - Partridge River watershed by the Regional Copper-Nickel Study team and by the Erie

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Mining Company. The data reveal that water quality at the monitoring sites was within legislated limits for a majority of the parameters. Occasional excursions below the minimum dissolved oxygen and pH levels as well as excessive turbidities and oil and grease concentrations were occasionally noted on the Partridge River monitoring sites. Second Creek water quality was compatible with standards except for one excessive turbidity measurement and high iron concentrations. Iron and manganese were the only two heavy metals measured in excess of the limits at any of the monitoring sites. Iron and manganese compounds are known to occur in the geological formations of the area and are somewhat water soluble.

The existing noise levels attributable to the taconite plant and associated local sources were evaluated at several receptor sites. A buffer zone of approximately four miles exists between the project site and the nearest residence. Two monitoring sites, the Longyear Drill Site and the north access road, were identified as potentially sensitive receptor locations. The maximum noise level at the Longyear site was 45 dBA and occurred during the morning period of commuter traffic. The taconite processing plant was barely audible during the late night. No significant measures of man-made noise, including the taconite plant, were present at the north access road site.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Biological Environment

The land surrounding the Erie Mining Company site is typical of Northeastern Minnesota and is characterized by numerous streams, lakes and bogs. Headwater streams are generally of two types: Those that drain upland forests and those that drain lowland bogs. Natural lakes in Minnesota are generally of glacial origin. As the process of eutrophication occurs, many of these lakes reach bog stage. These bogs produce a moderating influence on rivers through the collection and storage of runoff waters.

The Hoyt Lakes area is in the boreal-hardwood forest characteristic of Northeast Minnesota. The original forests have undergone significant changes as a result of fire and logging. The major forest communities include aspen-birch, black spruce, jack pine-black spruce, red pine, mixed maple-aspen-birch-pine-fir, alder and white cedar.

The site on which the Coal Gasification Plant is to be built had its original vegetation removed in the 1950's when the taconite plant was constructed. It currently is sparsely vegetated with grass, shrubs and small trees and consists largely of rock outcrops and unvegetated soils. The ages of the trees indicate that they developed following site clearing.

The wide variety of terrain in the Hoyt Lakes area provides suitable habitat for a diversity of wildlife. Common game species in the area include ruffed grouse, spruce grouse, snowshoe hare, black bear, moose and white-tailed deer. The area also supports a substantial timber wolf population.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

A survey of the coal gasification site found evidence of use by red fox, mink, muskrat and short-tailed weasel. Limited food, cover and nesting sites were found. The gasification site is surrounded by the taconite production facility and is considered to provide limited wildlife habitat.

Surveys of the gasification site were conducted to determine if they harbored plant or animal species which are endangered, threatened or of special consideration. The surveys indicated that none of these species were present on the site.

Socioeconomic Environment

The population of the Arrowhead Region of Minnesota has been closely linked to the resourced based economy of the region. The fluctuations in population of communities on the Mesabi Iron Range have been a direct reflection of mining activity in the area. In the 1960's, the population in the Hoyt Lakes area increased significantly as a result of the development of the Erie Mining Company operations. The estimated 1974 populations of Hoyt Lakes and Aurora were 3,842 and 3,134, respectively.

In 1970, the average State income was \$9,931 while the income in Hoyt Lakes average \$9,843 and in Aurora averaged \$8,941. Both communities had fewer families receiving public welfare or below the poverty level than was the State average in 1970.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Mining remains the dominant employer in the East Iron Range area although some diversification is becoming evident. Expansion of the taconite industry is expected to add an additional 4,000 permanent jobs to the area and provide work for 8,000 construction workers.

In St. Louis County, forested land comprises over 81% of the land area. Other land uses vary from water at 8% to transportation at 0.1%. Mining ranks seventh in land use at 1%.

The area on which the gasification plant will be built contains no known sites of historical or archaeological significance. Similarly, the landfill area contains no historical sites, but must be surveyed for archaeological considerations.

ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

Construction

Fugitive dust will be the most common air pollutant associated with project construction. However, the limited size of the construction site and relatively short time required for earth moving and grading operations indicate that fugitive dust will create minimal environmental problems. Similarly, minimal effects are anticipated for exhaust gases from construction equipment. Because runoff from construction areas will be prevented from reaching streams except during infrequent, intense rainstorms when the settling pond may overflow, little (if any) degradation of surface water quality is expected

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

during construction. Solid and liquid wastes will be removed from the site by an industrial refuse contractor, who will assure that wastes are disposed of in accordance with Minnesota regulations. Thus, waste disposal is not expected to cause degradation of ground water or surface water resources.

Due to the isolation of the site and the limited habitat currently present, no significant impacts to biological species are expected during construction. Noise impact from construction is expected to be negligible; however, some noise disturbance may occur along certain roads as traffic volumes increase during construction..

The utilization of the existing local labor force on this project without the influx of a significant number of new people into the Hoyt Lakes area should produce minimal socioeconomic impacts. Overall, the project should have a generally positive effect on the community through an economic stimulation without a significant increase in residents.

No impacts to historical or archaeological sites are anticipated as a result of construction activities. The landfill area must still be surveyed for archaeological sites, however.

Operation

The operation of the Gasification Plant will cause some deterioration of air quality, although the magnitude and significance of the deterioration cannot

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

currently be quantified. Although systems are included in the plant design to remove sulfur from the produce gas, the partitioning of sulfur into by-products may result in the production of high-sulfur tars and oils. Combustion of these tars and oils in the boiler, incinerator and shaft furnaces may lead to elevated levels of sulfur dioxide emissions from these sources. Gasifier operation will also result in the emission of other criteria air pollutants and the release of a broad spectrum of exotic, non-criteria pollutants such as metal carbonyls, trace elements, acid gases and complex organic compounds. Although definitive emission data for these pollutants are not currently available, it is believed that they will not be released in significant quantities.

No discharge of waste water, including runoff from the coal pile or plant yard area to surface waters will occur. If natural, impervious rock or soil layers do not exist between the bottom of stockpile or waste storage areas and the ground-water table, these areas will be sealed to prevent leaching of contaminants into ground water. Therefore, degradation of ground water and surface water resources is not expected.

No information is available that would indicate that atmospheric emissions will reach levels high enough to produce impacts on plants and animals near the Gasification Plant. Habitat quality at the solid waste disposal area will be degraded during operation of the plant, however; as sections of the landfill are filled, they will be covered and revegetated.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Noise from the Gasification Plant is expected to be considerably lower than from the Taconite Processing Plant. The noise impact associated with the proposed plant's operation is expected to be negligible.

Because fly ash and other particulates released in coal gasifiers are removed during gas cleanup, airborne emission of ash particulates is not expected to be a radiological health hazard near the Gasification Plant. Transfer of any plant-incorporated radionuclides will not present human health hazards because domestic animals such as beef and dairy cattle will not be grazing on vegetation growing on the solid waste disposal area after it is revegetated.

The work force required to operate the gasification plant will be drawn from the local available labor pool. No adverse socioeconomic impacts are expected from the operation of the Gasification Plant.

The operation of the Gasification Plant will produce no impacts on historical or archaeological sites.

MITIGATION

Construction

Fugitive dust will be controlled by watering dirt roads and areas where earth-moving or grading is occurring. To mitigate the potential for water quality degradation, plant construction will begin with creation of levees, ditches and a settling pond. This measure will allow collection of runoff from construction areas and prevent runoff from entering Second Creek.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

The existing biological community on the site will be displaced when the coal gasification facility is constructed. During construction, care will be exercised to reduce erosion and prevent off-site impacts. Those areas that can be revegetated, such as berms and levees, will be planted utilizing established procedures and suitable species.

Since adverse socioeconomic impacts attributable to the gasification facility are anticipated to be minimal, no mitigation procedures will be necessary. During the construction period, staggering of the construction and plant work force shifts will be implemented to reduce the traffic loads on the access roads to the Erie Mining Company property.

The contractor will be required to utilize well maintained and muffled equipment during construction. In high noise areas, all workers will be required to wear approved ear protection gear.

Operation

Plant design includes the incorporation of systems to remove particulates, oils and tars, and sulfur from the product gas. Vent streams and off-gas streams are recycled back to the gasifier. Flaring of coal gas during start-up, shutdown or emergency situations will prevent its direct release to the atmosphere. Enclosed conveyors, vacuum systems and bag houses will help prevent release of coal dust. A biodegradable, water soluble, surface binding spray will be used to suppress dust at the coal pile and landfill.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Revegetation of filled sections of the landfill will minimize erosion and disturbance of the waste materials.

To reduce the opportunity for ground water contamination, the stockpile and waste storage areas will be sealed, if necessary, to prevent leachate from entering ground water. To insure that this control system is preventing the contamination of ground water, monitoring wells will be sampled and water analyzed for contaminants during plant operation.

All of the emission and effluent controls that are being employed in the gasification facility are designed to mitigate biological effects. At the present time, it is believed that these systems will prevent the production of direct biological impacts.

Since the additional labor force for the operation of the gasification facility will be drawn from the available labor pool, no adverse impacts requiring mitigation are anticipated.

The hearing conservation program that Erie Mining Company has implemented in its taconite operations will also be applied to the coal gasification facility. In addition, noise suppression measures will be incorporated into selected equipment. Noise production level will be a factor considered during equipment acquisition.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

UNAVOIDABLE ADVERSE EFFECTS

Physical Environment

Some deterioration of air quality is to be expected due to emissions from the Gasification Plant. A minor secondary effect on air quality would occur if increased vehicular traffic in Hoyt Lakes resulted from this project.

Biological Environment

A small amount of vegetation will be lost during construction of the plant. Some increase in turbidity levels in Second Creek could occur during early phases of construction before run-off control systems are completely installed.

Socioeconomic

Minor population increases may occur within an approximately 30-mile radius of the Gasification Plantsite. Population increases should not affect educational, housing, recreational and other social facilities.

SHORT-TERM VS. LONG-TERM PRODUCTIVITY

The principle resources consumed by the project will be coal. This coal will be obtained from existing mines. Local air quality is very good with short-term particulate levels being the only factor of concern in the past. Any degradation of air quality caused by the Gasification Plant will be short-term with no long-term deterioration of air quality being anticipated. Because this project is a small-scale industrial fuel gasification plant constructed adjacent to an existing industrial facility, it is not expected

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

to have major effects on the long-term productivity of the area. Also, since no pipeline construction, mine openings or extensive water use will be necessary, potential long-term impacts will be minimal.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The project will consume two natural resources - Coal and a limited quantity of water. Other resources in the form of equipment, construction materials and supplies will be consumed by the project.

ALTERNATIVES TO PROPOSED ACTION

The alternate fuels program at Erie Mining Company encompasses several major areas. Coal addition to the stockline and the use of an oil-coal slurry were investigated to lower fuel costs by partial replacement. Direct coal firing and coal gasification were investigated to provide total replacement of natural gas and oil. Coal liquefaction, specifically methanol production, was evaluated as a replacement for both natural gas and oil.

Natural Gas

Most of the taconite processing operations in the Iron Range have been utilizing natural gas as their prime fuel for pelletizing. In light of the recent curtailments which have affected both operations and the cost of pelletizing, it is unlikely that industry will be allowed to utilize gas in the long-term as a major supply.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Oil

In the short-term, the logical alternate fuel is oil. Domestic oil production peaked at 9.6 million barrels per day in 1970 and has been declining ever since. The result has been a growing dependence on imported energy, the availability and price of which are controlled by the Middle East countries. The Arab oil embargo in 1973 and 1974 demonstrated that the United States was vulnerable at the then 29% import level. A similar embargo in 1978 could have had more serious consequences at the estimated 47% to 50% import level.

For Erie Mining Company, provisions to accommodate the oil alternative requires no major capital outlay. However, problems of supply, transportation and storage could be a problem in Minnesota should all the taconite mines switch to oil. The 1977 "Energy Emergency" concerning natural gas, as well as No. 1 and 2 distillate fuel oils, emphasizes the need to assure the supply of alternate energy sources for the Minnesota iron ore industry.

Coal Addition

During the later part of 1975 and early 1976, tests were run using varied amounts of coal added directly to the furnace bed. Testing indicated that up to 30% BTU replacement was possible without adverse effects on pellet quality. Above 30% addition, quality deteriorated. Although successful, work was discontinued along the lines of partial replacement, as it was felt that the complete curtailment of natural gas required a "whole" rather than partial alternate fuel.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Coal Liquefaction - Methanol

Erie Mining Company examined the preliminary plant design and cost estimates for the production of methanol from Western lignite coal. The methanol produced at the minesite would be shipped to the Iron Range for use in pelletizing and other applications. The costs indicated that in today's market, methanol would be uneconomical.

Direct Coal Firing

Feasibility studies and preliminary cost estimates were developed for conversion to coal firing. A prototype chamber, minimizing major revisions to the system, was designed. The decision was made to construct a mock-up of the furnace port tiles and combustion chambers. The objectives of the mock-up were to determine the feasibility of direct firing coal and establish data on flame characteristics and operating efficiency. Both Eastern and Western coals were to be tested to establish the different economic and operating parameters. The proposed tests were to define optimum parameters for application at the Pellet Plant.

The results were mixed. Injection of iron ore dust at rates which could be expected to be found in recuperated air caused extreme iron oxide buildup throughout the system. To summarize the test results, coal firing is possible but several major problems would have to be solved to make it practical. Future tests will be required to determine:

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

1. Suitable burner design to minimize heat loss and maximize ash collection.
2. Coal specification with characteristics necessary to reduce slagging, ash accumulation and corrosive attack.
3. Refractory types which will eliminate premature material failure and which are compatible with the oxidizing and reducing zones.

Due to the physical configuration of the shaft furnace and potential operational and environmental problems defined in preliminary investigations, it appears that direct coal firing would require extensive modification of the shaft furnace. Even if the shaft furnaces were modified, there are still major questions of operability and environmental concerns.

Coal Gasification

The gasification of coal produces a gas with a low heating (BTU) value. While the transport of this type of gas through pipelines is usually considered uneconomical, its on-site production and use by industries is feasible. The use of low-BTU gas is, in fact, considered more economical for industrial use than the expensive conversion of the gas to a higher heating (BTU) value by catalytic conversion.

Coal Handling Alternatives - Gasification

A coal handling study was conducted to look at the various alternatives of Western and Eastern coal for low-BTU gasification. The purpose was to determine the most feasible method of (1) receiving coal, (2) screening, and

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

(3) coal fines usage. The study showed that Eastern low-sulfur coal, received and screened at Erie Mining Company's Taconite Harbor, provides the most economically attractive program. However, the use of run-of-mine Western coal is a better alternative, if technology is developed to successfully and economically agglomerate coal fines. Full commercial product would require a total nominal feed rate of 1,187 tons per day of sized Eastern Coal or 1,433 tons per day of sized Western coal.

Eastern coal can be received by vessel at three ports along the North Shore of Lake Superior. The three ports are Taconite Harbor, Two Harbors and Duluth. Taconite Harbor is preferred due to the presence of a power plant and railroad system. Twenty-one alternatives for receiving and handling coal at Taconite Harbor were investigated. Of these alternatives, the one preferred is a plan for receiving coal at a new facility on the west end of the ore dock. Handling equipment is sized so one trainload of coal can be screened and loaded within seven hours.

A major problem concerned with coal handling is the disposal or usage of coal fines produced as a result of handling and storage. The amount of fines produced will also play an important role in the decision as to whether to use sized coal (coal screened at the mine site) or run-of-mine coal. The method in which coal fines are utilized is an important factor in determining the most economical alternative in the study. Three methods of utilizing coal fines were considered. They are:

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

1. Use at Erie Mining Company's Taconite Harbor Power Plant.
2. Coal agglomeration used in plantsite gasifier.
3. Sale of fines.

The Taconite Harbor Power Plant is designed to use Eastern low-sulfur coal. The plant cannot use Eastern high-sulfur coal without changing its mode of operation. If sized high-sulfur coal is used, the total fines will make up about 30% of the power plant's coal requirements. Coal blending, if successful, could eliminate the need for installing expensive scrubbers for sulfur removal but would increase the operating cost.

If high-sulfur, run-of-mine coal is used, the fines will nearly meet the total power plant tonnage requirements. The excessive capital and operating costs of the power plant scrubbers would make the use of high-sulfur fines uneconomical.

The power plant is not designed to burn Western coal. If sized Western coal is used, the total fines generated will equal one-third of the power plant requirements. Utilization of these fines blended with Eastern coal would require expensive modification to maintain production capacity.

If run-of-mine Western coal is used and agglomerating is not feasible, total fines generated would exceed the power plant's requirements and the surplus fines would have to be disposed of elsewhere. This would also result in the

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

need for expensive modifications to maintain production capacity. Because of these reasons the use of Western coal fines in the Taconite Harbor Power Plant is considered uneconomical.

Agglomerating of coal fines is attractive because all of the coal purchased could then be used in the gasifier. It is not presently known, however, if briquettes can be economically manufactured and used successfully in a gasifier. Briquetting, if feasible, would be advantageous to Western or Eastern high-sulfur coal fines which cannot be readily used in the power plant.

The sale of coal fines to a commercial user is considered, but the market within an economical transporting distance of Hoyt Lakes is not large for either Western or Eastern coals.

A computer model examined 102 alternatives to the total coal handling problem. One-third of these alternatives utilized coal agglomeration. Of the 102 alternatives, the following three were chosen and are listed in order of ascending equivalent cost per million BTU's.

Alternative 1 - Western Run-of-Mine Coal

This alternative had the lowest equivalent cost per million BTU. This method used run-of mine Western coal delivered to Hoyt Lakes by unit train with the coal fines agglomerated for use in the gasifier. However, it has

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

not been demonstrated that Western coal can be economically agglomerated and used successfully as gasifier stock.

Alternative 2 - Eastern Low-Sulfur, Run-of-Mine Coal

Since agglomeration of coal fines for gasifier feed has not been commercially proven, the plan with the next lowest equivalent cost per million BTU received top consideration. This alternative uses Eastern run-of-mine, low-sulfur coal, received and screened at Taconite Harbor. The dockside screened fines are used in the Taconite Harbor Power Plant and the coarse material is shipped to Hoyt Lakes by railroad. The coal is screened again prior to being fed into the gasifier. These fines are transferred to Taconite Harbor and used in the power plant up to the plant's requirements. Fines exceeding power plant requirements would be sold.

Alternative 3 - Eastern Low-Sulfur, Run-of-Mine Coal

This alternative has a higher equivalent cost per million BTU but with the lowest capital cost. Eastern run-of-mine, low-sulfur coal is received and screened at a commercial dock and the coarse coal is commercially transported to the Hoyt Lakes Plant. Fines from dockside screening are shipped by vessel to Taconite Harbor for consumption in the power plant and gasifier screen fines are sold to a commercial power plant.

The study indicated that agglomerating studies using Western coal should be performed. In order to be competitive, the cost of coal agglomeration

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

should not exceed \$8 per ton. The selection of Alternative 2 was recommended until agglomeration studies show the feasibility of agglomerating Western coals.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

A2. Environmental Risk Analysis

Overview

There are fundamentally three problems which must be resolved or defined in order to evaluate the "risk" or rather practicability of the successful operation of the Coal Gasification Plant.

1. Is sulfur removal necessary? If so, at what level?
2. Will best available control technology (BACT) be required on the "end use" equipment, in Erie's case the Pellet Plant.
3. How will regulations concerning present "unknowns" affect the monitoring and economics of the process? Specifically:
 - a. The fate of trace elements which exist in coal; for example, gas combustion, tars and oils combustion, ash-sulfur and other by-product storage or disposal.
 - b. Development of Occupational Health and Safety Regulations or Mine Health and Safety Regulations (although not in themselves environmental considerations) on handling and using coal-oil/tars which may contain various carcinogenic materials.
 - c. Will an Environmental Impact Statement be required for the Commercial and/or Demonstration Plant?

In order to obtain normal business assurances that coal gasification, as envisioned by the Erie/DOE Project, is indeed practicable, it is necessary to conceive within reasonable parameters the criteria which will meet both economic and environmental goals.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

The "Environmental" risk of proceeding is very complex and will require technical development of both control and monitoring technologies to optimally protect the environment in an economically acceptable manner.

As our ability to monitor and control processes have developed, regulations and standards have been promulgated. Many of these standards will require costly equipment which significantly increase both capital and operating costs.

From the inception of the project, Erie has, in all cases, considered that the Gasification Plant will be a closed loop system with essentially "zero effluent" to the environment bordering the Erie plantsite. Designs, equipment operation and waste disposal have been developed to meet this goal as well as State and Federal Regulations as they currently exist. Additional estimates have been made for compliance with current State and Federal Regulations.

Essentially, the "risks" related to environmental concerns are not "technical." Erie feels that the technology is available to control the Gasification Plant effluents to meet State and Federal Standards. There are, however, technical questions concerning how the "end-use" cleanup would be effected should "best available control technology" be required on the Erie plant as a result of construction of the gasification facility. Further studies will be required to determine the leaching potential of the ash and sulfur in

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

order to adequately design the disposal site and to determine the fate of trace elements which occur in coal.

Primarily, the "risk" factor concerning environmental requirements is related to the capital and operating costs to meet "best available control technology" on existing facilities and disposal of waste products.

1. Sulfur Removal

No Sulfur Removal

Under the existing State requirements, Erie is allowed to burn a maximum 2% sulfur in oil or coal. There is for all practical purposes little risk in operating the gas plant at these levels. Adequate supply of both Eastern and Western coals are available within compliance limits.

No sulfur cleanup and recovery systems would be required. Waste water cleanup and disposal of spent chemicals from the sulfur cleanup system is minimized.

With Sulfur Removal

With a full sulfur removal system assumed for all coals, sulfur cleanup and waste disposal costs increase the capital cost of the plant. Similarly, operating costs are increased.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Clearly should sulfur removal be required on all coals, the economic penalty imposed could reduce the economic viability of using low-BTU gas in a commercial operation. The extent of such a reduction would be dependent on each user's alternate fuel capability and cost of alternate fuels.

In Erie's case, we do not anticipate that sulfur removal will be economical in the foreseeable future. (Ref. Section VI, Cost Summary)

Although the commercial facility could technically operate under "today's" regulations, the risk of being required to provide sulfur cleanup is considerable in light of current EPA and DOE positions concerning proposed environmental standards for coal-fired power generating facilities.

2. Control Technology Requirements

The present Erie facilities are in compliance with and meet all Federal, State and Local environmental requirements. If Erie were to change the fuel used in its pelletizing facility from the present combination of natural gas and No. 6 oil to the gas from the Coal Gasification Plant being discussed, its emissions to the ambient air would be no greater than, but more likely less than, those at the present time. It is our understanding that despite the foregoing, both EPA and DOE consider that the facilities using the gas from a Commercial Gasification Plant may nevertheless be required to retrofit the existing pellet facilities

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

in order to conform to the definition of "best available control technology."

We estimate that approximately 50-70 million in capital and (as yet undermined increases) additional operating costs would be incurred as a result of such a ruling.

The economic consequences of such a ruling would render any Commercial or Demonstration Plant used in fuel conversion at an existing facility (such as at Erie) impractical, uneconomical and would result in increased energy consumption per unit of manufactured product.

Further, the nation's economy, the National Energy Policy (coal conversion conservation) and the President's Economic Guidelines would be adversely affected by the needless imposition of such standards.

3. Regulations

As the interpretation of current regulations significantly alter the economics of coal gasification (the requirement for best available control technology on existing facilities served by the Gasification Plant) of both the Commercial and Demonstration Plant, we must assess the risk of future regulations concerning what are at present "unknowns."

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Monitoring and mitigation of the effects of these "unknowns" could add significant risk to development of a commercially viable Gasification Plant system. Risks may not be limited to economics. In particular, the fate of trace elements in coal as a result of the gasification process may prove difficult to monitor, costly to contain and present serious technical difficulties.

Similarly, development of Occupational Health and Safety or Mine Health and Safety Regulations on handling and using oils and tars from the gasification process which may contain carcinogenic materials are expected as research and knowledge matures from the relative "unknown" state of information currently developed.

The need to monitor and investigate these "unknown" areas in itself will reduce the economic viability and increase the risk of reaching a practicable Commercial Coal Gasification Facility.

Should, during "Phase II" it be determined that a full Environmental Impact Statement be required, additional extra cost and delay of construction could be anticipated.

The Assessment developed in Phase I was designed to provide as near a complete document as possible considering the time and cost restrictions.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

There would, however, be extra cost to update the draft Assessment and determine leaching potential from waste disposal as well as the fates of trace metals in the process.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

B1. Technical Process

Overview

The Small Scale Demonstration Plant Program provided a unique opportunity for the Department of Energy and the industrial partner, Erie Mining Company and Pickands Mather & Co., Managing Agent, to provide a program of coal gasification in an industrial environment under actual operating conditions. The intent of the program is to provide a reliable economic fuel which utilizes our Nation's most abundant source of energy, coal.

Erie Mining Company, in accordance with the provisions of the Erie/DOE contract, provided the design and plan for procurement, construction, operation and testing of the Demonstration Coal Gasification Plant.

The Program provides for use of commercially available technology to supply approximately one-third of the fuel required to operate the Erie iron ore pelletizing plant in Hoyt Lakes, Minnesota. The Demonstration Plant is designed as the initial module of a Commercial Plant which could be expanded to eventually replace all of the natural gas being consumed at Erie for pellet induration.

The coal gasification facilities of the Demonstration Plant were designed to produce 7.4×10^9 BTU/day of low BTU gas (160-180 BTU/cu. ft.) using approximately 500 tons/day of coal.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

This design was then expanded to provide the requirements for the Commercial Plant in a manner which is economical and utilizing technology which encourages energy and environmental conservation. The Commercial Plant was designed to produce 20×10^9 BTU/day using approximately 1400 tons of coal per day.

The plant designs have the ability to process coals of at least 2.5% sulfur content (moisture and ash-free basis) and a free-swelling index of at least 5.0.

Design criteria included retrofit of the existing pellet plant and the requirement to use and test various coal feedstocks.

The design basis coals which were contemplated for testing included Brookville, Clarion, Davis, DeKovan or Kittanning coals (Eastern coals) and Rosebud or McKay coals (Western coals).

Technical assessment is primarily focused around problems which were encountered during design activities in Phase I. Technical problems may be categorized by technical risks (problems that require an answer before the project becomes technically feasible) and detailed technical problems that arose during the progress of this project. The later category would normally be resolved during Phase II activities of the project by continuing trade-off studies and further evaluations during detailed engineering.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

To establish basic technical background, reference should be made to Design Manuals, both for the Demonstration Plant and the Commercial Plant.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

B2. Technical Risk

Erie Mining Company essentially concurs with the Technical Risk Analysis performed by Analytics, Applied Technology Division in June, 1978.

To Summarize:

Western Coal Operation

"Operation of the gasifiers on Western coal is a low risk" providing a warranty on the gasifier is provided by the vendor.

Note: Assumes gasification of sized coal.

Eastern Coal Operation

The operation of the gasifier on Eastern coals is an acceptable risk provided "hedges" are provided to reduce the developmental risks.

Under the general analysis listed above, Erie has proceeded on the basis for design as stated.

Coal handling, utilities and gas cleanup equipment has been designed utilizing commercially available equipment, which in Erie's opinion, will provide a technically feasible operation if operated in accordance with normal operating procedures under the terms and conditions of standard warranties which have been negotiated or are expected to be obtained should construction proceed.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

During the course of Phase I, trade-off studies and other evaluations have resulted in some redefinition and measures which will be required to minimize or obviate several technical or economic problems (high risk to commercial success).

Gasifiers

1. The central core of the gasifier has been designed to operate with or without a stirrer.
2. The initial plant installation would include only one stirred gasifier until the stirrer can be "proven."
3. Provision for briquetting of coal fines was included but not defined in the plant designs.

Equipment Sizing

A large measure of the success of any Commercial Plant (and as our contract provided for) will be the plant's ability to handle both caking and non-caking coals (Eastern and Western, respectively). Sizing considerations were defined to allow for a reasonable range of commercially available coal. As a result, the plant throughput was sized for Western low-caking coal, reflecting the moisture content and lower BTU content of the Western coal. Equipment so sized will have a greater capacity when operated on the high-BTU low-moisture Eastern coal. Oil and tar cleanup facilities were sized on Eastern coal feedstock and are oversized when operating on Western coal which contains less volatile matter.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

These design considerations have been made to assure commercial viability, maintain continuous operation and meet Erie/DOE contractual requirements.

Briquetting

The coal handling method used to transport coal from a mine site to the plantsite became a complex design problem due to the various alternatives involved with delivery of Eastern coal, Western coal and handling various levels of coal fines. The Eastern coal is to be shipped by boat through the Great Lakes system and then transported by rail to the plantsite. The Western coal is to be transported exclusively by rail. The two coals presented 102 different alternatives for transportation and handling fines. A computerized analysis and the Coal Trade-Off Study was conducted to optimize handling facilities. This study was issued on August 30, 1978 as Technical Progress Report No. 5. The report stated that the most viable technical and economical alternative for Eastern coal would be the shipment of Eastern low-sulfur coal to Taconite Harbor (Erie's own harbor facility) and then transfer at Taconite Harbor to rail for shipment to the plantsite. The Eastern coal shipment system involved conventional means of boat unloading, transferring to railroad cars and unloading at the plantsite and presented a very low technical risk.

Western coal presented a more unique problem than Eastern coal because Western coal has a larger amount of fines as it leaves the mine site.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

The computer evaluation determined that the most economical way to handle Western coal would be to receive mine-run Western coal at the plantsite and then briquette the fines. There is no operational experience with gasifiers using coal briquettes; and, therefore, this method involves the highest technical risk. This technical risk could be lessened, or at least defined, by an independent test program prior to construction of the plant and an extensive testing program carried out in the Demonstration Plant after construction.

Stirred Gasifier

Stirrers have only been used on single-stage gasifiers. Stirrer design on two-stage gasifiers has not been commercialized. Since the reaction time is longer in a two-stage gasifier, the stirrer operates under a more severe condition than in a single-stage gasifier. Due to the longer reaction time, the stirrer must be buried in several feet of coal to reach the critical zone or the plastic zone of the coal. The stirrer design criteria must include such things as material used for the stirrer, instrumentation necessary to indicate when there is an overtorque condition for the stirrer and, if any, what means of cooling should be used for the stirrer device. The gasifier subcontractor, Babcock Contractors, Inc., has performed the preliminary engineering for the stirrer. In review of preliminary design, it is apparent the bulk of the engineering is largely based on engineering assumptions; and, therefore, the stirred gasifier becomes a high technical risk

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

area. To reduce the risk, the stirred gasifier should be tested during Phase III of the contract. During this test phase, it is advisable that only one of the gasifier units be equipped with a stirrer and as the success of the stirrer is proven, then the other units should be retrofitted.

Gasifier Operation with Coal Fines

The gasifier can operate utilizing about 10 percent fines. After this percentage has been exceeded, the gasifier shows a marked decrease in efficiency. The efficiency decreases because of lack of good gas distribution through the coal bed. In commercially operated plants, coal feed has been screened prior to going into the gasifier. The Western coals present a problem because of their large quantities of fines. As previously mentioned, briquetting is a possible way of handling coal fines, except this does represent a high technical risk area. Therefore, it is desirable to introduce as many fines as possible into the gasifier. Currently, Babcock Contractors, Inc., has indicated that up to approximately 10 percent fines could be introduced to the gasifier without a severe loss of efficiency. During Phase III of this contract, the amount of the fines that can be effectively used in a gasifier should be tested. After this test work has been completed, then a trade-off study should be conducted on which is more economical--briquetting or introduction of fines into the gasifier. Tests should include fines processing with the stirred and nonstirred gasifiers.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Coal Sizing

During February, 1978, when preliminary procurement activities were initiated, it became apparent that an economical source of sized coal or run-of-mine coal with a minimum of fines for gasifier feed was not assured.

Run-of-mine coals were observed to contain 50 to 60% fines (coal fines are considered as those sizes below which gasifier manufacturers would not warrant operation). Further, Western coal samples were observed to generate an inordinate amount of coal fines during handling and storage.

Subsequent testing of samples and a detailed coal handling study was required to review the availability and insure minimum degradation of selected coals and alternate coals were selected as contractual coals were determined unsatisfactory.

Alternate uses of Eastern and Western coal fines were investigated and over 100 alternatives were defined and evaluated in computer simulation.

The "optimum" alternative with the lowest equivalent cost per million BTU's was identified as Western coal with agglomeration of fines.

Utilization of Western coal will be dependent on the ability to satisfactorily agglomerate and utilize the agglomerated fines in a gasifier.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Handling and disposal of large amounts of coal fines is not practicable as facility costs and raw material costs are significantly increased.

Coal Feed - Eastern Vs. Western

Specific Risks

	<u>Eastern Coal</u>	<u>Western Coal</u>
Stirred Gasifier	High	Not Determined
Briquetting	Not Required	Medium
Fines	Low	High

Eastern

Risk of using Eastern coal is dependent on the performance of the caking coal and the success of the deep bed stirrer. Erie has recommended to DOE that initially only one stirred gasifier be installed until the optimum mechanical design can be established. The central core of the gasifier has been designed to accomodate both the stirred and non-stirred internal components.

Western

Due to problems in coal sizing and degradation in handling commercially available, economically priced Western coals, gasification of Western coal, in our opinion, is not practicable and is a high risk.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

As our coal handling and coal procurement activities delineated, Western coal use is not practical or economical without briquetting and successful gasification of the briquetted fines.

To reduce this risk, Erie recommended to DOE that an agglomeration study be initiated, justified by the potential savings in operating and capital costs. Our request was deferred.

In order to satisfactorily utilize Western coal, the following parameters must be resolved and defined. Such definition would include production of briquettes for selected feedstocks and testing under both simulated and actual gasification. Particular parameter for:

1. Compressive strength (cold).
2. Strength and character during gasification.
3. Binder - effect on downstream equipment.
4. For caking coals:
 - Effect of caking tendency.
 - Reaction to temperature change.
5. Reaction to stirrer.
6. Sizing for optimum gasification.

Erie recommends that it is in the best interest of the government to satisfactorily resolve this "high risk" area prior to or during further design work prior to any actual construction of the Erie or other similar gasification project.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

B3. Detailed Engineering Review

As previously mentioned, there are several areas that were encountered during the development of Phase I that require additional detail engineering or Trade-Off Studies that would be included in Phase II activities. All of the problems or details are considered solvable by normal engineering practices. To organize the discussion of these problem areas, they will be discussed in the same categories that McKee used for design purposes.

Site Work

A preliminary subsurface soil investigation was conducted by Soil Testing Service. Their report, issued on July 26, 1978, revealed that there were three distinct layers of material. The first layer, which was probably a fill material of mine waste rock, varying in depths of 4 to 9 feet deep and then below that a layer from 2 to 9 feet of organic peat-type material. The last layer was essentially glacial outwash or glacial till. The recommendation of Soil Testing Service (used for design by McKee) was to remove all of the overburden material through the organic peat layer and then backfill with well compacted fill. There was some ground water present; however, during the excavation and backfilling process it was felt that this could be best handled with a simple sump and pump method. Due to the large plot plan area involved and the depths to which the overburden must be removed, several thousands

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

of yards of material would have to be removed and an equal amount of material brought in as fill material. Before detail engineering work could be completed on foundations, additional holes would have to be drilled and a further look at which would be the best way to solve this problem. Pilings or casings could be placed underneath the building foundations. This requires further investigation during Phase II.

Surface drainage becomes a very important part of site preparation on this project not just from the standpoint of structural problems but due to the many environmental restrictions. The coal pile must be adequately drained and collected so that no effluent from the coal pile would enter any of the State waterways. Likewise, plantsite buildings must have drainage to a central collection pond. Drainage has been provided for by the McKee design, a settling pond was designed into the plot plan.

Material Handling

The largest problem in this area is where to obtain the coal. To understand the background and the meaningful problem involved here, it is recommended that the coal handling trade-off study be reviewed and studied. This study was issued on August 30, 1978, as Technical Progress Report No. 5. The study considered both Eastern and Western coal. Western coal was the most promising choice provided briquetting of

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Western coal would be successful. As mentioned under high risk areas, the success of briquetting is measured on its performance in the gasifier. To date, there has been no usage of briquettes in a gasifier so this becomes an unknown area. Low-sulfur, low-caking Eastern coal is the next best selection in coal feedstock. Since this coal requires no briquetting, it may be the best selection.

Plantsite coal handling was designed for the receipt of coal via railroad cars. Western coal would be shipped in 100-car unit trains. The unit trains would be marshalled into 50 car cuts at a siding called Old Measbi located some 4 miles from the plantsite. Fifty car cuts then would enter into the plantsite loop arrangement. Once they are in the plantsite loop, they would be dumped by the use of rotary car dumper and automatic car positioner.

There is a question as to whether the rotary car dumper would be required for this operation. Perhaps a bottom dump method could be used. There are several considerations that must be taken into account before a dumping unit is decided. With unit train receipts, the problem of demurrage having to be paid on a unit train after it is on the plantsite for more than 24 hours. Another consideration is receiving coal during freezing months of the year. Presently, the design is based on receipt of coal during warm weather. However, a thorough investigation of receiving coal year-round might reveal that cheaper rates can be achieved

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

by receiving coal during both the winter and summer months. A thaw shed has been designed in the plantsite loop track. The thaw shed should be eliminated if coal is going to be received in nonfreezing seasons.

The design of the plantsite railroad trackage did allow for the connection of the present Erie pellet shipment track to the plantsite track. This allows for the receipt of Eastern coal through Erie's Taconite Harbor facility. The coal would be shipped from Taconite Harbor on the Erie Mainline track to the coal gasification plantsite. The plantsite trackage is adequate for handling Eastern coal trains for the Demonstration Plant.

Conveying and stacking systems for coal handling seemed to be adequate in their design. The design has shown several different vibrating feeders in the system. Erie Mining Company has had a great deal of experience with vibrating feeders and has found that during cold weather there is usually a freeze buildup on vibrating feeders and also, vibrating feeders have a high maintenance cost record. It is therefore recommended that the use of vibrating feeders be reviewed.

McKee in their design has indicated that there are two methods of stacking coal on the stockpile. The method used on the drawing is the lowering tubes and the other method is the use of an arc stacking

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

conveyor. Erie has had experience with both types of stacking systems and has found that the arc stacker performs much better and is less expensive than the lowering tube method.

Gasification Area

The coal storage bunkers above the gasifiers were designed for a 12-hour live storage. This design should be reviewed and, if possible, expanded to a 20-hour storage capacity. The additional capacity would then allow one operator to fill coal bunkers on an 8-hour shift and then, two shifts later, another operator would fill the bunkers once again. The same operator would also have duties in hauling ash and sulfur to the ash and sulfur disposal area. A 20-hour storage would allow this operator to perform his duties of filling the coal bunkers anytime during his 8-hour shift.

Coal is discharged from the coal bunkers down a series of lock hoppers, conveyors, coal tubes and a distribution system at the top of the gasifier. A general review of this handling system should be made. There seems to be too many potential plugging areas.

The stirrer is the central focus of attention in the gasification area. This item has already been discussed under technical risks. In summary, to date there has been no use of a stirrer on a two-stage gasifier. All the technology that has gone into the design of the stirrer has

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

been based on a single-stage stirrer. There are a number of small items in the stirrer design that could be discussed but the true success of the gasifier will only be known after a gasifier has been built with a stirrer installed. Therefore, it is recommended that only one stirrer be installed initially. After this stirrer has adequately performed, then additional stirrers could be installed in other gasifiers.

The ash level detection system, as designed, could be improved. The design uses one thermocouple located at the center and on top of the ash grate. This system does not detect a tilted bed condition. Phase II activities should include a review of this system, as well as review of the manual "poking" system with the intent to automate these functions.

The ash removal system in the gasifier is designed as a dry system. The ash is discharged from the grates of the gasifier into a hopper, then through a lock hopper assembly where it is cooled and discharged onto a belt conveyor. In reviewing this system, there is a question as to whether or not a belt conveying system should be used or a pneumatic handling system. Erie Mining Company believes that the best system would be the pneumatic conveying system in consideration of cold weather handling problems which could occur in a "wet" conveyor system.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Sulfur Removal Area

The sulfur removal area only had a very few minor design problems. The sulfur removal unit is an off-the-shelf Stretford system. The system was designed by Ralph M. Parsons. The Stretford process has been used on various applications ranging from coke oven gas to processing claus tail gas at oil refineries.

During Phase I, site visits were made to various installations of the Stretford process. All of the installations that were visited were working well and effectively removing the hydrogen sulfide from the gas streams. The Stretford process produces two by-products; one is the elemental sulfur and the other is the Stretford solution purge stream. The elemental sulfur can be handled in various ways. The system designed by Ralph M. Parsons would produce a flaked, dry sulfur. This flaked sulfur then would be transported from the plantsite area to a special sulfur ash disposal site. The elemental sulfur is removed at a high purity level. Since the sulfur is of high quality, it may be possible that it could be marketed locally. A preliminary investigation of possible markets had revealed that there may be potential customers. During Phase II of the project, a more thorough investigation of this market and possible usage of sulfur should be included.

The Stretford purge stream presented a problem of an environmental concern. The present plan calls for mixing of the Stretford purge

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

stream into the ash and then disposing in the ash disposal area.
Further investigations of disposal methods are necessary in Phase II.

Gas Transmission Area

The gas transmission area mainly consists of the necessary gas compressors for taking the gas from the gasifiers and compressing it to the proper pressure necessary to enter the combustion chambers of the pelletizing furnaces. Present design includes two compressors for the Demonstration Plant and three compressors for the Commercial size plant; both plants then would be operating with one spare unit. Several discussions were held on this subject and also a Trade-off Study conducted on the number and size of compressors necessary. The spare unit concept may seem redundant; however, it should be remembered that the total output of the plant is being funneled through the compressors; and, for this reason, spare compressor capacity has been determined as essential.

Waste Water Treatment

The waste water to be treated is the condensate that is collected from the gas stream before cooling prior to the Stretford unit. McKee developed a Trade-off Study on incineration versus biological treatment. The conclusion of the Trade-off Study indicated that incineration would be the most economical means of disposing of the waste water. This system was designed on the usage of Western coal. (With Eastern coal, there is less condensate.) Should Western coals be eliminated from the

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

design basis, a thorough review should be conducted of the waste water treatment facility requirements.

Another area that should be reviewed is the evaporation pond for disposing of coal pile, plantsite runoff and ash-sulfur disposal area. Presently, the design calls for a 5.5 acre settling pond which allows for evaporation of coal pile and plantsite run-off. If the flow into the settling pond exceeds the evaporation rate, then some other means of disposing of the waste water will have to be designed. As runoff from ash and sulfur disposal areas is defined in Phase II, Redesign or Further Trade-off Studies (Evaporation or incineration, etc.) will be required.

Utilities

The major portion of required utilities are provided for tie-ins to existing facilities. The cooling water system, as designed, receives water from Erie's Concentrator Building and returns the used water back to the Concentrator Building. This system is designed as a gravity system using two 24-inch lines. A more thorough investigation of this system may be in order to reduce the line size.

The fire water system uses an independent storage tank and pump. A review of this system with Factory Mutual revealed that tying into the existing Erie Mining Company's fire water protection system may be adequate. Without adding a storage tank and pump, additional review of this system would be required in Phase II.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Safety Systems

The safety system, as designed by McKee, is comprised of a ground flare. The ground flare's purpose is to protect the transmission line from overpressured conditions due to sudden power failures and also to aid in startup procedures. The only potential problem, in this area, seems to be whether or not environmental regulations can all be met. Before a final flare system is designed, appropriate approval should be obtained from the necessary environmental agencies. A detailed analysis and quantification of potential emissions is required during finalization of plant design.

Retrofit

This area covers the piping and burner modifications necessary in the existing pellet plant to burn and control the low Btu gas. In addition to burning the low Btu gas, the burners must be able to use multiple fuels, natural gas, bunker C oil and low BTU gas will be burned in the combustion chambers.

A proposal clarification trip to John Zinc Corporation revealed that there are many burners being used for multiple fuels. Controls will have to be reviewed in the final engineering to insure that proper control can be maintained in the pelletizing furnace. It is anticipated that there should be no great engineering problems in this area. This activity would replace "Burner Tests" currently included in the Phase II Scope of Work.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Employee Facilities

The employee facilities are currently designed to be a stand-alone, pre-engineered building, which would be approximately 50 feet x 50 feet in size and capable of handling 70 employees. The building is designed for the Commercial Plant capacity. A change in number of employees would require redesign. The number required to operate the plant will not be finalized until the plant has actually performed in its Phase III operation.

Erie normally tries to include necessary employee facilities within the plant battery limits. Service facilities are provided from central locations as needed.

DOE requirements may require a stand-alone Administrative area; however, Erie would recommend that elimination of "stand-alone facilities" versus "integrated facilities" be reviewed in Phase II.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

C. Economic Assessment

The economic assessment of the Demonstration and Commercial Plants presented for DOE review is based on contract requirements as per the Erie/DOE Contract EW-78-C-02-5066 and is presented as follows:

A detailed review of contract costs was provided to DOE during the Contract Pricing Review Meeting January 19, 1979. Section VI of this report includes final and updated cost estimates based on front end engineering completed since that time.

General - In defining the basis of assessment for the McKee Economic Evaluations, Erie took into consideration the manner in which the various alternates for the plant could be constructed. In view of the front end engineering delays due to subcontract negotiation difficulties, it was necessary for McKee to use information in preparing the Economic Evaluations, which was available at the time, in order to meet the scheduled delivery date of the cost estimates. In the areas where final data is substantially different from that which is presented in the Economic Evaluations, Erie has updated the base estimate (included as Item 6 of this report). The gasifier front end engineering estimate for gasification (Area 02) is the original preliminary estimate provided by Babcock Contractors, Inc., as amended by the final cost estimate provided by BCI with the final package of deliverables. The cost estimate for sulfur removal is the data provided by the Ralph M. Parsons Company in

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

the response to the bid proposal and with further estimating by McKee, contingency for the Parsons' design could increase the cost as presented in the proposal of \$3.6 million to \$5.5 million. Stretford operating costs, used in the economic evaluation, of \$311,000 were evaluated in the Stretford selection process to be \$675,000 for the Demonstration Plant and \$1.1 million for the Commercial Plant. As Parsons' activities were cancelled due to contractual problems, Erie has not updated the Stretford estimate.

In preparing the cost estimates for the Economic Evaluations, McKee did not incorporate site estimates provided by Erie. These items are included in Erie's evaluation of the cost estimates.

The following cost reductions are in Erie's view "potential" and would be the basis for further "trade-off studies" and review during final design (in Phase II). Costs have not been reduced from Phase I estimates.

Several approaches to material handling, in particular the coal handling costs, are appraised. The coal handling facility as designed is sized for the Commercial Plant. The idea of engineering and building a system sized for a Demonstration Plant with the objective of expanding or replacing such a system to a commercial size facility would increase gasification costs further. Therefore, Erie continues to recommend, in accordance with our existing contract provisions, sizing certain areas of the plant to the commercial size. These areas include the coal handling facilities, gas

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

compression facilities, gas transmission lines, utilities and disposal areas. Also to be included is the excavation and plant base preparation for the Commercial Plant.

Contract negotiations outlining financial arrangements must be made concerning any deferred costs on designs deferred to the Commercial expansion.

The coal handling facility is such an item. Erie's present system with certain modifications, is capable of transporting the coal tonnage necessary to operate a Demonstration Plant. However, increased operating costs with such coal handling procedures would substantially increase Phase III costs. Modifications to the present coal handling design are possible if this facility is to be constructed and should be taken into consideration for both the Demonstration and Commercial Plants.

Capital Cost Reductions

Potential capital reductions and additions, as summarized, indicate that although there is some potential for cost savings, further anticipated cost additions negate any significant net reduction.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

A summary of possible Capital Cost adjustments is presented for review:

Thaw Shed	\$ 182,300
Arc Conveyor	860,000
Spare Gasifier	2,072,000
Waste Water Incinerator	337,000
Fire Pumps	45,300
Employee Facility Building	189,000
Construction Management and Professional Services	5,500,000
Car Dumper Building	730,000
Conveyor Galleries	342,000
Vacuum Cleaning	197,000
Material Costs - Three Stirrers	<u>1,750,000</u>
Subtotal	\$12,204,600

Thaw Shed: Potential \$182,300

McKee estimated coal delivery for eight months to eliminate cold weather handling of coal. Erie agrees with an eight-month delivery, therefore, the thaw shed in the design would be eliminated. This does necessitate, however, special negotiations for receipt of Western coals by unit train. Coal prices would be higher for an eight-month operation as compared to a year-round operation. Further evaluation would be required should final design proceed.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Arc Conveyor: Potential \$860,000

Erie suggests replacing the lowering tubes in the McKee design with a radial arc conveyor. Increased flexibility in handling various coals, decreased capital costs and decreased operating costs due to the reduction in conveyors substantiate the substitution of the arc conveyor for the lowering tubes.

Spare Gasifier: Potential \$2,072,000

If high-moisture, low-BTU Western coal is not utilized and only high-BTU, low-moisture Eastern coal would be chosen as feedstock, Erie recommends that the spare gasifier could be eliminated. The design output would be maintained by the "high throughput" for Eastern coals. Further Trade-Off Studies and economic analysis would be required in Phase II as well as Erie/DOE contractual changes to redefine feedstock, Phase III Operating Plan and overall program objectives.

Waste Water Incinerator: Potential \$337,000

The waste water incinerator is oversized and recommendations should be considered to eliminate the system from the design. Eastern coals are very low-moisture and excess water is not expected to be an operating or environmental problem. The waste water incineration system was added to the design to process excess moisture from Western coals. Agglomerated Western coals are expected to be low-moisture and high-BTU following accepted agglomerating procedures. As a result, it is expected that the waste water incinerator may be unnecessary in the plant design, should Western coals be eliminated from the design basis.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Fire Pumps: Potential \$45,300

The fire system for the coal handling facility in the McKee design is larger than necessary for the expected size of the facility. The present water system at Erie may be capable of handling the volume of water required for adequate protection. Therefore, it may be possible to eliminate the fire water pumps included in the cost estimate.

Employee Facilities Building: Potential \$189,000

Erie recommends the elimination of the employee facility building. Those integrated facilities deemed necessary should be included in the gasification building or present plant facilities. Further evaluation and redesign would be required in Phase II to determine requirements and savings.

Construction Management and Professional Fees: Potential \$5,500,000

Erie's assessment of the indirect costs associated with the capital expenditures reveal construction management fees of 28% of the total plant investment.

Erie proposes that 17-1/2% is more realistic under normal conditions. Various alternates are available for construction management. Management services can be acquired through bidding procedures, McKee can be retained for management services or the Taconite Contracting Corp. may be appointed construction manager. McKee utilized 28% reflecting added costs to perform under Government procedures and project control requirements. Erie would recommend that DOE minimize reporting and control requirements to those normally utilized by industry.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Engineering assessment of the professional services outlined by McKee resulted in a reduction from 234 man-year hours to 156 man-year hours. This estimate is based on the engineering done to date, assuming normal business practice. DOE should consider minimizing reporting and other government administrative requirements.

Additional add-ins would be included for Erie's construction management costs and the costs associated with reporting and procurement through Phase III.

Car Dumper Building: Potential \$730,000

A sophisticated building for housing the rotary car dumper has been designed into the material handling facilities. It is an accepted standard at Erie to install pre-engineered buildings wherever possible. Installation of a pre-engineered building could result in a potential cost saving and should be considered in Phase II.

Conveyor Galleries: Potential \$342,000

Since coal delivery is expected to be a warm-weather operation, Erie recommends elimination of all conveyor galleries, provided that control of fugitive emissions could be designed to meet environmental requirements. Verification of environmental concerns would be required in Phase II before any potential savings could be realized.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Vacuum Cleaning: Potential \$197,000

A dust collection system is installed for dust control. In addition, a vacuum system is installed to supplement the dust collectors. Erie recommends elimination of the vacuum system as it is unnecessary.

Material Costs - Three Stirrers: Deferred \$1,750,000

Pending technical and operating confirmation of stirrer feasibilities, Erie would recommend that only one stirrer be installed in the Demonstration Plant until testing and confidence in the stirring procedure during gasification was gained. Additional stirrers could then be installed. Capital costs of the additional stirrers are a possible saving or deferred cost. Contract amendment would be required with DOE concurrence to extend or modify the contractual operating requirements of Phase III.

CAPITAL COST ADDITIONS

Engineering Additions

Additional costs not included in the December cost estimates as a result of Erie's review or modifications to engineering since December 1978, are as follows:

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Sulfur-Ash Disposal	\$ 1,750,000
Erie Construction/Program Management	2,000,000
Structural Steel, Concrete	5,000,000
Gasifier Subcontract	15,000,000
Stretford Subcontract	Unestimated
Other Potential Additions	<u>Unestimated</u>
TOTAL	\$23,750,000

Sulfur-Ash Disposal: Addition \$1,750,000

As a result of site drilling and environmental studies, ash and sulfur disposal area preparation is currently estimated at \$1,750,000, to ensure that environmental regulations are met. Further site drilling and analysis is required in Phase II to confirm and substantiate preliminary drilling and current estimates.

Runoff from the disposal areas must be adequately disposed of when defined in Phase II. Additional costs will be incurred.

Erie Construction/Program Management: Addition \$2,000,000

Erie's costs to manage and develop the Erie/DOE Program are estimated in addition to the capital and operating costs presented by subcontractors in the plant cost estimates.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Structural Steel/Concrete: Addition \$5,000,000

Further engineering assessment of the economic evaluation reveals that subcontractors estimated the cost of concrete (installed) at \$280/cu. yd; actual recent experience in Hibbing, Minnesota cost is \$300/cu. yd. Subcontractors estimated structural steel at \$1,255-2,017/ton. Actual experience at Hibbing costs \$2,250-3,000/ton. Other estimating differences include: Trackwork estimated at \$52/ft., actual \$78/ft.; overpass estimated at \$231/ft., actual \$540/ft.; and, piping estimated at \$60-72/ft., actual \$75/ft.

Gasifier Subcontract Estimates: Addition \$15,000,000

The preliminary gasifier estimate used in December 1978 for current project costs did not reflect the final data from the BCI Front End Engineering effort.

Final cost estimate submitted by BCI in March 1979, indicated additional capital costs for the gasifiers and related equipment.

Stretford Subcontract

A potential add-in is expected in this area due to inflation and engineering contingency. However, at this time, the exact number is not available due to lack of a finalization of Stretford Subcontract.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

Other Potential Additions

Erie feels the following items could be expected to result in significant cost additions to the construction and operation of the completed plant.

In light of the environmental uncertainties and the intent of reduced scope of work to minimize activities, Erie has not attempted to quantify or further define the following potential areas for cost additions.

1. Additional costs to develop a gasifier stirrer that meets commercial criteria for operating and maintenance reliability.
2. Delays in construction due to regulatory permitting.
3. Construction contracting under DOE procurement regulations.
4. Coal briquetting, development, testing and establishment of firm costs.
5. Regulatory - Environmental and Others Directly Related:
 - a. Environmental Impact Statement
 - b. Health and Safety Standards
 - c. Best Available Control Technology Applied to Total Erie Operation
 - d. Environmental Reporting and Monitoring Requirements
 - e. Sulfur Removal from all Coals

Pickands Mather & Co.

*1100 Superior Avenue
Cleveland, Ohio 44114*

August 1, 1979

Mr. R. W. Laza
Contracting Officer
U. S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439

SUBJECT: Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
REF: ERDA - 404

Dear Mr. Laza:

In accordance with your letter of June 6, 1979 and subsequent discussions, we have modified Section VI-Cost Summary and VII-Recommendations of the final report submitted May 15, 1979.

Twenty copies of Section VI and VII are provided for replacement of the previous sections. Please destroy the old sections.

Descriptive comments have been added to the Cost Summarys as discussed with Mr. Rader.

Our previous curves for gas costs did include amortization and were generated to show the sensitivity of gas cost with variable capital costs. Curves and tables were modified for a 15% DCF and escalation was made at 10% as requested. Descriptive narrative was also provided.

We did not utilize 1977 costs as per our discussion and your verbal concurrence. All costs generated in Phase I were in 1978 dollars. Escalation was based from 1978.

De-escalation of the detailed costs generated during the project would require an extensive and costly re-estimation of the project and entail re-opening of subcontracts which have been closed or terminated.

Mr. R. W. Laza
Page -2-
August 1, 1979

Technical and environmental risks are now summarized in the Section VII Revision with reference to the detailed risk analysis which was previously included in Section V Parts A2 and B2.

Costs incurred for the above referenced clarifications were considered part of wrap-up activities in Task 10 per the reduced scope of deliverables.

Funds in addition to the current estimated cost of the contract (3.999 million) were not required.

Your earliest acceptance of this final report is requested in order to allow completion of the 60 day Government Decision Period, as referenced in your correspondence of May 15, 1979 and subsequent reference in your letter of June 6, 1979.

If there are any further questions or clarifications, please contact us.

Sincerely,

ERIE MINING COMPANY
PICKANDS MATHER & CO.
MANAGING AGENT

J. H. Fatum
Project Director

JHFatum/cap

cc: H. P. Whaley
C. A. Stiles
J. Gannon

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

VI. COST SUMMARY INDEX

A. Capital Cost Summary	VI-3
B. Operating Cost Summary	VI-9
C. Gas Selling Cost	VI-16
Current Estimate - Phase I, II, III	VI-17
Cost Analysis - General Assumptions	VI-21
Cost Analysis - Demonstration Plant Assumptions	VI-23
Cost Analysis - Commercial Plant Assumptions	VI-24
<u>Demonstration Plant</u>	
Eastern Coal - 1978 Constant Dollar Analysis	VI-25
Eastern Coal - 1978 10% Inflation Analysis	VI-26
Gas Selling Price Vs. Var. Operating Costs	VI-27
Gas Selling Price Vs. Plant Investment	VI-31
<u>Commercial Plant</u>	
Eastern Coal - 1978 Constant Dollar Analysis	VI-35
Eastern Coal - 10% Inflation Analysis	VI-36
Gas Selling Price Vs. Var. Operating Cost	VI-37
Gas Selling Price Vs. Var. Plant Investment	VI-41
<u>Demonstration Plant</u>	
Western Coal - 1978 Constant Dollar Analysis	VI-45
Western Coal - 10% Inflation Analysis	VI-46
Gas Selling Price Vs. Var. Operating Costs	VI-47
Gas Selling Price Vs. Plant Investment	VI-51
<u>Commercial Plant</u>	
Western Coal - 1978 Constant Dollar Analysis	VI-54
Western Coal - 10% Inflation Analysis	VI-55
Gas Selling Price Vs. Var. Operating Costs	VI-56
Gas Selling Price Vs. Plant Investment	VI-60
D. General Description of Plant by Area	VI-64

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

VI. COST SUMMARY

The following revised charts and tables explain the various capital costs, operating costs and contract costs. The original charts were presented at the Contract Pricing Review held in Cleveland, Ohio, on January 19, 1979.

The cost data shown on the charts are generated from McKee's Economic Evaluation of the Commercial and Demonstration Plant, Erie's cost estimate, and cost data received after the January meeting.

Adjustments have been made to reflect changes in the December McKee estimate resulting from final costs received from final documents and Front End Engineering Design Manuals delivered in March, 1979.

Cost adjustments have not been made for "Potential" Cost Savings resulting from design changes and further Trade-off Studies which would be performed in Phase II should the project proceed. Further engineering and or regulatory clearances would be required to authenticate and define any such Potential Cost Reductions.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

Potential Cost Additions, with the exception of the Gasifier and Ash Disposal Area, have not been included as adjustments. As in the case of "Potential Cost Savings", Potential Additions will require more definition and/or engineering in Phase II should the project proceed.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

A. CAPITAL COST SUMMARY

DEMONSTRATION PLANT

(000 Omitted)

McKee Battery Limits	\$ 57,244
Erie Off-Sites	<u>1,750</u>
Total Direct Cost	\$ 58,994
Total Indirect Cost	19,357
Escalation to 1981 @ 10%/annum 3½ yrs.	28,541
Contingency at 10% (on \$78,351)	<u>7,835</u>
TOTAL CAPITAL INVESTMENT	\$114,727

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

DIRECT CAPITAL COST

DEMONSTRATION PLANT

(000 Omitted)

McKee

01	Material Handling	\$15,984
02	Gasification	19,507
03	Sulfur Removal	4,537
04	Gas Compression	2,075
05	Waste Treatment	787
06	Utilities	12,655
07	Safety Systems	143
08	Retrofit	1,367
09	Employee Facilities	189

Erie

10	Sulfur & Ash Disposal	<u>1,750</u>
----	-----------------------	--------------

TOTAL DIRECT COST		<u>\$58,994</u>
-------------------	--	-----------------

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

INDIRECT CAPITAL COST

DEMONSTRATION PLANT

(000 Omitted)

Construction Management	\$ 3,362
Professional Services	11,722
Royalties	192
Taxes	1,576
Insurance	505
BCI Increase	<u>2,000</u>
TOTAL INDIRECT COST	\$19,357

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

CAPITAL COST SUMMARY

COMMERCIAL PLANT

(000 Omitted)

	<u>EASTERN COAL WITH STRETFORD</u>	<u>WESTERN COAL WITHOUT STRETFORD</u>	<u>DEMONSTRATION WITH STRETFORD</u>
Mckee Battery Limits	\$85,433	\$62,514	\$57,244
Erie Off-Sites	<u>14,250</u>	<u>1,750</u>	<u>1,750</u>
Total Direct Cost	\$99,683	\$74,264	\$58,994
Total Indirect Cost	29,466	25,133	19,357
Escalation to 1981 (3½ yrs) @ 10% rate	47,046	36,208	28,541
Contingency at 10%	12,915 (on 129,149)	9,940 (on 99,397)	7,835 (on 78,351)
TOTAL CAPITAL INVESTMENT	\$189,110	\$145,545	\$114,727

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

DIRECT CAPITAL COST

COMMERCIAL PLANT

(000 Omitted)

	<u>EASTERN COAL WITH STRETFORD</u>	<u>WESTERN COAL WITHOUT STRETFORD</u>	<u>DEMONSTRATION WITH STRETFORD</u>
<u>McKee</u>			
01 Material Handling	\$15,984	\$15,984	\$15,984
02 Gasification	38,303	35,864	19,507
03 Sulfur Removal	10,480	--	4,537
04 Gas Compression	3,074	3,074	2,075
05 Waste Treatment	855	855	787
06 Utilities	13,367	13,367	12,655
07 Safety Systems	143	143	143
08 Retrofit	3,038	3,038	1,367
09 Employee Facilities	189	189	189
<u>Erie</u>			
10 Sulfur & Ash Disposal	1,750	1,750	1,750
11 Taconite Harbor	12,500	--	--
TOTAL DIRECT COST	<u>\$99,683</u>	<u>\$74,264</u>	<u>\$58,994</u>

Final Report
Erie Mining Company
Coal Gasification Report
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

INDIRECT CAPITAL COST

COMMERCIAL PLANT

(000 Omitted)

	<u>EASTERN COAL WITH STRETFORD</u>	<u>WESTERN COAL WITHOUT STRETFORD</u>	<u>DEMONSTRATION WITH STRETFORD</u>
Construction Management	\$ 4,906	\$ 4,235	\$ 3,362
Professional Services	16,635*	13,845	11,722
Royalties	525	204	192
Taxes	2,504	2,210	1,576
Insurance	896	639	505
BCI Increase	<u>4,000</u>	<u>4,000</u>	<u>2,000</u>
TOTAL INDIRECT CAPITAL	\$29,466	\$25,133	\$19,357

*510,000 Man-Hours

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

B. ANNUAL OPERATING COST SUMMARY
 OF
DEMONSTRATION AND COMMERCIAL PLANTS

(000 Omitted)

<u>ITEM</u>	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
Labor	\$ 3,243	\$ 3,064	\$ 4,286	\$ 3,652
Operating Materials	7,462	5,921	19,846	15,710
Maintenance Materials	1,036	1,036	1,653	1,220
Power	670	554	1,448	1,182
Miscellaneous	<u>2,345</u>	<u>2,277</u>	<u>3,660</u>	<u>2,787</u>
Subtotal	\$14,756	\$12,852	\$30,893	\$24,551
Less Credits	<u>(3,411)</u>	<u>(448)</u>	<u>(9,630)</u>	<u>(2,028)</u>
TOTAL	\$11,345	\$12,404	\$21,263	\$22,523
Cost for Gas/MBtu	\$ 4.20	\$ 4.60	\$ 2.91	\$ 3.09
Combined Cost/MBtu (Gas Tars & Oils)	\$ 3.90	\$ 4.50	\$ 2.94	\$ 3.08

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

To determine the operating cost per million BTU of energy produced at the Erie Mining Co. Coal Gasification Project.

LET A = OPERATING COST	Ref. Page VI-6
B = COAL CREDIT	" " VI-13
C = OIL AND TAR CREDIT	" " VI-13 and criteria below
D = ANNUAL PRODUCTION RATE	criteria below

CRITERIA

- . Annual Production Rate, Demonstration Plant 2,701 Billion BTU
- . " " " Commercial Plant 7,300 Billion BTU
- . Daily " " " 20 Billion BTU
- . " " " Demonstration Plant 7.4 Billion BTU
- . Oil and Tar Credit for useage or sales \$3.00/M BTU
- . Coal Fines Credit, Taconite Harbor Useage \$37.75/T Eastern Coal

Calculation of operating cost is based on inclusion of oil and tar useage in economic analysis.

DERIVED FORMULA

$$\frac{A - B}{D + \left(\frac{C}{3} \times 1,000,000 \right)} \quad \$/1,000,000 \text{ BTU}$$

Calculation of operating cost is based on exclusion of oil and tar useage in the economic analysis.

DERIVED FORMULA

$$\frac{A - (B+C)}{D} \quad \$/1,000,000 \text{ BTU}$$

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

ANNUAL OPERATING COSTS

LABOR

	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
<u>SALARIED</u>				
Operating	7	7	8	8
Maintenance	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>
SUBTOTAL	8	8	9	9
<u>HOURLY</u>				
Operating	49	44*	59	54*
Maintenance	<u>6</u>	<u>6</u>	<u>10</u>	<u>10</u>
SUBTOTAL	55	50	69	64
TOTAL WORK FORCE	63	58	78	73
TOTAL COST	\$3,243	\$3,064	\$4,286	\$3,652
(000 Omitted)				

*Reflects Elimination of Sulfur Removal Plant Operators.

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ANNUAL OPERATING COSTS

OPERATING MATERIALS

(000 Omitted)

<u>ITEM</u>	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
<u>COAL</u>				
Tons/Year	173	183	468	497
Cost/Ton	\$ 40	\$ 31	\$ 40	\$ 31
Subtotal	\$6,926	\$5,701	\$18,724	\$15,415
<u>CHEMICALS/GAS</u>				
Inert Gas	\$ 26	\$ 26	\$ 50	\$ 50
Nitrogen	14	14	24	24
Stretford Chemicals	299	-	811	-
Misc. Chemicals	5	5	10	10
Subtotal	\$ 344	\$ 45	\$ 895	\$ 84
OTHER OPERATING MATERIALS	192	175	227	211
TOTAL	<u>\$7,462</u>	<u>\$5,921</u>	<u>\$19,846</u>	<u>\$15,710</u>

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ANNUAL OPERATING COSTS

MAINTENANCE MATERIALS

(000 Omitted)

<u>ITEM</u>	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
Maintenance Materials	\$1,036	\$1,036	\$1,653	\$1,220

NOTE: 1.5% of Plant Investment.

ANNUAL OPERATING COSTS

OPERATING POWER

<u>ITEM</u>	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
Operating Power				
KWH	4,025	3,327	8,692	7,095
Cost/KWH	\$.02	\$.02	\$.02	\$.02
TOTAL COST	\$670,000	\$554,000	\$1,448,000	\$1,182,000

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ANNUAL OPERATING COSTS

MISCELLANEOUS ITEMS

(000 Omitted)

<u>ITEM</u>	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
Water	\$ 41	\$ 30	\$ 99	\$ 80
Ash Disposal	64	66	129	134
Stretford Purge Disposal	12	-	32	-
Sulfur Disposal	20	-	41	-
General Overhead	481	454	603	539
Taxes & Insurance	<u>1,727</u>	<u>1,727</u>	<u>2,756</u>	<u>2,034</u>
TOTAL	<u>\$2,345</u>	<u>\$2,277</u>	<u>\$3,660</u>	<u>\$2,787</u>

ANNUAL BY-PRODUCT CREDITS

(000 Omitted)

<u>ITEM</u>	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
Excess Tars/Oils to Pellet Plant	\$2,625	\$448	\$7,508	\$2,028
Coal Fines to Taconite Harbor	<u>786</u>	<u> </u>	<u>2,122</u>	<u> </u>
TOTAL	\$3,411	\$448	\$9,630	\$2,028

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

OPERATING COST SUMMARY
OF
DEMONSTRATION AND COMMERCIAL PLANTS

<u>ITEM</u>	<u>DEMONSTRATION PLANT</u>		<u>COMMERCIAL PLANT</u>	
	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>	<u>EASTERN COAL</u>	<u>WESTERN COAL</u>
Gas Cost/MBtu	\$4.20	\$4.60	\$2.91	\$3.09
Combined Cost/MBtu (Gas, Tars & Oils)	\$3.90	\$4.50	\$2.94	\$3.08

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

EXPLANATION OF CHARTS

GAS SELLING COST

The following graphs are provided for reference and indication of the cost required to produce low-BTU gas from the Contractural Plant configurations.

Curves were generated from the cost estimate and economic evaluation issued in December, 1978. Detailed criteria used to generate the curves were provided in the above referenced documents.

(000 Omitted)

<u>Commercial</u>	<u>Eastern Coal With Stretford</u>	<u>Western Coal Without Stretford</u>	<u>Demonstration With Stretford</u>
<u>Direct</u>	\$ 99,683	\$74,264	\$58,994
<u>Indirect</u>	<u>29,466</u>	<u>25,133</u>	<u>19,357</u>
<u>TOTAL</u>	\$129,149	\$99,397	\$78,351

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

CURRENT ESTIMATED COSTS

(000 Omitted)

(1978 \$)

		<u>CONTRACT</u>	<u>FINAL</u>
Phase I	Preliminary Design	\$ 2,200	\$ 3,700*
Phase II	Construction	24,768	80,351
Phase III	Operation	<u>20,426</u>	<u>23,839</u>
		<u>\$47,394</u>	<u>\$107,890</u>

*Estimated, Parson's paid \$145,000

Escalation and contingency not included

Escalation	28,541
Contingency	<u>7,835</u>
Total cost of project	<u>144,266</u>

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

PHASE II COSTS (\$000)

(000 Omitted)

	<u>PLANT AREA</u>	<u>CONTRACT</u>	<u>FINAL</u> <u>ESTIMATE</u>
01	Material Handling	\$ 2,889	\$15,984
02	Gasification	8,759	14,507
	BCI Increase	-0-	5,000
03	Sulfur Removal	2,020	4,537
04	Gas Transmission	581	2,075
05	Waste Treatment	600	787
06	Utilities	679	12,655
07	Safety Systems	-0-	143
08	Retrofit	150	1,367
09	Employee Facilities	125	180
10	Sulfur-Ash Disposal	-0-	1,750
	Escalation 1976-77	<u>1,663</u>	<u>Included</u>
	TOTAL DIRECT COST	<u>\$17,466</u>	<u>\$ 58,994</u>

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

PHASE II COSTS

(000 Omitted)

(PROJECTED THROUGH CONSTRUCTION 1981)

	<u>CONTRACT</u>	<u>FINAL</u>
Direct Cost	\$17,466	\$ 58,994
Construction Management	1,633	3,362*
McKee Services	4,830	11,722
Royalties	88	192
Insurance	-0-	505
Taxes	-0-	1,576
BCI Increase	<u>-0-</u>	<u>2,000</u>
Subtotal	\$24,017	\$ 78,351
Erie Costs	<u>751</u>	<u>2,000</u>
Total Estimated	\$24,768	\$ 80,351
Escalation for 1978-1981	<u>3,574</u>	<u>28,541</u>
Cost to Construct	\$28,342	\$108,892**

*No Contingency Included.

**No Environmental Costs Included for Impact Statements or Monitoring.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

2-YEAR OPERATING COST - PHASE III

(000 Omitted)

	<u>CONTRACT</u>	FINAL <u>ESTIMATE</u>
Labor and Supervision	\$ 5,067	\$ 6,307
Operating Material	13,469	13,383
Maintenance Material	1,500	2,072
Equipment Distribution	350	Included
Other Services	40	5,846
Oil Credits	<u>Included</u>	<u>(3,859)</u>
	\$ 20,426	\$ 23,839

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

GENERAL ASSUMPTIONS

1. Utilized discrete period compounding; 23 time periods.

McKee employed continuous compounding; same time frame.

2. Timing of capital expenditure was split equally between the three years-- 1979, 1980 and 1981.
3. 85% of the capital expenditure was classified as "equipment", the remainder was "building".
4. Depreciation Methods

For Tax Purposes:

Building = 150% declining balance, 40 years, no residual value

Equipment = double declining balance, 13 years, no residual value

Per discussion with PM & Co. Tax Department:

ADR class would be either Class 13.3 13 yrs.

or

Class 28 9 yrs.

Utilized 13 yrs.

For Book Purposes:

Straight-time depreciation; 40 years for building; 15 years for equipment;
no residual value.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

5. Residual Value

The undepreciated balance (for tax purposes) of the building and the change in net working capital are shown as a cash inflow in the final period (year 2001).

6. Escalation of cost and revenues was at 10% annually.

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

DEMONSTRATION PLANT - ASSUMPTIONS

	<u>Eastern</u>		<u>Western</u>	
Productive Capacity	3,000	Billion Btu/A.	3,000	
Productive Volume	2,568	Billion Btu/A.	2,568	
Selling Price	Var.		Var.	
Semi-Var. costs (Fixed Costs)	\$6,547,000		\$6,324,000	
Variable Rate	\$3.90*	M Btu	\$4.50*	
Other Income	\$2,625,000		\$448,000	
	<u>Base</u>	<u>Esc.</u>	<u>Base</u>	<u>Enc.</u>
Cost of Building (\$000 omitted)	\$12,928	17,209*	12,928	17,209*
Cost of Equipment (\$000 omitted)	<u>\$73,258</u>	<u>97,518*</u>	<u>73,258</u>	<u>97,518*</u>
TOTAL	\$86,186	114,727*	86,186	114,727*
Changes in Working Capital	\$2,389,300		\$2,389,000	

*

Revised: All other amounts per McKee Runout

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

COMMERCIAL PLANT - ASSUMPTIONS

	<u>Eastern</u> plus esc.			<u>Western</u> plus esc.	
Productive Capacity	7,500		Billion Btu/A.	7,500	
Productive Volume	6,940		Billion Btu/A.	6,940	
Selling Price	Var.			Var.	
Semi-Var. costs (Fixed Costs)	\$8,552,000			\$7,447,000	
Variable Rate	2.94 [*]	M Btu		3.08 [*]	
Other Income	\$9,630,000			\$2,028,000	
	<u>Base</u>	<u>Esc.</u>		<u>Base</u>	<u>Esc.</u>
Cost of Building (\$000 omitted)	21,309.6	28,366.5 [*]		16,401	21,831.75 [*]
Cost of Equipment (\$000 omitted)	<u>120,754.4</u>	<u>160,743.5</u> [*]		<u>92,936</u>	<u>123,713.25</u> [*]
TOTAL	142,064	189,110 [*]		109,337	145,545 [*]
Changes in Working Capital		4,608.2			4,434.7

*

Revised: All other amounts per McKee Runout

Friday JUL 20, 1979 15:29

DEMONSTRATION PLANT --- EASTERN COAL --- 1978 CONSTANT DOLLARS

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	51360
PROJECTED P&L																

REVENUE	0	0	0	40009	40009	40009	40009	40009	40009	40009	40009	40009	40009	40009	40009	800188
SEMI-VAR. COST	0	0	0	6547	6547	6547	6547	6547	6547	6547	6547	6547	6547	6547	6547	130939
VARIABLE COSTS	0	0	0	10015	10015	10015	10015	10015	10015	10015	10015	10015	10015	10015	10015	200304

OPERATING PROFIT	0	0	0	23447	23447	23447	23447	23447	23447	23447	23447	23447	23447	23447	23447	468944
OTHER INCOME	0	0	0	2625	2625	2625	2625	2625	2625	2625	2625	2625	2625	2625	2625	52500
DEPRECIATION	0	0	0	2604	5207	5207	5207	5207	5207	5207	5207	323	323	323	323	79560

PRETAX PROFIT	0	0	0	23469	20865	20865	20865	20865	20865	20865	20865	25749	25749	25749	25749	441884
TAX-CURRENT	0	0	0	10097	7597	8238	8644	9049	9454	9859	11880	12891	12891	12891	12891	220614
TAX-DEFERRED	0	0	0	1637	2836	2195	1789	1383	978	573	-1448	-16	-16	-16	-16	328

NET INCOME	0	0	0	11734	10433	10433	10433	10433	10433	10433	10433	12875	12875	12875	12875	220942
=====																

CASH FLOW																

NET INCOME	0	0	0	11734	10433	10433	10433	10433	10433	10433	10433	12875	12875	12875	12875	220942
DEPRECIATION	0	0	0	2604	5207	5207	5207	5207	5207	5207	5207	323	323	323	323	79560
TAX-DEFERRED	0	0	0	1637	2836	2195	1789	1383	978	573	-1448	-16	-16	-16	-16	328
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5970	5970
CAPITAL EXPENDIT	28729	28729	28729	2389	0	0	0	0	0	0	0	0	0	0	0	88575

CASH FLOW	-28729	-28729	-28729	13586	18476	17835	17429	17023	16618	16213	14192	13182	13182	13182	19152	218225
=====																

DCFROR 15.01

ASSUMPTIONS

SELLING PRICE				15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58	15.58	
VARIABLE COST RATE				3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	
COST OF BUILDING	4309.30	4309.30	4309.30													12927.88
COST OF EQUIP.	24419.39	24419.39	24419.29													73258.06
CHANGE IN NWC				2389.30												2389.30

Friday JUL 20, 1979 15:42

DEMONSTRATION PLANT ---- EASTERN COAL --- INFLATED AT 10%/YEAR

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	51360
PROJECTED P&L																
REVENUE	0	0	0	38897	42786	47065	51772	56949	62643	68908	110976	178728	196600	216260	237886	2227791
SEMI-VAR. COST	0	0	0	9585	10544	11598	12758	14034	15437	16981	27348	44044	48449	53294	58623	549002
VARIABLE COSTS	0	0	0	14663	16130	17742	19517	21468	23615	25977	41836	67376	74114	81525	89678	839829
OPERATING PROFIT	0	0	0	14648	16113	17724	19497	21446	23591	25950	41792	67307	74038	81441	89585	838963
OTHER INCOME	0	0	0	3843	4228	4650	5115	5627	6190	6809	10965	17659	19425	21368	23505	220120
DEPRECIATION	0	0	0	3466	6931	6931	6931	6931	6931	6931	6931	430	430	430	430	105907
PRETAX PROFIT	0	0	0	15026	13409	15443	17681	20142	22849	25827	45826	84536	93033	102379	112660	953176
TAX-CURRENT	0	0	0	5334	2929	4800	6459	8229	10122	12151	24840	42289	46538	51211	56351	476151
TAX-DEFERRED	0	0	0	2179	3775	2922	2382	1842	1302	763	-1927	-21	-21	-21	-21	437
NET INCOME	0	0	0	7513	6705	7722	8840	10071	11425	12913	22913	42268	46516	51189	56330	476588

CASH FLOW																
NET INCOME	0	0	0	7513	6705	7722	8840	10071	11425	12913	22913	42268	46516	51189	56330	476588
DEPRECIATION	0	0	0	3466	6931	6931	6931	6931	6931	6931	6931	430	430	430	430	105907
TAX-DEFERRED	0	0	0	2179	3775	2922	2382	1842	1302	763	-1927	-21	-21	-21	-21	437
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7947	7947
CAPITAL EXPENDIT	38242	38242	38242	3498	0	0	0	0	0	0	0	0	0	0	0	118225
CASH FLOW	-38242	-38242	-38242	9660	17411	17575	18153	18844	19658	20608	27917	42677	46925	51598	64686	472654

DCFROR 15.01

ASSUMPTIONS

SELLING PRICE	11.38	12.52	13.77	15.15	16.66	18.33	20.16	22.18	24.39	26.83	43.22	69.60	76.56	84.21	92.63	
VARIABLE COST RATE	4.29	4.72	5.19	5.71	6.28	6.91	7.60	8.36	9.20	10.12	16.29	26.24	28.86	31.75	34.92	
COST OF BUILDING	5736.35	5736.35	5736.35													17209.03
COST OF EQUIP.	32506.00	32506.00	32506.00													97518.00
CHANGE IN NWC				3498.17												3498.17

GAS SELLING PRICE VS. VARIABLE OPERATING COSTS

DEMONSTRATION PLANT
EASTERN COAL

CONSTANT IRR - 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of variable operating cost levels, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumed 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely variable operating cost level, 3.90/M Btu (in 1978 dollars), the selling price necessary to achieve the desired IRR is (in 1978 dollars):

CONSTANT	\$15.58/M Btu
INFLATED	\$10.35/M Btu

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

EASTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE

(\$/M Btu)

<u>VO\$</u>	<u>SELLING PRICE</u>
1.00	12.66+
1.50	13.16+
2.00	13.66+
2.50	14.16+
3.00	14.66+
3.50	15.16+
4.00	15.66+
4.50	16.16+
5.00	16.66+
Most Likely 3.90	15.58
IRR 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE (10%)

EASTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE

(\$/M Btu)

	VO\$		SELLING PRICE	
	1978	1979	1978	1979
	.50	.55		
	1.00	1.10	7.42	8.17+
	1.50	1.65	7.92	8.72+
	2.00	2.20	8.42	9.27+
	2.50	2.75	8.92	9.82+
	3.00	3.30	9.42	10.37+
	3.50	3.85	9.42	10.92+
	4.00	4.40	10.42	11.47+
	4.50	4.95	10.92	12.02+
	5.00	5.50	11.42	12.57+
Most likely	3.90	4.29	10.35	11.38
IRR 15%

GAS SELLING PRICE VS. PLANT INVESTMENT

**DEMONSTRATION PLANT
EASTERN COAL**

CONSTANT IRR - 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of plant investments, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumes 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely level of plant investment \$86,186,000 (in 1978 dollars) and \$114,727,000 (escalated), the selling price required to achieve the desired IRR is (in 1978 dollars):

CONSTANT	\$15.58/M Btu
----------	---------------

INFLATED	\$10.35/M Btu
----------	---------------

This, of course, is the same selling price computed in the previous graph:
Gas selling Price vs. Variable Operating Costs.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

EASTERN COAL

PLANT INVESTMENT VS. SELLING PRICE

	<u>PLANT INVESTMENT</u> (\$000 omitted)	<u>SELLING PRICE</u> (\$/M Btu)
9,000 51,000	60,000	12.57
12,000 68,000	80,000	14.87
15,000 85,000	100,000	17.16
18,000 102,000	120,000	19.45
21,000 119,000	140,000	21.74

PROJECTED

86,186

IRR 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE

EASTERN COAL

PLANT INVESTMENT VS. SELLING PRICE

PLANT INVESTMENT		SELLING PRICE	
(\$000 omitted)		(\$/M Btu)	
<u>BASE</u>	<u>ESCALATED</u>	<u>1978</u>	<u>1979</u>
	133%		
60,000	79,800	8.88	9.77
80,000	106,400	9.99	10.99
100,000	133,000	11.10	12.21
120,000	159,600	12.20	13.43
140,000	186,620	13.32	14.65
PROJECTED 86,186	114,727		
IRR 15%			

Friday JUL 20, 1979 13:41

COMMERCIAL PLANT. --- EASTERN COAL --- 1978 CONSTANT DOLLARS

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	138794
PROJECTED P&L																

REVENUE	0	0	0	62319	62319	62319	62319	62319	62319	62319	62319	62319	62319	62319	62319	1246374
SEMI-VAR. COST	0	0	0	8552	8552	8552	8552	8552	8552	8552	8552	8552	8552	8552	8552	171040
VARIABLE COSTS	0	0	0	20403	20403	20403	20403	20403	20403	20403	20403	20403	20403	20403	20403	408056
OPERATING PROFIT	0	0	0	33364	33364	33364	33364	33364	33364	33364	33364	33364	33364	33364	33364	667281
OTHER INCOME	0	0	0	9630	9630	9630	9630	9630	9630	9630	9630	9630	9630	9630	9630	192600
DEPRECIATION	0	0	0	4292	8583	8583	8583	8583	8583	8583	8583	533	533	533	533	131142
PRETAX PROFIT	0	0	0	38703	34411	34411	34411	34411	34411	34411	34411	42461	42461	42461	42461	728738
TAX-CURRENT	0	0	0	16653	12531	13587	14257	14925	15593	16261	19592	21257	21257	21257	21257	363828
TAX-DEFERRED	0	0	0	2698	4675	3618	2949	2280	1612	945	-2387	-26	-26	-26	-26	541
NET INCOME	0	0	0	19351	17206	17206	17206	17206	17206	17206	17206	21231	21231	21231	21231	364369
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
CASH FLOW																

NET INCOME	0	0	0	19351	17206	17206	17206	17206	17206	17206	17206	21231	21231	21231	21231	364369
DEPRECIATION	0	0	0	4292	8583	8583	8583	8583	8583	8583	8583	533	533	533	533	131142
TAX-DEFERRED	0	0	0	2698	4675	3618	2949	2280	1612	945	-2387	-26	-26	-26	-26	541
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14448
CAPITAL EXPENDIT	47355	47355	47355	4608	0	0	0	0	0	0	0	0	0	0	0	146672
CASH FLOW	-47355	-47355	-47355	21733	30463	29407	28738	28069	27401	26733	23402	21737	21737	21737	36185	363829
=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====	=====
DCFROR	14.98															

ASSUMPTIONS

SELLING PRICE				8.98	8.98	8.98	8.98	8.98	8.98	8.98	8.98	8.98	8.98	8.98	8.98	
VARIABLE COST RATE			2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	2.94	
COST OF BUILDING	7103.19	7103.19	7103.19													
COST OF EQUIP.	40251.39	40251.49	40251.39													
CHANGE IN NWC				4608.20												

VI-35

Friday JUL 20, 1979 13:46

COMMERCIAL PLANT --- EASTERN COAL --- INFLATED AT 10%/YEAR

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	138794
PROJECTED P&L																
REVENUE	0	0	0	58838	64722	71194	78314	86145	94759	104235	167871	270357	297393	327132	359845	3369929
SEMI-VAR. COST	0	0	0	12521	13773	15150	16665	18332	20165	22182	35723	57533	63286	69615	76576	717132
VARIABLE COSTS	0	0	0	29872	32859	36145	39759	43735	48109	52919	85227	137258	150984	166082	182691	1710888
OPERATING PROFIT	0	0	0	16446	18090	19899	21889	24078	26486	29134	46921	75566	83123	91435	100578	941911
OTHER INCOME	0	0	0	14099	15509	17060	18766	20643	22707	24978	40227	64785	71264	78390	86229	807528
DEPRECIATION	0	0	0	5713	11425	11425	11425	11425	11425	11425	11425	709	709	709	709	174571
PRETAX PROFIT	0	0	0	24832	22174	25534	29230	33295	37767	42687	75722	139642	153677	169115	186098	1574865
TAX-CURRENT	0	0	0	8824	4864	7951	10689	13612	16737	20086	41038	69856	76874	84593	93084	786713
TAX-DEFERRED	0	0	0	3592	6223	4816	3926	3036	2146	1258	-3177	-35	-35	-35	-35	720
NET INCOME	0	0	0	12416	11087	12767	14615	16648	18884	21343	37861	69821	76838	84558	93049	787433

CASH FLOW																
NET INCOME	0	0	0	12416	11087	12767	14615	16648	18884	21343	37861	69821	76838	84558	93049	787433
DEPRECIATION	0	0	0	5713	11425	11425	11425	11425	11425	11425	11425	709	709	709	709	174571
TAX-DEFERRED	0	0	0	3592	6223	4816	3926	3036	2146	1258	-3177	-35	-35	-35	-35	720
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19845	19845
CAPITAL EXPENDIT	63037	63037	63037	6747	0	0	0	0	0	0	0	0	0	0	0	195857
CASH FLOW	-63037	-63037	-63037	14974	28735	29009	29966	31109	32455	34026	46109	70495	77512	85232	113568	786714

DCFROR 15.00

ASSUMPTIONS

SELLING PRICE	6.37	7.01	7.71	8.48	9.33	10.26	11.28	12.41	13.65	15.02	24.19	38.96	42.85	47.14	51.85	
VARIABLE COST RATE	3.23	3.56	3.91	4.30	4.73	5.21	5.73	6.30	6.93	7.63	12.28	19.78	21.76	23.93	26.33	
COST OF BUILDING	9455.49	9455.49	9455.49													
COST OF EQUIP.	53581.19	53581.19	53581.09													
CHANGE IN NWC				6746.86

GAS SELLING PRICE VS. VARIABLE OPERATING COSTS

**COMMERCIAL PLANT
EASTERN COAL**

CONSTANT IRR - 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of variable operating cost levels, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumes 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely variable cost level, \$2.94/M Btu (in 1978 dollars), the selling price necessary to achieve the desired IRR is (in 1978 dollars):

CONSTANT	\$8.98/M Btu
INFLATED	\$5.79/M Btu

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

EASTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE
(\$/M Btu)

<u>VO\$</u>	<u>SELLING PRICE</u>
1.00	7.04+
1.50	7.54+
2.00	8.04+
2.50	8.54+
3.00	9.04+
3.50	9.54+
4.00	10.04+
4.50	10.54+
5.00	11.04+
MOST LIKELY:	
2.94	8.98
IRR 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE

EASTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE
 (\$/M Btu)

	VO\$		SELLING PRICE	
	1978	1979	1978	1979
	1.00	1.10	3.85	4.23+
	1.50	1.65	4.35	4.78+
	2.00	2.20	4.85	5.33+
	2.50	2.75	5.35	5.88+
	3.00	3.30	5.85	6.43+
	3.50	3.85	6.35	6.98+
	4.00	4.40	6.85	7.53+
	4.50	4.95	7.35	8.08+
	5.00	5.50	7.85	8.63+
Most Likely	2.94	3.234	5.79	6.37
IRR 15%

GAS SELLING PRICE VS. PLANT INVESTMENT

**COMMERCIAL PLANT
EASTERN COAL**

CONSTANT IRR - 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of plant investments, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumed 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely level of plant investment--\$142,064,000 (in 1978 dollars) and \$189,110,000 (escalated)--the selling price required to achieve the desired IRR is (in 1978 dollars):

CONSTANT	\$8.98/ $\bar{M}$ Btu
INFLATED	\$5.79/ $\bar{M}$ Btu

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

EASTERN COAL

PLANT INVESTMENT VS. SELLING PRICE

<u>PLANT INVESTMENT</u> (\$000 omitted)	<u>SELLING PRICE</u> (\$/M Btu)
60,000	5.50
80,000	6.35
100,000	7.20
120,000	8.05
140,000	8.90
160,000	9.75
180,000	10.60

MOST LIKELY: 189,110
- 47,046

142,064

IRR 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE

EASTERN COAL

PLANT INVESTMENT VS. SELLING PRICE

PLANT INVESTMENT		SELLING PRICE	
1978	1979	1978	1979
(\$000 omitted)		(\$/M Btu)	
+33%			
60,000	19,800	4.10	4.51
80,000	106,400	4.51	4.96
100,000	133,000	4.92	5.41
120,000	159,600	5.33	5.86
140,000	186,200	5.74	6.31
160,000	212,800	6.15	6.76
180,000	239,400	6.55	7.21
MOST LIKELY	142,064	189,110	
IRR 15%			

Friday JUL 20, 1979 14:18

DEMONSTRATION PLANT --- WESTERN COAL --- 1978 CONSTANT DOLLARS

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	51360
PROJECTED P&L																
REVENUE	0	0	0	43451	43451	43451	43451	43451	43451	43451	43451	43451	43451	43451	43451	869010
SEMI-VAR. COST	0	0	0	6324	6324	6324	6324	6324	6324	6324	6324	6324	6324	6324	6324	126480
VARIABLE COSTS	0	0	0	11556	11556	11556	11556	11556	11556	11556	11556	11556	11556	11556	11556	231119
OPERATING PROFIT	0	0	0	25571	25571	25571	25571	25571	25571	25571	25571	25571	25571	25571	25571	511410
OTHER INCOME	0	0	0	448	448	448	448	448	448	448	448	448	448	448	448	8960
DEPRECIATION	0	0	0	2604	5207	5207	5207	5207	5207	5207	5207	323	323	323	323	79560
PRETAX PROFIT	0	0	0	23415	20811	20811	20811	20811	20811	20811	20811	25695	25695	25695	25695	440810
TAX-CURRENT	0	0	0	10070	7570	8211	8617	9022	9428	9833	11854	12864	12864	12864	12864	220077
TAX-DEFERRED	0	0	0	1637	2836	2195	1789	1383	978	573	-1448	-16	-16	-16	-16	328
NET INCOME	0	0	0	11708	10406	10406	10406	10406	10406	10406	10406	12848	12848	12848	12848	220405
CASH FLOW																
NET INCOME	0	0	0	11708	10406	10406	10406	10406	10406	10406	10406	12848	12848	12848	12848	220405
DEPRECIATION	0	0	0	2604	5207	5207	5207	5207	5207	5207	5207	323	323	323	323	79560
TAX-DEFERRED	0	0	0	1637	2836	2195	1789	1383	978	573	-1448	-16	-16	-16	-16	328
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5970	5970
CAPITAL EXPENDIT	28729	28729	28729	2389	0	0	0	0	0	0	0	0	0	0	0	88575
CASH FLOW	-28729	-28729	-28729	13559	18449	17808	17402	16996	16591	16186	14165	13155	13155	13155	19125	217688
DCFROR	14.98															

ASSUMPTIONS

SELLING PRICE				16.92	16.92	16.92	16.92	16.92	16.92	16.92	16.92	16.92	16.92	16.92	16.92	
VARIABLE COST RATE				4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	
COST OF BUILDING	4309.30	4309.30	4309.30													12927.88
COST OF EQUIP.	24419.39	24419.39	24419.29													73258.06
CHANGE IN NWC				2389.30												2389.30

VI-45

Friday JUL 20, 1979 15:04

DEMONSTRATION PLANT --- WESTERN COAL --- INFLATED AT 10%/YEAR

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	2568	51360
PROJECTED P&L																

REVENUE	0	0	0	43990	48389	53227	58550	64405	70846	77930	125507	202129	222342	244576	269033	2519480
SEMI-VAR. COST	0	0	0	9259	10185	11203	12324	13556	14912	16403	26417	42544	46799	51478	56626	530301
VARIABLE COSTS	0	0	0	16919	18611	20472	22519	24771	27248	29973	48272	77742	85516	94068	103474	969034

OPERATING PROFIT	0	0	0	17812	19593	21552	23707	26078	28686	31554	50818	81843	90027	99030	108933	1020148
OTHER INCOME	0	0	0	656	722	794	873	960	1056	1162	1871	3014	3315	3647	4011	37567
DEPRECIATION	0	0	0	3466	6931	6931	6931	6931	6931	6931	6931	430	430	430	430	105907

PRETAX PROFIT	0	0	0	15002	13383	15414	17649	20107	22811	25785	45758	84426	92912	102246	112514	951808
TAX-CURRENT	0	0	0	5322	2916	4785	6443	8212	10103	12129	24806	42235	46477	51144	56278	475467
TAX-DEFERRED	0	0	0	2179	3775	2922	2382	1842	1302	763	-1927	-21	-21	-21	-21	437

NET INCOME	0	0	0	7501	6691	7707	8824	10053	11405	12892	22879	42213	46456	51123	56257	475904
=====																

CASH FLOW																

NET INCOME	0	0	0	7501	6691	7707	8824	10053	11405	12892	22879	42213	46456	51123	56257	475904
DEPRECIATION	0	0	0	3466	6931	6931	6931	6931	6931	6931	6931	430	430	430	430	105907
TAX-DEFERRED	0	0	0	2179	3775	2922	2382	1842	1302	763	-1927	-21	-21	-21	-21	437
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7947	7947
CAPITAL EXPENDIT	38242	38242	38242	3498	0	0	0	0	0	0	0	0	0	0	0	118225

CASH FLOW	-38242	-38242	-38242	9648	17398	17560	18137	18826	19639	20587	27883	42622	46865	51532	64613	471970
=====																

DCFROR 14.99

ASSUMPTIONS

SELLING PRICE	12.87	14.16	15.57	17.13	18.84	20.73	22.80	25.08	27.59	30.35	48.87	78.71	86.58	95.24	104.76	
VARIABLE COST RATE	4.95	5.44	5.99	6.59	7.25	7.97	8.77	9.65	10.61	11.67	18.80	30.27	33.30	36.63	40.29	
COST OF BUILDING	5736.35	5736.35	5736.35													17209.03
COST OF EQUIP.	32506.00	32506.00	32506.00													97518.00
CHANGE IN NWC				3498.17												3498.17

GAS SELLING PRICE VS. VARIABLE OPERATING COSTS

**DEMONSTRATION PLANT
WESTERN COAL**

CONSTANT IRR - 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of variable operating cost levels, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumed 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely variable operating cost level, \$4.50/M Btu (in 1978 dollars), the selling price necessary to achieve the desired IRR is (1978 dollars):

CONSTANT	\$16.92/M Btu
INFLATED	\$11.69/M Btu

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

WESTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE

<u>VO\$</u> (\$/M Btu)	<u>SELLING PRICE</u> (\$/M Btu)
1.00	13.42
1.50	13.92
2.00	14.42
2.50	14.92
3.00	15.42
3.50	15.92
4.00	16.42
4.50	16.92
5.00	17.42
Most Likely	
4.50	16.92
IRR 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE

WESTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE
 (\$/M Btu)

VO\$		SELLING PRICE	
1978	1979	1978	1979
.50	.55		
1.00	1.10	8.19	9.01
1.50	1.65	8.69	9.56
2.00	2.20	9.19	10.11
2.50	2.75	9.69	10.66
3.00	3.30	10.19	11.21
3.50	3.85	10.69	11.76
4.00	4.40	11.19	12.31
4.50	4.95	11.69	12.86
5.00	5.50	12.19	13.41
Most Likely	4.50 4.95	11.69	12.86
IRR 15%

GAS SELLING PRICE VS. PLANT INVESTMENT

DEMONSTRATION PLANT
WESTERN COAL

CONSTANT IRR — 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of plant investments, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumed 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely level of plant investment--\$86,186,000 (in 1978 dollars), and \$114,727,000 (escalated)--the required selling price (in 1978 dollars) is:

CONSTANT	\$16.92/M Btu
INFLATED	\$11.69/M Btu

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

WESTERN COAL

PLANT INVESTMENT VS. SELLING PRICE
(\$000 omitted)

<u>PLANT INVESTMENT</u>	<u>SELLING PRICE</u>
60,000	13.93
80,000	16.22
100,000	18.51
120,000	20.81
140,000	23.09
PROJECTED	86,186
IRR. 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE

WESTERN COAL

PLANT INVESTMENT VS. SELLING PRICE

PLANT INVESTMENT (\$000 omitted)		SELLING PRICE (\$/M Btu)	
BASE	ESCALATED	1978	1979
60,000	79,800	10.25	11.27
80,000	106,400	11.35	12.49
100,000	133,000	12.46	13.71
120,000	159,600	13.57	14.93
140,000	186,620	14.68	16.15
PROJECTED	86,186	114,727	
IRR 15%			

COMMERCIAL PLANT - WESTERN COAL - 1978 CONSTANT DOLLARS

Friday JUL 20, 1979 13:11

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	138794
PROJECTED P&L																

REVENUE	0	0	0	60168	60168	60168	60168	60168	60168	60168	60168	60168	60168	60168	60168	1203350
SEMI-VAR. COST	0	0	0	7447	7447	7447	7447	7447	7447	7447	7447	7447	7447	7447	7447	148940
VARIABLE COSTS	0	0	0	21374	21374	21374	21374	21374	21374	21374	21374	21374	21374	21374	21374	427488

OPERATING PROFIT	0	0	0	31346	31346	31346	31346	31346	31346	31346	31346	31346	31346	31346	31346	626923
OTHER INCOME	0	0	0	2028	2028	2028	2028	2028	2028	2028	2028	2028	2028	2028	2028	40560
DEPRECIATION	0	0	0	3303	6606	6606	6606	6606	6606	6606	6606	410	410	410	410	100931

PRETAX PROFIT	0	0	0	30071	26768	26768	26768	26768	26768	26768	26768	32964	32964	32964	32964	566551
TAX-CURRENT	0	0	0	12959	9786	10600	11115	11629	12143	12657	15221	16502	16502	16502	16502	282859
TAX-DEFERRED	0	0	0	2077	3598	2785	2270	1755	1241	727	-1837	-20	-20	-20	-20	416

NET INCOME	0	0	0	15036	13384	13384	13384	13384	13384	13384	13384	16482	16482	16482	16482	283276
=====																

CASH FLOW																

NET INCOME	0	0	0	15036	13384	13384	13384	13384	13384	13384	13384	16482	16482	16482	16482	283276
DEPRECIATION	0	0	0	3303	6606	6606	6606	6606	6606	6606	6606	410	410	410	410	100931
TAX-DEFERRED	0	0	0	2077	3598	2785	2270	1755	1241	727	-1837	-20	-20	-20	-20	416
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12008	12008
CAPITAL EXPENDIT	36446	36446	36445	4435	0	0	0	0	0	0	0	0	0	0	0	113772

CASH FLOW	-36446	-36446	-36445	15981	23588	22775	22260	21745	21231	20717	18153	16872	16872	16872	28880	282860
=====																

DCFROR 15.01

ASSUMPTIONS

SELLING PRICE				8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	8.67	
VARIABLE COST RATE				3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	
COST OF BUILDING	5467.00	5467.00	5467.00													
COST OF EQUIP.	30979.00	30979.00	30978.00													
CHANGE IN NWC				4434.70												

VI-55

Friday JUL 20, 1979 12:45

COMMERCIAL PLANT - WESTERN COAL - INFLATED AT 10%/year

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1993	1998	1999	2000	2001	TOTAL
PRODUCTIVE VOLUM	0	0	0	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	6940	138794
PROJECTED P&L																

REVENUE	0	0	0	62903	69193	76112	83723	92095	101305	111435	179467	289032	317935	349728	384701	3602705
SEMI-VAR. COST	0	0	0	10903	11993	13193	14512	15963	17560	19315	31108	50099	55109	60620	66682	624471
VARIABLE COSTS	0	0	0	31294	34424	37366	41653	45818	50400	55439	89285	143795	158174	173991	191390	1792358

OPERATING PROFIT	0	0	0	20705	22776	25053	27558	30314	33346	36680	59074	95138	104652	115118	126629	1185876
OTHER INCOME	0	0	0	2969	3266	3593	3952	4347	4732	5260	8471	13643	15007	16508	18159	170058
DEPRECIATION	0	0	0	4397	8793	8793	8793	8793	8793	8793	8793	546	546	546	546	134356

PRETAX PROFIT	0	0	0	19278	17248	19853	22717	25868	29334	33147	58752	108236	119114	131080	144242	1221578
TAX-CURRENT	0	0	0	6874	3835	6220	8337	10598	13015	15606	31821	54145	59584	65567	72148	610235
TAX-DEFERRED	0	0	0	2765	4789	3707	3021	2336	1652	963	-2445	-27	-27	-27	-27	554

NET INCOME	0	0	0	9639	8624	9926	11359	12934	14667	16574	29376	54118	59557	65540	72121	610789
=====																
CASH FLOW																

NET INCOME	0	0	0	9639	8624	9926	11359	12934	14667	16574	29376	54118	59557	65540	72121	610789
DEPRECIATION	0	0	0	4397	8793	8793	8793	8793	8793	8793	8793	546	546	546	546	134356
TAX-DEFERRED	0	0	0	2765	4789	3707	3021	2336	1652	963	-2445	-27	-27	-27	-27	554
RESIDUAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14690	14690
CAPITAL EXPENDIT	48515	48515	48515	6493	0	0	0	0	0	0	0	0	0	0	0	152038

CASH FLOW	-48515	-48515	-48515	10307	22207	22426	23173	24064	25112	26335	35724	54637	60076	66059	87330	608351
=====																
DCFROR	14.99															

ASSUMPTIONS

SELLING PRICE	6.81	7.49	8.24	9.06	9.97	10.97	12.06	13.27	14.60	16.06	25.86	41.65	45.81	50.39	55.43	
VARIABLE COST RATE	3.39	3.73	4.10	4.51	4.96	5.46	6.00	6.60	7.26	7.99	12.87	20.72	22.79	25.07	27.58	
COST OF BUILDING	7277.24	7277.24	7277.24													
COST OF EQUIP.	41237.74	41237.74	41237.74													
CHANGE IN NWC				6492.80

GAS SELLING PRICE VS. VARIABLE OPERATING COSTS

COMMERCIAL PLANT
WESTERN COAL

CONSTANT IRR - 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of variable operating cost levels, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumed 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely variable operating cost level, \$3.08/ $\bar{M}$ Btu (in 1978 dollars), the selling price necessary to achieve the desired IRR is (in 1978 dollars):

CONSTANT	\$8.67/ $\bar{M}$ Btu
INFLATED	\$6.19/ $\bar{M}$ Btu

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

WESTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE

	<u>VARIABLE OPERATING COSTS</u>	<u>SELLING PRICE</u>
	(\$/M Btu)	(\$/M Btu)
	1.00	6.59
	1.50	7.09
	2.00	7.59
	2.50	8.09
	3.00	8.59
	3.50	9.09
	4.00	9.59
	4.50	10.09
	5.00	10.59
MOST LIKELY	3.08	8.67
IRR 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE

WESTERN COAL

VARIABLE OPERATING COST VS. SELLING PRICE

(\$/M Btu)

	VO\$		SELLING PRICE	
	1978	1979	1978	1979
	1.00	1.10	4.11	4.52
	1.50	1.65	4.61	5.07
	2.00	2.20	5.11	5.62
	2.50	2.75	5.61	6.17
	3.00	3.30	6.11	6.72
	3.50	3.85	6.61	7.27
	4.00	4.40	7.11	7.82
	4.50	4.95	7.61	8.37
	5.00	5.50	8.11	8.92
Most Likely	3.08	3.388	6.10	6.81
IRR 15%

GAS SELLING PRICE VS. PLANT INVESTMENT

COMMERCIAL PLANT
WESTERN COAL

CONSTANT IRR - 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

The gas selling price was determined for a range of plant investments, assuming a required internal rate of return of 15%.

The analysis was performed utilizing a constant dollar and inflated dollar approach. The constant dollar approach assumed 1978 dollars over the entire time frame, while the inflated method is based upon the escalation of the capital expenditure and the inflation of revenues and costs at 10% annually.

At the most likely level of plant investment--\$109,337,000 (in 1978 dollars) and \$145,545,000 (escalated)--the selling price required to achieve the desired IRR is (in 1978 dollars):

CONSTANT	\$8.67/M Btu
INFLATED	\$6.19/M Btu

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

BASE CASE

WESTERN COAL

PLANT INVESTMENT VS. SELLING PRICE

<u>PLANT INVESTMENT</u> (\$000 omitted)	<u>SELLING PRICE</u> (\$/M Btu)
60,000	6.58
80,000	7.43
100,000	8.27
120,000	9.12
140,000	9.97
160,000	10.82
180,000	11.67

MOST LIKELY: 109,337

IRR 15%

Final Report
 Erie Mining Company
 Coal Gasification Project
 DOE Contract EW-78-C-02-5066
 (ET-78-C-01-2578)
 Revised August 1, 1979

ESCALATED CASE

WESTERN COAL

PLANT INVESTMENT VS. SELLING PRICE

PLANT INVESTMENT			SELLING PRICE	
(\$000 omitted)			(\$/M Btu)	
1978	1979		1978	1979
60,000	79,800		5.18	5.70
80,000	106,400		5.59	6.15
100,000	133,000		6.00	6.60
120,000	159,600		6.41	7.05
140,000	186,200		6.82	7.50
160,000	212,800		7.23	7.95
180,000	239,400		7.64	8.40
MOST LIKELY	109,337	145,545		
IRR 15%

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

AREA 00
GENERAL PLANT AREA

DESCRIPTION

The plant is sited on Erie Mining Company property west of and adjacent to the battery limits of the existing pellet plant. It is in a hollow, at an elevation lower than that of the pelletizing facilities.

The plant layout is based on the sequential material flow pattern, and incorporates generally accepted equipment spacing standards and safety precautions.

The layout requirements are integrated into the selected site in accordance with good engineering practice. Allowances are made throughout for later expansion of the Demonstration Plant to the Commercial Plant.

The track arrangement is designed for unloading and handling 50 car segments of unit trains, taking into account the specified spacing requirements between the commercial railroad and the Erie Mining Company railroad.

The layout is designed to supply coal to the gasifiers at an approximate rate to sustain the design capacity of 7.4 billion Btu/day (HHV), to handle Eastern or Western coals delivered to the site by unit train to a stockpile of 180 day capacity, and to handle fines produced during the sizing process to a fines loadout area.

RAILROAD FREIGHT RATES

Pig Iron

Rates in cents per ton of 2240 lbs., unless otherwise noted

X-357-A

MINNESOTA

Page No. 21

Issue No. 1

Date Issued 7-25-79

FROM:

		S	P	
		S	O	M
C	T	M	R	L
H	O	A	T	W
I	L	R	S	A
C	E	I	M	U
A	D	E	O	K
G	O		U	E
O			T	
		O	H	
		N		

TO:

Albert Lea	A	2060			
	B	1865	2921		3443
Duluth	B	2283	3083		
Fairmont	A	2819			
	B	2427	3035		3502
	C		2836		3273
Faribault	B	1865	2977		3502
	C		2782		3273
Lake City	A	2060		2440	
	B	1865	2867		
Mankato	A	2284		2884	
	B	2072	3035	2613	
Medford	B	1865	2977		
Minneapolis	A	2060			
	B	1865	2977		3502 1865
	C		2782		3273
St. Cloud	A				
	B	2520	3140		
St. Paul	A	2060			
	B	1865	2977		3502
	C		2782		3273
Stillwater	B	1865	2977		3502
	C		2782		3273
Virginia	B	2520	3253		3772
	C		3040		3273
Winona	A	1558		2440	
	B	1417	2702		3195
	C		2525		2986

REFERENCE MARKS

A—56,000 lbs. min. wgt.

B—112,000 lbs. min. wgt.

C—Rate only applies on 12,000 lbs. min. wgt. via AA car ferry only.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 01
MATERIAL HANDLING - \$15,984,000

Coal Handling and Preparation

DESCRIPTION

Unit trains will be delivered to the materials handling area in 50 car maximum unit lengths. Entering the plant site loop, the cars will be spotted and automatically positioned in a rotary car dump, and the coal will be discharged into a hopper below the dumper. Coal will be discharged from the hopper via a 60" belt feeder to an active storage pile, from which it may be drawn by front end loader and a reclaim hopper for use at the gasifier, being processed enroute by crushing and sizing screens. Oversize will report to the gasifier surge hopper, and undersize will report to an active fines storage pile of 500 ton capacity where it may be reclaimed by front end loader and loaded into trucks or railroad cars. Alternately, the coal as received may be reclaimed from the initial active storage and transported by truck to a 180 day storage pile.

Dust suppression techniques will be practiced throughout the materials handling system.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

MAJOR EQUIPMENT

- . Thaw Shed and Heaters
- . Rotary Car Dumper and Train Positioner
- . Conveyors, Crushers, Screening Plant, Conveyor Scales
- . Mobile Equipment

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 02
GASIFICATION - \$19,507,000

Five Stirred Gasifiers
Gasifier Building

DESCRIPTION

Sized coal from the materials handling system will be received in storage bunkers of 12 hours live storage capacity, capable of expansion to 20 hours. Additional capacity will permit charging of the bunkers on a one shift per day basis.

Coal is discharged from the bunkers via a system of lock hoppers, conveyors, coal tubes and distributors at the top of, and supplying, the gasifiers.

The gasifiers are classified as two stage. Sized coal enters the top of the gasifiers, and progresses vertically down the column that is formed by the refractory lined walls of the cylindrical furnace. While descending the column, the coal is heated in a controlled atmosphere created by the introduction of steam and air into the bottom of the furnace, and volatile matter and moisture are carried upward, counterflow to coal descent.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

Top gas at about 250° F is emitted at the top of the gasifier and is subsequently passed through an electrostatic precipitator, where tar is precipitated from the gas stream, cooled to precipitate oils and water at about 95° F, and is combined with the clear gas stream.

Bottom gas, or clear gas, is relatively clean and is de-dusted in a cyclone, to remove carbon and ash particulate matter, and has its temperature reduced from about 1200° F to about 95° F, and its "waste heat" recuperated, in a heat exchanger. The clear gas combined downstream with the top gas for oil and water removal by electrostatic precipitator. A Stretford process is to be used to remove hydrogen sulphide from sulphur bearing Eastern coals.

A stirring mechanism will be used to achieve and maintain maximum gasification efficiency.

MAJOR EQUIPMENT

- . Five Gasifiers (one stirred initially)
- . Coal Bunkers, Feeders, Conveyors, etc.
- . Air Blowers
- . Cyclones - Dust - Tar
- . Heat Exchangers
- . Pumps - Oil, Sludge, Water, Ejector, Hydraulic
- . Precipitators - Electrostatic, Tar and Oil
- . Flare Stacks

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 03

SULPHUR REMOVAL - \$4,537,000

DESCRIPTION

The Stretford process utilizes a gas scrubber, reaction tanks and a series of oxidation tanks and ancillary equipment to subject the gas to chemicals used in the process. Elemental sulphur byproduct and a producer gas are produced. The gas, containing less than 50 ppm hydrogen sulphide is compressed and transported via gas transmission line to the pellet plant.

MAJOR EQUIPMENT

- . Venturi Scrubber, Knockout Drum
- . Reaction Tanks, Oxidizing Air Blowers, Agitators, Froth Tank, Balance Tank, Chemical Addition Tank, Pumps and Heat Exchanger
- . Slurry Accumulator, Pumps, Sulphur Melter, Sulphur Decanter, Molten Sulphur Storage, Sulphur Pump, Cooler, Flaker
- . Purge Evaporator, Incinerator Feed Pump, Incinerator

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 04

GAS COMPRESSION AND TRANSMISSION - \$2,075,000

DESCRIPTION

Process gas will have a temperature of about 100⁰ F at the compressor, and 5" H₂O pressure. The gas will be compressed to a nominal 12 psig, and transmitted to the pellet plant. Pellet plant shaft furnaces (12 only) will be retrofitted to accept the fuel gas. Three of the twelve will also accept tars as fuel.

MAJOR EQUIPMENT

Coal Gas Booster Compressor

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 05

WASTE WATER TREATMENT - \$787,000

DESCRIPTION

Wastewater will be evaporated to the maximum degree possible. The balance will be incinerated.

Sanitary waste will be handled in the existing pellet plant system.

MAJOR EQUIPMENT

- . Combustion Air Blowers
- . Wastewater Evaporator, Tanks, Pumps, Heaters
- . Pumps, Dirty Oil, Dirty Water, Oil/Water Separation
- . Wastewater Incinerator Package
- . Incinerator Stack

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 06
UTILITIES - \$12,655,000

DESCRIPTION

- A. Electric power will be supplied through an existing substation located on the east side of the pellet plant concentrator. The source voltage will be 13.8 kv. New transformers, as required, will be provided for the coal gasification plant. An emergency electrical backup system will be installed.
- B. An inert gas generation system with dryers will be installed. The generator will be fired with low Btu gas. A liquid nitrogen system will be installed as a backup to the inert gas generator.
- C. Packaged steam boilers will be utilized for startup and supplemental use. They will be fired with product tar and/or fuel oil.
- D. Plant and instrument air, including driers for the instrument air, will be supplied from a new air compressor installation independent of existing facilities. Plant air will not be dried.
- E. Cooling water will be supplied through a tie-in to an existing line below the concentrator head tanks. Cooling water will be returned to the concentrator tailings sump.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

- F. Boiler feedwater will be supplied by treating water from the existing freshwater source in the pellet plant concentrator building.

Potable water will be supplied from the existing pellet plant system.

The firewater system will tie into the existing plant reservoir and will include new firewater pumps and piping.

- G. A control room suitable for controlling the facilities for coal gasification, Stretford H_2S removal and gas compression will be included in one main control center. The coal handling, utility, and wastewater incinerator control centers will be located in their three respective areas.
- H. Wash and change rooms, laboratory facilities and limited work shop facilities will be provided in the plant area.
- I. Conveyor galleries, coal crushing and screening stations, coal gasification facilities, gas and air compression, pumps, and utility service facilities will all be enclosed. The Stretford unit will also be enclosed, with the exception of the venturi scrubbers and knockout drums.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

MAJOR EQUIPMENT

- . Chemical Feed Tanks and Agitators
- . Inert Gas, Generator Airblowers, Gas Compressors, Storage Drum, etc.
- . System Complete
- . Instrument Air System
- . Emergency Power Control System
- . Boiler Feed Water System

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 07
SAFETY SYSTEMS - \$143,000

DESCRIPTION

Effluent containing contaminants, namely phenols, cyanide and chlorides, and which is the balance of the process waste water not evaporated will be disposed of by incineration. Along with the effluent (above noted), will be effluent from the inert gas generating system, and water from the flare seal drum.

To ensure safe operation during upset, startup and controlled shutdown, the design of the plant includes a flare system, independent of those provided for the gasifiers. The flare will provide relief in the event of over pressure conditions on the suction side of the gas compressor.

MAJOR EQUIPMENT

- . Flare Seal Drum
- . Safety System Flare Tip

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

AREA 08
RETROFIT - \$1,367,000

Burners
Agglomerator Piping
Instrumentation

DESCRIPTION

The Erie Mining Company will retrofit twelve furnaces to accept the fuel gas produced by the Demonstration plant. Three of the furnaces will also be retrofitted to accept the tars produced.

MAJOR EQUIPMENT

Burners for East and West Combustion Chambers on
Twelve Indurating Furnaces

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

AREA 09

EMPLOYEE FACILITIES - \$189,000

DESCRIPTION

Locker room, lunch room, shower and toilet facilities, etc. will be provided for the use of gasification plant employees. The building will be 50' x 50' in area.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)

AREA 10
ASH-SULPHUR DISPOSAL - \$1,750,000

DESCRIPTION

Erie have located and studied a site away from the gasification plant, but on their property, for ash and sulphur disposal.

Environmental studies indicate that environmental regulations can be met.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

VII. RECOMMENDATION

The estimated costs, as summarized in accordance with the contractual requirements and this final report, are considerable higher than the estimated capital and operating costs expected at the initiation of Phase I.

	<u>Contract</u>	<u>Final Estimate</u>	<u>Variance</u>
Phase II Construction	\$ 24,768	\$ 80,351	\$ 55,583
Phase III Operation	\$ 20,426	\$ 23,839	\$ 3,413

NOTE: 1978 Dollars, No Contingency or Escalation, 000 Omitted.
(REF VI-19)

In addition to the "high" cost considerations, Erie has outlined several areas of technical and environmental risks.

Technical Risks (REF. Section B2)

1. Western Coal Operation - Briquetting
((\$5/ton of feedstock added operating cost)
(Unproven technology - Gasification of Briquets)
2. Eastern Coal Operation - Stirred gasifier
(Unproven technology - Increased capital and operating costs)

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

Environmental Risks (REF. Section A2)

1. Will Best Available Control Technology (BACT) be required on the "end-use" equipment; in Erie's case, the pelletizing plant?
We estimate that 50-70 million dollars in capital and (as yet un-defined) additional operating costs would be incurred as a result of such a ruling.
2. How will regulations concerning present "unknowns" affect the economics of the process, e.g. gas combustion, ash-sulfur and other by-product disposal or storage.

Each of these risks areas can significantly affect the cost and viability of both the Demonstration and Commercial Plant.

A significant potential exists for increases in both operating and capital costs in addition to current cost estimates which in themselves are considerably above current and projected alternate costs.

Erie indicated in its' correspondence of December 13, 1978, (ERDA-335) that "proceeding with the demonstration or commercial plant is not practicable and not in the best interests of the Government or Erie." We also in the same correspondence, recommended a reduced scope of activities in light of the above statements.

Final Report
Erie Mining Company
Coal Gasification Project
DOE Contract EW-78-C-02-5066
(ET-78-C-01-2578)
Revised August 1, 1979

As a result of the Erie/DOE cost meeting on January 19, 1979, a final reduced scope of deliverables was mutually agreed upon the plans to finalize Phase I deliverables were agreed to. (REF. ERDA-349)

Erie continues to assert that proceeding with the demonstration plant or commercial plant is not practicable, and therefore, not in the best interests of the Government of Erie.

Further, Erie recommends that DOE and Erie mutually agree to terminate their contract with the finalization of Phase I activities, as per the mutually reduced scope of work.