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 comparions.

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, Subcontract, 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

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
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.

McKee was not able to proceed with letting sub-contracts until the Erie/McKee contract was releated 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.

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.

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.

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.

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.

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
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.

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.

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 subcontract which will require DOE approval.

Environmental data collection and preparation of rough draft copies of the existing enironmental 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 fo 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.

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 costswill 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.

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--Bottleneck" 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
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

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.

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.

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

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 1 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 $661,600 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.

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.

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.

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 boundries
   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

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.

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.

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

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:

Contract Number	Item	Status
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

C. 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

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
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.

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.

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 subcontract which will require DOE approval.

Environmental data collection and preparation of rough draft copies of the existing enironmental 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 fo 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.

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 costswill 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.

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--Bottleneck" monitoring can be, will be, and have been handled in this manner.

J. H. Fatum

Program Director for
Erie Mining Company

JHF:ljb

IV. COMPLETION STATUS

Contract Status

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

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-BCl
   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

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 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
PART 1 SCOPE OF WORK										
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									
PART 2 GENERAL DESIGN BASIS										
I. Demonstration Plant Basis										
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

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II. Coal Specification										
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. End Product Characteristics										
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. Demonstration Plant Operation and Fuel Gas Use										
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				

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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
16. Sustained operation is not necessarily consecutive months and will reflect testing schedule					5A					
17. The above gas is to be utilized in the Erie facilities	1A,B					6F	7A	8F,G	158	10C
V. Waste Products										
18. Shall dispose of waste products in environmentally acceptable manner	1A		3	4	5A,B,C	6A,B,C,D E	7A	8A,F,G	137	10A,C
VI. Commercial Plant Basis										
a. Commercial Plant Life										
19. Commercial plant shall have a design life of 20 years	1B				5A,B,C	6A,C,E	7B	8A		10A,B
b. Coal Specification										
20. Conceptual commercial plant shall process high-sulfur, highly caking coals	1B				5H,F	6A,B,C,D E	7B	8B,F,G		10A,B
c. Commercial Plant Size										
21. Conceptual commercial plant shall process a nominal 1500 tons/day	1B				5F,H	6A,B,C,D E	7B	8B,F,G		10A,B
22. Shall have a nominal value of 20 x 10 Btu/day	1B				5F,H	6A,B,C,D E	7B	8B,F,G		10A,B
d.										

d.

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
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,
PART 3 WORK BREAKDOWN										
I. Phase I - Program Development and Conceptual Design										
A. Task I - Conceptual Design and Evaluation of Commercial Plant										
1. Gasification Technology Selection										
24. Shall perform gasifier process tradeoff studies			3		5A	6A		8F,G	65	10A
2. Process Engineering Design										
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

product yield;

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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. Risk Analysis										
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. Project Engineering Design										
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

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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	1B				5A,B,C,G, D,E,F,H,J	6B,C	7B	8F,G		10A, B, C
b. preparation of equipment list for major equipment showing										
description										
operating temperature and pressure										
size parameters										
materials of construction										
performance requirement	1B	2			5A,B,C	6E,F	7B	8E		
major spares	1B	2			5A,B,C	6E	7B	8A,B,C,E, F,G		10A,C

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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. Cost Estimate										
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. Economic Impact Analysis										
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			

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40. Project inflation over the life of the plant					5A,B,C		7B			
41. Identify incentives					5A,B,C		7B			
7. Environmental Impact Analyses										
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. Demonstration Plant Recommendations										
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					

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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. Task II – Demonstration Plant Process and Mechanical Design										
51. Prepare a demonstration plant design approved by the Government	Government Approval Necessary After Issue Of Design Manual									
1. Process Engineering Design										
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. Process Description and Rationale										
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

processes

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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. Preliminary Engineering and Layouts										
60. Prepare equipment lists and first issue of engineering flow diagrams					5A,B,C					
4. Engineering and Equipment Specifications										
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

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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

diagram.

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64. Conduct preliminary design review	1A,B				5A,B,C					
5. Process Engineering Report										
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. Preliminary Procurement Requisitions										
67. Prepare preliminany procurement requisitions	1A,B				5A,B,C		7A,B		158	
C. Task III - Phase II and III Current Working Estimate										
1. Detailed Current Working Estimate for Phase II										
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,E

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72. Determine labor productivity for the area					5A		7A			10A,B
2. Detailed Current Working Estimate for Phase III										
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. Task IV - Site Evaluation and Agreements										
1. Site Data										
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

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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. Develop Site Agreement										
83. Identify and develop site agreements									57	
E. Task V - Demonstration Plant Environmental Analysis										
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

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88. Prepare a plant to accomplish the following:										
a. Project Description for Environmental Analysis				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. Demonstration Plant Environment				4	5A-J	6A-E		8C,D,F,G		10A,B, C
90. Describe the plantsite and surrounding area										
c. Significance of Project Operation with Respect to the Environment				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. Mitigation Measures										
94. Insure pollutant levels not exceeded				4	5A-J	6A-E		8C,D,F,G		10A,B C

94. Insure pollutant levels not exceeded				4	5A-J	6A-E		8C,D,F,G		10A,B C

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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. Adverse Environmental Effects Which Cannot Be Avoided				4	5A-J	6A-E		8C,D,F,G		10A,B, C
97. Identify detrimental aspects which cannot be eliminated or mitigated										
f. Relationship Between Local Short-Term Uses of the Environment and Long-Term Productivity				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. Irreversible and Irretrievable Commitments of Resources				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

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102. Determine long-term net gains h. Alternatives to Proposed Action				4	5A-J	6A-E		8C,D,F,G		10A,B C
103. Shall consider major alternatives				4	5A-J	6A-E		8C,D,F,G		10A,B C
104. Show demonstration plant environmentally acceptable				4	5A-J	6A-E		8C,D,F,G		10A,B C
105. Show that alternatives significantly improve environment				4	5A-J	6A-E		8C,D,F,G		10A,B. C
2. Environmental Impact Assessment										
106. Prepare EIA in accordance with 10 CFR, Part 711 amended (42 FR 4826)					5H					10A
107. Prepare and submit final report outline					5H					10A
108. Prepare recommendations on the need of an EIS										10A
3. Environmental Data										
109. Assist in preparation of EIS										10A
110. EIS will be prepared in accordance with 10 CFR, Part 711 amended (42 FR 4826)										10A
111. Avoid duplicate environmental statements					5C,D,H,F, G,J					10A,B
112. Cooperate with respective agencies										10A,B C

112. Cooperate with respective agencies										10A,B C

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F. Task VI - Materials, Licenses and Agreements										
1. Plan for Obtaining Coal, Water, Power, Chemicals	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. Plans for Use and Disposition of Products										
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,B C

	Nonusable by-products and waste streams									C

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117. Make available sample quantities of by-products						6D			158	10C
3. Proprietary Process Licenses										
118. Negotiate contingent royalty payments for licenses covering the use of proprietary processes					5A,B,C					10C
119. The above shall include coal gasification technology and Stretford sulfur removal technology					5A,B,C					10C
4. Construction Codes and Ordinances										
120. Investigate and identify Federal, State and local codes pertaining to construction and operation									158	10C
5. Plans for Acquiring Permits and Licenses										
121. Develop a plan for obtaining Federal, State, and local permits and licenses							7A		158	10A, C
122. The above plans shall include estimates of time, cost, and personnel							7A		158	10A, C
G. Task VII - Proposed Methods and Plans for Phase II and Phase III Accomplishments										

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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	

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l. 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. Task VIII - Economic Reassessment										
1. Commercial Plant										
126. Perform an economic reassessment and evaluation					5A,B,C		7B		232,288, 388	
2. Demonstration Plant										
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. Task IX - Technical Support										
129. Identify and propose solutions for shortcomings critical to the design, construction, and operation of the demonstration plant, including 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	

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J. Task X - Project Management										
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. Task XI - Long-Lead Items										
1. Procurement Schedule for Long-Lead Items										
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			

139. Establish priorities for process and engineering design of equipment	1A				5A,B,C		7A			

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
140. Obtain approval and authority from the Government to proceed with purchase of long-lead items			PHASE II ACTIVITY							
2. Vendor's Quotations										
141. Obtain quotations and warranties for all long-lead items	1A, B		NOT AVAILABLE AT THIS TIME							

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

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.

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

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: with Parsons	1629.2	VARIANCE:	25.3
Amendment	$ 707.3	Actual Expenditure: without Parsons	1339.8	VARIANCE:	(264.1)
	$1603.9				

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

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.

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.

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: INCLUDING PARSONS ($289,400)		$3,576,800

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).

V. COST MANAGEMENT REPORT

Following is the current Cost Management Report:

FORM DOE 533M
7/78)

U.S. DEPARTMENT OF ENERGY

COST MANAGEMENT REPORT

SUMMARY

PAGE . OF

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	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 Ord Outstanding
		During Reporting Period		Cumulative to Date		a. Subsequent Reporting Period	b. Balance of Fiscal Year	c. Total Contract			
TASK		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	
22.	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

26. Signature of Contractor's Authorized Financial Representative and Date: Ralph E Berger 3/30/79

27. Signature of Government Technical Representative and Date

FORM DOE 533M
(1/78)

U.S. DEPARTMENT OF ENERGY

COST MANAGEMENT REPORT

PAGE OF

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, 1979	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	13. Total Invoice Amounts Billed	14. Total Payment Received
			Monthly	15	615,589.14	615,589.14

15. Identification Number TASK	16. Reporting Category (e.g., contract line item or work breakdown structure element)	17. Accrued Costs — During Reporting Period: a. Actual	b. Planned	Cumulative to Date: c. Actual	d. Planned	18. Estimated Accrued Costs: a. Subsequent Reporting Period	b. Balance of Fiscal Year	c. Total Contract	19. Total Contract Value	20. Variance	21. Unfilled Orders Outstanding
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

26. Signature of Contractor's Authorized Financial Representative and Date Ralph E. Berger 3/20/79

27. Signature of Government Technical Representative and Date

FORM DOE ECOM
(1/78)

U.S. DEPARTMENT OF ENERGY

COST MANAGEMENT REPORT

PAGE OF

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	11. Frequency	12. Number of Invoices Paid	13. Total Invoice Amounts Billed	14. Total Payment Received
		46		26	$2709.1	2366.6

15. Identification Number Task	16. Reporting Category (e.g., contract line item or work breakdown structure element)	17. Accrued Costs: During Reporting Period a Actual	b Planned	Cumulative to Date c Actual	d Planned	18. Estimated Accrued Costs: a Subsequent Reporting Period	b Balance of Fiscal Year	c Total Contract	19. Total Contract Value	20. Variance	21. Unfilled Orders Outstanding
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	1866.0	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

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 agenices. 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

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.

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

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 rage 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.

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

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 runcff 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)

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

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 redesig-

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

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.

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.

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.

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

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 neglibible; however, some noise distruhance 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 genrally 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 s rveyed 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

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 contaiminants 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.

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 on 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.

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.

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.

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

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.

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.

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:

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

(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:

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

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 I - 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

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