DOE/ET/13060-T9
(DE81027894)

FOSSIL ENERGY

PHASE I: THE PIPELINE GAS DEMONSTRATION PLANT

Quarterly Technical Progress Report for the Period January 1—March 31, 1981

By
Robert A. DiFulgentiz

April 1981

Work Performed Under Contract No. AC01-77ET13060

Conoco Inc.
Stamford, Connecticut

U. S. DEPARTMENT OF ENERGY

DISCLAIMER

DISCLAIMER

Available from the National Technical Information Service, U. S. Department of Commerce, Springfield, Virginia 22161.

Price: Printed Copy A03
Microfiche A01

DOE/ET/13060-T9
(FE-2542-36)
(DE81027894)
Distribution Category UC-89

PHASE I: THE PIPELINE GAS DEMONSTRATION PLANT

Quarterly Technical Progress Report

for the Period

1 January 1981 - 31 March 1981

Compiled and Edited by

Robert A. DiFulgentiz

Conoco Inc.
High Ridge Park
Stamford, Connecticut 06904

Prepared for the
United States Department of Energy
Division of Fossil Fuel Processing
Under Contract EF-77-C-01-2542

TABLE OF CONTENTS

ABSTRACT

Contract No. EF-77-C-01-2542 between Conoco Inc. and the U.S. Department of Energy provides for the design, construction, and operation of a demonstration plant capable of processing bituminous caking coal into clean pipeline quality gas.

During the reporting period of January 1, 1981, through March 31, 1981, the major work effort of the project was focused on Task VI, Demonstration Plant Engineering and Design, and on Task VII, Construction Planning. Work continued on plans for obtaining coal, catalysts, chemicals, and flux, and on plans for sale of the products and by-products. Work on Task VIII, Economic Reassessment, was started during the reporting period.

The design phase of the project, Phase I, is scheduled for completion on June 30, 1981. Conoco Inc. expects to meet all major milestone dates and complete Phase I on schedule.

1.0 INTRODUCTION

Conoco Inc. and the United States Department of Energy executed Contract No. EF-77-C-01-2542 on May 27, 1977. This contract requires Conoco Inc., as Contractor, to analyze, design, construct, test, evaluate, and operate a demonstration plant capable of converting high-sulfur bituminous caking coal into a pipeline quality gas.

The Contract specifies that the work shall proceed in three phases:

Phase I: - Demonstration Plant Engineering
Phase II: - Demonstration Plant Construction
Phase III: - Demonstration Plant Operation

The estimated cost of Phase I is 38.05 million dollars. Estimated costs of Phases II and III are to be developed during Phase I. Phase I costs are funded entirely by the United States Government. Phase II and III costs will be shared by the United States Government and private industry. Work on Contract No. EF-77-C-01-2542 started on July 1, 1977.

Phase I work activities are divided into the following 12 tasks:

I. Design and Evaluation of Commercial Plant
II. Demonstration Plant Process Design
III. Site Evaluation and Selection
IV. Demonstration Plant Environmental Analysis
V. Materials and Licenses
VI. Demonstration Plant Engineering and Design
VII. Construction Planning
VIII. Economic Reassessment
IX. Technical Support
X. Long Lead Time Items
XI. Project Management
XII. Process Trade-Off Studies

The process selected by Conoco Inc. for demonstrating that acceptable pipeline quality gas can be manufactured from bituminous coals utilizes the following technologies:

a. British Gas/Lurgi Fixed-bed Slagging Gasification

b. Rectisol Process (for H_2S removal)

c. Benfield Process (for CO_2 removal)

d. Fixed-bed, Gas Recycle Shift-Methanation Process

e. Conventional TEG Gas Drying Process

f. Phenosolvan Process (for recovery of phenols)

g. Stretford Process (for recovery of sulfur)

h. Beavon Process (for treating Stretford tail gas)

i. Phosam W Process (for recovery of ammonia)

By March 31, 1981, the end of the current reporting period, the following project tasks were completed:

Task I - Design and Evaluation of Commercial Plant
Task II - Demonstration Plant Process Design
Task III - Site Evaluation and Selection
Task IV - Demonstration Plant Environmental Analysis
Task IX - Technical Support
Task XII - Process Trade-Off Studies

Previous technical progress reports are identified below:

Report No.	Reporting Period
FE-2542-1	July 1 - September 30, 1977
FE-2542-2	October 1 - December 31, 1977
FE-2542-6	January 1 - March 31, 1978
FE-2542-12	July 1, 1977 - June 30, 1978
FE-2542-14	July 1 - September 30, 1978
FE-2542-15	October 1 - December 31, 1978
FE-2542-18	January 1 - March 31, 1979
FE-2542-20	July 1, 1978 - June 30, 1979
FE-2542-24	July 1 - September 30, 1979
FE-2542-26	October 1 - December 31, 1979
FE-2542-27	January 1 - March 31, 1980
FE-2542-30	July 1, 1979 - June 30, 1980
FE-2542-31	July 1, 1980 - September 30, 1980
FE-2542-33	October 1 - December 31, 1980

These reports are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, 22161.

Phase I is scheduled for completion by June 30, 1981.

2.0 TASK I - DESIGN AND EVALUATION OF COMMERCIAL PLANT

The purpose of Task I is to prepare a preliminary design for a commercial scale plant based upon the process proposed for demonstration. The Commercial Plant design consisted of a process design, project engineering design, plot plans, estimates of capital and operating costs, and an economic analysis. The scope of the Demonstration Plant will be based in part upon the design of the Commercial Plant.

Task I was started in July 1977 and was completed in July 1978. The results were reported to DOE in four volumes, as follows:

Design and Evaluation of Commercial Plant

FE-2542-10: Vol. 1
Executive Summary

FE-2542-10: Vol. 2
Process and Project Engineering Design

FE-2542-10: Vol. 3
Economic Analysis and Technical Assessment

FE-2542-10: Vol. 4
Environmental Assessment and Site Requirements

The reports are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, 22161.

No further work is planned for Task I.

3.0 TASK II - DEMONSTRATION PLANT PROCESS DESIGN

The purpose of this task is to prepare the process design for the Demonstration Plant. The process will consist of heat and material balances, process flow diagrams, process descriptions, utility requirements, preliminary plot plans, and equipment lists. A preliminary project engineering design, capital cost estimate, and economic evaluation of the Demonstration Plant are included in Task II to provide an early estimate of Phase II and Phase III costs. The detailed engineering design of the Demonstration Plant is to be completed in Task VI.

Task II has been completed, and the final report was issued in five volumes:

Demonstration Plant Process Design

FE-2542-28: Vol. 1
Executive Summary

FE-2542-28: Vol. 2
Process Design and Preliminary Project Engineering Design

FE-2542-28: Vol. 3
Economic Analysis

FE-2542-28: Vol. 4
Process Description and Rationale

FE-2542-28: Vol. 5
Alternative Process

These reports will be available to the public from the National Technical Information Service after DOE has completed its review.

4.0 TASK III - SITE EVALUATION AND SELECTION

The goals of this task are:

a. To select the site for the Demonstration Plant;

b. To negotiate a purchase option for the approved site;

c. To obtain a soil survey, aerial photographs, and topographic maps for the selected site;

d. To prepare the requisite site-related reports; and

e. To prepare a report summarizing the Contractor's recommendations regarding the design and location of the Demonstration Plant.

All of the contractually required work under this task has been completed and reported, as shown below:

Report No.	Report Title
FE-2542-3	Site Selection Report
FE-2542-4	Real Estate Report
FE-2542-5	Transportation Report
FE-2542-9	Water Resources Report
FE-2542-16	Topographic Maps and Aerial Survey Report
FE-2542-17	Climatological and Meteorological Report
FE-2542-19	Foundation Investigation and Soil Analysis Report
FE-2542-21	Local Resources Report
FE-2542-22	Site Master Plan
FE-2542-29	Demonstration Plant Recommendations Report
FE-2542-35	Site Acquisition Report

The Site Acquisition Report was issued during the reporting period. These reports are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, 22161.

The entire proposed site for the Demonstration Plant is owned by Consolidation Coal Company. Consolidation Coal Company (Consol), is a wholly-owned subsidiary of Conoco Inc. Conoco Inc. has discussed the acquisition of the proposed site with Consol. Consol has agreed to transfer title to the site to Conoco Inc. at the time plant construction commences. This will be an intra-corporate transfer. Therefore a third-party negotiated price for the site, as originally planned, will not be necessary.

Conoco Inc. wishes to receive credit for the value of the site as part of Conoco's contribution toward Phase II costs of the

project if Phase II is undertaken. Conoco Inc. has proposed that DOE and Conoco Inc. enter into good faith negotiations to arrive at a monetary value for the plant site. These negotiations need to be completed before plant construction is started.

As a first step in the negotiations, Conoco Inc. has obtained two independent appraisals of the value of the plant site. The appraisals are divided into two parts: the value of the surface land and the value of the minable Ohio No. 9 coal beneath the land.

In performing the appraisals, the appraisers required certain information on the selected site. The total land area of the site is 1,265.094 acres. Coal is located under approximately 300 acres . Assuming an average coal seam thickness of 4 feet 2 inches and 1800 tons/acre-foot of coal, approximately 1.8 million tons of recoverable coal are located on the proposed site. The average analysis of the raw coal is as follows:

Ash	18.94 Wt.%
Sulfur	5.4 Wt.%
Heating Value	11,633 Btu/lb

The above estimates were made using data obtained from test borings performed by Consol throughout the site and its environs.

The two appraisers used by Conoco are from Cambridge, Ohio, and are experienced in appraising coal properties. The appraisers were Roberts Realty and Industrial Valley Appraisal Company.

A summary of the two appraisals is presented below:

	Roberts Realty	Industrial Valley Appraisal Company
Land Value	$ 632,550	$ 506,000
No. 9 Coal Value	3,048,650	2,250,000
Total Appraisal Value	$3,681,200	$2,756,000

The Department of Energy has obtained a third independent appraisal of the site. The three appraisals of the plant site will be used as a basis in negotiations between Conoco Inc. and DOE for determining the value of the proposed site.

No further work is planned in this task.

5.0 TASK IV - DEMONSTRATION PLANT ENVIRONMENTAL ANALYSIS

The purpose of this task is to obtain the data and information needed for preparation of an Environmental Impact Statement. The environmental data will also be used to obtain the requisite Federal and Ohio permits to construct and operate the Demonstration Plant.

Conoco Inc. executed a subcontract with Westinghouse Electric Corporation on June 20, 1977. This subcontract required the Environmental Systems Department of Westinghouse to obtain the requisite environmental data, analyze it, assess the impact of the Demonstration Plant upon the environment, and prepare an Environmental Report. Westinghouse sold its Environmental Systems Department to key employees of that department effective November 1, 1977. These employees formed a new company -- Energy Impact Associates, Inc. This company is located in Pittsburgh, Pennsylvania.

Westinghouse assigned the remaining work on its subcontract with Conoco Inc. to Energy Impact Associates but retained primary responsibility for seeing that the work requirements would be satisfactorily completed. Subsequently, Conoco Inc. subcontracted some additional environmental work for the project directly with Energy Impact Associates.

Energy Impact Associates has completed preparation of a six volume environmental report. This report is available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, 22161. The titles of the six volumes are given below:

Report No.	Report Title
FE-2542-25, Vol. 1	Project Description
FE-2542-25, Vol. 2	Existing Environment
FE-2542-25, Vol. 3	Project Impact and Alternatives
FE-2542-25, Vol. 4	Environmental Data Appendix A: Water Resources Report
FE-2542-25, Vol. 5	Environmental Data Appendix B: Seismology Appendix C: Surface Water Hydrology Appendix D: Water Quality Appendix E: Ground Water Hydrology
FE-2542-25, Vol. 6	Environmental Data Appendix F: Air Quality and Meteorology Appendix G: Terrestrial Ecology Appendix H: Aquatic Ecology

Oak Ridge National Laboratory is currently preparing the draft Environmental Impact Statement.

ATEC Associates, Inc. is monitoring the ground water quality of a well and natural springs in the secure landfill area of the Demonstration Plant site. The ground water is being monitored for a period of one year to obtain a baseline for water quality in order to properly assess the effects of placing hazardous waste in this landfill.

The data acquired for the period July 1980 through February 1981 are presented on the succeeding pages of this section. Samples were not collected in August 1980, and some springs were dry in other months.

GROUND WATER QUALITY MONITORING DATA FOR THE DEMONSTRATION PLANT SITE*

Spring No. 1

	1980					1981	
	July	Sept	Oct	Nov	Dec	Jan	Feb
Temperature ^{o}F	52	54	53	52	45	44	52
Conductivity, micromhos/cm	55	270	400	300	225	160	125
pH	7.6	7.7	8.0	8.0	8.0	8.0	7.4
Total Alkalinity as $CaCO_3$	190	204	188	175	209	210	145
Ammonia Nitrogen as Nitrogen	.69	2.12	1.25	.69	0.1	0.2	0.1
Total Kjeldahl Nitrogen	.79	2.63	1.88	1.44	0.1	0.3	2.2
Nitrate Nitrogen as Nitrogen	2	6.4	.40	5.0	2.8	2.3	4.2
Sulfate	34	16	5	26	45	33	27
Chloride	2	1	.25	12	7	1	2
Total Dissolved Solids	300	245	235	253	283	230	175
Calcium as $CaCO_3$	200	172	300	156	155	53	50
Magnesium	22	0.8	10.5	6.4	4.1	0.6	6.8
Sodium	13	18.5	5.7	9.9	1.9	3.0	4.8
Iron	.06	0.1	0.1	0.1	0.1	0.1	0.2
Chemical Oxygen Demand	60	40	10	10	10	10	10
Total Organic Carbon	1	12	14	45	5	2	8
Manganese	.01	0.2	.1	0.1	0.1	0.1	0.1
Selenium	.001	.001	.001	.001	.001	.01	0.01
Arsenic	.03	.03	.03	.03	.03	.03	0.03
Zinc	0	0	.1	0.1	0.1	.1	0.3
Potassium	1	1	1	1	1	2	2

* All concentrations reported in ppm.

GROUND WATER QUALITY MONITORING DATA FOR THE DEMONSTRATION PLANT SITE*

Spring No. 2

	1980			1981	
	July	Nov	Dec	Jan	Feb
Temperature ^{o}F	74	48	38	-	-
Conductivity, micromhos/cm	77	405	230	255	105
pH	7.5	7.2	7.1	6.7	6.5
Total Alkalinity as $CaCO_3$	380	289	309	239	53
Ammonia Nitrogen as Nitrogen	3.25	1.95	0.2	3.98	1.4
Total Kjeldahl Nitrogen	3.42	7.55	0.4	4.2	5.1
Nitrate Nitrogen as Nitrogen	6.8	3.2	0.2	0.8	5.1
Sulfate	8.5	48	47	31	36
Chloride	14	18	10	6	5
Total Dissolved Solids	508	340	453	340	83
Calcium as $CaCO_3$	400	248	185	60	30
Magnesium	19	9.8	4.0	3.8	2.3
Sodium	5	11.0	4.0	2.0	3.3
Iron	3.7	1.0	0.2	0.2	0.3
Chemical Oxygen Demand	20	10	10	10	10
Total Organic Carbon	47	25	7	-	6
Manganese	3.71	21.0	13.6	9.2	2.1
Selenium	.001	.001	.001	.01	0.01
Arsenic	.03	.03	.03	.03	.03
Zinc	0.1	.1	0.1	0.1	0.1
Potassium	1	1	1	3	2

* All concentrations reported in ppm.

GROUND WATER QUALITY MONITORING DATA FOR THE DEMONSTRATION PLANT SITE*

Spring No. 3

	1980					1981	
	July	Sept	Oct	Nov	Dec	Jan	Feb
Temperature °F	74	68	54	47	42	40	-
Conductivity, micromhos/cm	60	400	500	350	250	250	150
pH	6.6	7.0	7.2	7.3	7.8	7.3	7.1
Total Alkalinity as $CaCO_3$	240	199	150	110	111	40	69
Ammonia Nitrogen as Nitrogen	1.64	3.02	2.66	1.22	1.4	0.2	1.5
Total Kjeldahl Nitrogen	1.84	3.52	2.69	3.46	1.5	0.3	1.9
Nitrate Nitrogen as Nitrogen	1.7	1.1	.60	5.0	5.0	0.1	1.1
Sulfate	103	86	102	100	112	127	48
Chloride	2	1	.63	6	12	1	4
Total Dissolved Solids	468	312	329	293	315	210	152
Calcium as $CaCO_3$	300	192	250	172	150	29	28
Magnesium	8	1.3	10.7	6.0	3.2	0.7	3.4
Sodium	4	11.5	5.5	10.	1.9	3.5	3.6
Iron	.20	0.2	0.2	0.1	.1	0.1	0.2
Chemical Oxygen Demand	20	20	10	10	10	10	10
Total Organic Carbon	1	11	12	32	3	1	6
Manganese	14.35	13.6	12.4	5.2	3.9	.1	1.0
Selenium	.001	.001	.001	.001	.001	.01	.01
Arsenic	.03	.03	.03	.03	.03	.03	.03
Zinc	0	0	.1	0.2	.1	.1	.1
Potassium	1	1	1	1	1	3	1

* All concentrations reported in ppm.

GROUND WATER QUALITY MONITORING DATA FOR THE DEMONSTRATION PLANT SITE*

Spring No. 5

	1980					1981	
	July	Sept	Oct	Nov	Dec	Jan	Feb
Temperature ^{o}F	52	54	54	50	44	40	50
Conductivity, micromhos/cm	57	340	450	300	240	225	145
pH	7.9	7.7	8.0	8.1	7.9	8.0	7.9
Total Alkalinity as $CaCO_3$	200	192	211	234	238	204	89
Ammonia Nitrogen as Nitrogen	2.19	2.49	.60	1.22	0.3	0.2	0.1
Total Kjeldahl Nitrogen	2.37	2.63	.69	1.44	0.4	0.4	17
Nitrate Nitrogen as Nitrogen	1.4	5.6	.20	6.8	3.5	4.7	4.5
Sulfate	42	29	1	36	39	29	31
Chloride	2	1	1.0	5	11	2	3
Total Dissolved Solids	276	275	284	320	333	259	125
Calcium as $CaCO_3$	200	184	350	192	150	60	30
Magnesium	9	1.0	11.4	10.6	7.2	0.8	3.5
Sodium	8	8.2	5.5	10.6	2.5	3.0	5.0
Iron	.05	0.1	1.0	.1	.1	.1	0.1
Chemical Oxygen Demand	20	20	10	20	10	10	10
Total Organic Carbon	1	8	16	22	3	1	7
Manganese	.01	.01	.1	0.1	.1	.1	.1
Selenium	.001	.001	.001	.001	.001	.01	.01
Arsenic	.03	.03	.03	.03	.03	.03	.03
Zinc	0	0	.1	0.2	.1	.1	.1
Potassium	1	1	1	1	1	3	2

* All concentrations reported in ppm.

GROUND WATER QUALITY MONITORING DATA FOR THE DEMONSTRATION PLANT SITE*

WB-170

	1980					1981	
	July	Sept	Oct	Nov	Dec	Jan	Feb
Temperature ^{o}F	58	55	54	50	45	42	-
Conductivity, micromhos/cm	90	405	550	450	270	300	150
pH	7.8	7.5	7.3	7.7	7.4	7.7	7.7
Total Alkalinity as $CaCO_3$	200	203	181	183	218	209	193
Ammonia Nitrogen as Nitrogen	.26	2.40	.72	1.64	0.7	0.1	0.3
Total Kjeldahl Nitrogen	.53	2.72	.95	1.86	0.9	0.2	1.1
Nitrate Nitrogen as Nitrogen	2.6	0.80	.20	4.1	1.7	5.6	1.7
Sulfate	46	63	81	113	59	81	25
Chloride	8	1	.63	8	13	4	5
Total Dissolved Solids	348	310	346	407	327	331	221
Calcium as $CaCO_3$	300	172	300	204	145	63	52
Magnesium	9	1.5	13.6	14.2	20	1.2	8.2
Sodium	4	10.3	9.5	11.8	24	3.3	4.4
Iron	.09	0.1	0.4	0.2	0.1	0.1	0.2
Chemical Oxygen Demand	30	20	20	10	10	10	10
Total Organic Carbon	14	8	16	18	7	1	8
Manganese	.01	0.1	.1	0.1	0.1	0.3	0.1
Selenium	.001	.001	.001	.001	.001	.01	.01
Arsenic	.03	.03	.03	.03	.03	.03	.03
Zinc	0	0	.1	0.1	2.5	0.6	1.2
Potassium	1	1	1	1	7	6	4
Ground Surface Elevation		1203.2	1203.2	1203.2	1203.2	1203.2	1203.2
Ground Water Elevation		1102.1	1100.8	1101.2	1102.7	1102.7	1102.7

* All concentrations reported in ppm.

6.0 TASK V - MATERIALS AND LICENSES

The following assignments are to be undertaken and completed in Task V:

a. Sources of coal feedstock for Phase III of the Demonstration Plant project are to be located, and if required, contractual agreements for the coals are to be completed;

b. A preliminary plan for mining the Ohio No. 9 coal adjacent to the Demonstration Plant site is to be prepared;

c. Plans for obtaining electrical power, raw water, other raw materials, catalysts, and chemicals are to be prepared;

d. Plans and contracts, if germane, are to be made for the sale and/or disposal of all plant products and by-products;

e. The proprietary process licenses required for the Demonstration Plant are to be obtained; and

f. All Federal, State, and local licenses required to construct and operate the Demonstration Plant are to be identified and obtained, as required.

6.1 Sub-Task V-A: Plans for Obtaining Coal

Plans and contractual agreements, if needed, for obtaining the coal and coke feedstocks for the Demonstration Plant are being undertaken under this sub-task. The following feedstocks are being sought for Phase III of the project:

a. Primary coal feedstock - Ohio No. 9 coal;
b. Alternative Coal I - Pittsburgh No. 8 coal;
c. Alternative Coal II - to be selected;
d. Anthracite coal for start-up; and
e. Petroleum coke for start-up.

Contact has been made with present miners of Pittsburgh No. 8 and Ohio No. 9 coal (also known as Sewickly or Maple Town in Pennsylvania and West Virginia) in a three state area around the proposed plant site. The specifications and delivery requirements were presented to those coal suppliers. Based on the interviews, supplies of the coal are available and can be obtained when required for Phase III.

A pro forma Request for Proposal has been prepared for the purchase of the coals. A report on the potential coal suppliers is being prepared.

6.2 Sub-Task V-B: Coal Mining Plan

The purpose of this sub-task is to prepare a coal mining plan for a long-term coal supply for a potential commercial venture following Phase III of the project. The Coal Mining Plan has been completed and was issued in April 1978.

FE-2542-7
Preliminary Coal Mining Plan

This report is available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, 22161.

6.3 Sub-Task V-C: Plans for Obtaining Water, Power, Catalysts and Chemicals

Power for the Demonstration Plant will be purchased from Washington Electric Cooperative. The Cooperative is presently preparing a draft of the purchase subcontract. The supplier of potable water for the Demonstration Plant; Clear Water Corporation, was contacted, and a draft contract was sent for their review. Possible suppliers of fluxing agents, fuel oil, catalysts and chemicals have been contacted. Reports on these materials will be issued during the next quarter.

6.4 Sub-Task V-D: Plans for Sale, Use, or Disposition of Products

The Plan for Sale, Use, or Disposition of Demonstration Plant Products and By-Products, Report No. FE-2542-37, was issued on March 27, 1981. This report summarizes what will be done with the products and by-products produced during Phase III of the project.

It is currently planned to operate the Demonstration Plant for a 42-month period during Phase III. The table below lists the estimated quantity of each product that will be produced. The total Phase III estimate of production allows for planned shut-downs and operations at less than full capacity. The design production rate of each product is also shown.

Product	Total Phase III Production	Design Production Rate
SNG	13.9 billion SCF	18.96 MMSCFD
Slag	323,400 tons	32,912 lbs/hr
Naphtha	18,200 tons	1,852 lbs/hr
Tar	52,900 tons	5,382 lbs/hr
Oil	26,500 tons	2,696 lbs/hr
Crude Phenols	3,500 tons	360 lbs/hr
Ammonia	7,000 tons	717 lbs/hr

Sulfur	42,500 long tons	4,850 lbs/hr
Plant Site Coal*	135,000 tons	-

*Uncovered during Phase II site preparation

The SNG product will be piped to the Texas Eastern natural gas transmission line that crosses the southern edge of the plant site. The SNG will be sold to Texas Eastern at this point or sold to another gas company, in which case Texas Eastern would transport the SNG to the purchaser's system.

The slag that will be produced in Plant Section 1000 will be trucked to a solid waste disposal area on the plant site. Markets for the slag will be sought during Phase III. Usage of the slag in other than bulk aggregate applications is highly unlikely.

The naphtha that will be produced in Plant Section 400 will be marketed to a third party. The naphtha will be sold to a third party that produces benzene from coal derived liquids or to a petroleum refiner.

The primary method of disposition for the tar and oil produced in Plant Section 1100 is in-plant consumption. It is anticipated that the gasification of the tar and oil by injection through the tuyeres of the gasifier will be successful. Another in-plant use for the tar and oil is as a boiler fuel in Plant Section 2000. If both of the in-plant consumption methods are not possible, the tar and/or oil will be marketed to a coal tar refiner for use as a fuel or for upgrading.

The crude phenols produced in Plant Section 1200 will be consumed in the Demonstration Plant. This stream may be recycled to extinction through the tuyeres of the gasifier or used as a boiler fuel in Plant Section 2000. If the stream is not consumed within the plant, it will be sold to a third party for upgrading into cresylic acids or for use as a fuel.

The ammonia and sulfur products from the Demonstration Plant will be commercial-grade chemicals. These products have established markets and will be sold to companies that either market or use the ammonia or sulfur.

The plant site coal that is uncovered during site preparation work will be sold to a coal company in the Noble County area.

The optimum uses for the Demonstration Plant products have not been fully established. Extensive testing of these products will be performed during Phase III to determine the various potential uses for each product. One of the goals of Phase III will be to determine the commercial value, optimum usage, and market acceptance for the Demonstration Plant products and by-products.

6.5 Sub-Task V-E: Proprietary Process Licenses

Licenses for the following proprietary processes have been negotiated for use in the Demonstration Plant:

Process	Licensor
(1) British Gas/Lurgi Slagging Gasifier	British Gas Corporation
(2) Rectisol	Lurgi Kohle und Mineraloeltechnik, GmbH
(3) Gas Liquor Separation	Lurgi Kohle und Mineraloeltechnik, GmbH
(4) Phenosolvan	Lurgi Kohle und Mineraloeltechnik, GmbH
(5) Benfield Process	Benfield Corporation
(6) The Beavon Process	The Ralph M. Parsons Company
(7) The Stretford Process	The Ralph M. Parsons Company and British Gas Corporation
(8) PHOSAM W-Process	USS Engineers and Consultants

DOE has approved all of these licenses.

Conoco Inc. is providing the technology for the combined shift/methanation process known as SUPER-METH™. Conoco Inc. has submitted a pro forma license agreement for this process to DOE. A license for the SUPER-METH process would be required in the event the project was assigned to another contractor. Otherwise, no license is required for the SUPER-METH process as long as Conoco Inc. is the prime contractor.

6.6 Sub-Task V-F: Local Permits, Licenses, Codes and Ordinances

All Federal, State and local permits and licenses required for the Demonstration Plant construction and operation are to be obtained under this sub-task.

During the reporting period the following has occurred for each identified permit:

Prevention of Significant Deterioration (PSD) Permit

The PSD permit for the Demonstration Plant was granted by Region V, USEPA on February 23, 1981. The permit limits the plant to: particulate emissions of 0.06 pounds per million Btu of heat input to the boilers; fuel oil burned in boilers with less than

0.5 percent by weight sulfur; and emission of less than 1.6 pounds sulfur dioxide and 0.6 pounds nitrogen oxides per million Btu heat input to the boilers. Construction of the Demonstration Plant must commence within eighteen months. A justified extension may be granted.

Permit to Install (PTI)

A PTI for the Demonstration Plant was granted on March 2, 1981, by the Ohio EPA. The permit limits the plant to those air contaminants tested in the permit and liquids and solid wastes to those set forth in the approved specifications and plans. Substantial construction of the plant must take place within eighteen months. An extension of up to twelve months may be made for good cause.

National Pollutants Discharge Elimination System (NPDES) Permit

The period of public comment has been completed and the permit is being prepared for issue. This permit, required by the Clean Water Act, is expected to be issued before the end of Phase I.

Corps of Engineers, Water Intake Easements

The placement of water intake lines in the Senecaville Reservoir has been approved by the Huntington Division of the Corps of Engineers.

Permits from the Ohio Department of Natural Resources (ODNR)

The ODNR Division of Wildlife granted permission pursuant to utilization of blasting for the installation of the raw water and potable water pipelines. The District Wildlife Manager is to be informed of blasting and work in streams 48 hours prior to such work.

The State of Ohio has acted to implement the Surface Mining and Reclamation Act. Regulations which will permit the Division of Reclamation to exempt the Demonstration Plant from the requirements of the act are being promulgated. A letter of exemption is expected in April when the regulations become effective. This will permit the sale of coal which is uncovered on the site during site preparation work.

Other Permits

No other approvals or permits will be obtained during Phase I. Other requisite permits will be obtained in Phase II.

7.0 TASK VI - DEMONSTRATION PLANT ENGINEERING DESIGN

The following work activities are being done under Task VI:

a. Preparation and implementation of a network analysis for scheduling and project control of Task II and Task VI;

b. Completion of the engineering and design of the Demonstration Plant including the piping and instrument diagrams (P&ID's), equipment data sheets, electrical one-line drawings, building plans and specifications, site preparation drawings and specifications, final plot plans, job specifications, preparation of definitive estimate and procurement bid packages; and

c. The complete mechanical design of certain proprietary equipment offered by process licensors.

The network analysis was completed in September 1978. It is being used to monitor the progress of Task VI, as a control tool. At the end of the reporting period, the Task VI work was slightly behind schedule. Conoco Inc. and Foster Wheeler Energy Corporation, the primary architectural and engineering subcontractor, have implemented a recovery plan, and the network indicates it is still possible to meet the project major milestones on schedule and to complete Task VI work within the baseline schedule.

During the reporting period Conoco Inc. and Foster Wheeler performed a consistency review covering all design documentation. Inconsistencies that were found during the review have been corrected. This completes the Phase I design effort for all sections of the Demonstration Plant.

Foster Wheeler has completed the preparation of the job specifications, the detailed building designs, and the site preparation drawings.

The definitive estimate of the erected cost of the Demonstration Plant remains to be completed. The definitive estimate will be used as input to Task VIII - Economic Reassessment.

Work was begun on the reliability assessment of the Demonstration Plant by Mechanical Technologies Inc. (MTI). MTI has been subcontracted by Conoco Inc. to perform a mathematical simulation of the reliability/availability aspects of the plant. Inputs to this study include nonproprietary engineering flow diagrams, Conoco maintenance philosophy, and reliability estimates for each item of equipment. MTI is also performing a failure mode and effects analysis (FMEA) for the Demonstration Plant. This analysis considers and documents the possible failure modes of each equipment item and subsequent system responses and effects.

The remaining work effort of Task VI will in the main be devoted to the 90% Design Review and to the preparation of the Task VI final report. The 90% Design Review Meeting is scheduled to take place the week of May 11, 1981. This review will cover final drawings, specifications, and cost estimates.

The Task VI report, No. FE-2542-38, Demonstration Plant Engineering and Design, will consist of the following 24 volumes:

Volume	Title
1	Executive Summary
2	Overall Plant
3	Plant Section 100 - Feedstock Preparation
4	Plant Section 200 - Air Separation
5	Plant Section 300 - Gasification
6	Plant Section 400 - Rectisol
7	Plant Section 500 - Shift/Methanation
8	Plant Section 600 - CO_2 Removal
9	Plant Section 800 - Product Gas Compression and Drying
10	Plant Section 900 - Sulfur Recovery
11	Plant Section 1000 - Slag Handling/Disposal
12	Plant Section 1100 - Gas Liquor Separation
13	Plant Section 1200 - Phenol Extraction
14	Plant Section 1300 - Ammonia Recovery
15	Plant Section 2000 - Water Treatment and Steam Plant
16	Plant Section 2400 - Cooling Water
17	Plant Section 2500 - Plant and Instrument Air
18	Plant Section 2700 - Waste Water Treatment
19	Plant Section 3000 - Flare
20	Plant Section 3200 - Miscellaneous Offsites and Tank Farm
21	Plant Section 3300 - County Road
22	Plant Section 4000 - Electrical and Communications
23	Plant Section 4100 - Buildings
24	Job Specifications

Each volume will be issued when it is completed. All volumes are scheduled to be issued by May 29, 1981.

8.0 TASK VII - CONSTRUCTION PLANNING

The following plans and management procedures for constructing the Demonstration Plant are being prepared under this task:

a. Construction Configuration Management Plan
b. Field Organization and Staffing Plan
c. Construction Safety Procedures
d. Construction Environmental Control Plan
e. Equipment and Material Procurement Plan
f. Master Project Schedule
g. Final Engineering Schedule
h. Procurement Schedule
i. Construction Schedule
j. Construction Reporting Procedures
k. Construction Labor Surveys

These plans and management procedures will be issued in two reports. The titles and report numbers of the Task VII reports are as follows:

FE-2542-34	Procurement Plan for Demonstraton Plant Construction
FE-2542-40	Construction Plans
Volume 1:	Schedules, Controls, and Staffing
Volume 2:	Safety, Environmental Control, and Labor Survey

Procurement Plan for Demonstration Plant Construction

The Procurement Plan for Demonstration Plant Construction was issued on February 27, 1981. This plan consists of the method which will be employed to obtain the requisite goods and services for plant construction and the procedures and policies to be followed in effecting the procurements. Conoco Inc. has the overall responsibility for the procurement function but must follow the terms and conditions of the prime contract in carrying out this function.

Subcontractors and equipment vendors will be selected on a competitive basis to the maximum possible extent, but awards will be made only to those firms which have a proven capability of supplying the requisite goods and services. The main goal of the procurement plan is to provide for an erected Demonstration Plant which will operate in accordance with the plant design and specifications.

The procurement plan provides for the utilization of selected architectural and engineering firms to act as agents for Conoco Inc. in the procurement process. Conoco Inc. will evaluate and approve all awards to subcontractors and vendors and will pay all invoices resulting from the procurement function.

Schedules, Controls, and Staffing

Staffing plans have been developed and reviewed. The configuration management plan for construction has been prepared and is currently being reviewed by Conoco Inc.

Much progress was made on the schedule and control plans of Task VII. The procurement, engineering, and construction logic of Phase II was finalized and incorporated into the overall Phase II network. After the manpower requirements and definitive cost estimate have been loaded into the network, and the logic has been double-checked, the network will be run to determine schedule, start, and finish dates for Phase II. Most of the remaining work in Task VII is in the area of schedules and control.

Safety, Environmental Control, and Labor Survey

The labor survey and environmental control plan have been issued by Foster Wheeler and reviewed by Conoco Inc. Comments on these plans have been incorporated and the documentation is being finalized. The safety plan is being reviewed by Conoco Inc. After the review has been completed, this volume of the Task VII report will be issued. The scheduled delivery date of this volume is May 1, 1981.

9.0 TASK VIII - ECONOMIC REASSESSMENT

The completion of Tasks I, II, III, IV, V, and VI will provide more accurate investment and operating costs for the Commercial and Demonstration Plants. The data from these tasks will be used to reassess the economics of the proposed coal gasification process for both the Commercial and Demonstration Plants. A more accurate calculation of the gas cost from both the Commercial Plant and Demonstration Plant will result from this reassessment.

Work on Task VIII was started during the reporting period. Task VIII is scheduled to be completed in June 1981.

10.0 TASK IX - TECHNICAL SUPPORT

The purpose of Task IX is to provide the requisite technical support for designing the Demonstration Plant. The Contractor is required in Task IX:

a. To identify data gaps, technical problems, high-risk areas, and other shortcomings critical to the success of the Demonstration Plant;
b. To propose solutions to the problems, high-risk areas, and shortcomings;
c. To prepare plans and to estimate costs for proving the solutions or filling data gaps; and
d. To implement the plans after receiving DOE approval.

10.1 Sub-Task IX-A: Design Data for Demonstration Plant Coals

The only data gap which existed on the date of execution of the Prime Contract was the lack of yields, product compositions and properties, and operating conditions for designing the Demonstration Plant for Ohio No. 9 and Pittsburgh No. 8 coal feedstocks. The design data have been obtained in a technical support program which was carried out by British Gas Corporation on a large British Gas/Lurgi slagging gasifier pilot plant located in Westfield Development Centre, Cardenden, Scotland.

The work under Sub-Task IX-A was performed under two subcontracts with British Gas Corporation. The original Westfield Agreement was signed at the time the Prime Conract was executed and expired on March 31, 1978. A second subcontract was negotiated to add 4½ months to the program, beginning on April 1, 1978, and expiring on August 15, 1978. The second subcontract is known as the Westfield II Agreement.

By-products and waste water streams produced during the Technical Support Program were shipped to the United States for additional testing by Conoco Inc.

The details, data, and experimental results of the Technical Support Program have been fully reported.

Report No.	Report Title
FE-2542-13	Technical Support Program Report
FE-2542-23	Analyses of Coal, By-products, and Waste Waters from the Technical Support Program.

These two reports are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, 22161.

10.2 Sub-Task IX-B: Identify Critical Problem Areas

The purpose of this sub-task is to identify critical design and engineering problems associated with the Demonstration Plant so that studies can be initiated to solve them.

A number of design problems associated with the gasifier arose in carrying out the Westfield Technical Support Program. The identification of these problems led to modifying the internals of the pilot plant gasifier in January-February 1978 and to extending the original technical support program. Subsequent pilot plant results showed that no design problems associated with the gasifier remain.

No other critical design or engineering problems associated with the Demonstration Plant have surfaced to date.

11.0 TASK X - LONG LEAD TIME ITEMS

The purpose of Task X is to identify long lead time items, if any, which should be ordered or performed prior to the start of Phase II, Demonstration Plant Construction. If such items surface during Phase I, a procurement schedule and bid packages will be prepared. Procurement will be instigated, as required, with DOE approval.

No long lead time items have been identified as of March 31, 1981.

12.0 TASK XI - PROJECT MANAGEMENT

The basic administration, management, and control of the project during Phase I falls within this task.

The following reports were submitted to DOE during the reporting period to fulfill the requirements of the contract:

	Report	Date Submitted
a.	Formal Oral Briefing (minutes)	
	Oral Briefing No. 37	January 29, 1981
	Oral Briefing No. 38	February 20, 1981
	Oral Briefing No. 39	March 16, 1981
b.	Special Informal Presentations	None
c.	Integrated Project Management Summary Report	
	December 1980	January 29, 1981
	January 1981	February 23, 1981
	February 1981	March 23, 1981
d.	Quarterly Technical Progress Reports	
	1 October 1980 - 31 December 1980	January 29, 1981
e.	Annual Technical Progress Report	None
f.	Phase I Final Report	None
g.	Special Reports	
	Plan for Reliability and Quality Assurance (Revised)	February 18, 1981
	License Technology Report	February 12, 1981
	Procurement Plan for Demonstration Plant Construction	February 27, 1981
	Site Acquisition Report	March 2, 1981
	Plan for Sale, Use, or Disposition of Demonstration Plant Products and By-Products	March 27, 1981

The minutes of the Oral Briefings and the Integrated Project Management Summary Report constitute the monthly progress reporting mechanism for the project.

Conoco has prepared a Process Design Baseline, a Cost Baseline, and a Schedule Baseline which will be used under the Configuration Management Plan. The Resource Control Committee defined in this plan has been implemented and will deliberate all engineering changes affecting the above baselines. Further baselining is expected in the future.

13.0 TASK XII - PROCESS TRADE-OFF STUDIES

The purpose of this task is to segregate the process trade-off studies so that these studies will receive the desired degree of effort. Segregation into a separate task will enhance the cost control and reporting of the process trade-off studies and will better permit a later decision regarding capitalization versus expensing of each trade-off study.

Two trade-off studies have been undertaken, completed, and reported. These are:

Report No.	Report Title
FE-2542-8	Market Study for Sale of the Coal Fines By-Products from a Coal Gasification Plant
FE-2542-11	Coal Fines Briquetting Study

Both of these reports are available from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia, 22161.

All work scheduled for Task XII has been completed. No further process trade-off studies will be undertaken unless DOE and Conoco Inc. agree that additional studies would be beneficial to the project.

*U.S. GOVERNMENT PRINTING OFFICE: 1981-740-146/2347