



**U.S. Department of Energy  
National Energy Technology Laboratory**

**Early Entrance Co-Production Plant –  
Decentralized Gasification Cogeneration  
Transportation Fuels and Steam From Available  
Feedstocks**

DOE Cooperative Agreement DE-FC26-00NT40693

**Quarterly Technical Progress Report  
October to December 2002**

WMPI PTY., LLC  
February 2003

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## ABSTRACT

Waste Processors Management, Inc. (WMPI), along with its subcontractors Texaco Power & Gasification (now ChevronTexaco), SASOL Technology Ltd., and Nexant Inc. entered into a Cooperative Agreement DE-FC26-00NT40693 with the U. S. Department of Energy (DOE), National Energy Technology Laboratory (NETL) to assess the techno-economic viability of building an Early Entrance Co-Production Plant (EECP) in the United States to produce ultra clean Fischer-Tropsch (FT) transportation fuels with either power or steam as the major co-product. The EECP design includes recovery and gasification of low-cost coal waste (culm) from physical coal cleaning operations and will assess blends of the culm with coal or petroleum coke.

The project has three phases. Phase I is the concept definition and engineering feasibility study to identify areas of technical, environmental and financial risk. Phase II is an experimental testing program designed to validate the coal waste mixture gasification performance. Phase III updates the original EECP design based on results from Phase II, to prepare a preliminary engineering design package and financial plan for obtaining private funding to build a 5,000 barrel per day (BPD) coal gasification/liquefaction plant next to an existing co-generation plant in Gilberton, Schuylkill County, Pennsylvania.

The current report covers the period performance from October 1, 2002 through December 31, 2002. It was agreed by both WMPI and DOE to postpone some of the remaining Phase I and II technical activities pending on DOE's announcement of the Clean Coal Power Initiative awards. Thus, major activity during the current performance period focuses on only completing some of the reporting, and routine project administration.

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# Section 1 Introduction and Summary

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## 1.1 INTRODUCTION

WMPI, along with its subcontractors Texaco (now ChevronTexaco), Sasol, and Nexant entered into a Cooperative Agreement DE-FC26-00NT40693 with the U. S. Department of Energy (DOE), National Energy Technology Laboratory (NETL), to assess the technical and economic viability of building an Early Entrance Co-Production Plant (EECP) in the U. S. to produce ultra clean Fischer-Tropsch (FT) transportation fuels with either power or steam as the major co-product. The EECP design emphasizes on recovery and gasification of low-cost coal wastes (culm) from coal cleaning operations, and will assess blends of the culm with coal or petroleum coke as feedstocks. The project has three phases.

### 1.1.1 Phase I – Concept Definition and RD&T Planning

Phase I objectives include concept development, technology assessment, conceptual designs and economic evaluations of a Greenfield commercial co-production plant and of a site specific demonstration EECP to be located adjacent to the existing Gilberton Power Station. There are very few expected design differences between the Greenfield commercial co-production plant versus the EECP plant other than:

- The Greenfield commercial plant will be a stand-alone FT/power co-production plant, potentially with larger capacity than the EECP to take full advantage of economies of scale.
- The EECP plant, on the other hand, will be a nominal 5,000 bpd plant, fully integrated into the Gilberton Power Company's Cogeneration Plant's existing infrastructure to reduce cost and minimize project risks. The Gilberton EECP plant will be designed to use eastern Pennsylvania anthracite coal waste and/or a mixture of culm and other fuels as feedstock.

Phase I includes 11 tasks and the following major deliverables.

- A project management plan.
- A process feasibility design package with sufficient details to determine order-of-magnitude cost estimates for preliminary economic and market analyses.
- A preliminary environmental and site analysis.
- A Research, Development and Testing (RD&T) plan for Phase II tasks.
- A preliminary project financing plan.

### 1.1.2 Phase II – R&D and Testing

The Phase II objective is to perform research, development and process performance verification testing of any design deficiencies identified in Phase I. Due to the relative maturity of the two key technologies (Texaco's coal gasification and SASOL's FT) proposed for the EECP designs, Phase II activities will focus on feedstock

## Section 1 Introduction and Summary

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characterization and gasification process performance testing rather than research and development. Specific Phase II goals include:

- Characterization of anthracite culm and its mixture with other fuels as feedstocks for the Texaco gasifier.
- Gasification performance (pilot plant) testing of design anthracite culm feedstocks at an existing Texaco facility to verify its performance.

### 1.1.3 Phase III – Preliminary Engineering Design

The objective in Phase III is to upgrade the accuracy of the Phase I site-specific Gilberton EECP capital cost from plus or minus 35% to plus or minus 20%. The increased cost estimation accuracy is achieved by updating the Phase I inside battery limits (ISBL) processing plant design packages to incorporate Phase II findings, by refining the outside battery limits (OSBL) utility and offsite support facility design packages to include final and updated ISBL unit demands, by obtaining actual budgetary quotes for all major equipment, and by further engineering to define the actual bulk commodities requirements.

The upgraded Phase III capital cost estimate, together with the updated operating and maintenance cost estimate, are crucial elements to finalize the EECP Project Financing Plan needed to proceed with detailed engineering, procurement and construction of the EECP.

The Phase III goals and deliverables include the development of:

- Preliminary Engineering Design package of the EECP.
- A Project Financing Plan.
- An EECP Test Plan.

The project scope of work consists of sixteen tasks organized into the three phases as shown in Table 1.1. The table also shows the project team members responsible for the leading role for each task. The specific task description details were discussed in the Project Management Plan.

## 1.2 SUMMARY

Main technical activity performed during the current reporting period centers on completing the Phase I Task 6 report of Preliminary Site Analysis. Most of the remaining technical activities were postponed pending on DOE's Clean Coal Power Initiative award.

## Section 1 Introduction and Summary

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Table 1-1  
Scope of Work Task Summary

Phase/Task	Description	Task Leaders
Phase I	<b>Concept Definition and RD&amp;T Planning</b>	
Task 1	Project Plan	Nexant
Task 2	Concept Definition, Design Basis & EECF Process Configuration Development	Nexant
Task 3	System Technical Assessment (Trade-off Analysis)	Nexant
Task 4	Feasibility Study Design Package Development	Nexant (w/individual Process Design package from Texaco and Sasol)
Task 5	Market Assessment	Texaco
Task 6	Preliminary Site Analysis	WMPI and Consultants
Task 7	Preliminary Environmental Assessment	WMPI and Consultants
Task 8	Economic Assessment	WMPI and Consultants
Task 9	Research Development and Test Plan	Texaco
Task 10	Preliminary Project Financing Plan	WMPI and Consultants
Task 11	Phase I - Concept Report	Nexant
Phase II	<b>R&amp;D and Testing</b>	
Task 1	Feedstock Mix Characterization and Gasification Performance Verification	Texaco (w/ support from Nexant and WMPI)
Task 2	Update RD&T Plan	Texaco
Phase III	<b>EECF Engineering Design</b>	
Task 1	Preliminary Engineering Design Package Development	Nexant – with a) Texaco – Gasification Design Package b) Sasol – FT Design Package c) Nexant – BOP and cost estimate
Task 2	Project Financing Plan	WMPI and Consultants
Task 3	EECF Test Plan	Nexant



## Section 2 Phase I Task 1 – Project Plan

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TASK COMPLETED.

A Project Management Plan was prepared, issued and approved by DOE. A copy was submitted to the AAD Document Control Office of DOE/NETL on May 15, 2001.

This plan provides a road map for the overall project execution delineating the project:

- Objectives.
- Detailed work breakdown structure and obligated deliverables.
- Technical and management approach.
- Control plan – scheduling, budget and reporting.
- Administration details.

## Section 3 Phase I Task 2 – Concept Definition, Design Basis & EECF Process Configuration

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TASK COMPLETED.

3.1 EECF concept and process configuration defined, giving full considerations of:

- WMPI's feedstock availability and quality (e.g., ash content, composition and anticipated fusion temperature.)
- Desired mode of operation for Texaco's gasification process in handling the design project feed mix.
- Design consideration of Sasol's Low-Temperature FT (LTFT) process giving the estimated design syngas feed.
- System integration and site-related issues (e.g., syngas clean up, utility availability.)

3.2 Gilberton EECF Design Basis established, and a Basic Engineering Design Data (BEDD) package was developed to guide the overall process design development regarding:

- Plant capacity
- Site data
- Feedstock properties
- Product specifications
- Battery limits and offsite utility specifications

3.3 Project Instruction of Equipment Code of Accounts established.

Details of the above were reported in previous Quarterly Technical Progress reports.

## Section 4 Phase I Task 3 – System Technical Assessment

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TASK COMPLETED.

Under this task 1) technical design issues/systems (e.g., ash fusion characteristics of EECP feed mix and its potential effect on gasification performance) identified in Phase 1 Task 2 were assessed in more detail, and 2) preliminary heat, material and utility balance sensitivity analyses were carried out, based on process performance estimates and utility demands from Texaco and Sasol for the gasification and FT synthesis section respectively, to optimize the overall EECP process plant configuration for detailed process design package development of Phase I Task 4 activity.

## **Section 5 Phase I Task 4 – Feasibility Design Package Development**

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Greenfield (Texaco gasifier based) EECP Design Package COMPLETED.

## Section 6 Phase I Task 5 – Market Analysis

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TASK COMPLETED.

Purvin & Gertz, Inc. completed this task under a subcontract to Texaco. Final report was delivered to WMPI. The report contains sensitivity business information that WMPI would prefer not to report it in writing. Under an agreement, DOE can review the report and its findings with WMPI.

## **Section 7 Phase I Task 6 – Preliminary Site Analysis**

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TASK COMPLETED and topical report issued as a 2002 fourth quarter milestone activity.

WJP Engineers completed this task under a subcontract to WMPI. Nexant, with support from Bechtel personnel, helped with examining alternative modes of transporting large process vessels to the EECP site near the existing Gilberton cogen plant.

## Section 8 Project Management

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### **8.1 BIWEEKLY PROJECT STATUS REPORT**

Informal Biweekly Project Status Reports are transmitted to keep the DOE Project Manager updated of all work in progress.

### **8.2 PROJECT MILESTONE PLAN AND LOG**

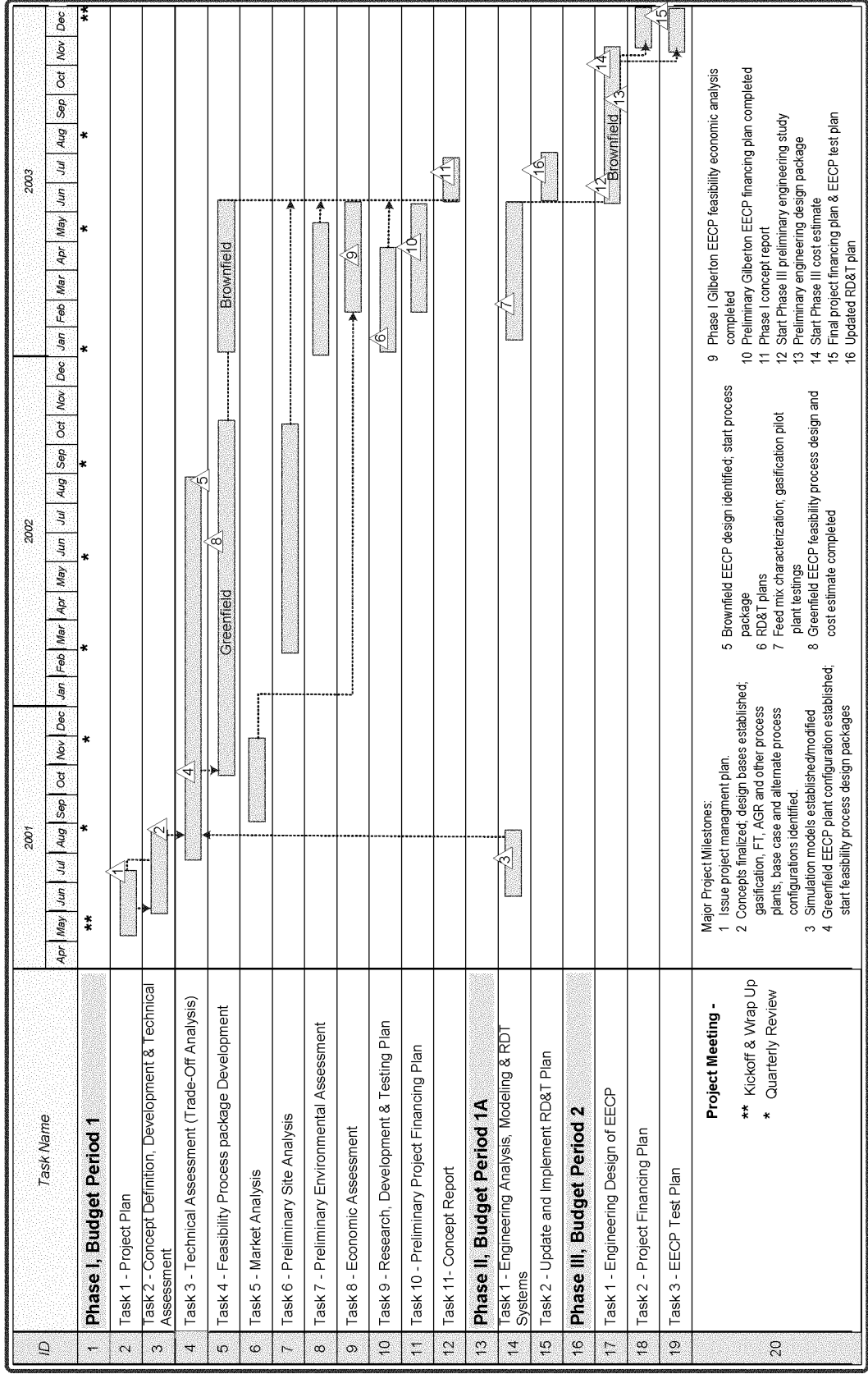
Project schedule and milestone were revised with concurrence from DOE on August 15, 2002 to re-prioritize the remaining work scope in anticipation of WMPI's submittal of a proposal in response to the DOE Clean Coal Power Initiative solicitation, as a means of advancing the WMPI EECF concept to project EPC (engineering, procurement and construction) and demonstration. Figure 8.1 shows the revised project schedule.

Project Milestone Plan and Milestone Log are submitted on time as prescribed by the contract to keep DOE management informed of work-in-progress and accomplishments against major project milestones planned.

# Section 8 Project Management

Figure 8.1

## EXHIBIT "B" - Revised 8/15/2002 WMPI/EECP [DE-FC26-00NT40693] M003 AMENDED PROJECT SCHEDULE





## **Section 9 Experimental**

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### **EXECUTIVE SUMMARY**

#### **9.1 EXPERIMENTAL**

#### **9.2 RESULTS AND DISCUSSION**

#### **9.3 CONCLUSION**

#### **9.4 REFERENCE**

NOT APPLICABLE - The current project is a design feasibility and economics study, leading to detailed engineering, construction and operation of an EECP plant. It's not a typical research and development (R&D) project where a topical report format described in this section applied. There was no experimental work performed. This section is included only to fulfill DOE's prescribed reporting format.

## List of Acronyms and Abbreviations

AGR .....	Acid Gas Removal
API .....	American Petroleum Institute
ASTM.....	American Standard Testing Methods
Bbls, bbls .....	Barrels
BEDD .....	Basic Engineering Design Data
BOC .....	British Oxygen Company
BOD .....	Biological Oxygen Demand
BOP .....	Balance Of Plant
BPD .....	Barrel Per Day
BFW .....	Boiler Feed Water
CFB .....	Circulating Fluidized Bed
COD .....	Chemical Oxygen Demand
CPI .....	Coalescing Plate Interceptor
DAF .....	Dissolved Air Flootation
DCS .....	Distributed Control System
DOE.....	U.S. Department of Energy
EECP .....	Early Entrance Co-Production Plant
ft .....	Feet
FT .....	Fischer-Tropsch
GPM .....	Gallons per Minute
GT .....	Gas Turbine
HC .....	Hydrocracking
HER.....	Heavy End Recovery
HHP .....	High High Pressure
HP .....	High Pressure, Horse Power
HRSG .....	Heat Recovery Steam Generator
I/O .....	Input/Output
IP .....	Intermediate Pressure
ISBL .....	Inside Battery Limits
KV.....	Kilo Volts
Lb/CF .....	Pounds per Cubic Feet
LCN.....	Logic Control Network
LHV.....	Lower-Heating Value
LP .....	Low Pressure
LTFT .....	Low-Temperature Fischer-Tropsch
LTGC .....	Low-Temperature Gas Cooling
MMSCFD .....	Million Standard Cubic Feet Per Day
MW .....	Mega Watt
NETL.....	National Energy Technology Laboratory
OSBL.....	Outside Battery Limits
OSHA .....	US Occupational Safety and Health Administration
PMCC .....	Pensky-Martens Closed Cup
PPM.....	Parts per Million
PSA .....	Pressure Swing Absorption

PSIG, psig.....	Pounds per Squared Inch, gauge
PWU.....	Product Work Up
RD&T.....	Research, Development & Testing
RON.....	Research Octane Number
RVP.....	Reid Vapor Pressure
SCFM.....	Standard Cubic Feet per Minute
SCR.....	Selective Catalytic Reduction
SRU.....	Sulfur Recovery Unit
STPD.....	Short Tons Per Day
SWS.....	Sour Water Stripper
TGTU.....	Tail Gas Treating Unit
UBC.....	Uniform Building Code
WMPI.....	Waste Processors Management, Inc.
Wt%.....	Weight Percent