**UTILIZATION OF COAL-WATER FUELS
IN FIRE-TUBE BOILERS**

DOE/PC/90165--T3

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**DOE CONTRACT
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CONTRACT PERIOD OF PERFORMANCE

TECHNICAL PROGRESS REPORT

**Period Covered By Report
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Submitted by:

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Executive Summary

Energy and Environmental Research Corporation (EER) was in the process of negotiating the host site agreement with the University of Alabama during this reporting period. EER has not been released by DOE to perform any technical work until the host site plan has been approved. EER completed the host site agreement with the University during this quarter and delivered the host site plan to DOE for approval.

Introduction

This project is a demonstration for firing coal-water slurry in a fire-tube boiler. It includes design, installation, and demonstration of the slurry firing equipment in a fire-tube boiler at the University of Alabama in Tuscaloosa. The project will be funded by the U.S. Department of Energy with cost sharing from Jim Walter Resources and the University of Alabama. Energy and Environmental Research Corporation is the prime contractor responsible for all aspects of the project.

The specific objective of this contract is to demonstrate the potential for coal-water fuels to be burned effectively in a fire-tube boiler designed for oil or gas. When the results of this project are combined with the results of the water-tube slurry testing, a broad data base will exist that will provide valuable information for the retrofit of future boilers.

Project Description

The project will be conducted according to the following five tasks:

Task 1 Establish Test Site; Acquire and Integrate Components This task provides for the design and retrofit of the host boiler to fire coal-water slurry. The host boiler is a Cleaver Brooks fire-tube boiler located at the University of Alabama Tuscaloosa campus. EER will negotiate a host agreement with the University for the use of the boiler on the test program and prepare a site plan. Based on the initial design that was presented in the proposal, EER will prepare a detailed design of the slurry retrofit. It will include additional site specific analysis of the combustion and heat transfer processes occurring in the fire-tube. The design will be submitted to DOE in the form of a design package for the components and a design package for the component integration. Following DOE approval at a formal review meeting, EER will procure and install the equipment. At the completion of Task 1, the host boiler will be fully equipped to fire slurry.

Task 2 Perform Preliminary System Tests This is a series of optimization tests that will be conducted to determine the effects of adjustable parameters on boiler performance and to document short term performance. EER will prepare a test plan and, following DOE approval, tests of approximately 100 hours duration will be conducted. The data will be compiled and evaluated to determine the potential for

long term commercial operation. The results will be presented to DOE in a second formal project review.

Task 3 Perform Proof-of-Concept System Tests EER will prepare a test plan based on the results of Task 2. It will provide for about 1000 hours of host boiler operation firing slurry over a duty cycle typical of commercial boilers. Following DOE approval of the test plan, EER will refurbish the retrofit equipment, if necessary, and proceed with the testing. The test results will be evaluated and submitted to DOE for review.

Task 4 Evaluate Economics EER will conduct a comprehensive review of the test data. The measured performance of the slurry firing system will be compared with the predictions from the analytical methodology. Any deviations will be evaluated and the models will be calibrated for fire-tube boiler designs. The methodology will then be used to prepare preliminary designs and performance predictions for several fire-tube boiler designs spanning the commercial range. The economics of slurry firing will be evaluated for these selected cases based on the specific economic data collected during the project. This will permit the key parameters which influence cost effective slurry conversions to be determined.

Task 5 Decommission Test Facility This provides for the final disposition of the property. It is expected that the DOE property acquired during this project will have little value for any purpose other than its use in firing slurry in the host boiler. The University has indicated interest in using the boiler as a slurry test facility following completion of the project and is expected to waive the restoration, so EER intends to recommend that DOE abandon the equipment in place.

Project Status

Energy and Environmental Research Corporation (EER) was in the process of negotiating the host site agreement with the University of Alabama during this reporting period. EER delivered the host site plan to DOE on June 25, 1991. The host site plan consisted of the following items:

1. Host Site Description
2. Fuel and Storage Delivery
3. Revised Project Schedule
4. University of Alabama Host Site Agreement
5. Environmental Compliance

6. Fuel Supply Contract

7. Host Site Plot Plan

EER has not been released by DOE to perform any technical work until the host site plan has been approved.

Planned Activities

EER expects to receive approval from DOE for the host site plan and begin the design process. The heat transfer and boiler modeling work will be accomplished first before the detailed engineering work.

Summary

The only activities EER was able to work on during this reporting period was the host site agreement and host site plan. EER will proceed with the technical work as soon as approval is received from DOE.

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