DOE/PC/90279--T21

DE90 009906

PHASE II

# ADVANCED COAL-FUELED COMBUSTOR FOR RESIDENTIAL SPACE HEATING APPLICATIONS

QUARTERLY REPORT

Period July 1 - September 30, 1988

DE-AC22-86PC90279

Prepared for:

Fred W. Steffgen and John C. Winslow
U.S. Department of Energy
Pittsburgh Energy Technology Center

Prepared by:

Energy and Environmental Research Corporation
18 Mason
Irvine, CA 92718

October 1988

---

# 1.0 INTRODUCTION

The objective of this program is to develop an integrated combustor/heat exchanger which burns coal either as a slurry or as dry ultrafine coal and which is suitable for use in a range of residential space heaters. The program has been divided into two phases. To date, Phase I has been completed. In Phase I, combustor concepts were developed and evaluated by means of mathematical modeling and experimental testing. The most promising concept, an air-cooled stainless steel combustion chamber, was fabricated and tested. In Phase II, an optimized prototype combustor will be integrated with a heat exchanger to complete the prototype residential space heater.

The goal of the second phase of this program is to prove that a coal-fired residential space heater can meet the following specifications:

| | |
|---|---|
| Primary Fuel: | Coal/liquid mixture or dry ultrafine coal |
| Ignition: | Automatic |
| Response Time: | $\leqslant$ 5 minutes to full load |
| Reliability/Safety: | Comparable to oil-fired residential heating systems |
| Steady-State Efficiency: | $\geqslant$80 percent |
| Combustion Efficiency: | $\geqslant$99 percent |
| Daily Maintenance: | None |
| Scheduled Maintenance: | $\leqslant$ twice a year |
| Size Constraints: | Height-6 ft. Floor space-15 sq. ft. |
| Service Life: | $\geqslant$20 years |

In order to accomplish the overall program objectives, the Phase II program will be carried out in five tasks:

Task 1. Program Plan and Management
Task 2. Combustor Optimization
Task 3. Integration of Heat Exchanger
Task 4. Testing of Space Heater
Task 5. Reporting

This quarterly report describes the work performed during the period from July 1, 1988 to September 30, 1988. During this initial period, attention has been focused on Task 1 - Program Plan and Management.

## 2.0 PROGRAM PLAN

A work plan, which outlined the technical approach to achieve the objectives for this phase of the program, was prepared and submitted.

A technical approach taken for this phase is resulted from internal reviews of the Phase I data, that prior to the integration of the prototype combustor with a heat exchanger, cycling tests should be conducted to define the cycling period and optimize the combustor's response time.

Also during this reporting period, the final report for Phase I efforts was prepared and submitted to Project Officer. The final version was approved for distribution.

## 3.0 FUTURE WORK

Effort will concentrate on the following areas:

- Conduct optimization and cycling characterization tests for the prototype combustor.

- Design hardware including heat exchanger and other accessories to be incorporated into the prototype coal space heater.