

PHASE II

ADVANCED COAL-FUELED COMBUSTOR FOR
RESIDENTIAL SPACE HEATING APPLICATIONS

QUARTERLY REPORT

Period July 1 - September 30, 1988

DE-AC22-86PC90279

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October 1988

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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:	≤ 5 minutes to full load
Reliability/Safety:	Comparable to oil-fired residential heating systems
Steady-State Efficiency:	≥ 80 percent
Combustion Efficiency:	≥ 99 percent
Daily Maintenance:	None
Scheduled Maintenance:	\leq twice a year
Size Constraints:	Height-6 ft. Floor space-15 sq. ft.
Service Life:	≥ 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.