

Rapid Deployment of Rich Catalytic Combustion

DE-FC26-03NT41890

I. PROJECT PARTICIPANTS

- A. Prime: United Technologies Corporation through its Pratt and Whitney Division
- B. Sub-award: Precision Combustion, Incorporated

II. PROJECT DESCRIPTION

- A. Objectives: Create an Implementation Plan and Integration Study for rich catalytic combustion as applied to industrial gas turbines fired on both natural gas and coal derived synthesis gas. The overall goal is a combustion system that will be capable of NO_x less than 2 ppmvd. at 15% oxygen in an F-class gas turbine without exhaust gas after-treatment.
- B. Background/relevancy: The objective of the Turbines (HEET) program is to create the necessary technology base leading to Vision 21 (V21) goals. V21 systems will offer a new class of fossil fueled power generation technology in the 2015 to 2020 time frame. V21 power systems will be fuel flexible, operating on either coal or natural gas, capable of achieving the highest efficiencies with near-zero emissions of criteria and unregulated pollutants. From a HEET program perspective the success of the V21 concepts is dependent on the availability of advanced power turbine technology to reach the anticipated performance goals. These goals include coal-fueled systems with efficiencies of 60 percent on a higher-heating-value basis (HHV) and natural gas fired systems with efficiencies of 75 percent on a lower-heating-value basis with near-zero emissions. An intermediate goal on the pathway to V21 systems is to produce a 50 percent efficient (on an HHV basis) coal fueled power plant at a cost less than \$1000 per kilowatt by 2008. In the near term, as reliance on natural gas increases and prices escalate, opportunities will arise to reinvest in the use of coal, our nations most abundant fossil fuel resource. Estimates suggest that 31,000 MW of new coal-based power generation will be installed over the next 17 years. Much of this added capacity could be based on integrated gasification combined-cycle technology (IGCC) as well as advanced combustion systems. Clean, efficient and cost effective coal based power systems depend on advanced power turbine technology to achieve higher levels of efficiency.
- C. Period of performance: October 1, 2003 to January 31, 2004
- D. Project summary: In response to the Department of Energy (DOE) *Solicitation for Financial Assistance Applications No. DE-PS26-02NT41613-14*, for the High Efficiency Engines and Turbines (HEET) Program, Pratt and Whitney Power Systems (PWPS) proposes to conduct research and development of rich catalytic combustion technology for rapid deployment in industrial gas turbines. The resulting combustion systems will provide fuel flexibility for gas turbines to burn coal derived synthesis gas or natural gas and achieve NO_x emissions of 2 ppmvd or less (at 15% O₂), cost effectively, without exhaust stack cleanup, by the end of

2007. This advance will signify a major step towards environmentally friendly power generation and coal-based energy independence for the United States.

III. PROJECT COSTS

- A. DOE: \$ 250,000
- B. Prime: \$ 107,113
- C. Partner: None

IV. MAJOR ACCOMPLISHMENTS SINCE THE BEGINNING OF THE PROJECT

- A. Preliminary sizing of the catalytic module complete, December 2003

V. MAJOR ACCOMPLISHMENTS PLANNED DURING THE NEXT SIX MONTHS

- A. Completion of the Integration Study, January, 2004
- B. Completion of the Implementation Plan, January, 2004

VI. MAJOR ACCOMPLISHMENTS PLANNED IN OUTYEARS (6-18 MONTHS)

- A. None

VII. MAJOR MILESTONES FOR ENTIRE PROJECT

- A. Same as the six month milestones

VIII. ISSUES

- A. None