DoD EXPERIENCES IMPLEMENTING FUEL CELL TECHNOLOGY

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BACKGROUND

The United States Department of Defense (DoD), like many other large utility customers, is constantly concerned about the supply of reliable, cost-effective electric power with minimal environmental impact. Distributed generation equipment such as fuel cell power plants have the potential for meeting these requirements. The arrival to the marketplace in 1992 of the ONSI PC25 Phosphoric Acid Fuel Cell (PAFC) power plant, the first fuel cell power plant to become commercially available, provided the DoD with the opportunity to evaluate this advanced technology as a possible replacement for outdated existing equipment on military facilities.

THE DoD FUEL CELL DEMONSTRATION PROGRAM

The FY 1993 and FY 1994 Defense Appropriations Acts provided $18M and $18.75M, respectively, worth of equipment procurement funds for the purchase and installation of natural gas fuel cells at DoD installations. The U. S. Army Engineer Research and Development Center's Construction Engineering Research Laboratory (USACERL) was requested to manage this fuel cell demonstration program for the DoD. Thirty ONSI PC25 PAFC power plants (1-Model PC25A, 14-Model PC25B, and 15-Model PC25C) were purchased and installed at DoD demonstration sites through this program. Selection of these sites was based on a combination of various criteria including interest of site personnel, energy cost savings, diversity of electrical and thermal applications, geographic region and climatic diversity, site physical considerations, and environmental considerations. The overall goal of this demonstration program was to provide a thorough evaluation of fuel cell performance over a wide range of conditions.

USACERL personnel have been monitoring the operational performance of each of the fuel cell power plants in the DoD fleet. This includes total operating hours, total electricity production, total waste heat recovery, cell voltage degradation, availability, efficiency, energy cost savings, forced outages, and air emissions.

FLEET PERFORMANCE SUMMARY (as of September 1, 2000)

The DoD fleet of 29 Model PC25B and Model PC25C PAFC power plants has logged more than 614,000 hours of operation. Unadjusted lifetime availability for the Model PC25Bs and model PC25Cs is 56% and 77%, respectively. The Model PC25Cs adjusted availability for the most recent 6-month period has been 83%. It is estimated that these plants have reduced utility energy costs by more than $4.14 million. Field measurement of environmental emissions was performed at three of the installed PAFC power plants. Measurement of NO_x, So_x, CO, non-methane hydrocarbons and other measurements were taken twice with 6 months time between measurements. Generally, the results confirm the manufacturer claims of extremely low emissions from the PAFC power plants. Compared to conventional utility electric generation and conventional boilers, these PAFC units have resulted in abated pollution as follows: NO_x 197 tons, SO_x 422 tons, CO 7 tons, and CO_2 25,001 tons.