



FuelCell Energy

World Leader in Ultra-Clean Power

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Executive Officers

Dan Brdar

President and
Chief Executive Officer

Christopher R. Bentley

Executive Vice President
Government Operations
Strategic Mfg. Development

Bruce Ludemann

Senior Vice President
Sales & Marketing

Joseph G. Mahler

Senior Vice President
Treasurer, Corp. Strategy

SHIPS SERVICE FUEL CELL POWER PLANT DEVELOPMENT

FuelCell Energy (FCE) is currently developing marine diesel applications for its DFC® technology under contracts with the U.S. Navy. Fuel cell based marine power plants possess the potential of superior performance with optimized fuel efficiency and environmental impact. The Office of Naval Research (ONR) and the Naval Sea Systems Command (NAVSEA) are conducting an advanced technology development program to develop and demonstrate fuel cell electric power generators for surface ship applications. A principal goal of the Navy's Ship Service Fuel Cell (SSFC) program is to demonstrate that commercially developed fuel cell technology can utilize naval logistic fuels and operate in a marine environment.

Megawatt-class direct carbonate fuel cell (DFC®) power plants are currently being marketed by FCE for distributed power generation applications using natural gas and digester gas fuels. Because of the unique ability of DFC® stacks to internally reform the methane in the fuels, DFC® plants can provide thermal efficiency approaching 50 percent over a wide range of operating power. To meet the Navy's shipboard power requirements, FCE is adapting the commercial DFC® technology for use with naval logistic fuels.

In the first phase of the SSFC program, FCE developed a conceptual design for a modular 2.5 MW first generation marine rated DFC® power plant and conducted critical component testing. The key features of this design include ability to operate with naval distillate fuels containing up to 1% sulfur, and internal process water recovery for water independent operation.

In the ongoing second phase, a logistic fuel processing and balance of plant (BOP) module for a 0.5 MW first generation demonstrator plant was designed and constructed. Process and Control (PAC) testing of the module verified conversion of high sulfur content Navy logistic fuels to anode fuel gas with composition transparent to the internal reforming carbonate fuel cell stack. For Factory Testing conducted at FCE's Danbury, CT facility, the BOP module was connected to an FCE commercial design DFC® fuel cell stack, and the integrated power plant was operated on-load for over 250 hours. On-board sulfur removal from the high sulfur logistic fuel and internal process water recovery from stack exhaust were verified. The power plant was shipped to Philadelphia during the summer of 2007 for additional evaluation at the NAVSEA test facility.

FCE is also participating in an ONR-sponsored second generation naval fuel cell development program aimed at substantially reducing the size and weight of the current first generation ships service fuel cell power plant. Toward this goal, FCE will investigate the feasibility of scaling up its high temperature polymer electrolyte fuel cell technology to power levels required in ship service power generators, and address approaches for reducing size and weight of the logistic fuel processing system.