XI.7 Accelerating Acceptance of Fuel Cell Backup Power Systems

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Objectives

- Increase distributed power generation.
- Improve reliability and efficiency of mission critical backup power.
- Decrease fossil fuel dependencies for power generation.

Relevance to ARRA and DOE-Fuel Cell Technologies Goals

- Demonstrates market viability and increase pull of hydrogen and fuel cell systems within our government customers/partners.
- Deploys 20 GenSys hybrid, hydrogen start/liquefied petroleum gas (LPG) or natural gas run units that provide economically viable backup power in excess of 72 hours.
- Maintains seven U.S., high-tech jobs in New York State and provides work for U.S. suppliers and field service contractors.

Accomplishments

- Warner Robins Air Force Base in Georgia and Fort Irwin in California have expressed interest in being site hosts for extended backup GenSys and Plug Power conducted a site review at Warner Robins in March 2010.
- An economically viable path to 72 hours worth of backup power with a pure hydrogen solution was not determined and the focus of the project has shifted to a successful hydrogen start with an LPG/natural gas run.

Introduction

Since 2001, Plug Power has installed more than 800 fuel cell systems worldwide. Plug Power's prime power systems have produced approximately 6.5 million kilowatt hours of electricity and have accumulated more than 2.5 million operating hours. Intermittent or backup power products have been deployed with telecommunications carriers, government and utility customers in North and South America, Europe, the United Kingdom, Japan and South Africa. Some of the largest material handling operations in North America are currently using the company's motive power units in fuel cell-powered forklifts for their warehouses, distribution centers and manufacturing facilities. The low-temperature GenSys fuel cell system provides remote, off-grid and primary power where grid power is unreliable or nonexistent. Built reliable and designed rugged, low-temperature GenSys delivers continuous or backup power through even the most extreme conditions. Coupled with high-efficiency ratings, low-temperature GenSys reduces operating costs making it an economical solution for prime power requirements. Currently, field trials at telecommunication and industrial sites across the globe are proving the advantages of fuel cells–lower maintenance, fuel costs and emissions, as well as longer life–compared with traditional internal combustion engines.

Plug Power has determined that extended backup power requirements of 72 hours and beyond can be best met with a hybrid GenSys solution. This system can both meet the demands of Department of Defense customers, and a broad global commercial market. At this time Plug Power was unable to determine an economically viable path to 72 hours worth of backup power with a pure hydrogen solution and has therefore stopped development of a pure hydrogen solution. The hybrid hydrogen/LPG or natural gas solution provides the economics needed for a flexible backup power solution.

Approach

This project will leverage technology from Plug Power's two existing product lines to create a reliable power source that starts fast and runs as long as fuel is available. The project tasks and status are shown in Table 1:

TABLE 1. Project Tasks and Status

Cost Analysis and Commercialization Study	85% complete
Site Planning and Applications Engineering	30% complete
Site Specific Engineering Development	Not started
System Builds and Factory Testing	20% complete
Field Deployment Go/No-Go	Not started
Fleet Operation and Managed Services	Not started
Project Closeout	Not started
Program Management	38% complete

For the past year Plug Power has collaborated with partners the Army Construction Engineering Research Laboratory and Warner Robins Air Force Base to demonstrate market viability and increase market pull of hydrogen fuel cell systems. To date, 38 percent of the project has been completed and barriers are actively being addressed, including: cost, system reliability and market volume.

Results

Fifteen percent of Plug Power's employees are supporting this effort to deploy 20 GenSys hybrid hydrogen start/LPG or natural gas run units. Automotive suppliers are delivering stack, reformer and balance-of-plant components.

Eighty-five percent of the cost analysis and commercialization study has been completed. The GenSys offers economic and environmental benefits over the incumbent diesel generator technology. It has a nearly threefold advantage in system life with only 20-25 percent higher maintenance cost and offers the customer a 20-30 percent decrease in power generation expense (Table 2).

TABLE 2. Telecom Cell Tower Application Comparison

GENSYS	Features	Diesel Generator
42,800 hours (5 years)	System Life	15,000 hours (1.71 years)
System, inverter, batteries 2.4% less	5 Year Capital Costs	3 generators, AMF panel, PIU, SMPS, batteries 2.4% more
Range: 20-32% 4.5kW point: 29.1% (Beginning of Life)	Efficiency	Range: 7-21% 4.5 kW point: 18.5% (Beginning of Life)
LPG, potential to run on a range of hydrocarbons	Fuel Type	Diesel
>99%	Reliability/ Availability	>99%
7.0 metric tons of Carbon, 0.04 g of NO_2, 0.06 g of SO_2, 0.051g of CO annually	Emissions	14.4 metric tons of Carbon, 743 g of NO_2, 49 g of SO_2, 160 g of CO annually
65 dBA at 3 m	Noise Level	75 dBA sheltered 92 dBA unsheltered

An economically viable path to 72 hours worth of backup power with a pure hydrogen solution was not determined, shifting focus to the success of a hydrogen start with LPG/natural gas run. This solution provides for a more flexible backup power solution.

In March 2010 Plug Power visited Warner Robins Air Force Base in Warner Robins, Georgia to discuss its viability as a site. Warner Robins Air Force Base requires extended backup power to enable base service operations, including a server room and heating, ventilation and air conditioning. Although hydrogen is available on site its proximity to potential unit placement and logistics may be difficult and costly.