VI. MANUFACTURING R&D

VI.0 Manufacturing R&D Sub-Program Overview

Introduction

The Manufacturing R&D Sub-Program supports research, development, and demonstration (RD&D) needed to reduce the manufacturing cost of fuel cell technologies and to develop a domestic supplier base. The Manufacturing R&D effort will enable the mass production of both supply and end-use technologies (in parallel with technology development) and will foster a strong domestic supplier capability. Activities will address the challenges of moving today's laboratory-produced technologies to high-volume, pre-commercial manufacturing to drive down the cost of fuel cell systems. Research will be conducted in coordination with the Department of Commerce and the White House Office of Science and Technology Policy's Interagency Working Groups. An RD&D technology roadmap has been developed with industry to identify critical technology development needs for high-volume manufacturing of high pressure storage and fuel cell systems.

In Fiscal Year 2009, manufacturing projects from a 2007 solicitation continued in the following areas: novel electrode deposition processes for membrane electrode assembly (MEA) fabrication, high-volume fuel cell leak-test processes, novel assembly processes for low cost MEAs, gas diffusion layer (GDL) cost reductions, and fabrication technologies for high-pressure composite storage tanks.

Goal

Research, develop and demonstrate technologies and processes that reduce the manufacturing cost of fuel cell and fuel storage systems.

Objectives

- Fuel Cells - Presently, fuel cell stacks are fabricated at low volume and the costs of these stacks is approximately $3,000 per kW. This is 50 times the projected cost of $60 per kW[1] for the same stack technology (2006) at high volume (500,000 units/year). The projected high-volume cost includes labor, materials, and capital expenditures, but does not account for manufacturing R&D investment. One objective of Manufacturing R&D is to enable this factor of 50 cost reduction in fuel cell stacks for stationary and transportation power systems.
- Hydrogen Storage - Another objective of Manufacturing R&D is to reduce the cost of making high-pressure carbon composite hydrogen storage tanks by a factor of 9 from 2005 costs.

FY 2009 Technology Status

This sub-program focuses on the manufacture of high pressure hydrogen storage and fuel cell technologies that will be needed in the early stages commercialization. Research investments are focused on reducing the cost of components currently used (or planned for use) in existing technologies, as well as reducing the cycle times of the processes being developed. Progress toward attaining the Manufacturing R&D objectives is measured in terms of the ability of funded research to reduce the cost of producing fuel cell technologies; and to increase manufacturing processing rates and annual manufacturing capacity.

The Multi-Year Research, Development and Demonstration Plan was updated in April 2007, with estimated status costs for fuel cell and hydrogen storage technologies. The current costs for these technologies are $250/kWh–$350/kWh for a 700 bar gaseous hydrogen storage system, and $3,000/kW for polymer electrolyte membrane fuel cell stacks fabricated at low volume.

[1] 2006 TIAX estimate for 80-kW automotive fuel cell systems

FY 2009 Accomplishments

FY 2009 saw a number of advancements in manufacturing for fuel cells and quality assurance. UltraCell has analyzed fuel cell stack manufacturing methods, procedures, throughput times, labor times, yield, failure modes and investigated leak-test methods resulting in the creation of a specification for leak-testing. Ballard down-selected an on-line GDL coating weight measurement tool to demonstrate the means of achieving six sigma quality standards. W. L. Gore developed a model for evaluating decal lamination processes for high speed electrode deposition. An ultrasonic welding (electrodes to sub-gaskets) cycle time of less than one second was achieved by Rensselaer Polytechnic Institute, an improvement from the current process (heated press) cycle time of one minute. An on-line measuring process developed by the National Renewable Energy Laboratory validated the thickness of membranes manufactured by industry partners such as BASF and 3M.

Budget

The President's FY 2010 EERE Fuel Cell Technologies Manufacturing R&D budget request was zero to allow for focused efforts on more near-term technologies.

2010 Plans

Competitively awarded research projects will have reached a logical decision point in development.

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