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## VII.0 Technology Validation Sub-Program Overview

### Introduction

The Technology Validation sub-program is focused on conducting learning demonstrations that emphasize co-development and integration of hydrogen infrastructure with hydrogen fuel cell-powered vehicles to permit industry to assess progress towards technology readiness. Technology Validation will test, demonstrate and validate hydrogen fuel cell vehicles and infrastructure and use the results to provide feedback to the Hydrogen Program.

### Goal

Validate the status of meeting program targets for integrated hydrogen and fuel cell technologies for transportation, infrastructure and electric generation under real-world operating conditions for both the transition and mature market periods.

### Objectives

- By 2008, validate that hydrogen vehicles have greater than 250-mile range without impacting passenger or cargo compartments.
- By 2009, validate 2,000-hour fuel cell durability in vehicles (the durability target has been delayed until 2011 due to changes in the DOE budget planning profile), and hydrogen infrastructure that results in a hydrogen production cost of less than \$3.00/gasoline gallon equivalent (gge), untaxed, and allows for safe and convenient refueling by drivers (with training).
- By 2014, validate \$1.60/gge (at the plant gate) hydrogen cost from biomass gasification and \$3.10/gge for central wind-based electrolysis at the plant gate.
- By 2015, validate hydrogen vehicles that have greater than 300-mile range, 5,000-hour fuel cell durability, and hydrogen infrastructure that results in a hydrogen production cost of \$2.50/gge (untaxed), and allows for safe and convenient refueling by drivers (with training).

### FY 2008 Technology Status

The Learning Demonstration in 2008 provided data for evaluating the technology status with respect to fuel cell durability, driving range, and power park demonstrations. The current data from the Learning Demonstration shows actual operating hours accumulated is over 1,700 and the projected hours to a 10% degradation of the fuel cell is over 1,900 hours. The 2008 objective of 250 mile vehicle range was met using Gen 2 vehicle testing data which achieved a range from 196 miles to 254 miles. In addition, the window sticker fuel economy data of Gen 2 vehicles was from 42.7 to 57.8 miles/kg of hydrogen. The most recent 2008 information from the Learning Demonstration project may be accessed through this link: [http://www.nrel.gov/hydrogen/cdp\\_topic.html](http://www.nrel.gov/hydrogen/cdp_topic.html).

### FY 2008 Accomplishments

#### Hydrogen Learning Demonstration

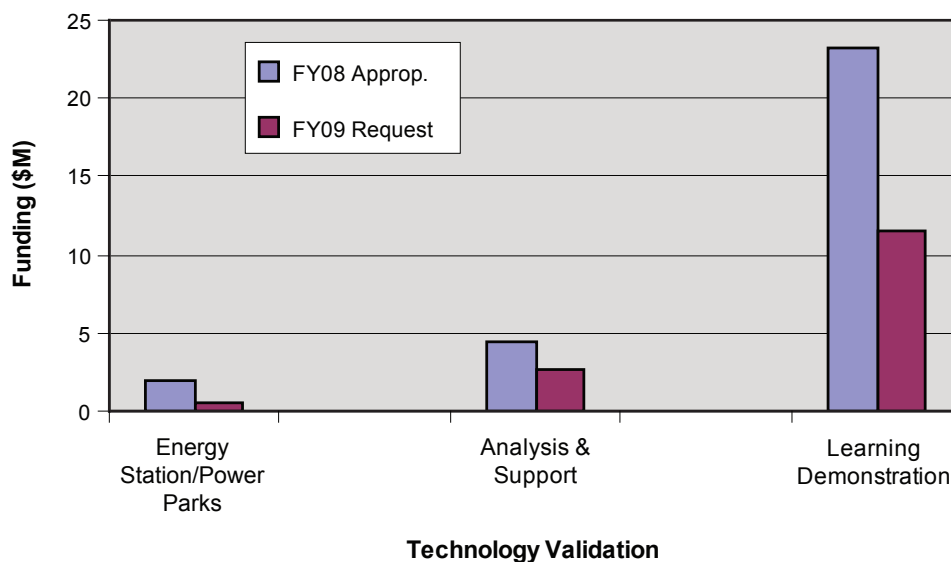
- In Fiscal Year 2008, generation 1 vehicles continued to be operated by customers, hydrogen refueling stations were installed and operated, and data was provided to the Hydrogen Secure Data Center at the National Renewable Energy Laboratory.
- Generation 2 vehicles continued to be placed into service bringing the total number of vehicles in the project to 122.
- A total of 16 hydrogen fueling stations are currently in the project located in Northern and Southern California, Orlando, FL, Washington, D.C., Detroit, MI and the New York City area.

### Hydrogen Power Parks

- In FY 2008, continued development of the Hawaii Hydrogen Power Park including: 1) securing commitment for funding from the State of Hawaii, 2) approval of funding from the Federal Transportation Administration through the National Park Service for the supply of two hydrogen plug-in hybrid electric (PHEV) shuttle buses, and 3) securing the support of the Department of Defense to install the fueling station at the Kilauea Military Camp. In addition, continued to work with Puna Geothermal Venture and Hawaiian Electric Company for delivery of geothermal power.
- In FY 2008, Air Products And Chemicals, Inc (APCI) and FuelCell Energy completed the detailed design for the Hydrogen Energy Station, comprising the molten carbonate fuel cell, anode exhaust gas skid, and hydrogen purification system.

### Budget

The funding portfolio for Technology Validation addresses the need to validate integrated hydrogen and fuel cell technologies for transportation, infrastructure, and electric generation in a systems context under real-world operating conditions. The FY 2009 funding profile (subject to Congressional appropriation) has been requested under the Vehicle Technologies Office in the Hybrid Electric Systems Activity. Moving this activity from the Hydrogen Program places all vehicle-related demonstration activities together.



### FY 2009 Plans

In FY 2009, Technology Validation will continue to add generation 2 vehicles and refueling stations to the project. Refueling stations will include the capability to fuel vehicles at 10,000 psi. The Learning Demonstration will continue to operate generation 1 and 2 vehicles and hydrogen fueling stations to update the composite data products with the most recent data. The data will be collected to support the overall target of 2,000-hour fuel cell durability in 2011 and hydrogen cost of \$3.00/gge in 2009.

In FY 2009, a hydrogen refueling station will be supplied, installed and operated on the Big Island of Hawaii at Hawaii Volcanoes National Park. PHEV shuttle buses refueling at the station will be transporting visitors through Volcanoes National Park. In addition, there will be two fuel cell(s) installed at the park's visitors' center which will be used to generate electricity.

FY 2009 APCI will fabricate components for the energy station, and test the components at FuelCell Energy's facilities in Danbury, CT in early FY 2009. The output from this project will be used in the California Air Resources Board award to APCI for a hydrogen station in Fountain Valley located at the Orange County Sanitation District Facility. APCI will be installing a new 350/700 bar station that will dispense 100% renewable hydrogen produced from digester gas from waste water utilizing a molten carbonate fuel cell. The station, collocated with compressed natural gas dispensing, will provide up to 100 kilograms hydrogen per day dispensing seven days a week. The South Coast Air Quality Management District will also participate in the California Air Resources Board award to APCI.



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