



U.S. DEPARTMENT OF
ENERGY

Technology Validation

John Garbak

**2007 DOE Hydrogen Program
Merit Review and Peer Evaluation Meeting**

May 17, 2007



Outline

- Goal and Objectives
- Budget
- Challenges
- Progress
 - Accomplishments/Status
- Future Plans
- Technology Validation Overview



Goals and Objectives

Technology Validation: Validate complete systems of integrated hydrogen and fuel cell technologies for transportation, infrastructure and electricity generation applications under real-world operating conditions

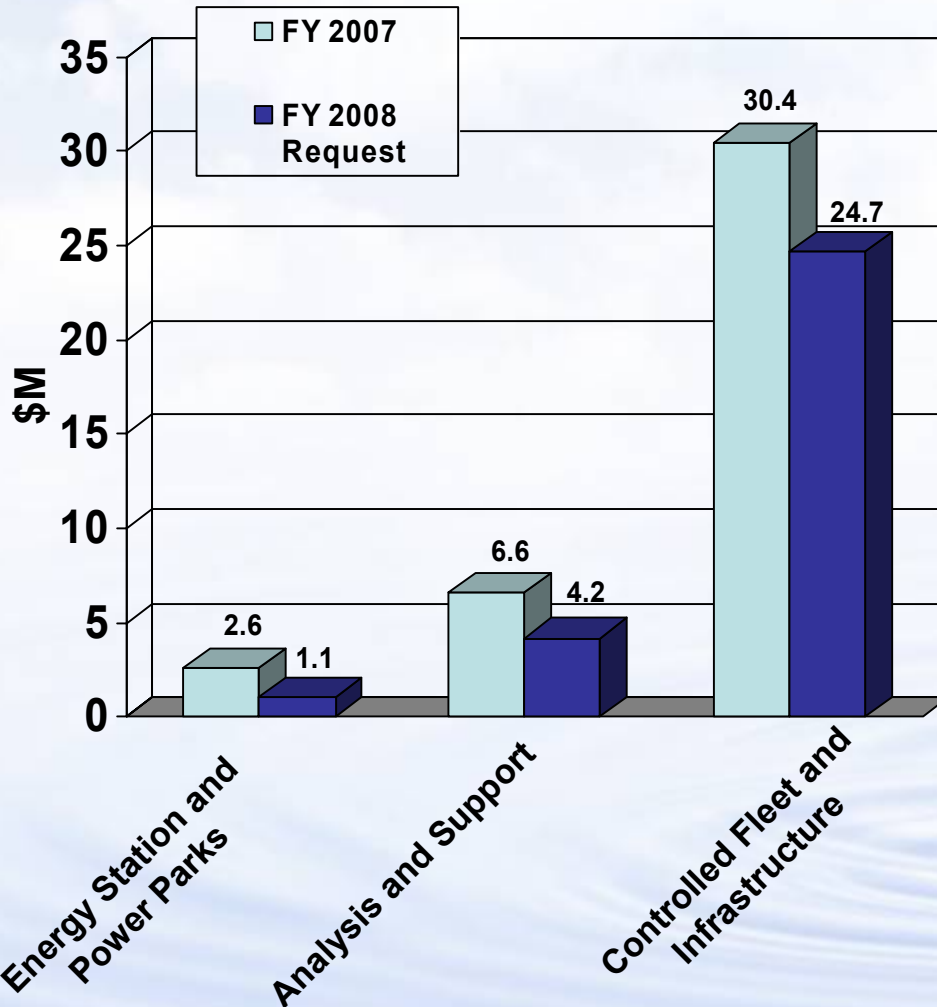
- Validate H₂ FC Vehicles and Infrastructure in Parallel
- Identify Current Status of the Technology
 - Assess Progress Toward Technology Readiness
 - Provide Feedback to H₂ Research and Development



Technology Validation

FY 2008 Budget Request = \$30.0M

FY 2007 Appropriation = \$39.6M



FY 2008 Emphasis:

- All Gen 2 vehicles and fueling stations in operation using advanced technology hardware to meet program objectives.
- Continue analysis to verify 2,000 hour fuel cell durability target by 2009
- Install equipment and collect data to meet \$3.00/gge by 2009
- Collect vehicle operational and maintenance data and conduct dynamometer testing to evaluate fuel cell performance and range

FY 2008 Budget Plan:

| | |
|-----------------------|----------------|
| Demo – Infrastructure | \$10.2M |
| Demo - Vehicle | \$14.5M |
| Other Industry/Lab | \$ 5.3M |
| Total | \$30.0M |



Challenges

- Lack of fuel cell vehicle performance and durability data
- Lack of refueling infrastructure performance and availability data
- Need to assess fuel cell start-up and operation in 3 different climatic conditions
- Determine fuel cell vehicle and infrastructure interface issues that need to be addressed



Generation 2 Vehicles Being Delivered in 2007





Progress

DOE Vehicle/Infrastructure Demonstration:

- **Four teams in 50/50 cost-shared projects:**
 - General Motors/Shell
 - Ford/BP; Ballard
 - Hyundai/Chevron; UTC Power
 - DaimlerChrysler/BP; Ballard

Current Status/Data

| | |
|----------------------|-----------------------------------|
| Fuel Cell Vehicles | 77 |
| Hydrogen Stations | 12 |
| Fuel Cell Efficiency | 53 - 58% |
| Range | 103 -190 miles |
| Durability | 1200 hrs (max) (~36,000 miles) |

DOT is demonstrating fuel cell buses and providing data to DOE for analysis.

- Eight buses in California, Massachusetts, New York, South Carolina, and Washington, DC





Future Plans

- Continue testing and operating generation 1 and generation 2 fuel cell vehicles
- Verify
 - 2,000 hour fuel cell durability
 - 250 mile range
 - \$3.00/gasoline gallon equivalent
- Build and operate a biomass energy station
- Build and operate a power park in Hawaii



Technology Validation Overview

- Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project
 - ✓ Klaus Bonhoff, DaimlerChrysler
 - ✓ Greg Frenette, Ford
 - ✓ Dan Casey, Chevron
 - ✓ Roz Sell, GM
- Controlled Hydrogen Fleet and Infrastructure Analysis, Keith Wipke, NREL
- Validation of an Integrated Hydrogen Energy Station- Dan Tyndall, APCI
- California Hydrogen Infrastructure Project – Ed Heydorn, APCI
- Cryogenic Capable Pressure Vessels for Vehicular Hydrogen - Salvador Aceves, LLNL
- Fuel Cell Bus Evaluations – Leslie Eudy, NREL



Technology Validation Overview

Poster Session

May 17 6- 8 PM

- Geographically Based Hydrogen Infrastructure Scenario Analysis – Margo Melendez, NREL
- Quantifying Consumer Sensitivity to Hydrogen Refueling Station Coverage – Corey Welch, NREL
- Policy Options for Hydrogen Vehicles and Infrastructure – Stefan Unnasch, TIAX
- Power Parks System Simulation - Andy Lutz, SNL
- Hydrogen Filling Station - Rick Hurt and Yitung Chen, UNLV
- Florida Hydrogen Initiative – Ed Levine, Florida Hydrogen Initiative
- Hawaii Hydrogen Center – Richard Rocheleau, Hawaii Natural Energy Institute



For More Information

Technology Validation Team

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The screenshot displays the homepage of the U.S. Department of Energy's Hydrogen Program website. The header includes the department name and the URL hydrogen.energy.gov. A navigation menu lists: Home, About, DOE Participants, International, Library, and News/Events. A search bar is located in the top right. The main content area features several sections:

- INCREASE YOUR H₂IQ**: An announcement titled "Peer Evaluation Report Focuses on Merit of DOE Hydrogen and Fuel Cell Projects".
- News**: "Independent Review Panels Assess Progress Towards Technical Targets" (October 5, 2006) and "DOE Announces Hydrogen Funding Opportunity for Small Businesses" (September 27, 2006).
- DOE Loan Guarantee Program Promotes Innovative Technologies**: A notice from August 23, 2006.

A sidebar on the left lists various topics: Hydrogen Production, Hydrogen Delivery, Hydrogen Storage, Hydrogen Manufacturing, Conversion/Fuel Cells, Applications/Technology Validation, Safety, Codes & Standards, Education, Basic Research, Systems Analysis, and Systems Integration. The right sidebar includes a "Features" section with "President's Hydrogen Fuel Initiative" and "ADVANCED ENERGY INITIATIVE".

www.hydrogen.energy.gov