Technology Validation

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2009 DOE Hydrogen Program & Vehicle Technologies Program

Merit Review and Peer Evaluation Meeting

May 20, 2009
Objectives:

- Validate hydrogen and fuel cell technologies under real world conditions
- Identify current status of the technology
  - Assess progress toward technology readiness
  - Provide feedback to H₂ Research and Development

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

Key Targets

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>2009</th>
<th>2015</th>
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<tbody>
<tr>
<td>Fuel Cell Stack Durability</td>
<td>2000 hours</td>
<td>5000 hours</td>
</tr>
<tr>
<td>Vehicle Range</td>
<td>250⁺ miles</td>
<td>300⁺ miles</td>
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<tr>
<td>Hydrogen Cost at Station</td>
<td>$3/gge</td>
<td>$2-3/gge</td>
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FY 2009 Appropriation = $14.8M
FY 2008 Appropriation = $ 29.6M

**EMPHASIS**

- All Gen 2 vehicles and fueling stations in operation using advanced technology hardware to meet program objectives.
- Verify 2,000 hour fuel cell durability target by 2010.
- Collect vehicle operational and maintenance data and conduct dynamometer testing to evaluate fuel cell performance and range.
Challenges

The lack of data on vehicles and infrastructure has been addressed in Phase 1 of the Learning Demonstration.

- 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
  - ability to start fuel cells in cold climates
- Evaluation of filling vehicles at 700 bar
- Need to address fuel cell vehicle and infrastructure interface issues
2009 Progress & Accomplishments

Fuel Cell Vehicles and hydrogen infrastructure continue to operate without major problems

- 140 fuel cell vehicles and 20 hydrogen fueling stations in operation
- All Gen 2 vehicles in operation now
- Fuel cell durability
  - 1,977 hours projected (nearly 60K miles)
- Over 1.9 million miles traveled
- Over 85K total vehicle hours driven
- Fuel cell efficiency 53-58%
- Over 88,000 kg of hydrogen produced or dispensed
- 6 hydrogen stations at 700 bar
FUTURE PLANS

- Continue testing and operation of generation 1 and 2 fuel cell vehicles
- Verify
  - 2,000 hour fuel cell durability
  - $3.00/gasoline gallon equivalent
- Complete the construction of refueling station for buses at Volcanoes National Park in Hawaii
- Continue data collection of fuel cell buses, stationary fuel cell and fork lifts
Session Schedule

- Analysis of the data from the Learning Demonstration Project – NREL
- Learning Demonstration Projects
  - Chevron and Hyundai-Kia
  - Ford and BP
  - Chrysler, Daimler and BP
  - GM and Shell
- Hydrogen Energy Station – APCI
- California Hydrogen Infrastructure Project – APCI
- Fuel Cell Bus Evaluations
- Hawaii Hydrogen Center – Hawaii Natural Energy Institute
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