



**U.S. DEPARTMENT OF
ENERGY**

**Hydrogen Program Cross-Cutting Activities:
Safety, Codes and Standards; Education;
Manufacturing R&D;
and Market Transformation**

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**2007 DOE Hydrogen Program
Merit Review and Peer Evaluation Meeting
May 15, 2007**



Outline

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



Safety, Codes and Standards



Safety, Codes and Standards Goals and Objectives

Safety: Develop and implement the practices and procedures that will ensure safety in the operation, handling, and use of hydrogen and hydrogen systems for all DOE-funded projects and utilize these practices and lessons learned to promote the safe use of hydrogen.

Codes & Standards: Perform the underlying research to enable codes and standards to be developed for the safe use of hydrogen in all applications. Facilitate the development and harmonization of domestic and international codes and standards.



Safety, Codes and Standards Challenges



- Limited historical data / insufficient technical data to develop and revise standards
- Large number of Authorities Having Jurisdiction
- Lack of uniform training of officials
- Lack of standard practices for safety assessments
- Lack of integrated, coordinated approach among C&S Organizations
- Lack of harmonization of domestic and international standards
- Limited government influence on C&S process
- Limited DOE role in international C&S development process



Safety, Codes and Standards Progress

- *Technical Reference for Hydrogen Compatibility of Materials* (v.1.0) – complete
- Compendium of Permitting Tools
 - Hydrogen Fuel Station Permitting Workshop conducted
 - Case Studies workshop to be conducted July, 2007
- Hydrogen Safety Panel
 - Conducted 22 safety reviews of production, storage, fuel cells and technology validation projects
 - Reviewed 60+ safety plans
- Hydrogen Incidents Database includes over 100 documented incidents (www.h2incidents.org)



Safety, Codes and Standards

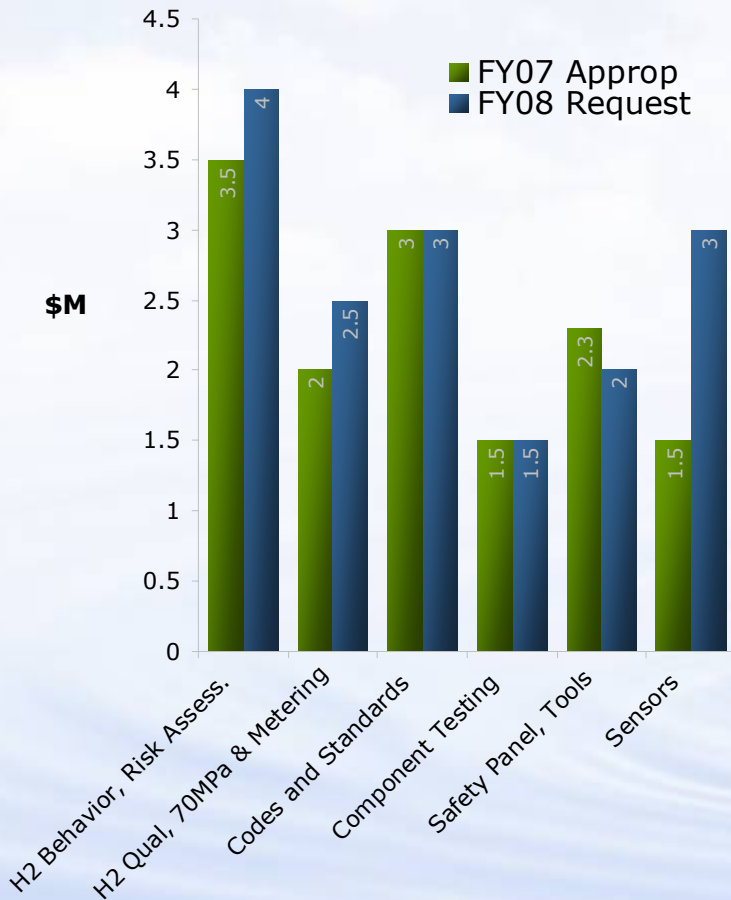
Future Plans

- Assess and improve the current state-of-the art for hydrogen safety sensors
- Publish a best practices manual for hydrogen safety
- Finalize hydrogen quality specification
- Expand efforts on hydrogen behavior, high-pressure refueling, and materials compatibility
- Grow the hydrogen safety and incidents databases
- Promote code development and permitting tools for commercial refueling stations
- Expand codes and standards activities for stationary and portable hydrogen and fuel cell systems



Safety, Codes and Standards Budget

FY 2008 Budget Request = \$16.0 M
 FY 2007 Appropriation = \$13.8 M



Emphasis

- Technically validated performance data needed for new codes and standards
- Permitting tools for siting of commercial refueling stations
- Hydrogen quality
- High-pressure refueling
- Conduct risk assessment and establish protocols to identify and mitigate risks
- Establish consensus R&D for global harmonization of hydrogen quality standards

FY2008 Budget Plan:

H2 Behavior/Risk Assessment	\$ 4.0M
H2 Quality/70 MPa	\$ 2.5M
Codes and Standards	\$ 3.0M
Component Testing	\$ 1.5M
Safety Panel/Tools	\$ 2.0M
Sensors	\$ 3.0M
Total	\$16.0M



Education



Education

Goal and Objectives

Goal: Educate key audiences about hydrogen and fuel cell technologies to facilitate near-term demonstration, commercialization, and long-term market acceptance.

- By 2009: Increase knowledge of hydrogen and fuel cell technologies among key target populations (compared to a 2004 baseline)
 - Among state and local governments and students (ages 12-17) by 10%
 - Among the public and potential end-users by 15%
- By 2012, increase knowledge of hydrogen and fuel cell technologies among key target populations (compared to a 2004 baseline)
 - Among state and local governments and students (ages 12-17) by 20%
 - Among the public and potential end-users by 30%



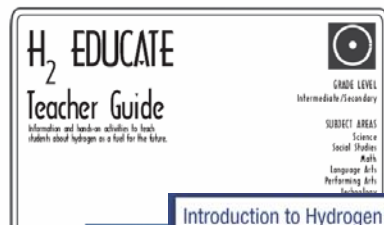
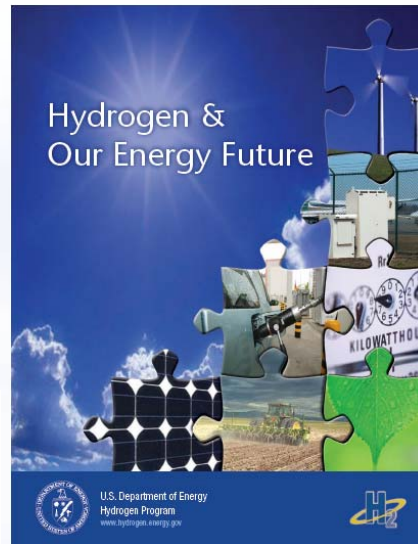
Education Challenges



- Resistance to change
 - Low awareness
 - Few examples of real-world use
 - “What’s in it for me?” factor
- Lack of readily-available, objective, technically-accurate – and “easily digestible” information
- Mixed messages
- Disconnect between hydrogen/fuel cell information and traditional dissemination networks
- Lack of educated trainers and training opportunities
- Regional differences
- Difficulty measuring success



Education Progress



2006 Accomplishments:

- Launched Introduction to Hydrogen Safety for First Responders education program
- Launched public education program H2IQ
 - Radio spots
 - Podcasts
 - Hydrogen book
- Restarted MS-HS projects unfunded since 2004
- State and regional initiatives: bimonthly informational conference calls and in-person networking meetings

NEED
2006-2009
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NEED
2006-2009
Pulling Energy into Education



Education

Future Plans

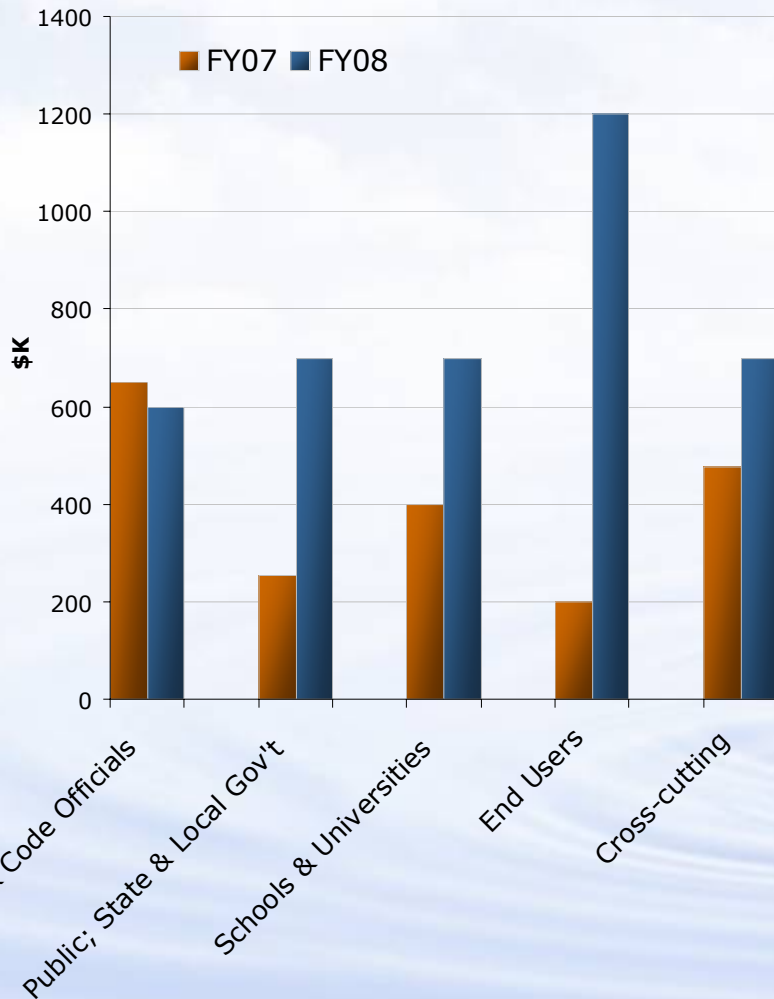
- Ramp up outreach for Introduction to Hydrogen Safety for First Responders and develop “prop course” for hands-on training
- Develop Introduction to Hydrogen for Code Officials
- Ramp up public outreach through H2IQ program and partnership with NHA’s “H2 and You” campaign
- Continue bimonthly state and regional conference calls
- Participate as partner in NHA’s H2U student design contest
- Support MS-HS hands-on activity development and teacher training
- New solicitations planned for FY08:
 - Early market deployments and coordinated outreach
 - State and local government outreach
 - Universities





Education Budget

FY2008 Budget Request = \$3.900K
FY2007 Budget Request = \$1.978K



Emphasis

Focus on near-term high-priority target audiences:

- First responders and code officials
- Local communities where hydrogen demonstration projects are planned
- State and local government officials
- End-users/early adopters

FY08 Budget Plan

Expand safety/code education	\$600K
Ramp up community outreach	\$300K
Ramp up state and local government outreach	\$400K
Initiate new end user outreach and early market deployment with state partners	\$1200K
Initiate new university program; continue support of middle/high school projects	\$700K
Cross-cutting and planning activities	\$700K
TOTAL	\$3,900K



Manufacturing R&D



Manufacturing R&D Goal and Challenges

Goal: Research, develop, and demonstrate technologies and processes that reduce the manufacturing cost of hydrogen production, delivery, storage, and polymer electrolyte membrane (PEM) fuel cell systems.

Challenges:

- Developing innovative, low-cost manufacturing technologies for new materials and material applications
 - Adapting and scaling up laboratory fabrication methods to low-cost, high-volume production
 - Establishing and refining cost-effective manufacturing techniques while hydrogen products are still evolving
- Developing and evaluating manufacturing processes to minimize total life cycle energy requirements and environmental effects
- Developing a domestic supplier network

Manufacturing R&D Budget

FY2007: \$1,978K

FY2008: \$5,000K



Manufacturing R&D

Progress

- Workshop on Manufacturing R&D for the Hydrogen Economy, July 13-14, 2005
 - R&D priorities identified
- Roadmap on Manufacturing R&D for the Hydrogen Economy
 - Based on workshop results, feedback from industry

Future Plans

- Pre-solicitation meeting Friday, May 18, 2007, 1-3:30 PM
- Solicitation planned - Summer 2007



Market Transformation



Market Transformation

Goal: To facilitate commercialization of hydrogen and fuel cell technologies by supporting early adoption, and by building partnerships with Federal, State, and local governments and industry.

Challenges:

- Resistance to new technologies
- Lack of information on life-cycle costs
- Lack of user confidence related to reliability
- High capital cost



Market Transformation

Progress

- Meeting: Matching Federal Government Energy Needs with Energy Efficient Fuel Cells, April 26, 2007
 - Brought Federal agency representatives and fuel cell companies together
- Request for Information (RFI) on Hydrogen and Fuel Cell Early Markets, April 26, 2007
 - Seeks public input in three areas by June 30, 2007:
 - Early market financial assistance
 - Fuel cell performance testing
 - Community partnerships, including utility applications

Future Plans

- GovEnergy 2007 Conference, August 5-8, 2007, New Orleans
 - “New Technology” track focusing on fuel cells and early market opportunities for Federal facility and energy managers
 - Exhibit in conjunction with the USFCC, bringing together Federal managers with fuel cell industry representatives
- Funding Opportunity Announcement (FOA) in first quarter of FY2008
 - Will provide financial assistance for activities that:
 - Cultivate demand for new hydrogen and fuel cell technologies
 - Accelerate market development
 - Reduce non R&D barriers that hinder market penetration



For More Information

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The screenshot shows the homepage of the Hydrogen Program website. The header includes the U.S. Department of Energy logo and the text "hydrogen.energy.gov". A navigation menu contains links for Home, About, DOE Participants, International, Library, and News/Events. A search bar is located in the top right. The main content area features a sidebar with a list of 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 main content area has a blue background and includes a "H₂IQ" section with the text "INCREASE YOUR H₂IQ". Below this is an "Announcement" section titled "Peer Evaluation Report Focuses on Merit of DOE Hydrogen and Fuel Cell Projects". A "News" section follows with the headline "Independent Review Panels Assess Progress Towards Technical Targets" and a sub-headline "Towards Technical Targets". Below that is another news item: "DOE Announces Hydrogen Funding Opportunity for Small Businesses". The bottom news item is "DOE Loan Guarantee Program Promotes Innovative Technologies". On the right side, there is a "DOE Hydrogen Program" logo, a "Features" section with a "President's Hydrogen Fuel Initiative" link and photo, an "ADVANCED ENERGY INITIATIVE" banner, a "Hydrogen.gov" link, a "FreedomCAR Fuel Partnership" logo, and an "Information on" section with a link to "Financial Opportunities".

www.hydrogen.energy.gov