

## IX.0 Education Sub-Program Overview

### Introduction

The Education sub-program seeks to support and facilitate hydrogen and fuel cell demonstration, deployment, and market transformation by providing technically-accurate and objective information to key target audiences that are directly and indirectly involved in the use of hydrogen today (see Table 1).

**TABLE 1.** Key Target Audiences for the Education Sub-Program

Target Audience	Rationale
First Responders	Fire fighters, as well as law enforcement and emergency medical personnel, must know how to handle potential incidents; their understanding can also facilitate local project approval.
Code Officials	Code officials must be familiar with hydrogen to facilitate the permitting process and local project approval.
Local Communities/ General Public	Local communities will be more likely to welcome hydrogen and fuel cell projects if they are familiar with hydrogen.
State and Local Government Representatives	A broad understanding of hydrogen supports decision-making on current opportunities for near-term deployment and lays the foundation for long-term change.
Potential End-Users	Potential early adopters need information about commercially available hydrogen and fuel cell products and the opportunities for incorporating the technology into their operation.
University Faculty and Students	Graduates are needed for research in government, industry, and academia.
Other Teachers and Students	Interest is high; teachers are looking for technically accurate information and usable classroom activities.

The Education sub-program includes the development and dissemination of information resources as well as training. It considers a balanced message to help target audiences become familiar with hydrogen and how it fits in the portfolio of energy choices, develop an accurate understanding of hydrogen safety, recognize opportunities for deployment in near-term markets, and understand their part in facilitating use of hydrogen and fuel cell technologies.

### Goal

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

### Objectives

In 2004, the Education sub-program conducted a national hydrogen knowledge survey to serve as a baseline for measuring changes in knowledge and opinion over time. A follow-on survey is ongoing; DOE plans to publish the results in Fiscal Year 2009. The baseline results provide important information about current knowledge gaps, information needs, and opinions of hydrogen technologies that help to inform the ongoing development of the Education sub-program.

Education objectives are based on the baseline hydrogen knowledge survey. The baseline for each target population is defined as that population's average score on the survey's technical knowledge questions. Objectives are:

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

## FY 2008 Status

The most recent revision of the Education chapter of the Multi-Year Research, Development and Demonstration Plan prioritizes the target audiences and emphasizes those that are directly and indirectly involved in the use of hydrogen and fuel cells today. These groups include safety and code officials, state and local governments, local communities and the public, and potential end-users. Undergraduate and graduate students, professors, and middle and high school teachers and scientists comprise another important audience as future researchers, scientists, engineers, and technology users.

As part of a major effort to ensure the safe use of hydrogen as an energy carrier, the sub-program has been working in collaboration with the Safety, Codes, and Standards sub-program to provide objective and technically accurate information to the safety community. In FY 2008, the sub-program launched an upgrade of the “Introduction to Hydrogen Safety for First Responders” course. This seven-module, Web-based course provides an overview of hydrogen to fire, law enforcement, and emergency medical personnel. Since its launch in January 2007, more than 7,000 users have accessed the course. A beta version of an advanced-level “Hydrogen for First Responders” training course was also completed in FY 2008. The course builds on the introductory course but provides more detail and includes a hands-on training component that uses a mock fuel cell vehicle prop and training scenarios to demonstrate the safe approach to a fuel cell vehicle, extinguishment of a compartment fire, extrication techniques, and hydrogen venting during a compartment fire. The sub-programs also developed a beta version of a companion course designed specifically for code and permitting officials. Like the introductory course for first responders, the “Introduction to Hydrogen Safety for Code Officials” is a five-module, Web-based course that provides a general overview of hydrogen and its properties and applications, but also includes additional information on the technology and equipment tailored to the needs of code and permitting officials.

The Education sub-program continued its efforts to reach out to and partner with state and local governments by hosting the Bi-monthly Informational Conference Call Series for State and Regional Hydrogen and Fuel Cell Initiatives. DOE also participated on the planning committee of the Hydrogen Road Tour with the U.S. Department of Transportation, California Fuel Cell Partnership, National Hydrogen Association, and nine auto companies. This two-week cross-country tour of a fleet of clean and efficient hydrogen vehicles provided an opportunity to reach out to the general public and collaborate with state and regional groups to raise awareness of hydrogen and fuel cell technologies.

In FY 2008, the Education sub-program continued to augment its “Increase Your H2IQ” public outreach program with additional resources for the information toolkit. Launched in FY 2006, “Increase Your H2IQ” uses various forms of media to raise public awareness of hydrogen and fuel cells, spark interest, and direct people to more information available on the DOE Hydrogen Program Web site. Projects include the continued roll out of two 30-second radio spots in five cities, a collaboration with the Orlando Magic, the launch of a MySpace page targeting teens and young adults, and the development of early market fuel cell case studies in support of the overall DOE Hydrogen Program’s market transformation efforts.

The “H2 Educate!,” a set of lesson plans and activities for middle school teachers and students continued to be disseminated through one-day teacher training workshops across the country. The companion effort for high schools, “HyTEC,” completed an iterative prototype testing and revision of a six-unit curriculum in California schools. Education sub-program funds also supported an update of the university program and textbook databases, as well as sponsorship of the Hydrogen Education Foundation’s design contest for university students, and U.S. student participation in the International

Hydrogen and Fuel Cells Education Forum (held in conjunction with the World Hydrogen Energy Conference).

The sub-program also awarded 13 new competitively-selected projects in FY 2008 for \$4.4 million over 3 years, totaling \$5.2 million with cost-sharing. These new projects will develop programs to educate and reach out to state and local government officials, with a focus on market transformation; early market demonstration and end-user outreach; and new and expanded university programs to educate undergraduate students about hydrogen and fuel cell technology.

### **FY 2008 Accomplishments**

- Upgraded and launched a new version of the “Introduction to Hydrogen Safety for First Responders” Web-based course, in coordination with the Safety, Codes and Standards sub-program. Based on user feedback and to support new market transformation efforts, updates include the addition of an audio narration, an extended video explaining the basic properties of hydrogen, an expanded codes and standards module, an expanded stationary facilities section, and the addition of early market fuel cell information on specialty vehicles. Since its launch in January 2007, more than 7,000 users have accessed the course; user groups include the fire prevention/protection community, law enforcement, industry, universities, military, non-profits, and national and international users. Outreach efforts continued with the dissemination of a poster summarizing essential hydrogen safety information and course CDs in addition to demonstrations of the small hydrogen flame prop at emergency responder conferences.
- Completed a beta version of “Hydrogen Safety for First Responders” in coordination with the Safety, Codes and Standards sub-program with input from a steering committee comprising representatives from auto companies, energy companies, and the fire safety community. This course includes use of a hands-on training device (a mock fuel cell vehicle). Building on the “Introduction to Hydrogen Safety for First Responders,” the advanced-level hands-on course includes training scenarios to demonstrate safe approach to a fuel cell vehicle, extinguishment of a compartment fire, extrication techniques, and hydrogen venting during a compartment fire. The hands-on training prop includes typical fuel cell vehicle components and is designed to realistically and safely simulate an actual fuel cell vehicle emergency response event.
- Completed a beta version of “Introduction to Hydrogen Safety for Code Officials.” This Web-based tutorial builds on modules in the introductory first responders’ course and includes additional information on technology and equipment tailored to the needs of code and permitting officials. Modules focused on fueling stations and stationary facilities present technical information essential to permitting hydrogen and fuel cell installations.
- Continued state and local government outreach with the Bi-monthly Informational Conference Call Series for State and Regional Hydrogen and Fuel Cell Initiatives. Featured topics included fuel cells for data centers, fuel cell tax incentives and perspectives on innovative financing, and HyDRA, a Web-based geographic information system tool to view, download, and analyze hydrogen demand, resource, and infrastructure data. In addition, to the bi-monthly calls, an in-person meeting at the National Hydrogen Conference allowed participants and experts to meet in small groups to network and discuss topics relevant to state and local hydrogen and fuel cell initiatives. As market transformation activities continue and state outreach activities ramp up, this group will provide a valuable mechanism for future collaboration between DOE and regional, state, and local entities.
- In collaboration with nine auto manufacturers, the U.S. Department of Transportation, California Fuel Cell Partnership, National Hydrogen Association, and many state and regional hydrogen and fuel cell initiatives, the U.S. Department of Energy participated in the Hydrogen Road Tour, a two-week cross-country tour of a fleet of clean and efficient hydrogen vehicles. The tour provided an opportunity to show the public the progress made toward hydrogen vehicle technology readiness.
- “Increase Your H2IQ” projects completed in FY 2008 include:
  - Radio Spots: In FY 2007, the Education sub-program produced two 30-second radio spots intended to spark interest and direct the general public to the H2IQ informational toolbox on the DOE Hydrogen Program Web site. In FY 2008, the initial deployment in the Orlando,

Florida area in conjunction with a hydrogen fueling station opening led to a collaboration with the Orlando Magic basketball team and the Florida Department of Environmental Protection. The radio spots were aired during games and the coach's radio show on the Magic Radio Network in conjunction with distribution of a print-promotion for the Office of Energy Efficiency and Renewable Energy in the Game Day playbill. A corresponding increase in visits to the [hydrogen.energy.gov](http://hydrogen.energy.gov) Web site during the radio spot roll-out signified the success of the radio spot. Additional roll-outs continued in parallel with Hydrogen Road Tour stops in Hartford, CT, Washington, D.C., Columbia, SC and Las Vegas, NV to facilitate public acceptance by raising community awareness on the use of hydrogen as an energy carrier.

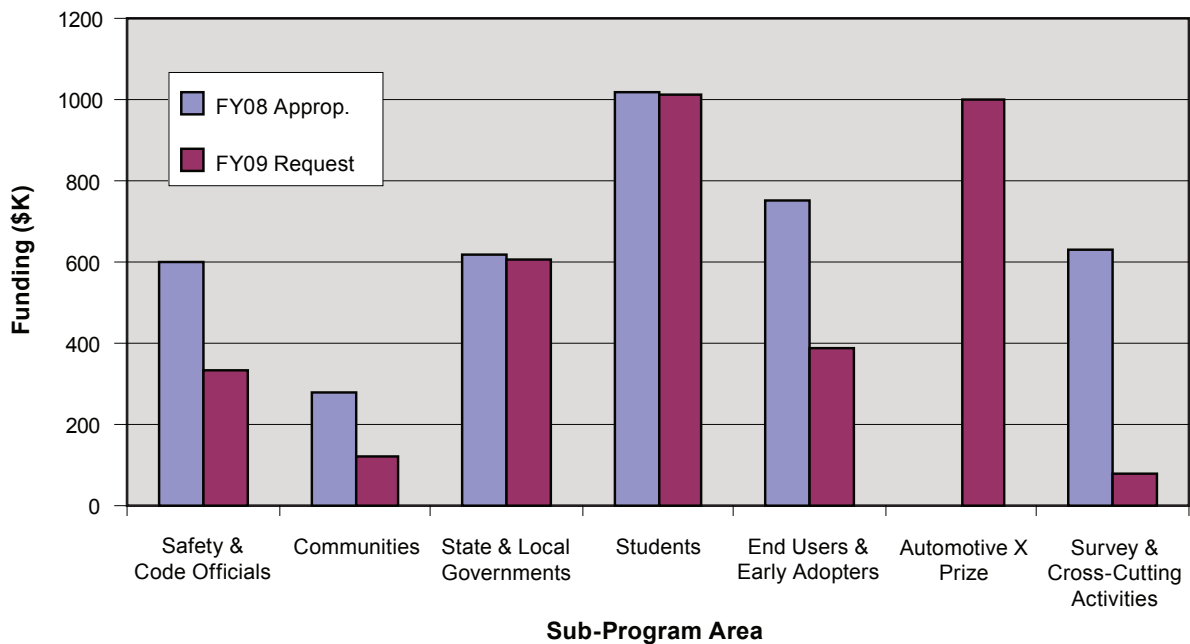
- MySpace Page: The "Increase your H2IQ" MySpace page targets teens and young adults through increasingly ubiquitous social networking media. The page presents dynamic educational information through embedded video, animation, and audio files intended to spark interest and excitement with resources and links directed to a younger audience. The page offers an alternative method of connecting with the student and university population through an audience-specific medium.
- Case Studies: As part of the Program's market transformation activities, the Education sub-program drafted five new case studies on early market fuel cells, describing current deployments and documenting user experiences. These case studies will provide a practical, step-by-step look at a fuel cell deployment and communicate lessons learned for future installations.
- Sponsored "H2 and You," an outreach campaign run by the Hydrogen Education Foundation focused on elevating knowledge among targeted stakeholders. The project seeks to dispel negative impressions and facilitate a broad understanding of the benefits of hydrogen with a simple easy to understand message. Tactics include increasing discussion in national and local media and online engagement through blogs and forums. Since the start of the program in 2007, there has been a 60-70% increase in online conversations in parallel with increased media attention on hydrogen.
- Sponsored the Hydrogen Education Foundation's student design contest. The 2007-2008 contest challenged teams of university students from around the world to develop and design hydrogen applications for real-world use at airports.
- Sponsored the International Hydrogen and Fuel Cells Education Forum held in conjunction with the 2008 World Hydrogen Energy Conference. International high school student teams participated in hands-on workshops and presented their fuel cell projects to an international audience.
- Continued to disseminate the middle school teacher and student "H2 Educate!" curriculum through one-day teacher training workshops across the country. Since its inception, the project has reached 6,000 middle school teachers through 40 full day workshops and 30 conference sessions. Teacher and student guides are available via the DOE Hydrogen Program Web site ([www.hydrogen.energy.gov](http://www.hydrogen.energy.gov)) and [www.need.org](http://www.need.org).
- The Hydrogen Technology and Energy Curriculum Project (HyTEC) for high schools completed an iterative prototype testing and revision of a six-unit curriculum in California chemistry and environmental science classes in preparation for national field testing and publication.
- Updated the Hydrogen and Fuel Cell Textbook Catalog and the University Research and Education Program database (available via [www.hydrogen.energy.gov](http://www.hydrogen.energy.gov)).
- Continued audience-targeted Hydrogen Program exhibit outreach to early end-user conferences (e.g. GovEnergy, Onsite Power 2007) and safety community conferences (e.g. Firehouse Expo, Fire Rescue International) in addition to hydrogen and fuel cell conferences. The exhibit schedule was expanded to include more general alternative energy conferences in an effort to incorporate hydrogen and fuel cells into the increasing public discussion of energy.
- Initiated the 2008/2009 Hydrogen Knowledge and Opinions survey. Surveys of the general public, students, state and local officials, and potential end users have been conducted in preparation for analysis and reporting of survey findings in FY 2009. This effort follows the baseline survey conducted in 2004 and will also include a separate survey of code officials – an audience that had

been previously incorporated into the state and local officials survey population but have been prioritized as a key target audience essential to the early adoption of fuel cells.

- Thirteen new hydrogen education projects were competitively selected in FY 2008 for \$4.4 million over 3 years totaling \$5.2 million with cost-sharing. Topics include state and local government outreach, early market deployment and coordinated outreach, and university programs.

## Budget

The FY 2008 Education sub-program budget was \$3.9 million, a significant increase from previous year and the highest it has been since FY 2004. In FY 2009, the Education sub-program will move to the Vehicle Technologies Program to build on synergy with related efforts for other alternative fuels and advanced transportation technologies. As part of this effort, funds in FY 2009 will support the Automotive X Prize, an international competition that challenges competitors to design, build, and bring to market a car that exceeds 100 miles per gallon, or its energy equivalent fuel efficiency, while meeting market requirements for size, capability, affordability, and safety.



## FY 2009 Plans

In FY 2009, the Education sub-program plans to complete final versions of advanced-level first responders course, “Hydrogen Safety for First Responders.” Deployment of this hands-on “prop course” will be fixed at the Hazardous Materials Management and Emergency Response facility in preparation for mobile on-site training at safety training centers across the nation in FY 2010. FY 2009 activities also include the completion of the “Introduction to Hydrogen for Code Officials.” Outreach for the introductory code officials course, as well as “Introduction to Hydrogen for First Responders,” will include exhibits at relevant conferences, promotion in related publications, and Web meetings and in-person workshops.

The “Increase your H2IQ” program will continue to expand its toolbox with additional case studies, podcasts, and videos. In addition, the radio spots will continue to be deployed in communities with current hydrogen and fuel cell demonstration and deployment activities.

A report on the analysis and findings of the 2009 Hydrogen Knowledge and Opinions survey will be published in FY 2009. The results will be used to measure changes in knowledge and awareness of hydrogen technologies over time and provide guidance to the sub-program on future activities.

The 13 new hydrogen education projects selected in late FY 2008 will begin work in earnest in FY 2009. Projects include seven projects to educate state and local government officials – focusing specifically in five states (CT, OH, SC, TX, VA), in addition to two broader efforts that are national in scope; one project to demonstrate fuel cell forklifts and conduct outreach to potential technology adopters, and five projects that will build and expand programs to educate undergraduate students.



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