
X.0 Education Sub-Program Overview

Introduction

The Education sub-program seeks to support and facilitate hydrogen and fuel cell demonstration, deployment, and early market introduction by providing technically accurate and objective information to key target audiences that can help transform the market (see Table 1).

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

Target Audience	Rationale
Code Officials	Code officials must be familiar with hydrogen to facilitate the permitting process and local project approval.
First Responders	Firefighters, as well as law enforcement and emergency medical personnel, must know how to handle potential incidents; their understanding can also facilitate 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.
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 operations.
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.
Teachers and Students	Teachers are looking for technically accurate information and usable classroom activities.
University Faculty and Students	Graduates are needed for research in government, industry, and academia.

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 fuel cell technologies and how they fit in the portfolio of energy and efficiency options. To aid with market introduction, the sub-program helps to develop an accurate understanding of hydrogen safety, to recognize opportunities for deployment in near-term markets, and to understand the role of early markets in facilitating use of hydrogen and fuel cell technologies.

Goals

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

Objectives

- By 2011, expand availability of university curricula developed under Fiscal Year (FY) 2008 solicitation projects and expand availability of case studies for near-term market applications.
- By 2012, complete analysis to identify domestic employment and workforce development opportunities for early market hydrogen and fuel cell applications.

FY 2010 Status

The Education sub-program works in collaboration with the Safety, Codes and Standards sub-program to provide objective and technically accurate information to the safety community—including fire, law enforcement, and emergency medical personnel.

In FY 2010, the sub-program conducted several sessions of a hands-on “prop course” for firefighters. This advanced-level, one-day course builds on a 2007 introductory course, “Introduction to Hydrogen Safety for First Responders.” The course has been developed to help first responders gain hands-on experience with personal protective equipment, monitoring and detection equipment, and the

basic control, containment, and confinement operations associated with fuel cell vehicles and stationary applications. It includes a hands-on training component 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 Web-based “Introduction to Hydrogen Safety for First Responders” was registered on the Training Finder Realtime Affiliate Network (TRAIN) Web site, a central repository for health training courses, to reach out to the 30,000 emergency responder members of TRAIN.

The Education sub-program and the Safety, Codes and Standards sub-program expanded the code and permitting official e-learning package with indoor fueling information and developed permitting case studies, in support of increasing early market deployments. Like the introductory course for first responders, “Introduction to Hydrogen Safety for Code Officials” is a five-module, Web-based course that provides a general overview of hydrogen, its properties, and its applications; the course also includes information on the technology and equipment tailored to the needs of code and permitting officials. The case studies were based on actual forklift and backup power deployments supported by the Hydrogen Program, and were developed to assist code officials and project developers in the permitting and safety evaluation of similar installations. Additionally, the in-person code official workshop curriculum was updated to include modules on electric vehicles and infrastructure, to provide a more comprehensive perspective on future transportation technologies.

In FY 2010, an early market outreach education project conducted hydrogen education sessions accompanied by hands-on forklift demonstrations at material handling equipment dealerships, customer sites, community colleges, and regional green-business expos to educate facilities managers, operators, maintenance personnel, safety groups, first responders, authorities having jurisdiction, technical and community colleges, and the general public on the benefits of fuel cell forklifts. In parallel, month-long demonstrations of two hydrogen fuel cell-powered lift trucks at five major retailers in geographically diverse locations provided real-world experience and showcased the economic and environmental benefits of fuel cells. As evidence of the project’s success, one site has decided to acquire over 100 fuel cell forklifts as a result of their experience with the demonstration units.

The Education sub-program continued its efforts to reach out to and partner with state and local governments through seven outreach projects. These efforts focused on states with an active hydrogen and fuel cell presence, to develop case studies, best practices, and technical assistance resources to help decision-makers identify and assess opportunities for future deployment. In their second year, these projects finalized or are finalizing the resource development phase and have moved into the deployment phase. Many groups have been using the results of their research to work directly with state agencies to implement policies, programs, and best practices that can support the growth of hydrogen and fuel cell markets in local economies.

In FY 2010, the Education sub-program’s five university projects targeted a broad student audience through general education courses, specialized science and engineering courses, minor and concentration programs, curricula modules, internships, labs, lab kits, and textbook chapters. Also in their second year, these projects are finalizing development of curriculum and have moved into teaching, reviewing, and refining the course materials. Some projects are leveraging the newly formed core of hydrogen and fuel cell undergraduates by implementing student-taught middle school and high school workshops in addition to outreach targeted toward community college students. The next phase of deployment will involve publicly disseminating these teaching resources to other universities and colleges for adoption into their curricula.

“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,” is deploying a six-unit science curriculum and laboratory kit on hydrogen and fuel cells through professional development workshops and science teacher conferences across the country.

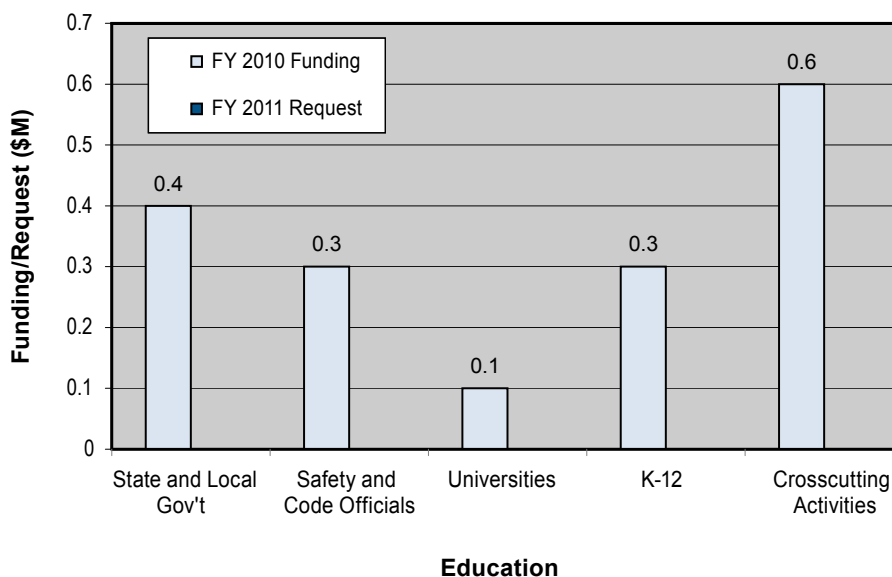
FY 2010 Accomplishments

- Deployed three sessions of the advanced-level prop-based course for first responders, in coordination with the Safety, Codes and Standards sub-program. After three sessions at the Hazardous Materials Management and Emergency Response training facility, DOE has trained 66 first responders from 14 states; an additional three courses are planned in California.
- In coordination with the Safety, Codes and Standards sub-program, increased accessibility of the “Introduction to Hydrogen Safety for First Responders” Web-based course by registering the course on the TRAIN Web site, a central repository for health training courses. Since its launch in January 2007, over 17,000 unique visitors have accessed the course, with an average of 300 to 500 users each month; user groups include the fire prevention/protection community, firefighters, fire department education coordinators, fire marshals, fire plan examiners/inspectors, code officials, law enforcement officials, and representatives from industry, universities, the military, and non-profit organizations.
- Expanded outreach to code officials through four in-person workshops, an updated “Introduction to Hydrogen Safety for Code Officials” Web-based training course, and case studies documenting the permitting process for two early market fuel cell installations in coordination with the Safety, Codes and Standards sub-program. The codes and standards workshops, held in collaboration with local fire department and government organizations, were expanded to include additional modules on electric vehicles and infrastructure in coordination with the DOE Vehicle Technologies Program. The e-learning package was updated with material on indoor hydrogen fueling to support the increasing number of fuel cell material handling equipment deployments. In support of the Fuel Cell Technologies Program, teams were asked to evaluate, assist with, and document the permitting of a backup fuel cell system and a fleet of fuel cell forklifts at two Department of Defense sites. The results were published as case studies to assist code officials and project developers in understanding the codes and standards and safety evaluations for similar early market installations.
- Outreach efforts continued for both first responder courses with the dissemination of hydrogen safety literature and course compact disks, promotion of the prop course, and demonstration of the small hydrogen flame prop at emergency responder conferences including Fire Department Instructor’s Conference and Fire Rescue International.
- Conducted nearly 20 hydrogen education sessions with hands-on forklift demonstrations at material handling dealerships, customer sites, community colleges and regional green business expos to educate facilities management, operators, maintenance personnel, safety groups, first responders, authorities having jurisdiction, technical and community colleges, and the general public on the benefits of fuel cell forklifts. In parallel, month-long demonstrations of two hydrogen fuel cell-powered lift trucks at five high-profile geographically diverse locations provided real-world experience and showcased the economic and environmental benefits of fuel cells.
- Continued state and government outreach projects in states with an active hydrogen and fuel cell presence; these projects involved work with the Clean Energy State Alliance, Technology Transition Corporation, and state organizations in Connecticut, Texas, Ohio, South Carolina, and Virginia. These seven projects have conducted over 80 workshops, seminars, briefings, and Webinars across the country; they have also produced fact sheets, newsletters, best practice guides, Web sites, video segments, print articles, and an installation analysis tool to educate government officials and help decision-makers identify and assess opportunities for future deployments.
- Taught over 25 courses, labs, and curriculum modules at California State University, Los Angeles; Humboldt State University; University of California, Berkeley; Michigan Technological University; the University of Central Florida; and the University of North Dakota for general science and engineering programs and specialized hydrogen and fuel cell concentrations. These universities are developing senior design projects, building labs, and sponsoring teaching assistantships and internships to provide hands-on experience with the technologies. Lab kits, textbook modules, problem set workbooks, and course curricula will be integrated into existing science and engineering teaching materials and shared on the Internet to introduce hydrogen and fuel cell technologies to university students across the country.

- 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 sub-program has reached over 8,000 middle school teachers through workshops and conference sessions in 35 states.
- Eleven high school science teachers in Connecticut, Georgia, New York, South Carolina, and southern California used the Hydrogen Technology and Energy Curriculum (HyTEC) to teach over 860 students about the science and engineering of hydrogen and fuel cells and their role in addressing energy needs. An additional 240 teachers were introduced to these course materials at science teacher conferences across the country.
- Continued audience-targeted Fuel Cell Technologies Program exhibit outreach to early end-user conferences (e.g., U.S. Conference of Mayors, North American Material Handling Logistics Tradeshow, Next Generation Data Center), and hydrogen and fuel cell conferences (e.g., National Hydrogen Association Conference and Expo, Fuel Cell Seminar)
- Published the final results from the 2008/2009 Hydrogen Knowledge and Opinions survey and analysis. This effort follows the baseline survey conducted in 2004 and includes a separate survey of code officials—an audience that had been previously incorporated into the state and local officials survey population but has since been prioritized as a separate key target audience essential to the early adoption of fuel cells.

Budget

In FY 2010 the Education sub-program returned from the Vehicle Technologies Program to be a part of the Fuel Cell Technologies Program, with an appropriation of \$2.0 million. The FY 2009 appropriation allowed for full funding of many of the education portfolio projects. The work of these projects continued in FY 2010 and many of these projects were reviewed in the FY 2010 Annual Merit Review. The FY 2010 appropriation allowed for support of existing projects across the education portfolio, including outreach to state and local government officials, university hydrogen and fuel cell education programs, in addition to ongoing efforts to educate first responders, code officials, and teachers and students at the middle and high school levels.



FY 2011 Plans

In FY 2011, the Education sub-program will continue to focus on facilitating the introduction of hydrogen and fuel cell technologies into early markets. Future efforts will begin to examine workforce development needs and include nearer-term employment needs and projections with the Systems Analysis sub-program.

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