

## VIII.8 Hydrogen Emergency Response Training for First Responders

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### Subcontractors:

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- Hanford Fire Department, Richland, WA
- Hazardous Materials Management and Emergency Response (HAMMER) Training Facility, Richland, WA

Project Start Date: October 2004

Project End Date: Project continuation and direction determined annually in consultations with DOE

- (D) Lack of Hydrogen Knowledge by Authorities Having Jurisdiction
- (E) Lack of Hydrogen Training Materials and Facilities for Emergency Responders

### Contribution to Achievement of DOE Hydrogen Safety Milestones

This project will contribute to achievement of the following DOE milestone from the Safety Codes and Standards section of the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan:

- 5.3 Enhance hydrogen safety training props and deliver classroom curriculum for emergency response training. (4Q, 2012)

### FY 2013 Accomplishments

- **Prop-Based Course:** This operations-level course was presented at two fire training centers in Honolulu and Hilo, Hawaii in the past year. Three consecutive one-day training classes were held at each location. Approximately 300 first responders from the above sites received this training. Extremely positive feedback from each of the sites continues to reinforce the value of this course to first responder organizations.
- **Awareness-Level Course:** After almost seven years, our website continues to receive ~200-300 unique visits per month from almost every state and some foreign countries. The course is registered on the Training finder Realtime Affiliate Network website for broader dissemination to first responders.
- **Outreach:** Compact disks (CDs) of the awareness-level course were distributed through the DOE Energy Efficiency and Renewable Energy Information Center, and upon receipt of individual requests.



### INTRODUCTION

Safety in all aspects of a future hydrogen infrastructure is a top priority, and safety concerns influence all DOE hydrogen and fuel cell projects. Despite the most concerted effort, however, no energy system can be made 100% risk-free. Therefore, for any fuel and energy system, a suitably trained emergency response force is an essential component of a viable infrastructure. The Fuel Cell Technologies Office has identified training of emergency response personnel as a high priority, not only because these personnel need to understand how to respond to a hydrogen incident, but also

### Overall Objective

Support the successful implementation of hydrogen and fuel cell technologies by providing technically accurate hydrogen safety and emergency response information to first responders.

### Fiscal Year (FY) 2013 Objectives

- Provide a one-day first responder training course, “Hydrogen Emergency Response Training for First Responders,” that integrates the use of DOE’s mobile hydrogen fuel cell vehicle (FCV) prop.
- Continue to support the Web-based awareness-level course, “Introduction to Hydrogen Safety for First Responders.” [www.hydrogen.energy.gov/firstresponders](http://www.hydrogen.energy.gov/firstresponders).
- Disseminate first responder hydrogen safety educational materials at appropriate fire fighter conferences to raise awareness.

### Technical Barriers

This project addresses the following technical barriers from the Safety Codes and Standards section of the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan:

- (A) Safety Data and Information: Limited Access and Availability

because firefighters and other emergency responders are influential in their communities and can be a positive force in the introduction of hydrogen and fuel cells into local markets.

This project employs the Occupational Safety and Health Administration and National Fire Protection Association frameworks for hazardous materials emergency response training to provide a tiered hydrogen safety education program for emergency responders. The effort started with development and distribution of the awareness-level Web-based course in FY 2006-2007. A more advanced course and materials to facilitate education were developed in FY 2008-2009, complementing the design, construction, and operation of an FCV prop (developed under PNNL's Hydrogen Safety project). The overall first-responder education program will continue to be updated. In addition, PNNL has implemented outreach efforts to key stakeholder groups to facilitate delivery of the training to a broad audience.

## APPROACH

PNNL works with subject matter experts in hydrogen safety and first responder training to develop hydrogen safety course materials. Draft materials undergo considerable review and revision before being released. The PNNL team works with DOE to make stakeholder groups aware of training opportunities and to provide “live” training when appropriate. The Web-based awareness-level course is available “online” or on CDs and provides the student with a basic understanding of hydrogen properties, uses, and appropriate emergency response actions. The prop-based course, a more advanced operations-level course, was initially presented at the HAMMER training facility in Richland, WA. Subsequently, the mobile prop has enabled the course to be delivered at several offsite fire training centers (in California during 2010-12, and Hawaii in 2013) in order to reach larger audiences in areas where hydrogen and fuel cell technologies are being deployed.

## RESULTS

**Prop-Based Course:** The focus of the curriculum is on teaching first responders what is the same and what is different about hydrogen and FCVs as compared to conventional fuels and vehicles. Feedback is requested at each class to help us improve the course content and delivery. Based on feedback from all the training sessions held this past year, we conclude that following the training, first responders are more familiar with the properties and behavior of hydrogen, and are prepared to operate in a safe and effective manner if a hydrogen incident should occur in their jurisdiction.

The FCV prop has been integrated into the “Hydrogen Emergency Response Training for First Responders” course.

The prop demonstrates potential conditions that could be encountered during the control and suppression of a FCV fire.

## CONCLUSIONS AND FUTURE DIRECTIONS

The introductory Web-based course has been highly successful, based on the usage recorded and feedback received. The course is fulfilling a need expressed by the first responder community to receive more information about hydrogen and fuel cells so they will be prepared in the rare event of a hydrogen incident. The in-depth prop-based course builds on that success and is very useful in giving first responders a hands-on experience with simulated FCV incidents that integrates well with classroom training. PNNL will continue to update both courses as needed to reflect current applications and markets for hydrogen and fuel cells.

H2USA launched at the U.S. Department of Energy's Annual Merit Review in May 2013. Through H2USA, the partners will focus on identifying actions to encourage early adopters of fuel cell electric vehicles, conduct coordinated technical and market analysis, and evaluate alternative fueling infrastructure that can enable cost reductions and economies of scale. Although the structure and activities of H2USA are still being defined, the new partnership will consider infrastructure, hydrogen production and vehicle deployment at a national level. It will also look at how other fuel cells deployments, such as back-up power and material handling, can help pave the way for mainstream hydrogen vehicle infrastructure.

A properly trained first responder community is critical to the success of this transformation to hydrogen fuel cell applications. First responders represent two demographics: a potential rescuer in a hydrogen incident and a potential consumer of fuel cell technology. It is critical that the information they receive is up to date, accurate, factual and technically correct. The national template for emergency responder education on hydrogen and fuel cells will aid in eliminating misinformation, and potentially assist with information about other vehicle technologies, as well.

Hydrogen and fuel cell emergency response information has been included in multiple training programs, such as the U.S. Department of Energy's Hydrogen Emergency Response Training for First Responders, developed and managed by PNNL, and a program developed for the California Office of the State Fire Marshal by the CaFCP. Additionally, emergency responder education for alternative fueled and electric vehicles, including hydrogen, has been developed and delivered by a number of other organizations around the country. However, consistency in the content and messaging about hydrogen and fuel cells varies across these programs, and may not be contemporary with the activities in early markets. Reasons for such discrepancies are many; however, in general may be attributed to the amount of hydrogen and

fuel cell activities in a given region, and access to industry-vetted information.

A single repository of information related to hydrogen and fuel cells (a National Hydrogen Emergency Response Template) is necessary to provide current and accurate information and to avoid duplication of efforts among various training programs. The primary goal for developing a national ‘template’ for hydrogen and fuel cell vehicle emergency response is to provide current, factual, relevant information with consistent messaging and for ease of review/updates on an annual or semi-annual basis. Once developed, the template must reside in a single location and be disseminated from that location as needed in various forms, depending on the level of information needed (i.e. awareness vs. operations level).

PNNL currently manages the DOE program on Hydrogen Emergency Response Training for First Responders, and has done so for several years, providing both internet-based awareness-level and classroom-based operations-level training (with hands-on demonstrations).

PNNL would develop and maintain the National Emergency Responder Template for hydrogen and fuel cell applications. Maintaining the template would include keeping a single source of information updated on fuel cell applications and on the proper response to hydrogen emergencies.

The training materials would be made available to other agencies wishing to include hydrogen safety training for first responders in their curricula. Example agencies may include the National Fire Protection Agency, Federal Emergency Management Agency’s National Fire Academy, and the National Alternative Fuels Training Consortium (West Virginia University). These organizations all have excellent training deployment capabilities.

### **FY 2013 PUBLICATIONS/PRESENTATIONS**

1. Elmore, M.R. “Hydrogen Emergency Response Training for First Responders” PNNL-SA-86615. Presented at the 2013 DOE Annual Merit Review, May 14, 2013. Washington, D.C.