VIII.7 Hydrogen Emergency Response Training for First Responders

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Project Start Date: October 2004
Project End Date: Project continuation and direction determined annually by DOE

Overall Objectives

A properly trained first responder community is critical to the successful introduction of hydrogen fuel cell applications and their role in transforming how we use energy. This project supports the implementation of hydrogen and fuel cell technologies by providing technically accurate hydrogen safety and emergency response information to first responders.

Fiscal Year (FY) 2014 Objectives

Develop and conduct reviews of the National Emergency Response Education Program training template and slide package.

Technical Barriers

This project addresses the following technical barriers from the Safety, Codes and Standards (SCS) section 3.7.5 and Education (ED) section 3.8.5 of the Fuel Cell Technologies Office Multi-Year Research, Development, and Demonstration Plan:

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

(D) Lack of Hydrogen Knowledge by AHJs (Authorities Having Jurisdiction) (SCS)

(E) Lack of Hydrogen Training Materials and Facilities for Emergency Responders (SCS)

(A) Lack of Readily Available, Objective and Technically Accurate Information (ED)

(D) Lack of Educated Trainers and Training Opportunities (ED)

Contribution to Achievement of DOE Safety, Codes and Standards and Education Milestones

This project will contribute to achievement of the following DOE milestones from the Safety, Codes and Standards section 3.7.7 and Education section 3.8.7 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) (SCS)
- 1.1 Update "Introduction to Hydrogen Safety for First Responders" course. (Biannually) (ED)

FY 2014 Accomplishments

- Several drafts of the slide package for the National Hydrogen Emergency Response Education Program have been prepared, reviewed and updated in anticipation of public release. A training template has been completed to guide program use and future enhancements.
- The PNNL project team interacted several times with the European Commission-funded HyResponse project to establish a collaborative effort on first responder training.
- The project team contributed to a PNNL-led planning session of diverse organizations and expertise to consider what electronic safety resource tools would benefit the next phase of hydrogen and fuel cell commercialization. The draft report identifies and recognizes the importance of new resource tools to meet the needs of a high priority user group—the first responder community [1].
- An educational session, "Hydrogen and Fuel Cell Vehicles: Educating Emergency Responders," was conducted at the 2014 NFPA Conference & Expo to expand outreach efforts and audiences as part of this project [2].

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 essential to a viable infrastructure. The Fuel Cell Technologies Office has placed a high priority on training of emergency response personnel, not only because these personnel need to understand how to respond to a hydrogen incident, but also 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 online course in FY 2006–2007. An operations-level classroom curriculum was developed in FY 2008–2009, including the design, construction and operation of a fuel cell vehicle prop for hands-on training. In addition, PNNL has implemented outreach efforts to key stakeholder groups to not only facilitate delivery of training to a broad audience, but to consider new and relevant resources and approaches for meeting an important need.

APPROACH

PNNL works with subject matter experts in hydrogen safety and first responder training to develop, review, and revise all training materials as needed. The PNNL project team works with DOE to inform stakeholder groups of training opportunities and to provide "live" training when appropriate. The online awareness-level course is also available as a CD and provides the student with a basic understanding of hydrogen properties, uses, and appropriate emergency response actions. The operations-level classroom/hands-on prop-based course was initially presented at the Volpentest HAMMER Federal Training Center in Richland, WA. Subsequently, the operations-level course has been delivered at several offsite fire training centers in California and Hawaii to reach larger audiences in areas where hydrogen and fuel cell technologies are being deployed (see Table 1).

New approaches are needed to meet the specific needs of first responders and presentation styles of training organizations and to complement numerous existing training programs. The National Hydrogen and Fuel Cell Emergency Response Education Program will help ensure a consistent source of accurate information and current knowledge. As part of this program, a training template will be developed as a resource and guide for the delivery of a variety of training regimens to various audiences.

RESULTS

Drafts of the slide package for the National Hydrogen and Fuel Cell Emergency Response Education Program were completed and distributed to stakeholders and training organizations for review and feedback. In parallel, a training template was developed that will be integral to the first version of the program. Working meetings were held in Washington, D.C. in June 2014 during the DOE Hydrogen Program Annual Merit Review and Peer Evaluation Meeting for PNNL and California Fuel Cell Partnership staff to review all program draft materials, identify improvements, suggest edits and establish actions to complete the first version of slide package. An updated template/slide package was released to the full project team in mid-July for further review.

PNNL and DOE staff met with U.S. Fire Administration staff at the National Fire Academy, Emmitsburg, MD on November 15, 2013 to discuss our work on first responder

TABLE 1. Deployment of Operations-Level First Responder Training

Agency	Location	Date	Trained
HAMMER Federal Training Center	Richland, WA	2009-2010	66
Rio Hondo Community College	Santa Fe Springs, CA	August 2010	103
Orange County Fire Authority	Irvine, CA	August 2010	92
Sunnyvale Department of Public Safety	Sunnyvale, CA	September 2010	110
San Joaquin Defense Logistics Agency	Stockton, CA	June 2011	41
Los Angeles City Fire Department	Los Angeles, CA	January 2012	128
Los Angeles County Fire Department	San Dimas, CA	March 2012	170
Honolulu Fire and Federal Fire-HI	Honolulu, HI	February 2013	155
HI County Fire and Volcanoes National Park	Hilo, HI	February 2013	135
		Total	**1000**

training and identify potential areas of collaboration. The U.S. Fire Administration is a strong proponent of first responder training on hydrogen and fuel cells, and sees a definite need for these resources and wishes to assist with the program. Follow-up interactions are planned.

The need for first responder training resources has been well recognized internationally, and the value of collaboration in meeting those needs is also well understood. For example, to fill a need in the European-based hydrogen and fuel cell program, the HyResponse project was initiated in 2013 to develop a comprehensive, standardized hydrogen safety training program for emergency personnel. Discussion with HyResponse project staff was initiated at the 2013 International Conference on Hydrogen Safety and continued during a teleconference meeting on March 26, 2014 with HyResponse project leads [3,4].

PNNL hosted Lieutenant Colonel Bertrand Cassou, a division chief in the French Academy for Fire, Rescue and Civil Protection Officers, and Franck Verbecke, hydrogen reliability and safety product manager at AREVA, during the week of April 21, 2014. The visit provided an opportunity to discuss how PNNL's hydrogen first responder training program, which supports DOE's Hydrogen and Fuel Cells Program, and the HyResponse team can collaborate for mutual benefit. The possible exchange of videos and virtual reality training resources to enhance each program's content was discussed. During the visit, PNNL demonstrated the hands-on, live-fire vehicle prop that is used for its operations-level first responder training curriculum as well as other PNNL capabilities that could support such collaboration. PNNL also invited local fire department officers to witness the live prop demonstrations. Subsequent to that visit, DOE and PNNL accepted invitations to speak at the HyResponse project's International Workshop on Hydrogen Safety Training for First Responders, at the French Academy for Fire, Rescue and Civil Protection Officers, Aix-en-Provence, France, September 3-4, 2014 [5].

CONCLUSIONS AND FUTURE DIRECTIONS

It is critical that training materials for the awareness-level and operations-level courses be kept accurate and current. To remain vital and useful, such resources require concerted efforts beyond general maintenance. Relevance to the community being served and value to the individual user/attendee are key attributes for these resources.

The National Hydrogen and Fuel Cell Emergency Response Education Program is expected to become the focal point for delivering training resources under this project. In that spirit, it is vital that feedback from presenters and audiences to the developers and content stewards be collected, assessed and acted on to ensure that new and updated training content and techniques are incorporated into the program. Outreach and collaboration will be essential to future work.

FY 2014 PUBLICATIONS/PRESENTATIONS

1. Barilo, N.F., "Hydrogen Emergency Response Training for First Responders," DOE Hydrogen Program Annual Merit Review and Peer Evaluation Meeting, Washington, DC, June 18, 2014.

REFERENCES

1. Barilo, N.F., "Electronic Safety Resource Tools – Supporting Hydrogen and Fuel Cell Commercialization," Draft PNNL report, August 2014.

2. Elmore, M.R., "Hydrogen and Fuel Cell Vehicles: Educating Emergency Responders," NFPA Conference and Expo, Las Vegas, NV, June 9–12, 2014.

3. Hamilton, J.J., "Development of a Hydrogen and Fuel Cell Vehicle Emergency Response National Template," International Conference on Hydrogen Safety, Brussels, Belgium, September 10, 2013.

4. Verbecke, F., Vesy, B., Lopez, M., Molkov, V., Reijalt, M., Dey, R., Maranne, E. and Dang-Nhu, G., "European Hydrogen Safety Training Platform for First Responders: HyResponse Project," international Conference on Hydrogen Safety, Brussels, Belgium, September 9–11, 2013.

5. Weiner, S.C., "First Responder Training – Resources and Future Direction," PNNL-SA-104297, International Workshop on Hydrogen Safety Training for First Responders, ENSOSP, Aix-en-Provence, France, September 3–4, 2014.