Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

PNNL-SA-86615

Hydrogen Emergency Response Training for First Responders

Monte Elmore
Pacific Northwest National Laboratory
May 15, 2012

2012 US DOE Hydrogen and Fuel Cells Program Annual Merit Review and Peer Evaluation Meeting

This presentation does not contain any proprietary, confidential, or otherwise restricted information.

SCS015

Overview

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Timeline

- Project start: October 2004
- Continuing

Partners

- Hanford Fire Department
- California Fuel Cell Partnership (CaFCP)
- Volpentest Hazardous Materials Management and Emergency Response (HAMMER) Training and Education Center

Budget

- Funding Received in FY11: $100K
- Planned Funding For FY12: $ 75K

Barriers*

A. Safety Data and Information: Limited Access and Availability

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

E. Lack of Hydrogen Training Materials and Facilities for Emergency Responders

* *Technical Plan – Safety, Codes, and Standards, Section 3.7.5, Multi-Year Research, Development and Demonstration Plan, 2011*

Relevance: Goals and Objectives

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

- **Long-Term Goal**
  - Support the successful implementation of hydrogen and fuel cell technologies by providing technically accurate hydrogen safety and emergency response information to first responders*
- **Objectives for FY12**
  - Offer the one-day operations-level course utilizing DOE's fuel cell electric vehicle (FCEV) prop at appropriate fire training centers
  - Continue to support the web-based awareness-level course (launched in FY07)
  - Continue outreach activities by disseminating first-responder hydrogen safety educational materials at fire training conferences to raise awareness

* *First responders (fire, law enforcement, and emergency medical personnel) must know how to respond to potential incidents. Their understanding can also facilitate local approval of hydrogen projects.*

Approach

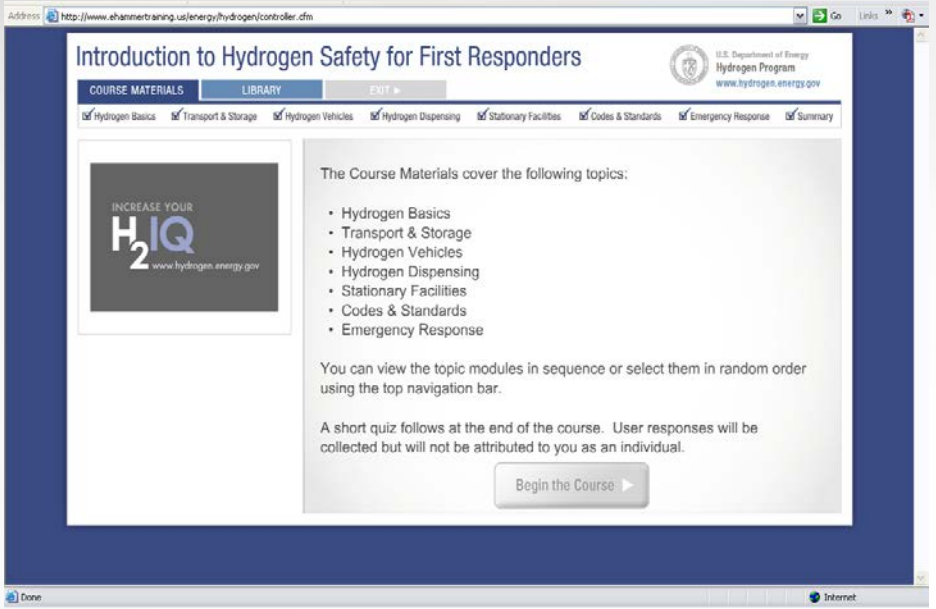
Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

- **Introduction to Hydrogen Safety for First Responders**
  - Support and update as needed the web-based awareness-level course “Introduction to Hydrogen Safety for First Responders”
- **Hydrogen Emergency Response Training for First Responders**
  - Transport the FCEV prop offsite and deliver the course at training centers across the U.S.
  - Current focus is on California, where fuel cell vehicles and infrastructure are concentrated

Introduction to Hydrogen Safety for First Responders

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

- Course Content
  - Hydrogen Basics
  - Transport and Storage
  - Hydrogen Vehicles
  - Hydrogen Dispensing
  - Stationary Facilities
  - Codes and Standards
  - Emergency Response
- The course is registered on the TRAIN* website for broader dissemination to first responders



http://hydrogen.pnl.gov/FirstResponders/

**TrainingFinder Realtime Affiliate Integrated Network (TRAIN) is a central repository for public health training courses. Almost 30,000 TRAIN users are emergency responders.*

Accomplishments/Progress
Introduction to Hydrogen Safety for First Responders

- Our website still averages ~200 to 300 unique visits per month after almost 6 years, from nearly every state and some foreign countries

Fiscal Year	Visits
2007	6192
2008	3984
2009	4230
2010	3614
2011	2734
2012 (Feb)	911
Total	**21,665**

Hydrogen Emergency Response Training for First Responders

- Classroom Content
  - Hydrogen and Fuel Cell Basics
  - Hydrogen Vehicles
  - Stationary Facilities
  - Emergency Response
  - Incident Scenarios
- Demonstrations/Hands-on Exercise with FCEV Prop
  - Demonstration of Hydrogen Flame Characteristics
  - Student Participation in Rescue Evolutions

Multiple instructors for classroom training

A "rescue" at Sunnyvale (CA) Department of Public Safety

Accomplishments/Progress

Hydrogen Emergency Response Training for First Responders

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Since May 2011 *(AMR)*

- Held training sessions at four California fire training facilities
  - June 2011 – Defense Logistics Agency (DLA): San Joaquin (Sharpe and Tracy Sites)
  - January 2012 – Los Angeles City Fire Department
  - March 2012 – Los Angeles County Fire Department
- Presented paper at ICHS 2011 in San Francisco (International Conference on Hydrogen Safety)

Live Fire Training at San Joaquin DLA

Accomplishments/Progress

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Agency	Location	Date	Number Trained
HAMMER	Richland, WA	2009 - 2010	66
Rio Hondo Comm. College	Santa Fe Springs, CA	August 2010	103
Orange Co Fire Authority	Irvine, CA	August 2010	92
Sunnyvale PSD	Sunnyvale, CA	September 2010	110
San Joaquin DLA	**Stockton, CA**	**June 2011**	**41**
Los Angeles City Fire Dept	**Los Angeles, CA**	**January 2012**	**128**
Los Angeles Co Fire Dept	**San Dimas, CA**	**March 2012**	**170**
		Total to Date:	***710***

Overheard from students at LA Co: *"Great course! I'm not nearly as concerned about hydrogen now as I was before (the course)."*

Collaborations

- California Fuel Cell Partnership
  - Jennifer Hamilton
- Hanford Fire Department
  - Captain James Bryan
- HAMMER Training and Education Center
  - Fire Fighter Scott Jones
- DLA Civilian Installation Support
- Kidde Fire Trainers
  - Design/Build/Maintain the FCEV Prop
- International Association of Fire Chiefs (IAFC) and US Department of Transportation (DOT)
  - Provided information/resources and reviewed course they are developing similar to our online course

Training at HAMMER With Multiple Burn Props

Proposed Future Work

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

- Planning site visits by PNNL and CaFCP to facilities in California (San Francisco and Emeryville), possibly East Coast
- Prepare collaborative agreements to provide training at these sites in FY13
- Prop to be transported to sites in its trailer, stay at each site for one week
- Anticipate three classes per site; ~100-150 first responders from each site

Trailer Used to Transport FCEV Burn Prop

Future Work: The Possibilities for Enhancing and Expanding Training

- Enhancing course content
  - Develop virtual hydrogen incident scenarios and responses
  - Add content to reflect market potential: materials handling equipment; stationary, portable, and auxiliary power units
- Expanding the reach of this training opportunity
  - Explore collaboration with other agencies and organizations, e.g., DOT, IAFC
  - Train cadre of additional instructors
- Utilizing outreach to:
  - Be visible at fire-related conferences (e.g., FDIC, FRI) to disseminate educational materials (CDs, laminated posters, and other information), raising awareness of our hydrogen safety training courses with our target audience

Training reinforces need for first responders to utilize thermal imaging camera to see hydrogen flames

Summary

- **Introduction to Hydrogen Safety for First Responders**
  - Available online at: http://hydrogen.pnl.gov/FirstResponders/
  - Continues to be successfully utilized
- **Hydrogen Emergency Response Training for First Responders**
  - Course delivered three times at HAMMER to first responders from across the U.S.
  - Successful offsite deployment in California at three locations in 2010, two locations in 2011, and two locations in 2012
  - Planning to take course to San Francisco area and other sites in 2013
- **Outreach**
  - Return to fire-related conferences to disseminate materials and recruit students for future classes

My Thanks To:

- U.S. Department of Energy
  - Sunita Satyapal, Program Manager
  - Antonio Ruiz, Safety Codes and Standards Team Lead
- My Instructors
  - Jennifer Hamilton (CaFCP)
  - Capt. James Bryan (Hanford Fire)
  - Scott Jones (HAMMER)
- All our great hosts in the fire service

"Smoky" - Station 64, LA County Fire