Hydrogen Emergency Response Training for First Responders

Monte Elmore
Hydrogen Program Annual Merit Review and Peer Evaluation Meeting
Washington, DC
June 18, 2014
Overview

Timeline
- Project start date: October 2004
- Project end date: September 2014*
  *Project continuation and direction determined annually by DOE

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

Budget
- FY13 DOE Funding: $ 50K
- Planned FY14 Funding: $ 100K
- Total DOE Project Value: $2194K

Partners
- California Fuel Cell Partnership
- Nat’l Fire Protection Association
- Project Lead: PNNL

** Technical Plan – Safety, Codes, and Standards, Section 3.7.5, Multi-Year Research, Development and Demonstration Plan, 2012
Relevance: Goals and Objectives

▶ 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 FY14
- Develop and implement a national hydrogen emergency response education program with downloadable training materials that are adaptable to the specific needs of first responders and training organizations
- Explore mutually beneficial collaborations with other programs and organizations to enhance first responder training content, techniques and delivery
Approach

Introduction to Hydrogen Safety for First Responders

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

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
Approach

National Hydrogen Emergency Response Education Program

- PNNL serves as content stewards for the national education program
- Arrange training materials into a multi-level training program appropriate for users with a variety of training perspectives, interests and needs
- Make these training materials available as downloadable/user-configurable presentations to individuals or organizations seeking information on hydrogen emergency response
- Utilize the template approach for a consistent source of accurate and current information for use in:
  - Assessing and developing updated/new training content
  - Delivering a variety of training regimens to various audiences
  - Integrating new video and animation tools into the program
Approach

The First Responder Training Template
Approach – The First Responder Template

1. Introduction
2. Hydrogen and Fuel Cell Basics
3. Hydrogen–Fueled Vehicles (light duty and transit)
4. Stationary Facilities
5. Managing Hydrogen–Related Emergencies
6. Practical Exercise

5.1 Vehicle incidents

5.1.1 Identification
5.1.2 Disabling
5.1.3 Review from above of redundant safety systems and how they're designed to perform
5.1.4 Fire
5.1.5 Extrication
   5.2.1 Review of safety systems
5.2 ii) Stationary (stations)
   5.2.2 Leak
   5.2.3 Fire

FOLLOW SOP’s for VEHICLE RESPONSE...

...and, pay attention to the unique items for hydrogen-powered fuel cell vehicles

Scene Size-Up
Identify
Isolate
Rescue
Wrap Up

Proudly Operated by Battelle Since 1965
National Hydrogen & Fuel Cell 
Emergency Response Education Program

<table>
<thead>
<tr>
<th>Level 1 – Basic Overview</th>
<th>Level 2 - Intermediate</th>
<th>Level 3 – Detailed</th>
</tr>
</thead>
</table>

1. Introduction – Why First Responder Training for H2 Emergencies?
   i) Hydrogen as a part of the Alt Fuel/Zero Emission Vehicle portfolio
      1) Individual state programs (CA, NY, CT)
      2) National plan (H2USA)
   ii) Course Objectives

2. Hydrogen and Fuel Cell Basics
   i. Uses of Hydrogen
   ii. Vehicles (light duty and transit)
Accomplishments/Progress

Introduction to Hydrogen Safety for First Responders (online training)

Our website still averages ~200 to 300 unique visits per month after more than 7 years from nearly every state and some foreign countries.

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<thead>
<tr>
<th>Fiscal Year</th>
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<td>2007</td>
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<td>Through 3/2014</td>
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</table>
# Accomplishments/Progress

## Operations Course Training Locations

<table>
<thead>
<tr>
<th>Agency</th>
<th>Location</th>
<th>Date</th>
<th>Number Trained</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAMMER</td>
<td>Richland, WA</td>
<td>2009 - 2010</td>
<td>66</td>
</tr>
<tr>
<td>Rio Hondo Comm. College</td>
<td>Santa Fe Springs, CA</td>
<td>August 2010</td>
<td>103</td>
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<tr>
<td>Orange Co Fire Authority</td>
<td>Irvine, CA</td>
<td>August 2010</td>
<td>92</td>
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<tr>
<td>Sunnyvale PSD</td>
<td>Sunnyvale, CA</td>
<td>September 2010</td>
<td>110</td>
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<tr>
<td>San Joaquin DLA</td>
<td>Stockton, CA</td>
<td>June 2011</td>
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<td>Los Angeles City Fire Dept</td>
<td>Los Angeles, CA</td>
<td>January 2012</td>
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<tr>
<td>Los Angeles Co Fire Dept</td>
<td>San Dimas, CA</td>
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<td>170</td>
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<tr>
<td>Honolulu Fire &amp; Fed Fire-HI</td>
<td>Honolulu, HI</td>
<td>February 2013</td>
<td>155</td>
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<tr>
<td>HI Co Fire &amp; Volcanoes NP</td>
<td>Hilo, HI</td>
<td>February 2013</td>
<td>135</td>
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</table>

**Total**: 1000
Accomplishments/Progress

Outreach


➢ Invited to present operations course at 25th Annual “Continuing Challenge” HazMat Workshop, Sacramento, CA, September 2014.
Accomplishments/Progress

Hydrogen Emergency Response Training for First Responders

- Identified auto industry, USFA, NFPA, national labs and academia partners and discussed draft national ER program. (December 2013 milestone – complete)

- Prepared draft of national ER program and submitted to reviewers. (March 2014 milestone – complete)
  - Comments received by mid-May 2014
  - Comments being considered and incorporated
  - Template developed for assessing content and planning forward program
  - Draft to be revised and program submitted as project milestone by end of June 2014

- Educational presentation at NFPA Conference & Expo June 2014 on the national education program.

- Partnered with NFPA to supplement their alternative fuel vehicle safety training with information on hydrogen fuel cell vehicles.
  - To be available from NFPA summer 2014
Accomplishments/Progress
International Collaboration

- Hosted HyResponse project personnel from AREVA and the French Academy for Fire, Rescue and Civil Protection Officers (ENSOOSP) to discuss projects, demonstrate our live-fire FCV burn prop and consider collaborative opportunities, April 21-22, 2014.

- Discussed collaborative possibilities
  - Animations and videos of accident scenarios for training
  - Incorporating virtual reality tools into U.S.-based training
  - Utilize ENSOSP’s International Workshop on Hydrogen Training for First Responders (September 3-4, 2014, Aix-en-Provence, France) for engaging full project team and related stakeholders
Accomplishments

Responses to 2013 Reviewers’ Comments

The project was not reviewed last year, so no comment responses are provided.
Collaborations

- **California Fuel Cell Partnership**
  - Developing “National Program”

- **NFPA**
  - NFPA Alt Fuel Vehicle ER Training and DOE Nat’l Program review

- **Program reviewers**
  - Vehicle and equipment manufacturers
  - Hydrogen suppliers
  - Training organizations

- **European HyResponse Project**
  - Collaborative activities on first responder training
Implement the National Hydrogen Emergency Response Education Program

- Complete development of education program – incorporating review comments
- Make the materials available through the Safety Knowledge Tools web portal
- Introduce program to training organizations by various means (webinars, press releases, etc.)
Future Work

- Continue providing emergency response training to support successful implementation of fuel cell deployment projects (e.g., Maritime Fuel Cell Generator Project)

- Advance outreach, education and content initiatives for the National Hydrogen Emergency Response Education Program

- Further advance the collaboration with the HyResponse project
  - Incorporate virtual reality tools into U.S.-based training

- Consider other initiatives to address first responder training needs
Summary

- **Introduction to Hydrogen Safety for First Responders**
  - Available online at: [http://hydrogen.pnl.gov/FirstResponders/](http://hydrogen.pnl.gov/FirstResponders/)
  - Still being successfully utilized, especially useful for ops course preparation

- **Hydrogen Emergency Response Training for First Responders**
  - Still available as an instructed classroom course
  - Available FCV burn prop for demonstrations/training evolutions

- **National Hydrogen Emergency Response Education Program**
  - When finalized hydrogen emergency response training materials will be available to individuals and organizations via the hydrogen safety web portal

- **Outreach**
  - Attend fire-related conferences (Continuing Challenge HazMat Workshop, Firehouse World) to present ops course, disseminate materials, and identify interest among first responder agencies for training

- **International Collaborations**
  - Continue work with HyResponse project and other similar programs
Summary

Integrating the Approach to First Responder Training

Introduction to Hydrogen Safety for First Responders *(online training)*

Hydrogen Emergency Response Training for First Responders *(classroom and hands-on)*

National Hydrogen Emergency Response Education Program
My Thanks To:

▶ U.S. Department of Energy
  - Sunita Satyapal, Director, Fuel Cell Technologies Office
  - Ned Stetson, Will James, and Kym Carey: Safety Codes and Standards Team

This training program continues to make a positive impact with first responders, and is a vital tool as we see an increase in the number of demonstration, deployment and commercialization projects!