PNNL-SA-78366

Hydrogen Emergency Response Training for First Responders

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May 11, 2011

Project ID # SCS015

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Overview

Timeline

- Project start: October 2004
- Continuing

Budget

- FY10 Funding:
  - SCS $150K
  - ED $265K
- FY11 Funding:
  - SCS $150K
  - ED $ 0K

Partners

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

Barriers*

- Lack of readily available, objective, and technically accurate information (ED)
- Disconnect between hydrogen information and dissemination networks (ED)
- Lack of educated trainers and training opportunities (ED)
- Lack of hydrogen knowledge by authorities having jurisdiction (SCS)
- Lack of hydrogen training facilities for emergency responders (SCS)

* *Multi-Year Research, Development and Demonstration Plan: Planned Program Activities for 2005-2015*

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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 FY11**
  - Offer the one-day operations-level course utilizing DOE's fuel cell electric vehicle (FCEV) prop at DoD Defense Logistics Agency (DLA) fire training centers.
  - Continue to provide the one-day, operations-level, first responder training course at "civilian" fire training centers in CA.
  - Continue to support the web-based awareness-level course (launched in FY07).
  - Continue outreach activities by disseminating first-responder hydrogen safety educational materials at appropriate 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.*

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Approach

FCV Prop-Based Course

- Transport the FCV prop offsite and deliver the course at training centers across the U.S. Current focus is on CA, where fuel cell vehicles and infrastructure are concentrated.

Web-Based Course

- Support and update as needed the web-based awareness-level course “Introduction to Hydrogen Safety for First Responders.”

Outreach

- Continue to attend Fire Department Instructors Conference (FDIC) and Fire Rescue International (FRI) to disseminate educational materials (CDs, laminated posters, and other information) to raise awareness of our hydrogen safety training courses with our target audience.

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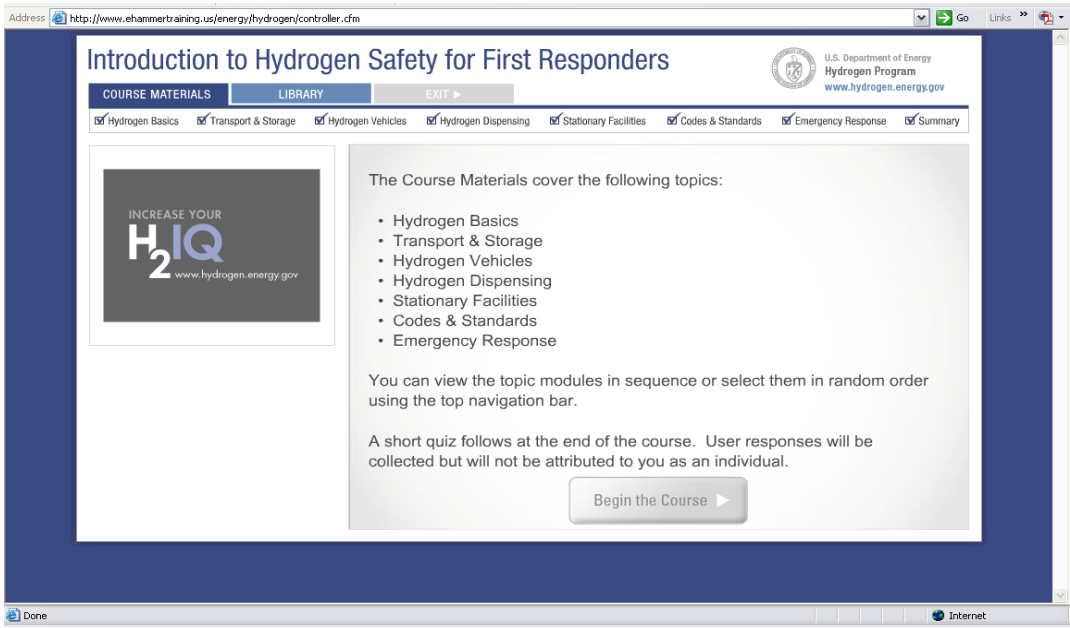
Technical Accomplishments
Web-Based Course

- Our website still averages ~300 unique visits per month after almost 4 years, from nearly every state and some foreign countries.
- The course is registered on the TRAIN* website for broader dissemination to first responders.



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

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Technical Accomplishments
Prop-Based Course

- Content
  - Hydrogen and Fuel Cell Basics
  - Hydrogen Vehicles
  - Stationary Facilities
  - Emergency Response
  - Incident Scenarios
  - Quiz
  - Hands-on Exercise with FCEV Prop

Multiple instructors for classroom training

- Held sessions at three CA training facilities
  - Rio Hondo College Fire Academy, Orange County Fire Authority, and Sunnyvale Department of Public Safety
  - August – September 2010
  - ~300 students trained

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

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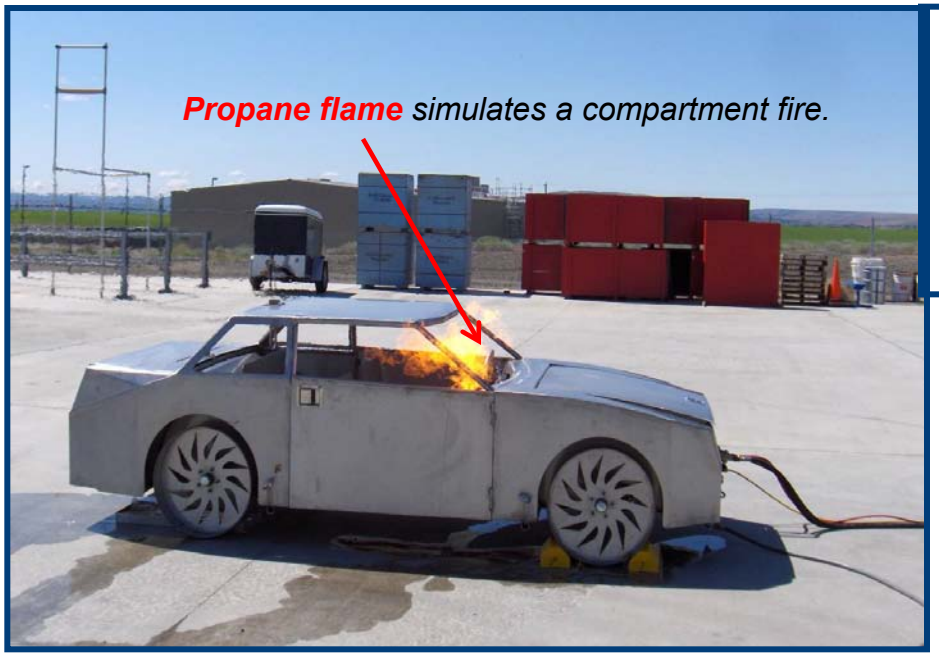
Technical Accomplishments
FCV Prop

Prop demonstrates potential conditions that could be encountered during the control and suppression of a FCEV fire.



***Hydrogen flame**, emitted from three vent locations, is not visible in daylight, but can be seen with a thermal imaging camera.*

Training prop features: (1) mock fuel cell stack, (2) mobile capability, and 3) mock hydrogen storage tank.

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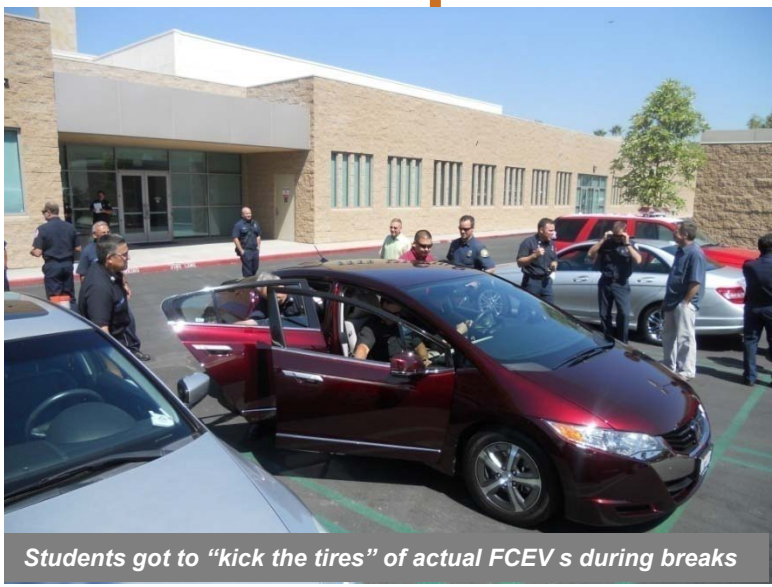
Technical Accomplishments
Photos and Quotes from Class Participants

Simulated 3-car accident with FCEV prop/victim in the middle

"A very student-friendly environment."

"Great experience."



Students got to "kick the tires" of actual FCEV s during breaks

"Good course. It has taken away the mystery of a hydrogen FCEV."

"Real good class. Thank you."

First "live-fire" training for some recruits at Rio Hondo Fire Academy

"Excellent program."

"Good practice for upcoming Captains and current Captains"

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Technical Accomplishments
Photos and Quotes from Class Participants

"Very pertinent to our jobs. Answered any myths or questions about fire/hydrogen."

"Real appropriate to real world."

Sunnyvale, CA August 2010 – Note prop transport & control trailer in background

"Well done. Well worth it."


"Live-fire" training at Sunnyvale

"Would love to make this class an annual requirement. Great group of instructors."

"I feel more comfortable with the topic of hydrogen."

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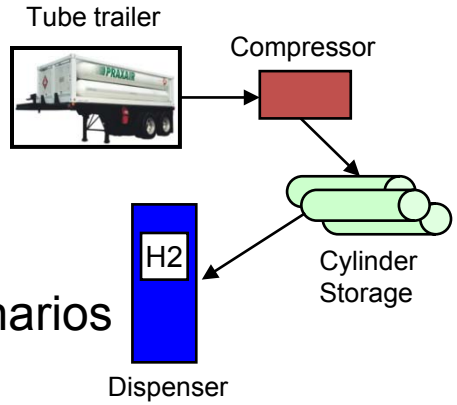
Technical Accomplishments
Plan Developed for Course Enhancement

- "Virtual Hydrogen Fueling Station" interactive model proposed
- Key missing piece of training that would create better balance between vehicles and stationary facilities modules
- Interactive 3-D animated virtual model with:
  - Visualization of dispensing system
  - Four configurations of hydrogen delivery/production
  - Text pop-ups describing fueling station components
  - Animations of five 30-second emergency response scenarios
  - Narration of script
- Similar virtual simulation tool could also be developed for other fuel cell applications (e.g., refueling of hydrogen-powered forklifts for materials handling)



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Technical Accomplishments
Plan for Offsite Deployment of Ops Course

- Site visits by PNNL and CaFCP in March 2011 to two DLA facilities in California (San Joaquin Depot: Sharpe and Tracy Sites)
- Preparing collaborative agreements to provide training at these sites in June
- Prop to be transported to CA in its trailer, stay at each site for one week
- Three classes per site; ~100 first responders from each site

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Technical Accomplishments
Outreach

- PNNL and Hanford Fire staff attended two major first-responder conferences to raise awareness about hydrogen safety
  - Fire Department Instructors Conference (April 2010)
  - Fire Rescue International (August 2010)
- Booth display and dissemination of ~1200 awareness-level course CDs, ~1200 prop course fliers, and ~300 laminated posters

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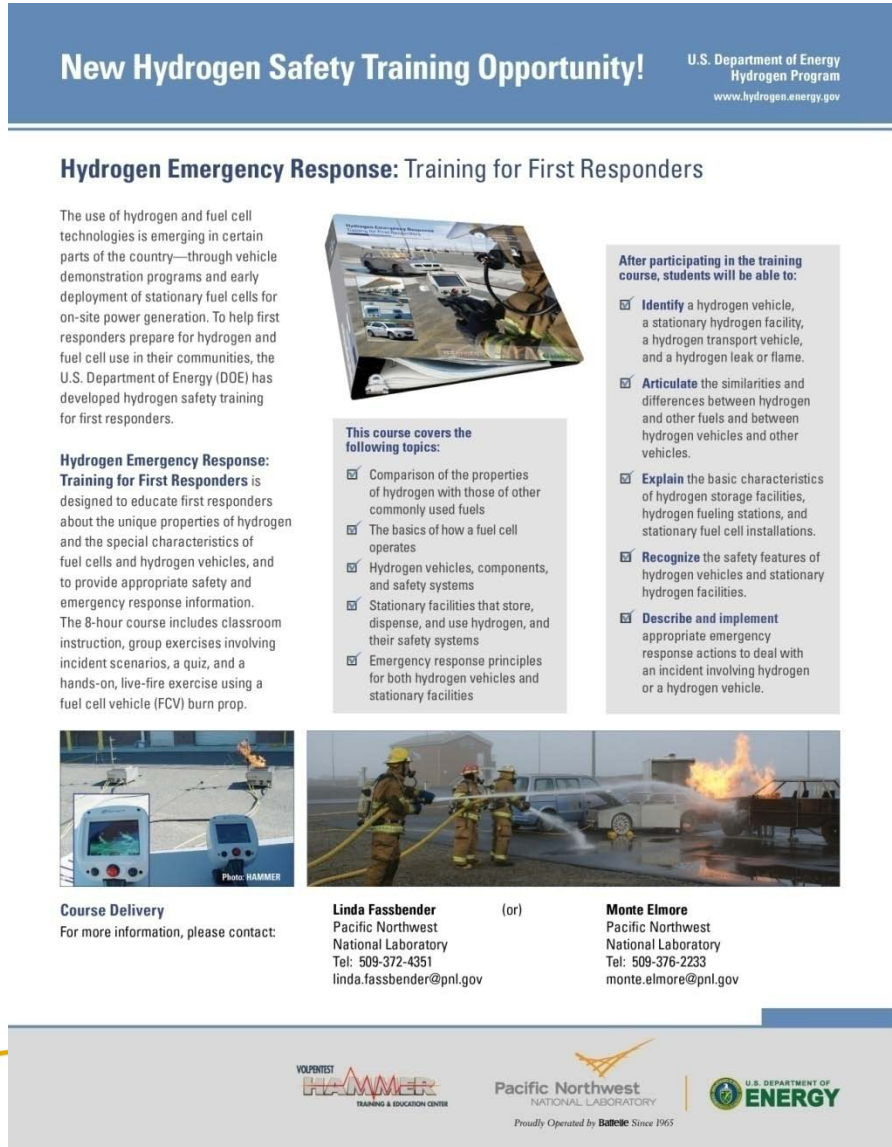
Proposed Future Work

- Take prop/course to DLA and civilian California training sites in 2011 and to other offsite facilities in 2012 and beyond
- Train cadre of additional instructors
- Explore opportunities to collaborate with DOT and IAFC on training
- Enhance content of prop-based course to reflect current large markets for stationary power, portable power, auxiliary power units, and forklifts
- Add a virtual fueling station model for stationary applications
- Continue to monitor usage, address comments, and revise content of web-based awareness-level course to reflect current markets
- Continue participation at FDIC and FRI



Collaborations

- California Fuel Cell Partnership
  - Jennifer Hamilton
- Hanford Fire Department
  - Captain James Bryan

- Volpentest Hazardous Materials Management and Emergency Response (HAMMER) Training and Education Center
  - Scott Jones
  - Dennis McCall

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Summary

- **Awareness-Level Course**
  - Available online at: http://hydrogen.pnl.gov/FirstResponders/
  - Still being successfully utilized
- **Prop-Based Course**
  - Course successfully delivered 3 times at HAMMER to first responders from across the U.S.
  - Successful offsite deployment at three training centers in California in 2010
  - Planning to take course to DLA and other sites in CA in 2011
- **Outreach**
  - Continue to attend FDIC and FRI to disseminate materials and recruit students for future classes

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