Hydrogen Safety Training for First Responders

presented by

Steven C. Weiner

for the

Hydrogen Program Annual Merit Review and Peer Evaluation Meeting

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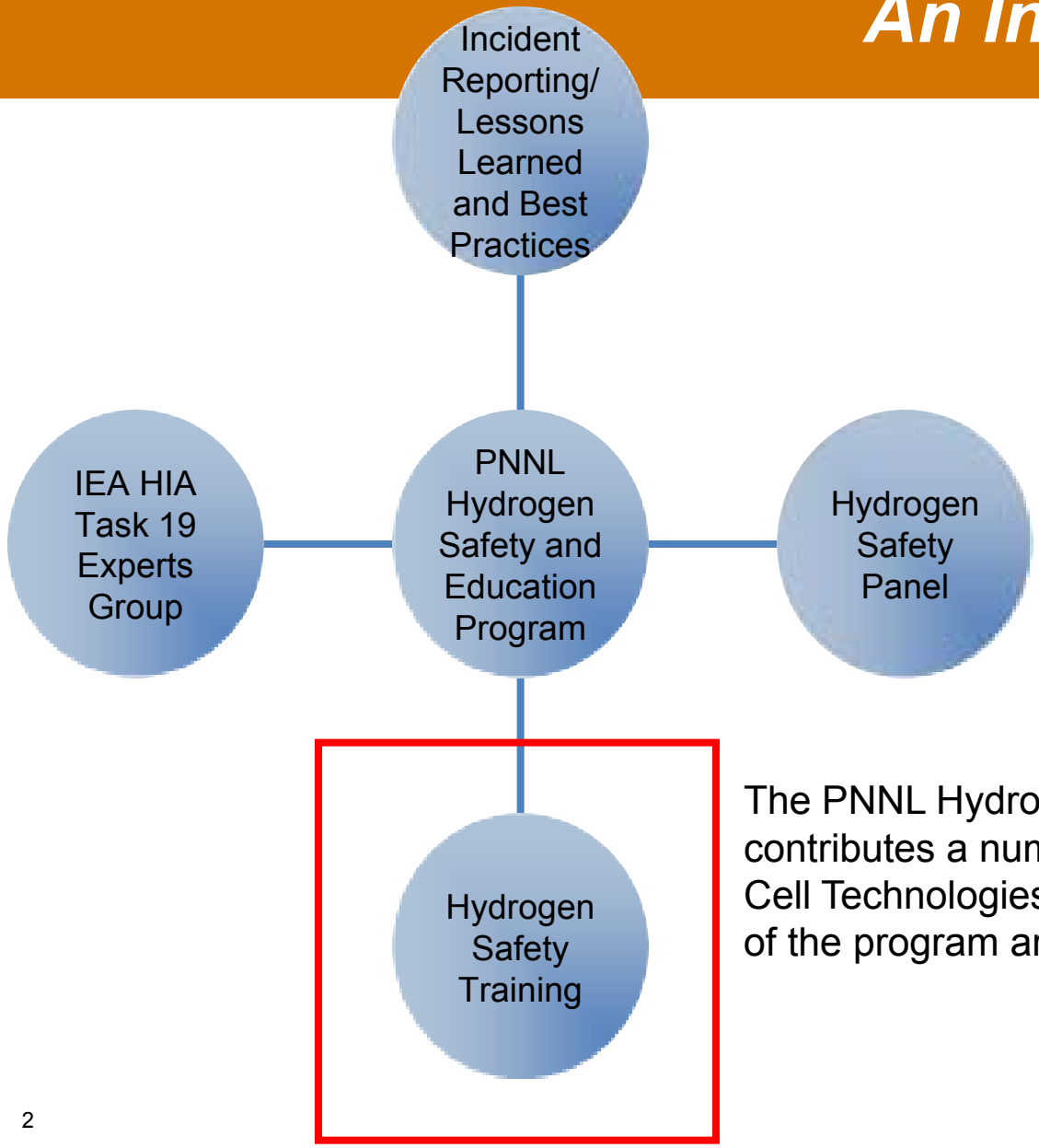
This presentation does not contain any proprietary, confidential or otherwise restricted information.

Project ED001

PNNL-SA-72206

PNNL Hydrogen Safety and Education Program
An Integrated Approach



The PNNL Hydrogen Safety and Education Program contributes a number of important activities to the Fuel Cell Technologies Program. The current main elements of the program are shown here.

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Overview

Timeline

- Project start: October 2004
- Continuing

Budget

- FY09 Funding:
  - SCS $150K
  - ED $265K
- FY10 Funding:
  - SCS $150K
  - ED $290K

Partners

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

Barriers[1]

A. Lack of readily available, objective and technically accurate information (ED)

C. Disconnect between hydrogen information and dissemination networks (ED)

D. Lack of educated trainers and training opportunities (ED)

H. Lack of hydrogen knowledge by authorities having jurisdiction (SCS)

I. Lack of hydrogen training facilities for emergency responders (SCS)

[1]Hydrogen, Fuel Cells & Infrastructure Technologies Program Multi-Year Research, Development and Demonstration Plan, April 2009.

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 FY10**
  - Continue to provide a one-day first responder training course utilizing DOE's fuel cell vehicle (FCV) prop at the HAMMER facility (launched in FY09).
  - Offer the FCV prop course at training centers in California for ~300 first responders.
  - Continue to support the web-based awareness-level course (launched in FY07).
  - Disseminate first-responder hydrogen safety educational materials at appropriate conferences to raise awareness.

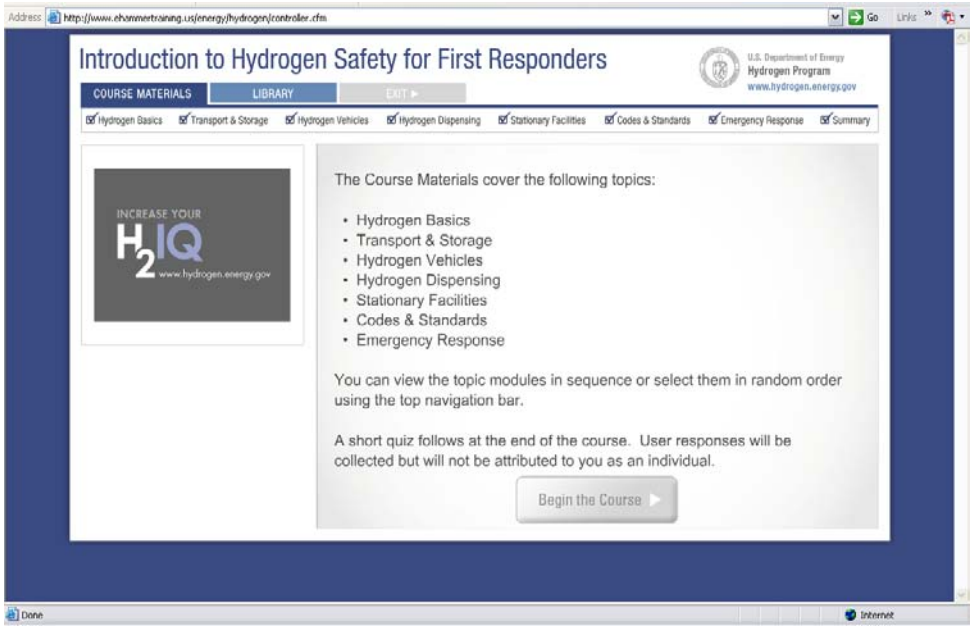
**First responders (fire, law enforcement, and emergency medical personnel) must know how to handle potential incidents. Their understanding can also facilitate local approval of hydrogen projects.*

Approach

- **FCV Prop-Based Course**
  - Invite first responders from all over the U.S. to attend “Hydrogen Emergency Response: Training for First Responders” at HAMMER and subsidize their travel costs.
  - Take the FCV prop offsite and deliver the course at other training centers across the U.S.
- **Web-Based Course**
  - Support and update as needed the web-based awareness-level course “Introduction to Hydrogen Safety for First Responders.”
- **Outreach**
  - Attend Fire Department Instructors Conference (FDIC) and Fire Rescue International (FRI) to disseminate CDs, laminated posters, and other information to raise awareness of our hydrogen safety training courses with our target audience.

Technical Accomplishments
Web-Based Course

- Our website still averages 300-500 unique visits per month from almost every state and some foreign countries.
- We registered the course on the TRAIN* website for broader dissemination to first responders.



**TrainingFinder Real-time Affiliate Integrated Network (TRAIN)*
Is a central repository for public health training courses: www.train.org
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 FCV Prop
- Held three sessions at the HAMMER facility
  - June 2009, August 2009, and April 2010
  - 66 students trained
  - 14 states represented

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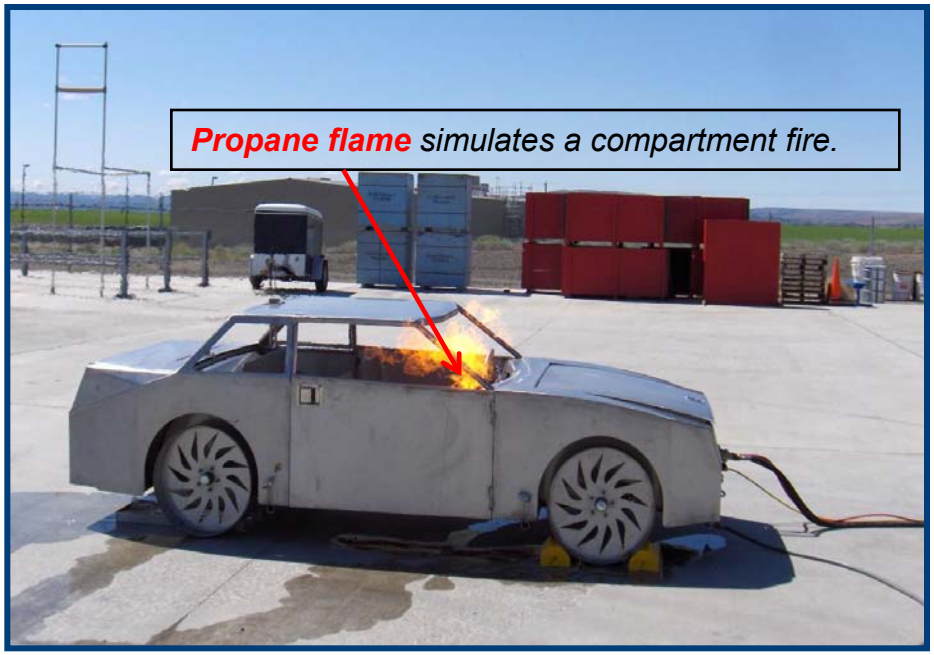
Fuel Cell Vehicle Prop

Prop demonstrates potential conditions that could be encountered during the control and suppression of a fire in or around a FCV.



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

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

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Training that is Hands-On!

"Hands-on training was beneficial."

"Great experience."

"Good job! You guys have it nailed."

"Bring it to New York."

"Great class!"

"Excellent program."

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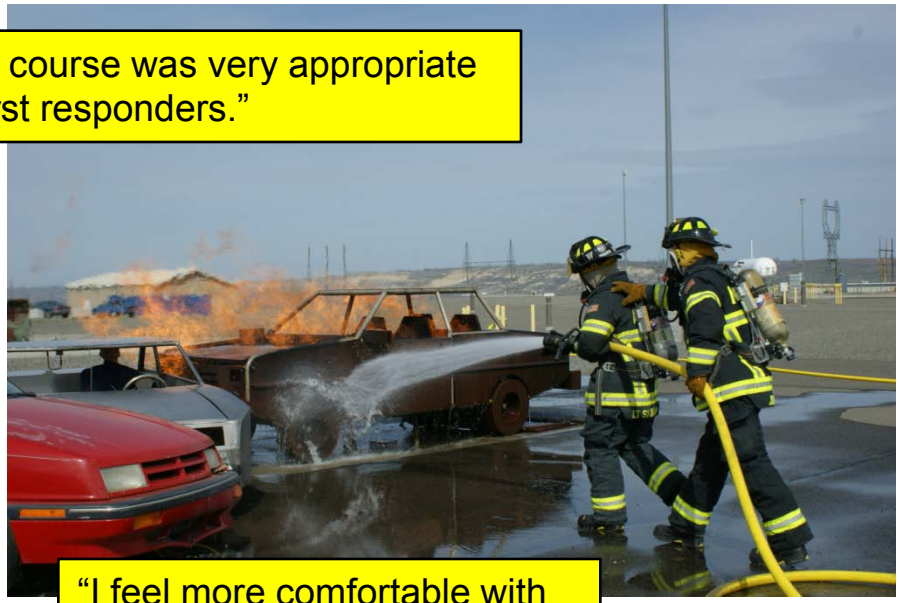
Training that is Hands-On! (continued)

"I am now prepared to operate in a safer and more effective manner."

"This course was very appropriate for first responders."



"Well done. Well worth it."

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

"Great interest in having this course to my home department."

Volpentest HAMMER

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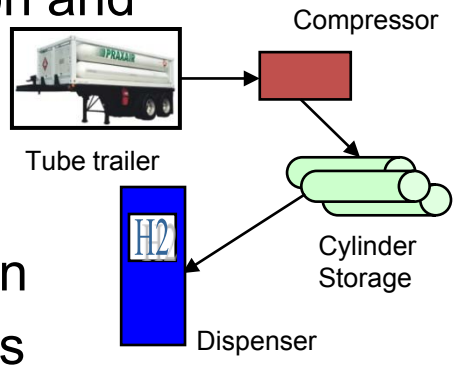
Technical Accomplishments Enhancing Course Content

- A concept white paper (*Virtual Hydrogen Fueling Station*) developed to enrich the course with new content
- To broaden and create better balance for transportation and stationary facilities content
- 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
- Virtual simulation tool could be developed for other fuel cell applications (e.g., materials handling)



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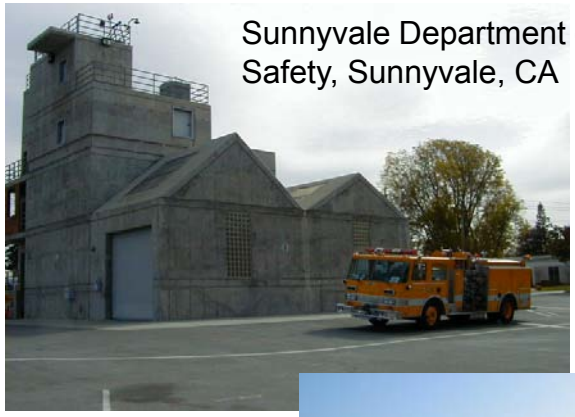
Technical Accomplishments
Offsite Deployment of Prop-Based Course

- "Planning for Offsite Deployment of the Hydrogen Fuel Cell Vehicle Prop and First Responder Training Course" developed and submitted to DOE
- Discusses key issues and activities in planning for offsite deployment of prop-based course.
- Key issues
  - Who will do the training?
  - Who will operate the prop?
  - Will we train actual first responders or their trainers?
  - Determination of instructor and prop operator qualifications
  - Contractual agreements with host training sites

Technical Accomplishments
Offsite Deployment of Prop-Based Course

- Site visits by PNNL, HAMMER, and CaFCP staff in March 2010 to three training facilities in California
- Discussions underway on collaborative agreements to provide training at these sites
- Prop will be transported to CA in its trailer and left at each site for about a week
- Three classes per site
- ~100 first responders to be trained at each site



Sunnyvale Department of Public Safety, Sunnyvale, CA

Rio Hondo College Fire Academy, Santa Fe Springs, CA

Orange County Fire Authority, Irvine, CA

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Technical Accomplishments
Outreach

- HAMMER staff attended two major first-responder conferences to raise awareness about hydrogen safety
  - Fire Department Instructors Conference (April 2009)
  - Fire Rescue International (August 2009)
- Booth display and dissemination of ~1200 awareness-level course CDs, ~1200 prop course fliers, and ~300 laminated posters

Volpentest HAMMER

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Proposed Future Work

- Take prop/course to three CA training sites in 2010 and other offsite training facilities in 2011
- Train cadre of new instructors
- Consider opportunities to collaborate with others, e.g., DOT and IAFC on training
- Enhance content of prop-based course to reflect developing markets for stationary power, portable power, auxiliary power units, and forklifts
- Add a virtual 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

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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 at HAMMER to first responders from all over the U.S.
  - Plans underway for offsite deployment at three training centers in California in 2010
  - Strong interest expressed by training centers all over the U.S. for deployment at their sites in 2011 and beyond
- **Outreach**
  - Continue to attend FDIC and FRI to disseminate materials and recruit students for future classes

Acknowledging the Collaboration

- Volpentest Hazardous Materials Management and Emergency Response (HAMMER) Training and Education Center
  - Dennis McCall
  - Scott Jones
- Hanford Fire Department
  - Captain James Bryan
- California Fuel Cell Partnership
  - Jennifer Hamilton
- PNNL
  - Linda Fassbender
  - Monte Elmore
  - Other colleagues supporting our work