



# 2010 DOE Fuel Cell Technologies Program Codes and Standards Training and Outreach and Education for Emerging Fuel Cell Technologies



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**National Renewable Energy  
Laboratory  
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**Project ID # SCS003  
and ED002**

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

# Overview

## Timeline

- Start date: Oct 1, 2007
- Percent complete: ongoing

## Barriers

- Knowledge of codes and standards – (D,E)
- Jurisdictional Issues (M)

## Budget

- Funding received in FY09: \$0.5M (Vehicle Technologies)
- Funding for FY10: \$0.45M, (\$0.3M from SCS and \$0.15M from Education)

## Partners

- National H2/Fuel Cells Codes and Standards Coordinating Committee (NHA, USFCC), CaFCP, CARB
- FreedomCAR-Fuel Partnership C&S Technical Team, DoD

# Objectives

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- Advance renewable energy safety, code development, and market transformation issues by distribution of information
- Facilitate the safe deployment of renewable energy technologies
- Overcome barriers to emerging fuel cell technologies, specifically fuel cell powered forklift vehicles and stationary fuel cells used for back up power

# Approach

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- Research and Development
  - Use workshops to help define research needs
- Codes & Standards Coordination
  - Code and Standards workshops to help define codes and standards gaps
  - SNL, LANL, ORNL, ANL, PNNL, NASA, NIST, JRC, UL, NHA, USFCC, CaFCP, CARB, SDO's, CDO's, Industry
- Support Technology Readiness/Market Transformation
  - Permitting workshops, web based information compendium, hydrogen fact sheets, third party safety reviews and site visits

# Technical Accomplishments

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- Conducted the following workshops in FY10:
  - October 15, 2009 Tampa, Florida in collaboration with the Florida Fire Bureau
  - November 13, 2009 Metairie, LA in collaboration with the Jefferson Parish Fire Department
- The following workshops are planned for remainder of FY10:
  - May San Francisco, CA in collaboration with the California Fuel Cell Partnership and San Francisco Fire Department
  - July Los Angeles, CA in collaboration with the California Fuel Cell Partnership and Los Angeles Fire Department
  - September East Coast location TBD
- Web based Information Compendium maintained

# Technical Accomplishments

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- Code Official training course deployed in FY09
- Electric vehicle (EV) module added to web based Code Officials Training that covers the following topics:
  - Basics of electric vehicles
  - Charging stations
- More than 500 course visitors to date

# Technical Accomplishments

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- Identified two key emerging fuel cell technology projects for direct project support including site visits:
  - Stationary fuel cell for back up power
  - Indoor hydrogen fueling for forklifts
- Site visit for stationary fuel cell conducted April 26, 2010
  - Draft report for stationary fuel cell
- Site visit for indoor hydrogen fueling scheduled

# Codes and Standards Workshops

- Workshops held in Tampa, FL (Oct 09) & Metairie, LA (Nov 09)
  - Held in key locations identified by Industry and Regional trade organizations with invited code officials and project developers
  - Provide essential background on renewable energy technologies and applications
    - hydrogen fueling stations
    - hydrogen fuel cells in telecom applications
    - electric vehicle safety and charging stations
  - Provide workshop participants with with basic safety information and an overview of applicable codes and standards
  - Participants develop a permitting tool to assist in future permit review
- Proceedings on NHA website:  
[www.hydrogenandfuelcellsafety.info](http://www.hydrogenandfuelcellsafety.info)
- 5 Workshops planned for FY10 in key regions



# Jefferson Parish, LA Workshop

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- Key workshop objective was providing information on codes and standards to code officials who will be directly involved in project review
- Attendees included key individuals such the parish's Plans Review Officer and the Fire prevention Chief
- Workshop conducted in partnership with the Jefferson Parish Fire Department and in conjunction with training in NFPA 1 Uniform Fire Code® which ensured a good audience

# Jefferson Parish, LA Workshop

## Agenda

**NREL Hydrogen and Renewable Energy Technologies**

**Codes and Standards Workshop**

**Metairie, Louisiana**

**November 13, 2009**

## **AGENDA**

**11:30 AM – 12:30 PM Lunch**

**12:30 PM Welcome Remarks**

Sam Vanover, Jefferson Parish Fire Department

**12:30 PM – 12:45 PM Workshop Background & Objectives**

*Carl Rivkin, NREL*

**12:45 PM – 1:15 PM Overview of Renewable Energy and Fuels**

*Melanie Caton, NREL*

**1:15 PM – 2:15 PM Hydrogen Regulations, Codes, and Standards**

*Carl Rivkin, NREL*

**2:15 PM – 2:45 PM Break**

**2:45 PM – 3:15 PM Codes and Standards Website & Education Tools**

*Melanie Caton, NREL*

**3:15 PM – 4:00 PM Hydrogen Fueling Station Case Studies**

*Carl Rivkin, NREL*

**4:00 PM – 4:30 PM Workshop Wrap-Up**

*Carl Rivkin, NREL*

# Jefferson Parish, LA Workshop

- **Responses to What did you like about the workshop?**
  - Very professionally presented with plenty of information
  - It was a new topic considering what we have been exposed to
  - Introduced new technology
  - A lot of information. Lots of great sites given for further viewing
  - I learned new ideas about alternative fuels, mainly hydrogen
  - The reference to resources, including the flash drive of the presentation that can be stored for future use and reference and share with colleagues.
  - Good awareness of what's coming
  - Subject was new to me
  - The informal exchange of information. Q & A
  - Did not know anything on this subject. Helped me understand better
  - Had info no one else has

# Jefferson Parish, LA Workshop

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## Responses to What improvements, if any, would you recommend to the workshop?

- More time to be more in depth with regard to questions and the Processes
- Make it more concise
- More ideas of how will effect me personally
- More on codes
- None
- None
- Good as is

# Web Based Information Compendium

Accessible at

<http://www1.eere.energy.gov/hydrogenandfuelcells/codes/>

Information compendium:

NREL will update  
code official training  
to include a module  
on electric vehicles

Fuel Cell Technologies Program: Safety, Codes and Standards

4/7/10 9:45 AM

The screenshot displays the website for the Fuel Cell Technologies Program, specifically the Safety, Codes and Standards section. The header includes the U.S. Department of Energy logo and the program name. A navigation bar contains links for 'About the Program', 'Program Areas', 'Information Resources', 'Financial Opportunities', 'Technologies', 'Market Transformation', and 'Home'. A search bar is located in the top right corner. The main content area features a 'H<sub>2</sub> Safety Snapshot' article with a sub-header 'Check out safety best practices, lessons learned, and a bibliographic database featured in the inaugural issue of this hydrogen safety bulletin (PDF 431 KB). Download Adobe Reader.' Below the article, there are sections for 'Hydrogen, in vast quantities, has been used safely for many years...', 'DOE is working to develop and implement practices...', 'The Hydrogen Safety Bibliographic Database provides references...', 'The Hydrogen Incident Reporting Database provides lessons learned...', 'A Permitting Hydrogen Facilities Web site identifies model codes...', and 'The Introduction to Hydrogen Safety for First Responders Web-based course provides an "awareness level" hydrogen overview...'. A 'Quick Links' sidebar on the left lists categories like 'Hydrogen Production', 'Hydrogen Delivery', 'Hydrogen Storage', 'Fuel Cells', 'Technology', 'Validation', 'Education', and 'Systems Analysis'. A 'NEWS' sidebar on the right lists recent events such as 'DOE Publishes Fuel Cell Workshop Proceedings' and 'DOE To Host Annual Merit Review Meeting'. A 'Permitting Hydrogen Facilities' sidebar at the bottom right highlights fueling stations and telecommunication use.

file:///Users/crivkin/Documents/Administration/AOP/AOP-10/FuelN2OC...nologies%20Program%20Safety%20Codes%20and%20Standards.webarchive

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# Code Official Training Course

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- Electric vehicle module added to web based Code Officials Training covers:
  - Types of electric vehicles
  - Battery technologies
  - Electric vehicle charging
- Additional deployments efforts will include:
  - Posting course links on key web sites
  - Presenting information on the course at codes and standards workshops
  - Developing a fact sheet describing the course for potential attendees
  - Large conferences and other key events

# Web Based Information Compendium

Accessible at [http://www.hydrogen.energy.gov/fueling\\_stations/](http://www.hydrogen.energy.gov/fueling_stations/)

The screenshot shows a web browser window displaying the U.S. Department of Energy's Hydrogen Program website. The page title is "Hydrogen Fueling Station Codes and Standards". The header includes the U.S. Department of Energy logo and the "hydrogen.energy.gov" URL. A search bar is visible in the top right corner. The main content area is divided into several sections:

- Hydrogen Fueling Stations:** A paragraph explaining that as the nation moves toward a hydrogen economy, key infrastructures must be developed to support the growing number of hydrogen-powered vehicles. One basic need is hydrogen fueling stations. These stations will provide the hydrogen to power America's vehicles, and economy, toward energy independence.
- Permitting Process:** A paragraph stating that today, more than 60 hydrogen fueling stations are operating throughout the United States, but fewer than 20 are available for public use. In contrast, according to the U.S. Census Bureau, the United States has more than 121,000 gasoline fueling stations. If hydrogen-powered vehicles are to become an important, and common, technology of America's energy future, a vast network of public stations will be necessary to support them.
- Codes & Standards Search:** A paragraph noting that although there is only a small number of hydrogen fueling stations today, national codes and standards have been developed to address their construction, operation, and maintenance. These codes and standards are necessary to ensure safe development and deployment, and many organizations are working to improve the existing codes and standards and address remaining gaps.
- Related Links:** A paragraph stating that to support smoother, more efficient permitting of hydrogen fueling stations, the U.S. Department of Energy is working with codes and standards development organizations, code officials, national laboratories, and industry experts. Its goals are to identify and address hydrogen fueling station codes and standards issues, support the creation of relevant codes and standards, and provide up-to-date information to permitting officials.

On the left side of the page, there is a navigation menu with the following items:

- > Hydrogen Fueling Stations
- > Permitting Process
- > Codes & Standards Search
- > Related Links
- > Contacts

At the bottom of the page, there is a footer with the following text: "Contact Us | Security & Privacy | Hydrogen Program Home | USA.gov". The browser's address bar shows the URL "http://www.hydrogen.energy.gov/".

# Two Case Studies In Emerging Fuel Cell Technologies

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**Case 1:** Indoor hydrogen dispensing operation to support forklift vehicles

- Select project that is in the planning phase where NREL's involvement could assist the project developers and Authority Having Jurisdictions (AHJ) in their codes and standards evaluation and safety review

**Case 2:** Stationary Fuel Cell used for back up power at the Marine Corps Logistics Base, Barstow, CA

- Plan to use a PEM fuel cell for backup power at the base fire station



# Project Components and Procedures

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- Identify the AHJ (s) (projects may have multiple AHJs which can increase coordination efforts)
- Perform site safety review identifying hazards that may be unique to the site
- Perform Codes and Standards evaluation for the project
  - List of applicable codes and standard citations
  - Evaluation of compliance status for each citation
  - Recommendations on any potential compliance issue
- Work directly with site project personnel and AHJs to ensure safety, and codes and standards questions are addressed
- Provide background information to site project personnel and AHJs

# Case 1: Indoor Hydrogen Dispensing

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- Evaluate all components of the operation including:
  - Hydrogen storage/generation
  - Hydrogen dispensing unit (s)
  - Operation of the forklift vehicles within the facility and in the cargo containers that they service and other potentially confined spaces
  - Building ventilation
  - Building alarm system
  - Building egress requirements relative to dispenser location
  - Operator training plans
  - Facility and vehicle maintenance plans

# Case 2: Stationary Fuel Cell

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- Evaluate all components of fuel cell installation and operation including:
  - Storage and delivery of hydrogen to the site
  - Fuel cell operation and maintenance
  - Operator training

# Technical Report

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- The technical report will include the following elements:
- Project description and background including project funding information if available
- Comprehensive codes and standards evaluation including any applicable local ordinances
- Recommendations on any compliance issues
- Recommendations on any potential improvements in the administrative process the project required
- Recommendations on how the findings could be applied to other projects
- Photographs of the site and equipment (if allowed)

# Future Work

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- Continue outreach activities such as workshops and safety reviews
- Workshops will be planned and delivered in close collaboration with local and regional organizations
- Continue to extend web based compendium to include information on other alternative fuels and renewable energy technologies
- Add case studies on emerging fuel cell technology projects to the compendium

# Summary

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- NREL will continue to support technology readiness of renewable energy technologies through programs such as the workshops for code officials, project developers and other interested parties safety reviews, and the web based information compendium that includes on line training
- Workshops will be focused on geographic areas where there is project activity and desired attendees are code officials, project developers, and other interested parties who will be directly involved in project work
- Look to workshops to help define potential codes and standards issues as well as research and development efforts
- Technical reports documenting site visits will assist code official and project developers

Mr. Rivkin,

On behalf of the Jefferson Parish Fire Prevention Bureau and Inspector Vanover, please allow me to express our gratitude for the classroom instruction, distributed information, refreshments and the excellent meal that you provided for our seminar. You, Ms. Caton and NREL put on a first class event. We are fortunate to acquire this leading edge training.

Initially, I was worried about the topic being a bit too technical for our group. That all went away in the manner the information was delivered. Especially when the questions came repetitively, I knew that the audience was taking an interest.

Thank you,

Dennis Guidry

Fire Prevention Chief

Jefferson Parish Fire Prevention Bureau

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