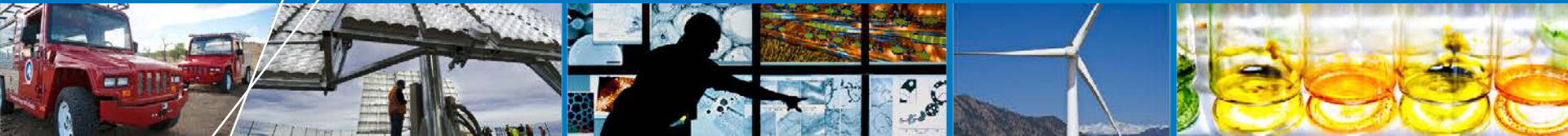


# Fuel Cell Technologies National Codes & Standards Coordination



**2012 DOE Annual Merit Review**

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**National Renewable Energy Laboratory**

**May 15, 2012**

**Project ID # SCS001**

THIS PRESENTATION DOES NOT CONTAIN ANY PROPRIETARY, CONFIDENTIAL OR OTHERWISE RESTRICTED INFORMATION

# Overview

## T I M E L I N E

- Start date: **October 1, 2002**
- End date: **10/2012\***

\*Project continuation and direction determined annually by DOE

## B A R R I E R S

- Insufficient synchronization of national codes and standards
- Safety data and information: limited access and availability
- Lack of hydrogen knowledge by AHJs
- Enabling national and international markets requires consistent RCS
- Insufficient technical data to revise standards

## B U D G E T

- Funding received in FY11:  
**\$ 0.75M\***
- Funding planned for FY12:  
**\$ 1.25M\***

\* *Project has added several subcontracts that account for increased funding*

## P A R T N E R S

- National H2/Fuel Cells Codes and Standards Coordinating Committee, SDOs, FCHEA, CaFCP, CARB
- US Drive and C&S Technical Team

# Relevance/Objectives

- **Conduct research & development (R&D) needed to establish sound technical requirements for renewable energy codes & standards with a major emphasis on hydrogen and fuel cell technologies**
  - Note that there is an NREL presentation (scs\_002) on research supporting codes and standards development
- **Support code development for the safe use of renewable energy in commercial, residential, and transportation applications with a major emphasis on hydrogen fuel cell vehicle technologies**
- **Advance renewable energy safety and code development by collaboration with stakeholders**
- **Facilitate the safe deployment of renewable energy technologies by working directly on key codes and standards projects and hydrogen technology deployment projects**

# Approach

The following approach will ensure that all codes and standards are in place to deploy hydrogen and fuel cell technologies:

- **Codes & Standards Coordination and Development**

- Code development support including: Society of Automotive Engineers (SAE), National Fire Protection Association (NFPA), CSA Standards, International Code Council (ICC), Compressed Gas Association (CGA), International Organization for Standardization (ISO), International Electrical Commission (IEC), Underwriters Laboratories (UL)
- Direct technical committee involvement is key element of approach
- Coordination committees: C&S Tech Team, HIPOC, National Codes and Standards Coordinating Committee
- Technical studies such as NREL's gap analyses:
  - Blake, C.; Rivkin, C. (2010). Stationary Fuel Cells Codes and Standards: Overview and Gap Analysis. 32 pp.; NREL Report No. TP-560-49165.
  - Blake, C.; Buttner, W.; Rivkin, C. (2010). Vehicle Codes and Standards: Overview and Gap Analysis. 193 pp.; NREL Report No. TP-560-47336.

- **Collaboration**

- SNL, LANL, PNNL, NASA, NIST, JRC, FCHEA, CaFCP, CARB, SDOs, CDOs, industry

- **Support Technology Deployment**

- Permitting workshops, third party safety review, codes and standards compliance templates, and web based information compendium

# Approach—Coordinating Tool—NREL Product

By clicking on the SDO logo from the first slide, the user is guided to information on collaborative work within codes and standards, with online links.

Click on logos for more information

INTERNATIONAL ORGANIZATIONS

DOE/National Laboratory Representation in the Codes and Standards Development Process

Updated Nov 2010

**SAE** Society of Automotive Engineers

RESPONSIBILITY: Vehicle Standards

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COMMITTEES:

- SAE Fuel Cell Technology Committee
  - SAE J1766
  - SAE J2572
  - SAE J2574
  - SAE J2578
  - SAE J2610
  - SAE J2615
  - SAE J2616
  - SAE J2617

DOE/National Laboratory Representation in the Codes and Standards Development Process

**SAE** Society of Automotive Engineers: J2578

HOME

SAE Main

Document (s)	Technical Committee	Representative
SAE J2578	SAE J2578 Recommended Practice for General Fuel Cell Vehicle Safety	Robert Burgess, NREL Glenn Scheffler, Consultant to DOE Christine Sloane, Consultant to NREL

Hydrogen/Fuel Cell Codes & Standards Web links

• [SAE J2578](#)

Information from [fuelcellstandards.com](http://fuelcellstandards.com)

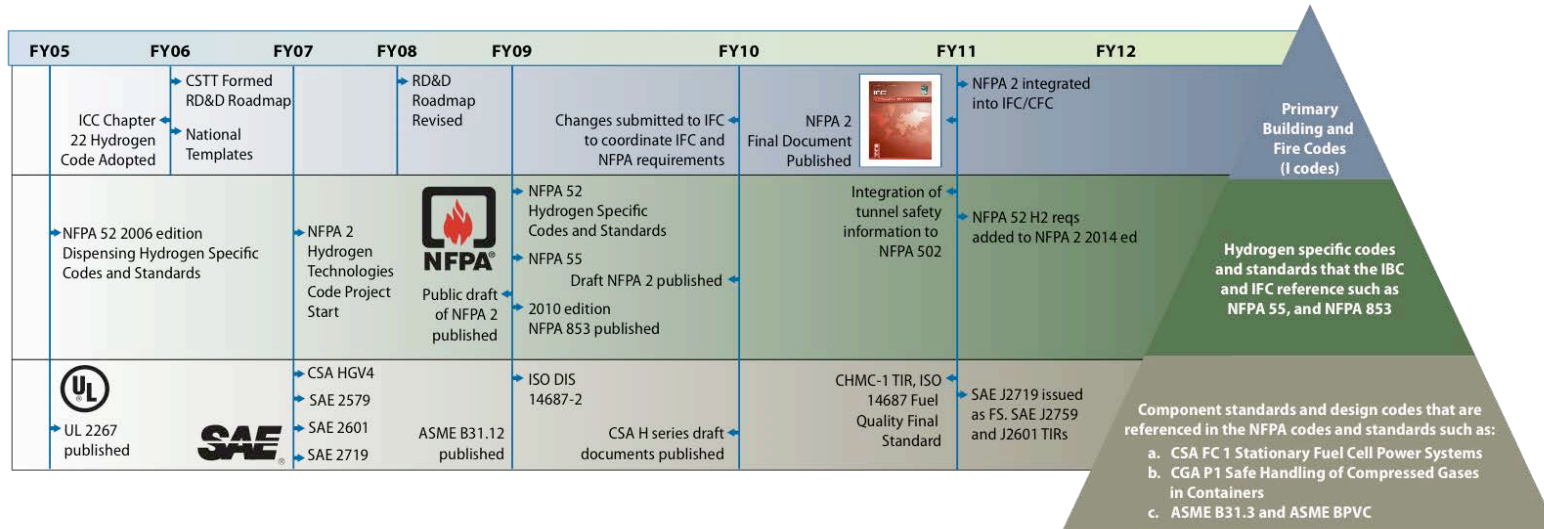
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Updated Nov 2010

# Technical Accomplishments & Progress

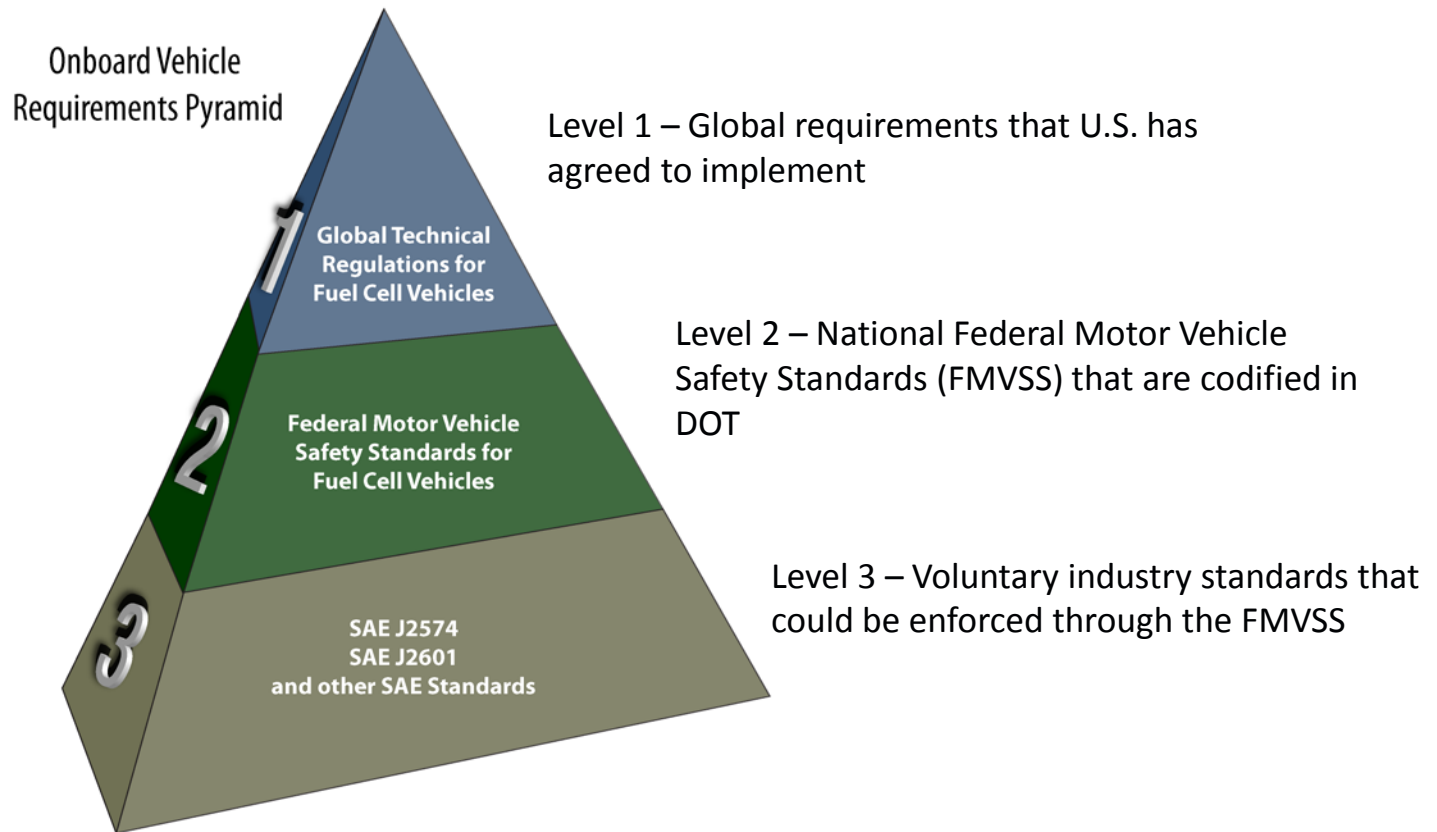
- Timeline showing development of key C&S

- Pyramid showing hierarchy of infrastructure C&S



# Technical Accomplishments & Progress

## Hierarchy of Vehicle Regulations, Codes and Standards (RCS) and RCS accomplishments



# Technical Accomplishment – NREL Developed 2020 Vehicle Deployment Plan

- **Plan that will identify the Regulations, Codes and Standards (RCS) required to deploy hydrogen fuel cell vehicles on a commercial basis by 2020**
- **Key RCS issues identified in the 2020 Plan:**
  - Promulgation of Federal Motor Vehicle Safety Standards (FMVSS) that address hydrogen fuel cell vehicles
  - Integration of NFPA 2 Hydrogen Technologies Code into the International Fire Code (IFC)
  - Modification of regional infrastructure regulations and ordinances that restrict the use of hydrogen fuel cell vehicles (i.e., restrictions on the use of hydrogen fuel cell vehicles in regional tunnel systems)
  - State metrology regulations that allow for the commercial sale of hydrogen
  - Identify regional regulations such as the California CEQA regulations that impact hydrogen fueling station deployment
  - Promulgate as final standards key component and vehicle standards such as CSA HPRD-1 and SAE J2601



# Technical Accomplishment – Create Path to U.S. Fuel Cell Vehicle Deployment

- **NREL has defined a key path to deployment of hydrogen fuel cell vehicles in the U.S.:**
  - California has the most substantive regulatory requirements pushing the deployment of hydrogen fuel cell vehicles
  - Promulgation of the 2020 California Fire Code based on the 2018 IFC that would contain the 2014 NFPA 2 requirements
  - NREL has worked closely with the California organizations such as the California Fuel Cell Partnership and California Air Resources Board to:
    - Develop guidance documents for technology deployment
    - Provide codes and standards training
    - Provide third party safety reviews for key projects

# Technical Accomplishment – NFPA 2 Hydrogen Technologies Codes

- **NFPA 2 is a comprehensive hydrogen technologies code, 1<sup>st</sup> edition issued 2011**
- **Chapters that cover the fundamental safety aspects of hydrogen applications followed by application specific chapters**
- **NREL has supported the development of the second edition of this code through:**
  - Evaluation of outstanding code issues - particularly the chapters that were designated as reserved in the 2011 edition of NFPA 2
  - Identification of key project work areas such as tunnels and public parking garages
  - Identification of portions of the code to be integrated into the IFC
  - Acted as principal committee members and task group members
- **NREL has also made contributions to other codes and standards projects including SAE J2601 and CSA H series of documents**

# Technical Accomplishment – Codes & Standards Coordination Committees

- **Manage codes and standards development by**
  - Supporting CSTT (Codes & Standards Tech Team) – develop and maintain the “2020” plan for defining and tracking C&S work required for deployment of hydrogen fuel cell vehicles
  - Supporting National Hydrogen and Fuel Cells Codes & Standards Coordinating Committee (NHA, USFCC) – monthly meetings that serve as a forum for the C&S development community to share information
  - Supporting HIPOC (Hydrogen Industry Panel on Codes) – industry group chartered with coordinating the hydrogen technology requirements found in the ICC codes and NFPA codes and standards
  - Acting as technical monitor for subcontracts supporting codes and standards development
  - Coordinated domestic and international code development efforts by meeting with international code development organizations including representatives from Japan and Canada

# Technical Accomplishments – Subcontracting Support Distributed Across RCS Development

- **Manage subcontracts with the following organizations tasked with furthering the development of specific aspects of hydrogen technology codes and standards:**
  - FCHEA – Coordinating activities and safety report
  - NFPA – Research Foundation
  - ICC – HIPOC and code integration
  - SAE – Research and testing for developing SAE J2601
  - CGA – ISO T/C 197 secretariat
  - CSA Standards – Testing and validation for standards development
  - Other companies supporting key code development projects such as the GTR and NFPA 2

# Milestones

- NREL has met all milestones and deliverables to date

## FY 2012 Milestones

	Milestones	Completion Date
7.1.1	Review of 2020 Implementation Plan Complete	2/28/12
7.1.2	Review of NREL coverage on codes and standards committees	12/31/11
7.1.3	Key projects requiring coordination identified	3/31/12
7.2.1	Complete Plan for Sensor Test laboratory based on input from FY 2011 Sensor Workshop	12/31/11
7.3.1	Codes and standards outreach plan complete	11/30/11
7.3.2	Identify site for third party safety analysis	4/30/12
7.4	Subcontracting Plan Complete	10/31/11
7.5	Component testing plan complete	12/31/12

## FY 2012 Deliverables

	Deliverables	Completion Date
7.1-7.3	Quarterly technical reports	10/11, 04/12, 07/12
7.1.1	Biannual reports on the progress made in the 2020 deployment plan	3/31/12 and 9/30/12
7.1.2	Biannual updates of the Codes and Standards activities entered into coordinating software	3/31/12 and 9/30/12
7.1.2	Produce annual report on fuel quality coordination activities including ISO standard development, ASTM standard development, and NIST weight and measures manuals	09/12
7.1.3	International Codes and Standards Coordination Plan Complete Update and progress Report	6/30/12
7.2.1	Biannual reports summarizing sensor test results	3/12 and 9/12
7.3.1	Final report summarizing workshops	9/12
7.3.2	NREL Technical Report documenting third party safety analysis	9/30/12
7.4	Report summarizing results of research activities supported through subcontracts	9/12
7.5	Report describing component testing projects, the codes and standards projects they support, and their place in the 2020 Deployment Plan	8/31/12

# Summary

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- **Research efforts to support codes and standards development will be focused on component testing and hydrogen safety sensor testing**
- **Codes & standards development will continue through direct support of standards development organizations and participation on or operation of coordination committees**
- **Deployment support will be focused on locations with project activity and concrete deployment plans**
- **These goals can only be accomplished through collaborations with key stakeholders at all levels**
- **NREL will continue to support deployment of hydrogen and fuel cell technologies through programs such as the workshops for permitting officials, safety reviews, and the web-based information compendium**

# Proposed Future Work

## *Codes and Standards Coordination*

- **Continue work with national and international codes & standards development through direct support of SDO and CDO organizations and collaboration with key stakeholders with special focus on C&S coordination to increase efficiency in incorporating research into C&S**
- **Support the development of the FMVSS and other key project areas such as comprehensive infrastructure requirements identified in the 2020 plan**
- **Assist code officials, project developers, and other interested parties use new codes and standards such NFPA 2 through outreach activities with special focus on key jurisdictions in California**
- **Work at the leading edge of vehicle deployment to reduce barriers to fueling station deployment**