

## VIII.6 National Codes and Standards Coordination

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### Subcontractors:

- Bethlehem Hydrogen, Emmaus, PA
- CSA Standards, Cleveland, OH
- FP2 Fire Protection Engineering, Golden, CO
- GWS Solutions, Tolland, CT
- Kelvin Hecht, Avon, CT
- MorEvents, Englewood, CO
- SAE International (SAE), Warrendale, PA
- Sloane Solutions, Oxford, MI
- Steele Consulting, Cypress, CA

Project Start Date: 1995

Project End Date: Project continuation and direction determined annually by DOE

- (F) Limited DOE Role in the Development of International Standards
- (G) Inadequate Representation at International Forums
- (H) International Competitiveness
- (I) Conflicts between Domestic and International Standards
- (J) Lack of National Consensus on Codes and Standards
- (K) Lack of Sustained Domestic Industry Support at International Technical Committees
- (L) Competition in Sales of Published Standards
- (M) Insufficient Technical Data to Revise Standards
- (N) Affordable Insurance is Not Available
- (O) Large Footprint Requirements for Hydrogen Refueling Stations
- (P) Parking and Other Access Restrictions

### Technical Targets

Table 1 shows the NREL support for achieving DOE technical targets, specifically supporting the development of the codes and standards required to deploy hydrogen and fuel cell technologies. This technical target is described on pages 3.7-1 and 2 of the Codes and Standards – Technical Plan.

### Fiscal Year (FY) 2011 Objectives

- Facilitate the safe deployment of hydrogen and fuel cell technologies.
- Identify the codes and standards required to deploy hydrogen and fuel cell technologies. Identify the research and validation testing required to support the development of the needed codes and standards.
- Advance safety, code development, and market transformation through collaboration with appropriate stakeholders.

### Technical Barriers

This project addresses the following technical barriers from the Safety, Codes and Standards section (3.7) of the Fuel Cell Technologies Program Multi-Year Research, Development and Demonstration Plan:

- (A) Limited Government Influence on Model Codes
- (B) Competition among SDOs and CDOs
- (C) Limited State Funds for New Codes
- (D) Large Number of Local Government Jurisdictions.
- (E) Lack of Consistency in Training of Officials

### FY 2011 Accomplishments

NREL accomplished the following in support of section 3.7 of the DOE Fuel Cell Technologies Program Multi-Year Research, Development and Demonstration Plan:

- NREL supported the development of National Fire Protection Association (NFPA) 2 Hydrogen Technologies Code that was published as a final document January 2011. NREL staff acted as a principal member of the NFPA Hydrogen Technology Technical Committee and acted as task group leader with the planning task group.
- Sensor Workshop: NREL conducted a Sensor Workshop in June 2011. The purpose of the workshop was to review the performance benchmarks set at the 2007 DOE Sensor Workshop and refine them based on defining performance criteria for specific applications. These applications include indoor hydrogen fueling, hydrogen storage, and residential fuel cells and fuel dispensing.
- Component testing: Initiated test work on compressed natural gas (CNG) nozzle failures. The purpose of this project is to determine the root cause for CNG nozzle failures that took place approximately 10 years ago. The concern is that the same failure mechanism may be an issue with hydrogen fueling operations. Test results should be available by the end of FY 2011.

TABLE 1. Progress toward Meeting Technical Targets for Safety Codes and Standards

DOE Accomplishments in Support of the Development of Regulations, Codes and Standards for the Deployment of Hydrogen and Fuel Cell Technologies			
Regulation, Code, or Standard	NREL Support	Status	Time Saved Producing Document (resulting from DOE support)
1. Global Technical Regulation for Fuel Cell Vehicles	Tank testing data, SAE standard that provided basis for document, expert technical support from Dr. Sloane and Glenn Scheffler	Phase 1 work complete in 2011	5 years
2. NFPA 2 Hydrogen Technologies Code	Extensive technical analysis to develop risk informed requirements for siting hydrogen storage systems. Extensive logistical support including support committee chair and consultant producing draft code document	Final document promulgated 2011	3 years
3. International Fire Code (IFC) Section 2209 Hydrogen Motor-Fuel Dispensing and Generation Facilities	Supported Hydrogen Ad Hoc Working Group that wrote section 2209	Final document promulgated 2003	6 years
4. SAE J2579 Technical Information Report (TIR) for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles	Performed validation testing through subcontractor Provided logistical support for SAE Fuel Cell Technical Committee	TIR published 2009	3 years
5. SAE J2601 Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles	Performed validation testing for fueling algorithm in standard. Provided logistical support for SAE Fuel Cell Technical Committee	Standard published 2010	3 years
6. International Organization for Standardization (ISO) 14687 Hydrogen fuel – Product specification – Part 2: Proton exchange membrane fuel cell applications for road vehicles, SAE J2719 – Development of a Hydrogen Quality Guideline for Fuel Cell Vehicles	Extensive test data, logistical support, and coordination of ISO/SAE standard development activities	Both documents will likely be issued as final in 2011	5 years
7. CSA Standards H series of component standards for hydrogen dispensing operations and onboard vehicle safety	Extensive logistical support as well as validation testing of the high-pressure relief device standard	Documents published as drafts to be issued as final documents in 2011 and 2012 for hydrogen gaseous vehicle 4.3	6 years
8. American Society of Mechanical Engineers B31.12 Hydrogen Piping and Pipelines	Provided test data and logistical support	Final document 2008	3 years
9. Compressed Gas Association Hydrogen Documents including G-5 through G5-8	Provided logistical support	Documents issued 2004 through 2007	3 years

- Fuel quality specification: NREL continued to support the promulgation of ASTM standards that require contaminant testing to show compliance with the ISO standard through funding the production of calibration gases required to verify the ASTM test methods. Additionally, NREL supported the work of Michael Steele, Chairman of the SAE Fuel Cells Technical Committee, who has produced an Information Report on the development of a hydrogen quality guideline for fuel cell vehicles.
- Codes and standards coordination: NREL continued to support the coordination of codes and standards development through software that identified the

standards development organizations (SDOs) and code development organizations (CDOs) involved in hydrogen and fuel cell technologies codes and standards development. NREL has updated this software to include current project information.

- Subcontract Management: NREL assumed responsibility for several additional subcontracts. NREL staff developed new statements of work for these subcontracts that reflect DOE priorities and budget constraints.



## Introduction

It is essential to develop and promulgate codes and standards in order to provide for the safe use of hydrogen and fuel cell technologies. With the help of key stakeholders, the DOE Fuel Cell Technologies (FCT) Program and NREL are coordinating a collaborative national effort to prepare, review, and promulgate codes and standards for all hydrogen and fuel cell technologies.

## Approach

The FCT program recognizes that domestic and international codes and standards must be established to enable the timely commercialization and safe use of hydrogen and fuel cell technologies. The lack of codes and standards applicable to hydrogen and fuel cell technologies is an institutional barrier to deploying these technologies. It is in the national interest to eliminate this potential barrier. As such, the sub-program works with domestic and international SDOs to facilitate the development of performance-based and prescriptive codes and standards. These standards are then referenced by building and other codes to expedite regulatory approval of hydrogen and fuel cell technologies. This approach ensures that United States (U.S.) consumers can purchase products that are safe and reliable, regardless of their country of origin, and that U.S. companies can compete internationally by having coordinated consistent requirements.

## Results

The Safety, Codes and Standards work is divided into three major areas:

1. Codes and Standards Coordination
2. Codes and Standards Research
3. Codes and Standards Training and Outreach

This report addresses the National Template.

## Codes and Standards Coordination

Figure 1, Hierarchy of Codes and Standards Implementation, shows both the hierarchy for enforcing codes and standards and some of the progress made in promulgating the codes and standards required to implement hydrogen and fuel cell technologies. Figure 2 shows the front page of the coordinating software NREL has developed to track codes and standards development activities.

In FY 2011 substantial progress was made in this implementation effort. NFPA 2 Hydrogen Technologies Code was published as a final document in January 2011. NREL will be working on coordinating the requirements of NFPA 2 with the hydrogen requirements in the IFC through a proposal to reference NFPA 2 in the 2015 edition of the IFC. NREL supported the development of NFPA 2 in several ways, including:

- Participated as a principal member of the technical committee.
- Funded subcontractors actively participating in the development of the document such as FP2 Fire Protection Engineering.
- Hosted Report on Comment meeting.

Another important part of codes and standards is the development of hydrogen fueling station component and system standards being performed by CSA Standards. These H-4 series of documents consists of nine component standards and one system standard that addresses hydrogen dispensing. An NREL staff member participated as a member of the CSA technical committee drafting these documents.

NREL supports the Fuel Cell and Hydrogen Energy Codes and Standards Coordinating Committee by coordinating and directing monthly meetings where SDOs,

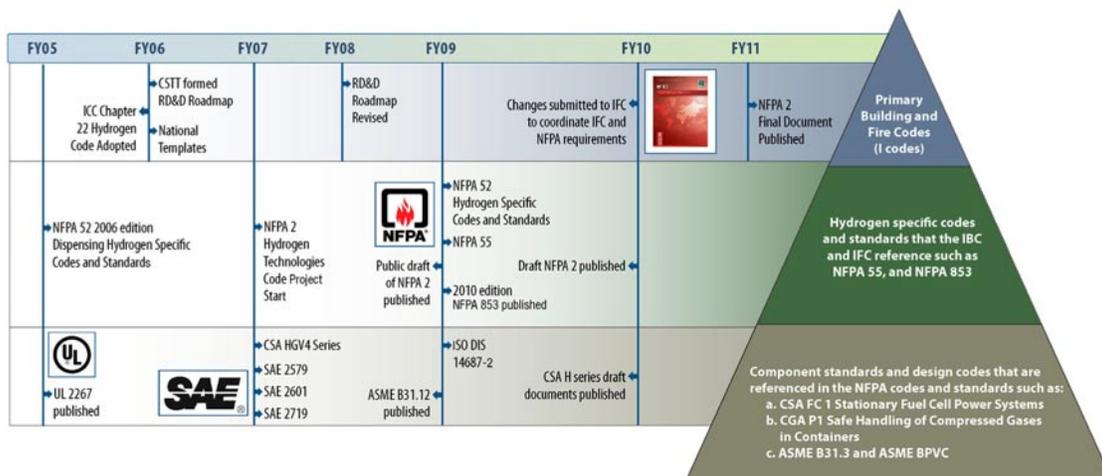


FIGURE 1. Hierarchy of Codes and Standards Implementation

