

IX.8 Codes & Standards for the Hydrogen Economy

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Subcontractors:

- American National Standards Institute (ANSI), New York, NY
- Compressed Gas Association (CGA), Inc., Chantilly, VA
- CSA America, Cleveland, OH
- GWS Solutions of Tolland, Tolland, CT
- United States Fuel Cell Council (USFCC), Washington, D.C.
- International Code Council, Inc., Country Club Hills, IL
- Kelvin Hecht, Avon, CT
- National Hydrogen Association, Washington, D.C.
- National Fire Protection Association (NFPA), Quincy, MA
- Society of Automotive Engineers (SAE) International, Troy, MI
- FP2 (Martin T Gresho, PE), Livermore, CA
- James M. Ohi, PhD, Denver, CO

Project Start Date: December 5, 2006

Project End Date: September 30, 2011

Objectives

- Develop a supporting research and development project to provide critical hydrogen behavior data and a detailed understanding of hydrogen combustion and safety across a range of scenarios which are needed to establish setback distances in building codes and minimize the overall data gaps in code development.
- Support and facilitate the effort, led by the NFPA, to complete the draft Hydrogen Technologies Code (NFPA 2).
- With experimental data and input from Technology Validation subprogram element activities, support and facilitate the completion of standards for bulk hydrogen storage (e.g., NFPA 55).
- Facilitate the adoption of the most recently available model codes (e.g., from the International Code Council [ICC]) in key regions.
- Complete preliminary research and development on hydrogen release scenarios to support the establishment of setback distances in building codes and provide a sound basis for model code development and adoption.
- Support and facilitate the development of Global Technical Regulations (GTR) by 2010 for hydrogen vehicle systems under the United Nations Economic Commission for Europe, World Forum for Harmonization of Vehicle Regulations and Working Party on Pollution and Energy Program (ECE-WP29/GRPE).
- Support and facilitate the completion by 2012 of necessary codes and standards needed for the early commercialization and market entry of hydrogen energy technologies.

Technical Barriers

This project addresses the following technical barriers from the Codes & Standards section of the Hydrogen, Fuel Cells and Infrastructure 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 (approximately 44,000)
- (E) Lack of Consistency in Training of Officials
- (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) Jurisdictional Legacy Issues
- (N) Insufficient Technical Data to Revise Standards
- (O) Affordable Insurance is Not Available

- (P) Large Footprint Requirements for Hydrogen Refueling Stations
- (Q) Parking and Other Access Restrictions

Accomplishments

NFPA: Entered NFPA 2 into the Fall 2010 Revision Cycle; released draft of NFPA 2, Hydrogen Technologies Code, now ready for public proposals.

Glenn Scheffler: Supported the U.S. delegation in the drafting of the GTR for fuel cell vehicles (FCVs); chaired the SAE Safety Working Group; wrote and presented a paper of FCV Safety at the 2009 SAE World Congress; chaired the U.S. Technical Advisory Groups (USTAGs) for both ISO TC197 for hydrogen and TC22/SC21 for electric vehicles including FCVs.

USFFC: Served as chair of the Technologies Committee which is responsible for development of NFPA 2 (see NFPA, above); completed first formal technical meeting focused on addressing all public proposals received during the solicitation period; changed technical committee membership representation from Sandia Labs to FP2 (Marty Gresho, another Regulatory Logic subcontractor funded by DOE) to address concerns related to separation of code makers from researchers; selected new alternate member. (Approval anticipated August 2009.)

NFPA 55 Compressed Gas Standard - Separation distance proposal developed, submitted and approved; NFPA 51A Report On Proposals meeting completed; Hydrogen Industry Panel on Codes (HIPOC) participation included development of several code change proposals to the International Fire Code (IFC) for HIPOC review, deliberation and approval; started NFPA 52 versus IFC Chapter 22 review to identify additional correlating code change proposals needed; supported NFPA 52 motion to NFPA general assembly and appeal to NFPA Standards Council with coordinated in- person appearances and testimony; initiated reformulation of HIPOC charter to balance membership and scope.

NHA: Expanded Hydrogen and Fuel Cell Safety Report to include regular contributions by the USFCC and others; developed a primer for parties who are new to hydrogen and fuel cell codes and standards; conducted a codes and standards workshop in conjunction with the NHA Annual Conference in March 2009; published reports on key national codes activities and international standards activities between NFPA's Hydrogen Technology Technical Committee (NFPA 2) and NFPA's Industrial and Medical standards activities to keep interested parties informed and provide opportunities for comment; played a leading role in developing administrative procedures for the HIPOC for 2009.

CGA: A joint task group effort was undertaken by the Gases Technical Committee to establish scientifically based fundamental separation distances between bulk compressed hydrogen systems and sensitive receptors ("exposures"). Distances are designated as "fundamental" to indicate that these distances may be altered with the application of mitigation methods, some of which have been identified while others remain in the developmental phase

SAE: Completed two research projects, thereby establishing sound technical requirements for hydrogen codes and standards; published three Technical Information Reports advancing hydrogen safety standards and code development

Kelvin Hecht: Completed redesign of the American National Standards Institute (ANSI) portal (supported by ANSI, another Regulatory Logic subcontractor) in response to National Renewable Energy Laboratory suggestions, with limited impact on users; continued to monitor the status of approximately 150 U.S. and 80 international standards, and to update the Web site in real time when changes in standards occur; provided a valuable resource to hydrogen and fuel cell development efforts and to authorities having jurisdiction for siting and operating permits as demonstrated by almost 6,000 visits per month, as well as disseminating knowledge to researchers and graduate students as reference material to address development of commercial hydrogen energy resources.



Introduction

As suggested by the barriers listed previously, the Codes & Standards area is an unusual DOE activity in that the ultimate goals and objectives cannot be achieved directly by DOE or its contractors, but must be met indirectly, as the necessary process of consensus-based codes and standards development is carried out. Virtually all relevant hydrogen-related codes and standards work rests on a voluntary, consensus-based process, in contrast to the direct development of government-based rules and regulations. In addressing the barriers, therefore, this project relies on positioning the strategic value of targeted resources aimed at removing identified "log jams" in the process, and the provision of resources when the voluntary process would otherwise succumb to delays inherent in such negotiated results. This approach enhances the free flow of important and credible information, including supporting research wherever necessary to develop or adapt new codes and standards, consistently supporting optimum participation by U.S. industry and related industry associations.

Approach

This project utilizes close collaboration between DOE program leadership, national laboratory technical experts, and the individual standards development organization (SDO) and code development organization (CDO) sub-awardees to identify the highest value contributions available for improving timeliness of the consensus-based standard development process for successful commercialization of hydrogen in stationary and mobile applications.

Results

See also the achievements listed previously: The major achievement for the year has been that NFPA 2 has been issued and entered into the standard cycle – this is a major milestone from many perspectives, including establishment of scientifically-based fundamental separation distances between bulk compressed hydrogen systems and sensitive receptors (“exposures”).

Conclusions and Future Directions

Regulatory Logic’s close collaboration with DOE and the technical experts of the national laboratories continues the funding announcement prescription that the awardee work in close collaboration with DOE to fulfill objectives of the project. The subcontractors contributing to the NFPA 2 portion of the project will continue to support and improve this document during the development cycle; subcontractors, including NHA, USFCC, ICC, SAE, ANSI, NFPA, and CSA America shall continue to publish articles and announcements of interest to the hydrogen and fuel cell communities from USFCC and third parties. In addition to expanding the reach of available information, this effort reduces the cost of producing the Hydrogen and Fuel Cell Safety Reports, as fewer original articles will need to be written due to harmonization efforts by subcontractors. The Hydrogen Primer will be included posted under the “Technical Resources” area of the Hydrogen and

Fuel Cell Safety Web site to make it easy for interested parties to locate. This tool is additionally useful for presentations to countries which are just beginning to establish national codes and standards for hydrogen and fuel cell systems. The primer will also be used to develop a site map for the Web site in late 2009; SAE documents will continue to be revised so that they will continue to be relevant as fuel cell vehicle development moves forward. Revisions reflect unique aspects of fuel cell vehicles and harmonize requirements with international standards. Future document revisions include *SAE J2578, J2799, J2579 and FTA or FMEA for H2 Refueling Process*. SAE will continue to compile necessary test data for an engineer to access the suitability of using a specific commodity plastic for containment of hydrogen; the intent is to collect this information and have it included in a central source thus facilitating reference by standards development organizations and other interested parties. A secondary objective is to generate a comprehensive testing list to facilitate the evaluation of newly developed materials. SAE International shall continue to provide technical expertise and administrative services/support to the USTAGs of ISO TC22 SC21, ISO TC197, International Electrotechnical Commission, and other groups and agencies as directed by DOE pertaining to the development of fuel cell vehicles, fueling stations, and other interface technologies.

Special Recognitions & Awards/Patents Issued

1. Kelvin Hecht was recipient for 2008 of the International Electrotechnical Commission’s annual award for outstanding service to TC105 fuel cell standards.

FY 2009 Publications/Presentations

1. All of Regulatory Logic LLC’s subcontractors presented a variety of presentations as described in their individual annual reports. Regulatory Logic LLC presented a poster at the Hydrogen Program and Vehicle Technologies Program Annual Merit Review and Peer Evaluation Meeting this past year, May 13–17, 2009.