

NATIONAL HYDROGEN AND FUEL CELLS CODES AND STANDARDS COORDINATING COMMITTEE

Wednesday, November 16th, 2011
TIME: 3:00 – 4:30 pm (Eastern Daylight Time)
CALL-IN NUMBER: 866.762.9101 Access Code 7257657#
International Call-In Number 1-203-480-6527

1 Welcome and agenda additions

2 The October draft minutes were adopted

3 DOE/HQ Update

Antonio Ruiz

Antonio provided an update. The FreedomCar and Fuel Partnership has been renamed to U.S. Drive. A new element to the partnership is that they are now admitting associate members to the partnership outside of OEMs and Energy Companies. Examples include equipment manufacturers, etc. More information can be found at: <http://www.uscar.org/guest/partnership/1/us-drive>

The FY12 budget is still under a CR. The current request is \$7M and that is what the program is working with. There has been positive support from congress regarding the request.

The ISO TC 197 Plenary meeting will be held in December in Beijing China and is considered important by the Program.

4 C&S Events and Fuel Cell Safety Information

http://www.fuelcellstandards.com/calendar_new.html

<http://www.hydrogenandfuelcellsafety.info/>

<http://www.h2incidents.org/>

Kelvin Hecht

Karen Hall

Steve Weiner/Linda Fassbender

Steve Weiner provided an update. Hypothesis IX will be taking place as noted on the calendars above. He will be giving two presentations: (1) “Web-Based Resources Enhance Hydrogen Safety Knowledge,” co-authored with a number of individuals who are active contributors to the DOE SC&S program; (2) “Safety, Codes and Standards – An Overview,” a plenary talk on behalf of DOE for its Fuel Cell Technologies Program.

The latest incidents in “H2incidents.org” were reviewed. A new Lessons Learned Corner on the compatibility of materials is in the process of being prepared for posting.

As a follow-up to ICHS topics, PNNL is working with the EC’s Joint Research Centre on a safety event information template that could be used for adding safety event records into both “H2incidents.org” and HIAD.

5 Discussion Topics

Certification of Hydrogen Dispensing Stations

Robert Wichert

Robert Wichert confirms that nozzles at the newest AC transit site are NOT listed and labeled.

Robert Boyd added that the bus fuelling nozzles at the AC transit site have been changed to high-flow, high-capacity nozzles that are not interchangeable with light vehicles and confirms that they are not listed or labeled.

Robert Boyd also provided the following information:

Continued

When we look to certify station components, we must keep in mind that the quality of the hydrogen supplied to the station must in many aspects of fuel quality such as water, oxygen and total H₂ content be of a higher “quality” than what is required at the nozzle and comply with SAE J2719. It is also important to know that while we expect some degradation in hydrogen fuel quality between the input and output of a HFS, components are not compatible with hydrogen if they outgas impurities such as sulfur compounds that are detrimental to fuel cell as detailed in SAE J2719.

CGA G-5.3 is a commercially recognized hydrogen Commodity specification and the 2011 edition provides good guidance for use with Fuel Cells and the relative hydrogen quality comparing all commercial hydrogen grades with the specification in SAE J2719. Hydrogen vehicle fueling station side component must be certified for use with hydrogen that has lower water and oxygen than the 5 ppm requirements of SAE J2719.

At CSA I have proposed using the following definition for Hydrogen currently shown in draft copies of 4.2 and CSA 4.3 which is now out for comment.

HYDROGEN: Hydrogen supplied to Hydrogen Fueling Stations (HFS) and for hydrogen component compatibility testing shall meet the H₂ commodity specifications found within CGA G-5.3-2011 (or later) for Fuel Cell grade hydrogen. The output of a HFS is a H35 or H70 dispenser nozzle that connects to a Hydrogen Fuel Cell Vehicle. Hydrogen (fuel) quality as measured at the HFS dispenser nozzle shall comply with SAE J2719.

I believe that the publication of CGA G-5.3 and strong linkage between CGA G-5.3 and SAE J2719 is further evidence of industry support for SAE J2719 and adds further credibility to the NIST approach to link the definition of motor fuel hydrogen in Hand Book 130, “*Engine Fuel Quality Requirements for Hydrogen*” to SAE J2719.

2.XX. Hydrogen Fuel. - Shall meet the most recent version of SAE J2719, “Hydrogen Fuel Quality for Fuel Cell Vehicles.”

One further thought is that EIGA will likely be currently trying to harmonize CGA G-5.3 with the fuel commodity specifications that EIGA IGC members currently use for commercial sales, however it appears that the only relevant counterpart CGA G-5.3 is the ISO document 14687-1 and it will be interesting to see how is eventually updated to refer to 14687-2 (and 14687-3)

Hydrogen Fuel Quality and Measurement

SAE J2719

Mike Steele

The standard has been published. As a result, the item will be removed from the agenda.

ISO DIS 14687-2

Jim Ohi

A working group 12 meeting was held last week. The group addressed each comment submitted on the DIS and submitted a final DIS draft to the group for review. It will be submitted to the TC 197 Secretariat next month. Final ballot will be late spring 2012.

ASTM D.03-14

Jackie Birdsall

The ASTM meetings will be held in New Orleans Dec 6-7. ILS results to date are expected to be available. The committee seeks GC/MS ILS participants; currently Ca DMS and Atlantic Analytical have submitted

Continued

intentions to participate. Jim Ohi also stated that the Japanese would like to participate in some way, although an ILS would be difficult due to shipping. They would like to discuss parallel efforts.

NIST (See Attachment)

Juana Williams & Marc Buttler

John Roach, California DMS provided information that a second type evaluation application has been submitted to DMS. The first application is nearing approval, and the process has begun on the latest application. Flat rates are currently being used in most locations, however, in California, the evaluation is related to sale by mass (kilogram).

Fuel Cell Forklifts/Indoor Fueling

Aaron Harris

Aaron Harris provided an update. CSA HPIT-1 is out for public comment. Please submit your comments.

6 Codes and Standards Organization Updates

ISO TC 197

November 2011 Update

ANSI-Accredited U.S. TAG for ISO/TC 197, *Hydrogen technologies*

1. Pending ballots

- ISO/FDIS 22734-2, *Hydrogen generators using water electrolysis process — Part 2: Residential applications*
The U.S. TAG submitted a vote of "**Approve.**" The ISO ballot ends on October 27.
- ISO/DIS 15869, *Gaseous hydrogen and hydrogen blends — Land vehicle fuel tanks*
The U.S. TAG submitted a vote of "**Disapprove.**" The ISO ballot ends on December 7.

2. Ballots recently closed

- ISO/DIS 17268.2, *Gaseous hydrogen land vehicle refueling connection devices*
The DIS was approved. The U.S. TAG submitted a vote of "**Approve.**"

3. Meetings

- WG 12, *Hydrogen Fuel — Product Specification — PEM fuel cell applications for road vehicles*
November 8-9, Washington, DC
- WG 5, *Gaseous hydrogen land vehicle refueling connection devices*
November 22, Montréal, Québec
- ISO/TC 197 plenary in Beijing, China
The next plenary will be held on December 15, at the Loong Palace Hotel & Resort Beijing. The schedule of working group meetings has not been confirmed at this time. Individuals who plan to attend this meeting must notify Jill Thompson (jthompson@cganet.com) no later than October 24. An official letter of invitation from the meeting host also is required as most

Continued

delegates will need a visa. Contact Jill Thompson for specifics on requesting this invitation letter.

IEC TC 105

TC105 – Fuel Cell Technologies

- **WG#3 (IEC 62282-3-100 – *Stationary Fuel Cells - Safety*)**
 - **FDIS posted. Vote to USTAG by December 21, 2011.**
- **WG#3 (IEC 62282-3-150 – *Small Stationary Fuel Cells used as Heating Appliances – Safety, Installation, Performance*)**
 - **Meeting November 17-18 in Frankfurt, Germany**
- **WG#8 (IEC 62282-6-100 – *Micro Fuel Cells – Safety*)**
 - **Meeting November 9-11 in Tokyo, Japan**
- **WG#10 (IEC 62282-6-300 Ed. 2 – *Micro Fuel Cells – Interchangeability*)**
 - **CDV posted. Comments to USTAG by March 23, 2012.**
- **WG#11 (IEC 62282-7-2 – *Single Cell/Stack Performance Test Methods for Solid Oxide Fuel Cells*)**
 - **CD posted. Comments to USTAG by January 12, 2012.**
- **TC105 Plenary Meeting November 21-22 in Cairo, Egypt**
 - **USTAG held teleconference to review agenda.**

NFPA

Paul May provided information that the NFPA Standards Council did approve NFPA 2 cycle moving from the Fall 2013 to the Fall 2014 Revision Cycle due to NFPA 2 being recently published.

ICC

Justin Wiley provided an update. The 2015 cycle of the ICC Codes start with Group A, the Building Code, Fuel Gas Code, and Mechanical Code. Proposals are due January 3rd, 2012. The Green Construction Code final action hearings have been completed and the newest edition will be available in March 2012.

CSA

Bob Boyd provided that CSA 4.3 is out for industry review.

Josip Novkovic provided a written update to be included with the minutes (see attached).

Others

7 Open Discussion & Other Issues

Next Meeting December 7th.

Continued

NIST Office of Weights and Measures (OWM) on the Development of Commercial Hydrogen Measurement Standards

NHFCCSCC November 16, 2011

by Juana Williams and Marc Buttler

(1) U.S. Weights and Measures Standards Development Process

Fuel Quality Regulation

The U.S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards held a tele/web conference meeting on October 12, 2011. The USNWG's Fuel Specification Subcommittee (FSS) reviewed and updated two hydrogen fuel quality regulation proposals it had before the July 2011 National Conference on Weights and Measures (NCWM) as Laws & Regulations (L&R) Committee (Cmte) Agenda Items 237-1 and 237-2. Both these items will be carried over to the 2012 NCWM agenda. The USNWG FSS agreed to modify both items to address comments from the 2011 NCWM and to prepare the items to move forward for eventual adoption at the July 2012 NCWM.

L&R Cmte Agenda Item 237-1 “HB 130, Engine Fuel Quality Requirements for Hydrogen.” The USNWG agreed to replace its previously proposed table of constituents with an alternate proposal that adds a single hydrogen fuel quality requirement to the Engine Fuels and Automotive Lubricants Regulation in NIST Handbook 130 (HB 130), which reads:

2.XX. **Hydrogen Fuel.** - Shall meet the most recent version of SAE J2719, “Hydrogen Fuel Quality for Fuel Cell Vehicles.”
(Added 2012)

This direct reference to SAE J2719 was made possible by the September 20, 2011 publication of the standard by SAE and the format is consistent with other fuel specifications in HB 130.

L&R Cmte Agenda Item 237-2 “HB 130, Definitions for Hydrogen Fuel for Internal Combustion Engines and Fuel Cell Vehicles.” The USNWG updated this agenda item to revise the definitions for the terms *fuel cell*, *hydrogen fuel*, and *internal combustion engine*. These revisions were based on language that was proposed during the July 2011 NCWM and subsequently approved by the USNWG. During its October 12th meeting the USNWG also agreed to additional revisions to the definition of the term *fuel cell* to reflect the same language that is in the definition for that term in SAE J2574 “Fuel Cell Vehicle Terminology,” (released on September 9). The USNWG also agreed to recommend that the definition for *hydrogen fuel* that currently appears in the 2011 NIST HB 130 Uniform Regulation for the Method of Sale of Commodities in paragraph 2.32.1 should be updated to match the latest modifications the group is proposing for the term in Agenda Item 237-2 (a

Continued

proposal to add three new hydrogen related terms to the NIST HB 130 section for Uniform Engine Fuels and Automotive Lubricants Regulation).

The USNWG recommendations for these alternate proposals to update both carryover agenda items received additional support during hearing sessions at the Southern Weights and Measures Association (SWMA) regional meeting in Norfolk, VA held Oct. 23-26, 2011. The SWMA voted to support the USNWG's latest revisions to Agenda Items 237-1 and 237-2. The SWMA will send that recommendation on to the January 2012 NCWM Interim Meeting with a recommendation to move both USNWG proposals forward for national adoption at the July 2012 NCWM Annual Meeting.

Commercial Device Type Evaluation Criteria

On August 11, 2011, the NCWM NTETC-Measuring Sector Subgroup completed its work on a Draft Hydrogen Gas-Measuring Devices Checklist (general criteria based on NIST Handbook 44 Hydrogen Gas-Measuring Devices - Tentative Code). The draft checklist was forwarded to the U.S. National Work Group (USNWG) for its review and comment. During its meeting on October 12, 2011, the USNWG's Device Specification Subcommittee agreed to move the draft checklist forward for the approval of the entire Measuring Sector with no recommendations for changes at this time.

The draft checklist was reviewed and discussed during the NTETC-Measuring Sector Annual Meeting in Norfolk, VA held October 21-22, 2011. The Measuring Sector agreed by unanimous consent to forward the final draft checklist to the NCWM National Type Evaluation Program (NTEP) Committee with a recommendation to include the document in the next edition of NCWM Publication 14 "NTEP Technical Policy, Checklists, and Test Procedures" as a new checklist for use in type evaluation of hydrogen gas-measuring devices. During its annual meeting, the Measuring Sector also voted in favor of two other items related to type approval of hydrogen gas-measuring devices. The first item was to recognize hydrogen in the list of product categories for meters in Technical Policy C. This policy specifies the test procedures that must be conducted on a device before a device can be approved for use in a single or multiple product application(s). The second item adds the "kilogram" (kg) as an approved unit of measurement that can be displayed on a retail fueling dispenser's indications when the device is used to deliver hydrogen. Additionally, a note was added to the draft checklist to indicate that hydrogen dispensers will be held to the field evaluation and permanence tests already established for mass flow meters (a mandatory period of use and/or product throughput for subsequent verification) in Section I. The document now enters into the last stages for approval and subsequent publication as a type evaluation checklist. Both items, along with the checklist, will be forwarded to the NCWM NTEP Committee with the Measuring Sector's recommendation that the checklist be included in the upcoming spring 2012 edition of NCWM Publication 14.

CSA Hydrogen and Fuel Cell Standards Update



HYDROGEN DOCUMENTS



TIR's being processed through ANSI

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|---------------------|--------------------|---|---|
| CSA America HGV 4.1 | Hydrogen Dispenser | TAG ballot for industry review and comment (R&C) distribution of revised TIR document . Anticipate distribution of R&C December 2011 | March 2012 (anticipated ANSI approval) |
| CSA America HGV 4.2 | Hoses | Nov 2011- Revised TIR to include revisions to both automotive and stationary applications. Meeting weekly to update the document. | March 2012 (anticipated ANSI approval) |
| CSA America HGV 4.4 | Breakaway Devices | Anticipate distribution of R&C in December 2011 | March 2012 (anticipated ANSI approval) |

TIR's being processed through ANSI

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|---------------------|--|---|--|
| CSA America HGV 4.5 | Priority and Sequencing | TAG is tentatively scheduled to meet in December 2011 to develop proposed revisions based on industry feedback for distribution for R&C | June 2012 |
| CSA America HGV 4.6 | Manual Valves for use in Hydrogen Fueling Station(s) | <p>Industry Comments recommend developing coverage for Safety Shutoff Valves- either include in HGV 4.6 or separate standard.</p> <p>Nov/Dec 2011-resolve with TAG and Auto TC direction.</p> | <p><i>Option 1: March 2012</i></p> <ul style="list-style-type: none"> • Existing TIR process through ANSI • Separate revisions for Safety Shutoff Valves <p><i>Option 2: October 2012</i></p> <ul style="list-style-type: none"> • Inclusion of Safety Shutoff Valve Coverage in existing TIR |

TIR's being processed through ANSI

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|----------------------|---|---|---|
| CSA America HGV 4.7 | Automatic Valves for use in Hydrogen Fueling Station(s) | The TAG is anticipated to meet in January 2012 to review the existing TIR. | <i>Option 1: March 2012</i> <ul style="list-style-type: none"> • Existing TIR process through ANSI <i>Option 2: October 2012</i> <ul style="list-style-type: none"> • Inclusion of additional coverage in existing TIR |
| CSA America HGV 4.10 | Fittings | Concurrent ANSI Public Review and Auto TC ballot. TC Ballot ends on December 1, 2011. | February 2012 (anticipated ANSI approval) |

TIR's under development

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|---------------------|--|---|---|
| CSA America HPRD 1 | Pressure Relief Devices | The TAG agreed that continuous discharge and hydrogen service suitability coverage is to be included. Industry is seeking funding to perform validation testing on PRD's prior to the coverage being drafted. | July 2012 |
| CSA America HGV 3.1 | Fuel System Components for Hydrogen Vehicles | Hydrogen service suitability validation testing completed by Powertech. Powertech recommends additional testing to determine effect of cycle count and exposure time | Pending validation results. (June 2012) |

TIR's under development (Cont'd)

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|---------------------|---|--|---|
| CSA America HGV 4.8 | Fueling Station Compressors | Actively searching for compressor manufacturer(s) to join TAG. Anticipated to have TAG meeting January 2012. | July 2012 (anticipated ANSI approval) |
| CSA America HPIT1 | System Components for Powered Industrial Trucks | R&C distributed on October 24, 2011; comment period ends December 23, 2011 | February 2012 |
| CSA America HPIT2 | Fueling for Powered Industrial Trucks | HPIT 2 is scheduled to begin upon completion of HGV 4.3 due to overlapping technical issues. | February 2013 |

TIR's under development (Cont'd)

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|-------------------|---|---|---|
| CSA America CHMC1 | Material Compatibility for Use in Hydrogen Applications | Draft CHMC1 <ul style="list-style-type: none"> • Phase 1-metallic • Ballot to TC expected in December 2011 • Phase 2- plastics/non-metallic Meeting held on November 17, 2011. Next meeting is scheduled for November 29, 2011. | January 2012 January 2013 (anticipated) |

TIR's under development (Cont'd)

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|-------------------|---------------------------------|---|---|
| CSA America HGV 2 | Hydrogen Fuel System Containers | <p>Harmonization with SAE J2579</p> <ol style="list-style-type: none"> 1. Cycle Life 2. Stress ratio vs burst ratio 3. Fire testing <p>HGV2 and SAE Safety WG have agreed on the cycle life. Stress ratio vs. burst ratio and fire testing is still under discussion. HGV2 may consider an OEM and Non-OEM option.</p> | Pending resolution of agreement on tests. (June 2012) |

TIR's under development (Cont'd)

| Number | Title | Status | Anticipated Publication Date * Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting |
|---------------------|---------------------------|---|---|
| CSA America HGV 4.3 | Fueling Parameters | Document distributed for review and comment on November 14, 2011. R&C period ends on December 5, 2011. | February 2012 (v1) <i>Validation of requirements in TIR during Pilot Program of HDTA</i> |
| CSA America HGV 4.9 | Fueling Station Guideline | CSA technical expert reviewed and submitted comments to be addressed during a tentatively scheduled meeting in December 2011. | May 2012 (anticipated TIR publication) |

FUEL CELL DOCUMENTS



FUEL CELL Documents

| Number | Title | Status | Anticipated Publication Date |
|--------------------|------------------------------------|--|---|
| ANSI/FC 1 | Stationary Fuel Cell Power Systems | <p>Revisions to FC 1 were approved by the Fuel Cell TC. ANSI public review ends on December 12, 2011.</p> <p>FC 1 TAG plans to adopt IEC 62282-3-1 once the 2nd Edition is published</p> | <p>January 2012</p> <p><small>* Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting</small></p> |
| ANSI/FC 3 | Portable Fuel Cell Power Systems | CSA Fuel Cell TC approved a proposal to adopt IEC 62282-5-1 as an ANS standard | TAG tabled pending issuance of the FDIS later this year |
| CSA/UL 62282-6-100 | Micro Fuel Cell Power Systems | CSA Fuel Cell TC approved project to adopt IEC 62282-6-100 as an American National Standard with national modifications | Industry requested - wait until the 2nd edition is published prior to continuing the project |

Recent & Upcoming Meetings

- NGV 4.2/HGV 4.2 TAG – November 23, 2011
- CHMC 1 TAG – November 29, 2011
- HGV 4.3 TAG – December 9, 2011

* Meetings can be changed or cancelled without prior notice.

* Working groups meet more frequently and meetings are not shown.