

# NATIONAL HYDROGEN AND FUEL CELLS CODES AND STANDARDS COORDINATING COMMITTEE

Wednesday, April 6th, 2011  
TIME: 3:00 – 4:30 pm (Eastern Daylight Time)  
CALL-IN NUMBER: (641) 594-7000 Passcode: 824011#  
WEBINAR: <https://www1.gotomeeting.com/register/877740576>

## Present on the call:

Bill Collins	Gary Nakarado	Josip Novkovic
David McColskey	Bill Buttner	Tom Prevish
Mike Steele	Steven Weiner	Juana Williams
John Mough	Karen Hall	Jim Ohi
Chris Manchester	Bob Boyd	Anthony Amato
Chad Blake	Doug Horne	Kelvin Hecht
Antonio Ruiz	Aaron Harris	Josip Novkovic

1 Roll Call

2 Review of Anti-Trust Guidelines  
[http://www.usfcc.com/members/antitrust\\_guidelines\\_rev.pdf](http://www.usfcc.com/members/antitrust_guidelines_rev.pdf)

3 Review of/Corrections to March Draft Minutes (attached and can be found at [www.hydrogenandfuelcellsafety.info/](http://www.hydrogenandfuelcellsafety.info/))  
Adopted

4 DOE/HQ Update Antonio Ruiz

Jim Ohi provided an update -- There was a DOE workshop with METI last month and they stressed how they will be rolling out vehicles for sale and have infrastructure in place, encouraged by the German plans to roll out fuel cell vehicles and have hydrogen infrastructure in place.

There were several good meetings with the Japanese industry experts in conjunction with the Fuel Cell Expo.

Steve Weiner noted that national laboratories were expected to be operating in case of a government shutdown, pending any additional DOE guidance.

Antonio Ruiz provided an update. The possibility of a government shutdown was discussed, but the most recent information has been disseminated by the media. The concept of a shutdown will mean that DOE Headquarters will shutdown and turn off their phones. It is possible that FY 2010 will be used as the template for FY 2011. (\$170M / \$9M)

The AMR is coming up in May. May 9-13.  
Several side meetings are also planned.

5 Calendar of C&S Events and Fuel Cell Safety Information  
[http://www.fuelcellstandards.com/calendar\\_new.html](http://www.fuelcellstandards.com/calendar_new.html)  
<http://www.hydrogenandfuelcellsafety.info/>  
<http://www.h2incidents.org/>  
FCHEA Priority Matrix

Kelvin Hecht  
Karen Hall  
Steve Weiner/Linda Fassbender  
Robert Wichert

# AGENDA

## Continued

**SIGNIFICANCE TO COMMERCIALIZATION**  
 ← *More Critical*

	A: Essential To or Enables Commercialization	B: Important to Commercialization	C: Supports Commercialization
Highest Effort	ICAO Technical Instructions IEC Micro Fuel Cell Safety Standards Indoor refueling (fork lifts and other applications) US DOT Harmonization NPRM – HM215K ICC Model Codes NFPA 52 Vehicle Fuel Systems Code UL 2267 Fuel Cell Power Systems for Installation in Industrial Trucks CSA America HGV 4 Series for Fuel Dispensing Equipment and Components <b>Modeling of a spectrum of fork lift hydrogen leak sizes and frequencies</b> CSA America HPIT 1 Hydrogen Powered Industrial Trucks CSA America HPIT 2 Fuelling Hydrogen Powered Industrial Trucks SAE J 2919 Compressed Hydrogen Fuel Systems in Fuel Cell Powered Industrial Trucks SAE 2600 & 2601 increased activity due to specialty vehicle use Hydrogen Dispenser Metrology Inter-Laboratory Testing to validate ASTM protocols International Organization for Legal Metrology (IOML) OIML R 81 Dynamic Measuring Devices and Systems for Cryogenic Liquids International Organization for Legal Metrology (IOML) OIML R 139 Compressed Gaseous Fuel Measuring Systems for Vehicles	Micro Fuel Cell Interchangeability Standards IEC 62282-6-300 UL 1741 Inverters, Converters and Controllers for Use in Independent Power Systems IEEE 1547.XX, Interconnection of Distributed Generation – Application Guides State Permitting Templates (C&S Gaps Analysis): California ISO/NP 14687-3 Hydrogen Fuel – Product specification – Part 3: proton exchange membrane (PEM) fuel cell application for stationary applications CSA America HGV 3.1 Fuel System Components for Hydrogen Gas Powered Vehicles SAE J 2600 Compressed Hydrogen Vehicle Fueling Connection Devices SAE J 2799 - TIR 70 MPa Compressed Hydrogen Surface Vehicle Refueling Connection Device and Optional vehicle to Station Communication SAE J 2783 Liquid Hydrogen Surface Vehicle Refueling Connection Devices	ASME B31.12 H2 Piping and Pipeline Code SAE J 2572 Recommended Practice for Measuring the Exhaust Emissions, Energy Consumption and Range of Fuel Cell Powered Electric Vehicles using Compressed Gaseous Hydrogen

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6 Discussion Topics

Discussion Leader

Hydrogen Fuel Quality

Jim Ohi

ASTM

Jackie Button

Jackie provided the following update. Two new standards have been published.

# AGENDA

## Continued

### ASTM D03.14 Hydrogen and Fuel Cells Update

Work Item	Title	Constituents (DL)	Update
4548	Standard Test Method for Determination of Trace Contaminants in Hydrogen and Related Fuel Cell Feed Gases	CO <sub>2</sub> (0.5 ppm), nitrogen (5 ppm), argon (1 ppm), oxygen (2 ppm), and water (1 ppm)	<i>Published official item: D7649-10</i>
5847	Standard Practice for Sampling of High Pressure Hydrogen and Related Fuel Cell Feed Gases	Gaseous sampling	<i>In publishing: D7606-11</i>
6527	Standard Test Method for Ion Selective Electrode Based Determination of Ammonia in Hydrogen and Other Fuel Cell Feed Gases	Ammonia (unknown)	N/A
6624	Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Hydrogen and Other Fuel Cell Feed Gases	Formaldehyde (unknown)	N/A
9211	Standard Test Method Ion Chromatography Based Determination of Cations in Hydrogen and Other Fuel Cell Feed Gases	Formic Acid (low ppb to ppm)	<i>Published official item: D7550-09</i>
9688	Standard Test Method for Sampling of Particulate Matter in High Pressure Hydrogen used as a Gaseous Fuel with an In-Stream Filter	Particulate sampling	<i>Published official item: D7650-10</i>
10196 (27163)	Standard Test Method for Determination of Ammonia and Trace Water in Hydrogen and Other Gaseous Fuels by Infrared Spectroscopy	Ammonia, CO <sub>2</sub> , CO, formaldehyde, formic acid, and water (defined by EPA 40 CFR part 136 Appendix A "meet detection limits of SAE TIR J2719")	<i>In publishing: D7653-10</i>
21162	Standard Test Method for the Characterization of Particles from Hydrogen Fuel Streams by Scanning Electron Microscope	Particulates	N/A
21597	Standard test method for microscopic measurement of particulates in hydrogen fuel	Particulates	<i>Published official item: D7634-10</i>
21611	Standard test method for gravimetric measurement of particulates in hydrogen fuel	Particulates	<i>Published official item: D7651-10</i>
22378	Determination of Total Hydrocarbons (C1 basis) in Hydrogen by Total Hydrocarbon Analyzer (THC)	Total hydrocarbons (0.1 ppm)	<i>In publishing: D7675-11</i>
23815	Determination of Total Halocarbons contained in Hydrogen and other gaseous fuels	Total halogenated compounds ("halocarbon determination requirements contained in SAE J2719" 0.1 ppb)	Being revised for main ballot (March '11)

# AGENDA

Continued

NIST

Juana Williams

Juana Williams provided the following update:

## **NHFCCSCC April 6, 2011**

by Juana Williams

### **U.S. Weights and Measures Standards Development Process**

#### **Commercial Device Type Evaluation Criteria**

On April 7, 2011, the NCWM National Type Evaluation Technical Committee-Measuring Sector Subgroup will hold a web/teleconference meeting at 11:00 a.m. to noon [EDT] to continue its review of the draft Hydrogen Gas-Measuring Devices Checklist.

#### **U. S. National Work Group (USNWG) for the Development of Commercial Hydrogen Measurement Standards**

The USNWG has tentative plans for a web/teleconference meeting at 3:00 p.m. to 4:30 p.m. [EDT] on either April 19 or 20, 2011. Plans will be finalized by close of business today. The USNWG will discuss the work to refine and develop test procedures (gravimetric, volumetric, and master meter test methods) and the progress of work to develop the type evaluation checklist for hydrogen dispensers.

July – October 2010 finalized the type evaluation checklist for hydrogen dispensers

#### Major Accomplishments

July 2010-National Conference on Weights and Measures (NCWM) adopts the Hydrogen Gas Measuring Devices-Tentative Code and a Method of Sale Regulation for commercial hydrogen refueling applications.

January 2011- Hydrogen Gas Measuring Devices-Tentative Code is published in NIST Handbook (HB) 44 “Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices.” A Method of Sale Regulation and definitions for related terms are published in NIST HB 130 “Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality” for hydrogen.

January 2011- California Division of Measurement Standards develops a draft checklist that is ready for the NCWM National Type Evaluation Technical Committee to review.

March 2011-NCWM National Type Evaluation Program Subgroup to the Measuring Section begins review of the draft checklist criteria for hydrogen dispensers.

The HB 44 Code(s) is the basis for (1) Type Evaluation Criteria used to conduct evaluations on a device before that device can receive approval for commercial use, (2) Field Inspection and Test Procedures used by regulatory officials in their day-to-day evaluation of devices in commercial use to determine if a device meets design

# AGENDA

## Continued

and performance requirements, and (3) Training Manuals/Materials (etc.) that provide instruction to regulatory officials and industry on code requirements and the appropriate application of these codes.

SAE J2719

Mike Steele

J2719 is in voting now, closing on April 18<sup>th</sup>. No negatives so far.

J2600 is now including the 70MPa nozzle interface geometry included. It is out for revote as a standard.

These were two big accomplishments.

CA Update

John Mough will provide more information next month.

ISO TC 197 WG 12

Jim Ohi

WG 12 is awaiting votes and the standard.

The DIS is out for vote and this is a big accomplishment.

ISO TC 197 WG 14

Karen Hall

Karen Hall provided an update. The Committee Draft has been out for comment.

Many comments have been provided. The Working Group will meet for two days on June 27 and June 28 in Grenoble to address the comments.

Fuel Cell Forklifts/Indoor Fueling

Aaron Harris

Aaron Harris provided an update. Aaron attended the Industrial Truck Association (ITA).

UL 2267, UL 583 and NFPA 505 were discussed. NFPA 505 might be modified to provide a method for conversion to hydrogen fuel using a “hydrogen conversion kit”. Work on indoor refueling continues. Harmonization with the Fire Code will most likely be done by a working group under NFPA 2.

Tank Testing

SNL

Sandia was not able to attend the call.

CSA

Josip Novkovic

HPIT 2 membership is being reviewed. The plan is to initiate that activity in May of 2011.

See presentation at end of minutes for further updates

Sandia Modeling

SNL/Aaron

Aaron Harris provided an update on tank testing. Positive results – tank failure as expected at ~8000 cycles (four times predicted). This was a “leak before break” event and the leak rate was estimated. This is an accomplishment.

Aaron Harris also provided an update on modeling. Sandia may be waiting for input from industry.

Matrix of Leak Sizes – Risk Informed Standards

The engineered failure (above) may add some data for the matrix.

Hydrogen Sensors

Robert Wichert

UL 2075, ISA 12.13.01 (Harmonized with IEC 61779 – 1 thru 5), ISO 26142

# AGENDA

## Continued

Bill Buttner, Manufacturers, Greg Chirdon, Robert Wichert, CSA Standard, Bill Collins will form a working group for sensors to report to this call.

- 6 Codes and Standards Organizations  
This is the opportunity for CDOs, SDOs, Panels, Committees, etc. to provide updates and issues to the group.

### US Tag

#### April 2011 Update

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

1. Comments submitted
  - N486, ISO/CD 14687-3, *Hydrogen Fuel — Product Specification — Part 3: Proton exchange membrane (PEM) fuel cell applications for stationary appliances*  
The U.S. TAG submitted comments on the draft of ISO/CD 14687-3 on March 8.
  
3. Ballot pending
  - ISO/DIS 14687-2, *Hydrogen fuel — Product specification — Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles*  
The U.S. TAG is requested to vote by April 11.  
A TAG webconference will be held at the end of April or in early May to review the comments and prepare a consensus list for submission with the U.S. position.
  
4. Past meetings
  - WG 6, *Gaseous hydrogen and hydrogen blends — Land vehicle fuel tanks* (joint with ISO/TC 58/SC 3, *Cylinder design*, and ISO/TC 22/SC 25, *Vehicles using gaseous fuels*)  
March 2-3 in Tokyo, Japan
  - WG 15, *Gaseous hydrogen — Cylinders and tubes for stationary storage*  
March 16-17 in Montreal, Canada
  - WG 5, *Gaseous hydrogen land vehicle refuelling connection devices* (joint with ISO/TC 22, *Road vehicles*)  
March 17-18 in Long Beach, CA
  
5. Future meeting
  - WG 14, *Hydrogen fuel — Product Specification — Proton exchange membrane (PEM) fuel cell applications for stationary appliances*  
June 27-18 in Grenoble, France

# AGENDA

## Continued

TC 105  
*Kelvin Hecht*

### TC105 – Fuel Cell Technologies

- WG#3 (NWIP -*Stationary Fuel Cells-Small systems serving as a heating appliance*)
  - Fuel heat input based on net caloric value < 70 kW
  - Vote by April 29, 2011.
- WG#4 (62282-3-200 Ed.1 – *Stationary - Performance*)
  - CDV approved, FDIS will be distributed by June 2011.
- WG#7 (62282-5-1 Ed.2 – *Portable - Safety*)
  - CDV approved, FDIS will be distributed by September 14, 2011.
- WG#8 (62282-6-110 – *Aluminum Micro Fuel Cell – Safety*)
  - New work approved.
- WG#9 (62282-6-200 Ed.2 – *Micro – Performance*)
  - CD approved, a revised CD will be distributed by May 2011.
- WG#11 (NWIP – *Single Cell/Stack Performance – Solid Oxide Fuel Cells*)
  - Vote by May 6<sup>th</sup>
- Flow Batteries
  - A study group has been approved to determine if flow batteries should be included within the scope of TC105 – Winkler (Germany), Zhang (China) & Choudhury (USA)

### NFPA

Paul May was not on the call, however he provided an update by e-mail.

- 1) The NFPA Standards Council approved the request made by the NFPA 52 Technical Committee on Vehicular Alternative Fuel Systems to have hydrogen removed from the scope of NFPA 52. Ownership of this material is transferred to NFPA 2, the Hydrogen Technologies Code, and the Technical Committee on Hydrogen Technology because they are considered to have primacy on any material that is not covered in other NFPA documents.
- 2) NFPA 52 will be meeting for the Report on Proposals (ROP) at NFPA in Quincy, MA during the week of Monday-Friday, August 1-5, 2011.
- 3) NFPA 2 will be having a Pre-ROP meeting on Tuesday, May 17, 2011 at NFPA in Quincy, MA and via web conference to plan for the next cycle.
- 4) NFPA 55 will be receiving public comments until August 30, 2011 and meeting in Quincy, MA during Tuesday-Thursday, October 3-7, 2011 for the Report on Comments (ROC).

### ICC

No update

# **AGENDA**

**Continued**

CSA

See presentation at the end of the minutes

- 7 Open Discussion & Other Issues
  - a. Are people interested in meeting at the AMR?
- 8 Next meeting – May 4, 2011



# CSA Hydrogen and Fuel Cell Standards Update



# HYDROGEN DOCUMENTS



# TIR's to be processed through ANSI

- Compressed Hydrogen Dispensers (CSA America HGV 4.1)
- Hoses and Hose Assemblies (CSA America HGV 4.2)
- Breakaway Devices for Hoses (CSA America HGV 4.4)
- Priority and Sequencing Equipment (CSA America HGV 4.5)
- Manually Operated Valves (CSA America HGV 4.6)
- Standard for Automatic Pressure Operated Valves (CSA America HGV 4.7)
- Hydrogen Fittings, (CSA America HGV 4.10)
- Pressure Relief Devices (CSA America HPRD 1) → 2<sup>nd</sup> edition is anticipated to be published in 2011

# TIR's to be processed through ANSI (Cont.)

- Comments submitted on TIR's that need to be resolved
  - Consideration of suggested revision to test gases specified in the TIRs under review by TAGs/Common Issues WG
    - Revision to accept this proposed modification requires redistribution for Review and Comment
    - Applicable to HGV 4.1, HGV 4.2, HGV 4.4, HGV 4.6, HGV 4.7, HGV 4.8, HGV 4.9, HGV 4.10, HGV 3.1 and HPRD1.
  - HGV 4.2 - Consideration by TAG/Common Issues WG of request to review the acceptable leakage rates and align with revisions contained in HGV 3.1 for the vehicle hose requirements. (HGV 4.2 addresses both station and vehicular hoses)
  - HGV 4.2 – Consideration by TAG/Common Issues WG of request to review sections related to material specifications

# TIR's to be processed through ANSI

- o These dates are contingent on the availability and responsiveness of the TAG/TC members and all TC ballots closing on time and without issue.

Activity	R&C Required	No R&C
TAG/Common Issues WG Meeting(s)	April 2011	April 2011
R&C Distribution	April 2011 (4 week review)	N/A
TAG to address comments-	June 2011	N/A
Automotive Technical Committee ballot	July 2011	April 2011
ANSI public review submittal	July 2011	April 2011
Automotive Technical Committee approval	August 2011* <small>*Assuming no negative votes on LB</small>	May 2011* <small>*Assuming no negative votes on LB</small>
ANSI Approval	September 2011	July 2011
Published	September/October 2011	August 2011

# 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 HGV 4.9	Hydrogen Fueling Station Guideline	<i>Editorial review being conducted prior Auto TC ballot</i>  <i>May 2011- Auto TC Ballot</i>	June 2011-TIR
CSA America HGV 3.1	Fuel System Components for Hydrogen Vehicles	Meeting scheduled on April 27, 2011. Document is still in development.	Will be addressed by Committee during its next meeting.
CSA America HGV 4.8	Hydrogen Gas Vehicle Fueling Station Compressor	TAG development-schedule of TAG meetings to be published May 2011	
CSA America HPIT1	System Components for Powered Industrial Trucks	Working Group meets every 2 weeks. Planning a face-to-face meeting in September/October 2011.	Dependent on the completion of the testing at Sandia.

# TIR's under development (Cont.)

Number	Title	Status	Anticipated Publication Date
CSA America HPIT2	Fueling for Powered Industrial Trucks	TAG Membership approval by Auto TC Chair Meeting Schedule will be available May 2011	* Dates dependent on availability and responsiveness of TAG/TC members to Ballots and meeting
Material Compatibility for Use in Hydrogen Applications	CSA America CHMC1	Meetings every 2 weeks - schedule published on CSA website	June 2011 - TIR
CSA America HGV 4.3	Fueling Parameters	Meetings every three weeks.	June 2011- TIR
Hydrogen Fuel System Containers	CSA American HGV 2	Meeting scheduled on April 26, 2011. Document is still in development.	

# TIR's under development (Con't)

- Anticipate drafts to be completed in 2011
- CSA staff working with respective TAG's to process documents



# Fueling Parameters (CSA America HGV 4.3)

- April 2011 - industry teleconference to discuss lessons learned
  - GM-Opel
  - Powertech
  - others
- TAG members working to complete section drafting assignments - compile the draft document for circulation for review
- July 2011 – Circulation of draft of Industry review
- August 2011 – In person Meeting (California) to review comments
- September Auto TC Ballot for approval of TIR
- October 2011 publish TIR

# FUEL CELL DOCUMENTS



# Status of ANSI Standards

- ANSI/FC 1 – Stationary Fuel Cell Power Systems
  - o Review of January 2010 R&C was completed in November 2010
  - o Distribution of revised R&C planned for April 2011
  - o Comments will need to be addressed by TAG during a meeting
  - o Document was revised to be consistent with IEC 62282-3-1
  - o FC 1 TAG plans to adopt IEC 62282-3-1 once the 2<sup>nd</sup> Edition is published

\* Dates are contingent on the availability and responsiveness of the TAG/TC members and all TC ballots closing on time and without issue.

# Status of ANSI Standards (Cont'd)

- ANSI/FC 3 – Portable Fuel Cell Power Systems
  - Ballot was distributed in March 2011 proposing to adopt IEC 62282-5-1
  - Meeting being planned for late 2011
- CSA/UL 62282-6-100 – Micro Fuel Cell Power Systems
  - Project started to adopt IEC 62282-6-100 as an American National Standard with national modifications
  - Ballot to be distributed to CSA Fuel Cell TC to consider project

# Upcoming Meetings

- HGV 4.3 – April 11, 2011
- NGV 2/HGV 2 – April 26, 2011
- NGV 3/HGV 3 – April 27, 2011
- PRD 1/HPRD 1 – April 28, 2011