

NATIONAL HYDROGEN AND FUEL CELLS CODES AND STANDARDS COORDINATING COMMITTEE

Wednesday, June 1, 2011

TIME: 3:00 – 4:30 pm (Eastern Daylight Time)

CALL-IN NUMBER: (641) 594-7000 Passcode: 824011#

WEBINAR: <https://www1.gotomeeting.com/register/114600913>

1 Roll Call

| | | |
|---------------|-----------------|------------------|
| Bruce Johnson | Antonio Ruiz | Chad Blake |
| Doug Horne | David McColskey | Jackie Button |
| Jill Thompson | Jim Ohi | Karen Hall |
| Mike Steele | Paul May | Steve McDermitt |
| Norm Newhouse | Tony Androsky` | Andrea Zajac |
| Will James | Gary Nakarado | Chris Manchester |
| Spencer Quong | Dan Reiswig | John Mough |

2 Review of Anti-Trust Guidelines

http://www.fccea.org/members/antitrust_guidelines_rev.pdf

3 Review of/Corrections to May Draft Minutes (attached and can be found at

www.hydrogenandfuelcellsafety.info/)

4 DOE/HQ Update

Antonio Ruiz

Antonio Ruiz provided an update. The program had a significant reduction of ~40% from 2010. Safety Codes and Standards (SCS) has experienced an approximately 25% reduction, for the remainder of the year. The Sandia tank testing should be able to continue, but support from industry is important to consider. Some partners have been asked to pick up some of the burden. FY 2012 request of \$7M for SCS should encourage additional working together to achieve savings.

The International Conference on Hydrogen Safety is coming to San Francisco in September. Everyone is encouraged to attend. Conference dates: September 12 – 14, 2011.

Coordination with China regarding Type-4 tanks continues to be a high priority.

Calendar of C&S Events and Fuel Cell Safety Information

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

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

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

FCHEA Priority Matrix - See Attachment

Kelvin Hecht

Karen Hall

Steve Weiner/Linda Fassbender

Robert Wichert

5 Discussion Topics

Discussion Leader

International Coordination

There was some support for one or two meetings a year that would allow participation from Europe and Asia. A Task Group will be formulated to put together a list of potential attendees and potential topics. Robert Wichert, Jim Ohi, Kelvin Hecht, Jackie Button, Chad Blake, Karen Hall, Tony Androsky, Will James will meet next month one hour prior to this meeting.

Continued

Hydrogen Fuel Quality

Jim Ohi

ISO TC 197 (WG #12) is counting the votes. The US voted to disapprove due to the lack of reference to the ASTM standards.

ASTM - see attachment

Jackie Button

Jackie Button provided an update. The inter-laboratory study is having a teleconference tomorrow at Noon PDT. The semi-annual ASTM meeting is coming up June 21 – 22.

NIST

Juana Williams

NIST Weights and Measures Division (WMD) on the Development of Commercial Hydrogen Measurement Standards NHFCCSCC June 1, 2011

by Juana Williams

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

Commercial Device Type Evaluation Criteria

The NCWM NTETC-Measuring Sector Subgroup met on May 19, 2011 to continue work on the development of a draft Hydrogen Gas-Measuring Devices Checklist. The group plans to hold its next web/teleconference meeting on June 16, 2011. The group remains on schedule for developing a final draft of the checklist for comment and review by the USNWG in late July 2011.

Fuel Quality Regulation

On July 21, 2011 in Missoula, MT during its 96th Annual Meeting, the NCWM will vote to adopt Laws and Regulations (L&R) Committee Interim Report Agenda Item 237-2; three proposed new definitions related to the hydrogen fuel specification. The L&R Committee Interim Report is available on the NCWM web site at: http://www.ncwm.net/sites/default/files/meetings/annual/2011/11_Pub_16_LR.pdf. Agenda Item 237-2 received support from all four U.S. regional weights and measures associations. The corresponding fuel specification proposal, Agenda Item 237-1, will be updated to reflect the latest work by ASTM and remain an information item that will be carried over to the 2012 NCWM L&R Committee's Agenda.

(2) Outreach on Commercial Hydrogen Measurement

On May 18, 2011 a workshop on "Commercial Hydrogen Measurement" was presented to representatives of the Central Weights and Measures Association (member states are: IL, IN, IA, KS, MI, MN, MO, NB, ND, OH, SD, and WI). The workshop was given to familiarize weights and measures officials and industry representatives in that region with information about hydrogen's properties, the hydrogen infrastructure, current weights and measures requirements for field inspection and test of hydrogen-gas refueling dispensers, the latest developments in the operation, performance and safety of hydrogen refueling technology and related transportation technologies.

SAE J2719

Mike Steele

Mike Steele provided an update. A May 5 teleconference was held to discuss comments to the 28 day ballot. The affirmation ballot closes June 8. J 2719 will now include a particulate size limit. This is the subject of the affirmation ballot.

Continued

California update

John Mough provided an update. The regulatory process will commence with the passage of SAE J2719. This will take several months to complete. California budget issues may affect the process.

Fuel Cell Forklifts/Indoor Fueling

Aaron Harris

Aaron Harris provided an update. This information is intended to feed into a standard, HPIT-1. Work continues on HPIT-1. Current work is addressing the tank section. Coordination with the material compatibility effort is in progress.

Tank Testing

SNL

See attached graph

Sandia Modeling

SNL/Aaron

NFPA 2 has met and a new Task Group has been formed on indoor refueling and refueling in general. These Task Groups should address risk assessment issues associated with Sandia modeling including the Matrix of Leak Sizes and Risk Informed Standards

CSA

Josip Novkovic

No changes to report

Hydrogen Sensors

Robert Wichert

The hydrogen sensor workshop is occurring June 8, 2011 in Rosemont, Ill. Robert Wichert provided an update. UL 2075 certified sensors are required in California repair garages that repair vehicles with lighter than air fuels, specifically hydrogen and natural gas.

6 Codes and Standards Organizations

All

This is the opportunity for CDOs, SDOs, Panels, Committees, etc. to provide updates and issues to the group.

Continued

US Tag

June 2011 Update ANSI-Accredited U.S. TAG for ISO/TC 197, *Hydrogen technologies*

2. Pending ballots

- Systematic review of ISO 22734-1:2008, *Hydrogen generators using water electrolysis process — Part 1: Industrial and commercial applications*
The U.S. TAG is requested to vote by August 26.
- ISO/DIS 20100, *Gaseous hydrogen — Fuelling stations*
The U.S. TAG is requested to vote by June 17.

3. Ballot recently closed

- ISO/DIS 14687-2, *Hydrogen fuel — Product specification — Part 2: Proton exchange membrane (PEM) fuel cell applications for road vehicles*
The U.S. TAG met by webconference on Tuesday, May 10, and finalized the comments on this draft. The TAG plans to vote "**Disapprove**" and submit its list of comments before the ISO ballot deadline of June 5.

4. Future meeting

- WG 14, *Hydrogen fuel — Product Specification — Proton exchange membrane (PEM) fuel cell applications for stationary appliances*
June **27-28** in Grenoble, France

Continued

TC 105

June 2011 Meeting of the
DOE Hydrogen Codes & Standards Coordinating Committees
Kelvin Hecht
TC105 – Fuel Cell Technologies

- WG#2 (IEC 62282-2 Ed. 2– *Fuel Cell Modules*)
 - Approved with comments (105/328/RVC)
 - July 4-5 meeting in Frankfurt, Germany to address comments.
 - FDIS by January 1, 2012
- WG#3 (IEC 62282-3-100 – *Stationary Fuel Cells - Safety*)
 - July 19-20 meeting in Cleveland to address comments to CDV (105/331/RVC)
 - FDIS by January 1, 2012 (September + French edition)
- WG#3 (IEC 62282-3-150 – *Small Stationary Fuel Cells used as Heating Appliances – Safety, Installation, Performance*)
 - Approved with Robert Wichert as chair
 - July 21-22 1st meeting in Cleveland
- WG#4 (IEC 62282-3-201 – *Stationary Fuel Cells – Performance for Small PEM*)
 - Revised CD posted May 6, 2011. Comments due July 8, 2011
 - Comments to USTAG by June 30th.
- WG#5 (IEC 62282-3-3 Ed.2 – *Stationary Fuel Cells – Installation*)
 - Approved with comments (105/329/RVC)
 - July 6-7 meeting in Frankfurt, Germany to address comments
 - FDIS by January 1, 2012
- WG#6 (IEC 62282-4-100 *Fuel cell systems for forklift applications –Safety requirements, environmental aspect and test procedures* and IEC 62282-4-200 *Fuel cell systems for forklift applications – Performance requirements and test procedures*)
 - Approved (Denmark, Finland, Italy, Japan, Spain, USA)
 - US experts – Chirdon, Florence, Harris, Milas, Steele, Wichert also Baumgartner, Dunn, Medwin from the trucking industry)
 - Trying to schedule 1st meeting July 20-21 in Geneva
- WG#7 (IEC 62282-5-1 – *Portable Fuel cells*)
 - July 15-16 in Chicago to address comments to CDV.
- WG#8 (IEC 62282-6-100 – *Micro Fuel Cells – Safety*)
 - July 12-14 meeting in Chicago
- WG#9 (IEC 62282-6-200 Ed.2 – *Micro Fuel Cells – Performance*)
 - CDV posted April 15, 2011. Comments due September 16, 2011.
 - Comments to USTAG by September 9th.
- WG#11 (IEC 62282-7-2 – *Single Cell/Stack Performance – Solid Oxide Fuel Cells*)
 - Approved
 - Ira Bloom, Argonne Nat'l Labs. to represent the US.

Continued

NFPA – Paul May

- a. Paul May provided an update. NFPA-2 held a Pre-ROP meeting on May 17th. Task Groups were disbanded and some new Task Groups were added. If new material is NOT added to reserved chapters during the next update, those reserved chapters will be removed. They may be resurrected later, but for now, those reserved chapters will be removed. Two errata have been issued. They are on the NFPA web site.
- b. NFPA 52 has received public proposals. A meeting has been scheduled for August 1, 2011.
- c. NFPA 55 comment closing date is August 1, 2011. October 4-6 ROC meeting is planned. The ROP is not out yet, but the ballot is available on the web site.

ICC

Bruce Johnson provided an update. The 2012 I Codes are being released. Proposals are due in January for the next cycle. HIPOC is forming work groups to look at the 2012 codes and make proposals for the 2015 codes to harmonize with the NFPA work.

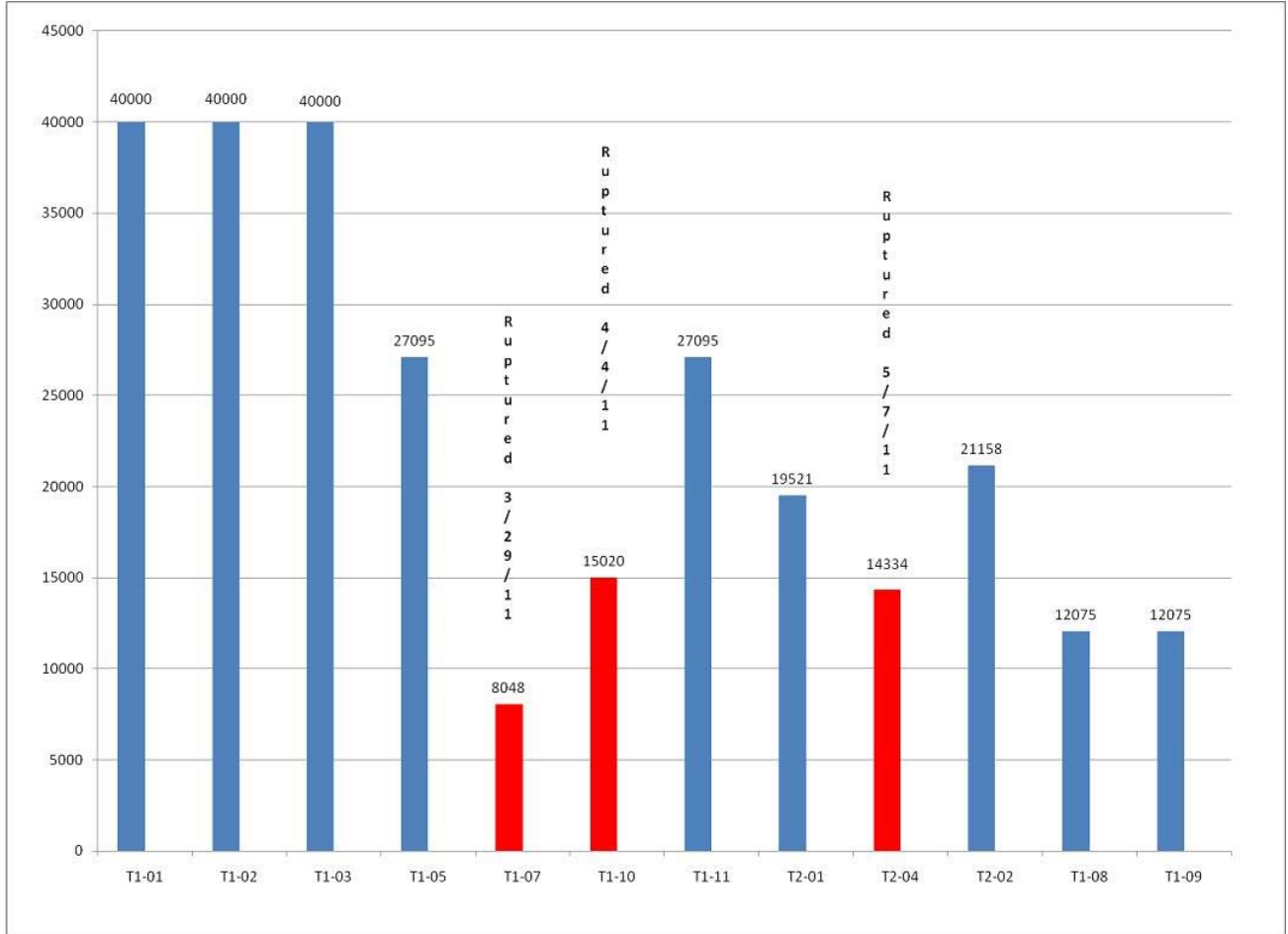
CSA

No update

6 Open Discussion & Other Issues

- a. Next meeting: July 6, 2011 at 3:00 PM EDT
- b. International task force meeting – July 6, 2011 2:00 PM EDT

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 ₂ (0.5 ppm), nitrogen (5 ppm), argon (1 ppm), oxygen (2 ppm), and water (1 ppm) | Published official item: D7649-10 |
| 5847 | Standard Practice for Sampling of High Pressure Hydrogen and Related Fuel Cell Feed Gases | Gaseous sampling | In publishing: D7606-11 |
| 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 ₂ , CO, formaldehyde, formic acid, and water (defined by EPA 40 CFR part 136 Appendix A "meet detection limits of SAE TIR J2719") | In publishing: D7653-10 |
| 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 | Published official item: D7634-10 |
| 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) | In publishing: D7675-11 |
| 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) |

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| 24073 | Standard Test Method for Determination of Trace Hydrogen Sulfide, Carbonyl Sulfide, Methyl Mercaptan, and Carbon Disulfide in Hydrogen Fuel by Gas Chromatography and Sulfur Chemiluminescence Detection | Total sulfur (0.02 ppb) | In publishing: D7652-11 |
| None | Standard Practice for the Determination of Carbon Monoxide, Formaldehyde, Ammonia and Other Trace Substances in Hydrogen Fuel Streams by Laser Based Spectrometric Methods | CO, formaldehyde, ammonia (unknown) | N/A |
| None | Field Sampling Apparatus | All | N/A |
| None | Vehicle Fueling Interface Surface Particulate Matter | Particulates | N/A |

SIGNIFICANCE TO COMMERCIALIZATION

← *More Critical*

| | A: Essential To or Enables Commercialization | B: Important to Commercialization | C: Supports Commercialization |
|-----------------------|--|--|--|
| Highest Effort | <p>ICAO Technical Instructions</p> <p>IEC Micro Fuel Cell Safety Standards</p> <p>Indoor refueling (fork lifts and other applications)</p> <p>US DOT Harmonization NPRM – HM215K</p> <p>ICC Model Codes</p> <p>NFPA 52 Vehicle Fuel Systems Code</p> <p>UL 2267 Fuel Cell Power Systems for Installation in Industrial Trucks</p> <p>CSA America HGV 4 Series for Fuel Dispensing Equipment and Components</p> <p>Modeling of a spectrum of fork lift hydrogen leak sizes and frequencies</p> <p>CSA America HPIT 1 Hydrogen Powered Industrial Trucks</p> <p>Fracture mechanics data suitable to develop design standards similar to ASME KD-10 with a suitable factor of safety for fuel cell fork lift tanks.</p> <p>CSA America HPIT 2 Fuelling Hydrogen Powered Industrial Trucks</p> <p>SAE J 2919 Compressed Hydrogen Fuel Systems in Fuel Cell Powered Industrial Trucks</p> <p>SAE 2600 & 2601 increased activity due to specialty vehicle use</p> <p>Hydrogen Dispenser Metrology</p> <p>Inter-Laboratory Testing to validate ASTM protocols</p> <p>International Organization for Legal Metrology (IOML) OIML R 81 Dynamic Measuring Devices and</p> | <p>Micro Fuel Cell Interchangeability Standards IEC 62282-6-300</p> <p>UL 1741 Inverters, Converters and Controllers for Use in Independent Power Systems</p> <p>IEEE 1547.XX, Interconnection of Distributed Generation – Application Guides</p> <p>State Permitting Templates (C&S Gaps Analysis): California</p> <p>ISO/NP 14687-3 Hydrogen Fuel – Product specification – Part 3: proton exchange membrane (PEM) fuel cell application for stationary applications</p> <p>CSA America HGV 3.1 Fuel System Components for Hydrogen Gas Powered Vehicles</p> <p>SAE J 2600 Compressed Hydrogen Vehicle Fueling Connection Devices</p> <p>SAE J 2799 - TIR 70 MPa Compressed Hydrogen Surface Vehicle Refueling Connection Device and Optional vehicle to Station Communication</p> <p>SAE J 2783 Liquid Hydrogen Surface Vehicle Refueling Connection Devices</p> | <p>ASME B31.12 H2 Piping and Pipeline Code</p> <p>SAE J 2572 Recommended Practice for Measuring the Exhaust Emissions, Energy Consumption and Range of Fuel Cell Powered Electric Vehicles using Compressed Gaseous Hydrogen</p> |

Systems for Cryogenic Liquids

International Organization for Legal Metrology (OIML) OIML R 139 Compressed Gaseous Fuel Measuring Systems for Vehicles

ISO/CD 14687-2 Hydrogen Fuel - Product Specification Part 2: PEM fuel cell applications for road vehicles

SAE J 2719 Hydrogen Quality Guideline for Fuel Cell Vehicles

ASTM D7550-09 Standard Test Method for Ion Chromatography Based Determination of Cations in Hydrogen and Other Fuel Cell Feed Gases

ASTM WK4548 Standard Test Method for Determination of Trace Contaminants in Hydrogen and Related Fuel Cell Feed Gases

ASTM WK5847 Standard Practice for Sampling of High Pressure Hydrogen and Related Fuel Cell Feed Stocks

ASTM WK6527 Standard Test Method for Ion Selective Electrode Based Determination of Ammonia in Hydrogen

ASTM WK6624 Standard Test Method for Determination of Formaldehyde and Other Carbonyl Compounds in Hydrogen

ASTM WK8150 Standard Test method for Determination of Ammonia in Hydrogen by Gas Chromatography and Nitrogen Chemiluminescence

ASTM WK9688 Standard Test Method for Determination and Sampling of Particulate Matter in High Pressure Hydrogen Gaseous Fuel with In-Stream Filter

ASTM WK10196 Standard Test Method for Determination of Ammonia and Trace Water in Hydrogen and Other Fuel Cell Gaseous Fuels by Infrared Spectroscopy

ASTM WK21162 Standard Test Method for the Characterization of Particles from Hydrogen Fuel Streams by Scanning Electron Microscope

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| | <p>ASTM WK21597 Microscopic Measurement of Particulates in Hydrogen Fuel</p> <p>ASTM WK21611 Gravimetric Measurement of Particulate Concentration in Hydrogen Fuel</p> <p>ASTM WK22378 Standard Test Method for Analysis of Total Hydrocarbon Content in Hydrogen Fuel Using a THC Analyzer</p> <p>ASTM WK23815 Standard Test Method for Determination of Total Halocarbons Contained in Hydrogen and Other Gaseous Fuels</p> <p>ASTM WK24073 Standard Test Method for Determination of Trace Hydrogen Sulfide, Methyl Mercaptan and Carbonyl Sulfide in Hydrogen Fuel</p> | | |
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| | A: Essential To or Enables Commercialization | B: Important to Commercialization | C: Supports Commercialization |
|------------------------|--|--|---|
| Moderate Effort | <p>CSA HGV 4.X Series</p> <p>NFPA 2 Hydrogen Technologies</p> <p>NFPA 55 Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in Portable in Portable and Stationary Containers, Cylinders and Tanks</p> <p>Global Technical Regulations (GTRs) for Vehicles</p> <p>Micro Fuel Cell Transportation Regulations</p> <p>ANSI/CSA America FC1-2001 Fuel Cell Power Systems (Safety)</p> <p>IEC 62282-3-1 (2007-04) Stationary Fuel Cell Power Systems - Safety</p> <p>NFPA 853, Fuel Cell Installation</p> <p>NFPA 70 (National Electrical Code) Article 692, Fuel Cell Systems</p> <p>Revision to FMVSS 305 and SAE J1766, Post Collision Electrical Safety in Vehicles</p> <p>FMVSS for High-Pressure Compressed Hydrogen Storage in Vehicles, CSA NGV/HGV,</p> <p>SAE J2579- H2 Storage Systems (design & performance)</p> <p>SAE J 2578 Recommended Practice for General Fuel Cell Vehicle Safety</p> <p>IEC 62282-6-300 (2009-06) Micro Fuel Cell Power Systems - Fuel Cartridge Interchangeability</p> <p>HIPOC (Hydrogen Industry Panel on Codes) Hydrogen Quality Standards(ASTM, CGA, ISO, SAE)</p> <p>New York City Construction & Fire Codes</p> <p>Cargo Shipping regulations of Fuel Cells, Fuel Cell</p> | <p>California Air Resources Board Emissions Regulations for Stationary Generation</p> <p>Portable Fuel Cell Regulations</p> <p>UL 2266 on Fuel Cells in Telecomm applications</p> <p>UL 2265 - Micro Fuel Cell Safety</p> <p>ANSI/CSA America FC3-2004 Portable Fuel Cell Power Systems (Safety)</p> <p>IEEE 1547 - Interconnection of Distributed Generation</p> <p>ISO TC 197 WG#9 – Hydrogen Generators</p> <p>ISO TC 22 SC21 Hydrogen Vehicle Standards</p> <p>Hydrogen Sensor Standards – ISO TC 197, UL 2075, ANSI/ISA 12.13.01/02</p> <p>IEC 62282-5-1 (2007-02) Portable Fuel Cell Appliances – Safety</p> <p>IEC/PAS 62282-6-1 (2006-02) Micro Fuel Cell Power Systems - Safety</p> <p>IEC 62282-6-100 Micro Fuel Cell Power Systems – Safety</p> <p>ISO 13985 Liquid Hydrogen, Land Vehicle Fuel Tanks</p> <p>ISO/TS 15869 Gaseous Hydrogen Blends & Hydrogen Fuels - Land Vehicles Fuel Tanks</p> <p>ISO TS 20100 Gaseous Hydrogen - Service Stations</p> <p>ISO 26142 Hydrogen Detector Apparatus</p> <p>SAE J 2601 Compressed Hydrogen Vehicle Fueling Communication Devices</p> <p>SAE J 2615 Performance Test Procedure of Fuel Cell Systems for Automotive Applications</p> <p>SAE J 2616 Performance Test Procedure of Fuel Processor Subsystem of Automotive Fuel Cell System</p> | <p>Stack Material & Components Protocols / Round Robins / Standardization / Investigations</p> <p>IEC 62282-3-2 (2006-03) Stationary Fuel Cell Power Systems - Performance Test Methods</p> <p>ASME PTC 50 – Fuel Cell Performance</p> <p>ASME Materials for a Hydrogen Economy</p> <p>FCTESTNET/QA</p> <p>IEC 62282-3-201 Small stationary polymer electrolyte fuel cell power system – Performance test method</p> <p>IEC/TS 62282-1 (2005-03) Terminology</p> <p>IEC 62282-2 (2004-03) Fuel Cell Modules</p> <p>IEC 62282-3-3 (2007-11) Stationary Fuel Cell Power Systems - Installation</p> <p>IEC 62282-6-200 (2007-11) Micro Fuel Cell Power Systems - Performance</p> <p>IEC 62282-7-1 TS Ed.1 Single Cell Test method for Polymer Electrolyte Fuel Cells</p> <p>IEC TC 105 Ad Hoc Group #1 Identification of the market needs for standardization work of fuel cell systems for propulsion and auxiliary power units</p> <p>ASTM WK7637 Measurement of Electrochemical Performance of Single Cell Planar Solid Oxide Fuel Cells</p> <p>UL 2075 Gas and Vapor Detectors and Sensors</p> <p>Outline of Investigation UL Subject 2264 B Gaseous Hydrogen Generation Appliances - Water Reaction</p> <p>Outline of Investigation UL Subject 2265 A Hand</p> |

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| | <p>Cartridges, Fuel Cell Engines and Fuel Cell Vehicles</p> <p>UN Sub-Committee of Experts ICAO Dangerous Goods Panel IMO Dangerous Goods Code ADR/ADN Joint Meeting US DOT Transport Canada</p> <p>IEC 62282-6-100 Micro Fuel Cell Safety</p> <p>ISO 17268:2006 Compressed Hydrogen Surface Vehicle - Refueling Connection Devices</p> <p>SAE J 2579 Recommended Practice for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles</p> <p>SAE J 1766 Recommended Practice for Electric and Hybrid Electric Vehicle Battery Systems Crash Integrity Testing</p> | <p>SAE J 2617 Performance Test Procedure of PEM Fuel Cell Stack Subsystem for Automotive Application</p> <p>SAE J 2722 Recommended Practice for the Durability Testing of PEM Fuel Cell Stacks</p> | <p>Held or Transportable Fuel Cell Power Units with Fuel Containers - Methanol Fuel Cartridges</p> <p>Outline of Investigation UL Subject 2265 C Hand Held or Transportable Fuel Cell Power Units with Fuel Containers - Borohydride Fuel Cartridges</p> |
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|-------------------|--|---|---|
| Low Effort | <p>ISO 16111 Transportable Gas Storage Devices - Hydrogen Absorbed in Reversible Metal Hydrides</p> <p>CSA America HPRD1 Basic Requirements for Pressure Relief Devices for Compressed Hydrogen Vehicle Fuel Containers</p> <p>UL Subject 2266 Electromagnetic Compatibility, Electrical Safety, and Physical Protection of Stationary and Portable Fuel Cell Power Systems for Use with Commercial Network Telecommunication Equipment</p> | <p>SAE performance, sustainability, and terminology documents for Fuel Cell Vehicles</p> <p>SAE J 2594 Fuel Cell Recyclability Guidelines</p> <p>SAE J 2760 Pressure Terminology Used in Fuel Cells and Other Hydrogen Vehicle Applications</p> <p>SAE J 2574 Information Report - Fuel Cell Electric Vehicle Terminology</p> <p>ISO 22734-1:2008 Hydrogen Generators Using Electrolysis Process</p> <p>ISO 16110-1 Hydrogen Generators Using Fuel Processing Technologies Part 1: Safety</p> <p>ISO 16110-2 Hydrogen Generators Using Fuel Processing Technologies Part 2: Test Method for Performance</p> <p>CSA America HGV2 Standards for Hydrogen Vehicle Fuel Containers</p> | <p>Standardized Industry Error Codes</p> <p>ASME B31.12 Performance based standard for approving Hydrogen components</p> <p>Propane Quality (Odorant) Standards</p> <p>IEC TC 105 Working Group #6 Fuel Cell Systems for Propulsion and Auxiliary Power Units</p> <p>ISO/PAS 15594 Airport Hydrogen Fuelling Facility Operation</p> <p>ISO TR 15916:2004 Basic Considerations for the Safety of Hydrogen Systems</p> <p>CSA America FC4 Fuel Cell Modules</p> <p>CSA America FC5 Hydrogen Generators</p> <p>CSA America FC11 Hand Held or Hand Transportable Fuel Cell Power Units with Fuel Containers</p> <p>UL Subject 2264 A Gaseous Hydrogen Generation Appliances - Electrolyzer Technology Waiting for international standard ISO TC197 WG#8</p> <p>UL Subject 2264 C (Joint activity with CSA America; FC5) Gaseous Hydrogen Generation Appliances - Fuel Processing Technology Waiting for international standard ISO TC197 WG#9</p> |

Most recent changes are **HIGHLIGHTED**.