

**National Hydrogen and Fuel Cell Codes and Standards Coordinating Committee  
(NHFCSCC)**

**Wednesday, October 12, 2021  
TIME: 2:00 – 3:00 pm (Eastern Standard Time)**

**Minutes**

**Attendees**

**Connor Dolan  
Brian Ehrhart  
Douglas Olenick  
Jay Keller  
Karen Quackenbush  
Kelvin Hecht  
Mark Luth  
Mukund**

**Norman Newhouse  
Sara Marxen  
Ray Rahaman  
Juana Williams  
Jennifer Gangi  
Ian MacIntire  
Yuk Wong  
Eric Prause**

**Owen Hopkins  
Christina Daniels  
Mike Steele  
Jennifer Hamilton  
John Eihusen  
Stella Papasavva  
Andrea Lubawy**

**I. Welcome and Housekeeping Items**

- FCHEA’s anti-trust guidelines – reviewed
- Meeting agenda – reviewed - Approved
- Previous meeting minutes – approved

**II. DOE/HQ Update**

**Brian Ehrhart**

Project announcements – CRADA Call supporting NREL ARIES systems, integrated hydrogen project testing and validation. Topics 2 and 3 – applied risk assessments and modeling for hydrogen and next-generation sensor technologies. Three topics under applied risk assessments – on-board and fueling for hydrogen locomotives, bulk hydrogen storage from electricity production, and risk assessment for fuel cell electric buses. Two CRADAs announced for next-generation sensor technologies (WAM), both led by NREL. First on outdoor leak detection and the second project on advanced sensor technologies for indoor hydrogen detection.

Demonstration project announced for hydrogen from nuclear power.

**III. Codes & Standards Events and Fuel Cell Safety Information**

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

**Karen Quackenbush**

ASTM D03 Committee week is also happening on December 7<sup>th</sup> and 8<sup>th</sup>.

**Request:** technical resource updates for the Hydrogen and Fuel Cell Safety website. Any committee members who have materials they would like hosted on the website can send them to Karen Quackenbush ([kquackenbush@fchea.org](mailto:kquackenbush@fchea.org)) or Connor Dolan ([cdolan@fchea.org](mailto:cdolan@fchea.org)).

#### IV. Global Technical Regulations

Ian MacIntire

GTR 13 working group (IWG) meeting 11<sup>th</sup> will be this week. Most issues on the phase 2 agenda have been resolved. An informal document will be prepared at the end of November. There will be one final IWG meeting planned for January before submitting the document in February 2022.

#### V. Codes and Standards Organization Updates

##### Institute of Electrical and Electronics Engineers

Mark Siira

FCHEA's Stationary Power WG has been looking at lot at IEEE 1547 and planned updates. A guideline has been developed for use of this standard which is now open for public review.

FCHEA Safety Report article is available here:

<https://www.hydrogenandfuelcellsafety.info/september-2021#Update3>

##### International Electrotechnical Commission IEC TC 105

Kelvin Hecht

- **Plenary**
  - Virtual - October 27 & 28
  - US Tag to meet 10/15 to address positions on agenda
- **IEC 62282-3-100**
  - Stationary fuel cell power systems – Safety 3<sup>rd</sup> edition
    - 1<sup>st</sup> meeting to be held 10/14
- **IEC 62282-3-202**
  - Performance test methods of small (<10kW) stationary fuel cell power systems that can be complemented with a supplementary heat generator for multiple unit operation by EMS
    - New Work Item Proposal
    - US TAG to meet 10/22 to coordinate comments
- **IEC 62282-4-101**
  - Fuel cell power systems for industrial electric trucks – Safety
    - Committee Draft for Vote (CDV) open until 11/12/21
    - US TAG met to coordinate comments
- **IEC 62282-4-600**
  - Fuel cell/battery hybrid systems performance test methods for excavators
    - Committee Draft for Vote (CDV) open until 11/19/21
    - US TAG to meet 10/22 to coordinate comments

##### International Standards Organization ISO/TC 197

Karen Quackenbush/Jay Keller

Andrei Tchouvelev is rotating off as Chair with Ikeda-san taking on the position. This will happen at the ISO plenary.

At the plenary, a new ISO Subcommittee will be launched that Andrei will chair. This group will explore various hydrogen at scale applications of which the Committee has not typically handled.

More details of this is available on the FCHEA Safety Report.

WG 2 – working on revision to the hose assembly document **Doc # to be added**. They have pulled together the leftover comments from the original document, as well as more comments received since then in order to advance this document along with CSA HGV 4.2.

WG 5 – nozzles is meeting monthly. Held latest meeting last week. Primarily getting comments from the 2020 published version and will implement those. Looking at several activities, including heavy-duty, H70 medium-flow compatibility, and breakaway separation force which is different across different standards and components.

WG 24 – advanced communications group is also meeting monthly. Next group is next Thursday. Working to develop scope for that document.

Hydrogen Quality Groups – WG 27, 28, and 33 – Meeting on a periodic basis. Starting to look at various hydrogen quality values, sampling methods, and quality assurance.

**National Fire Protection Association NFPA 2**

**Chris LaFleur**

No change from last month update.

**International Codes Council (ICC)**

**Spencer Quong**

No further work this cycle.

**Society of Automotive Engineers (SAE)**

**Mike Steele**

**SAE Fuel Cell Standards Committee Documents**

Task Force	Document	Title	Date	Status
Interface	J2600_201510	Compressed Hydrogen Surface Vehicle Fueling Connection Devices	21-Oct-15	Revised - Action required
Interface	J2601_202005	Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles	29-May-20	Revised
Interface	J2601/2_201409	Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles	24-Sep-14	Issued - Action Required
Interface	J2601/3_201306	Fueling Protocol for Gaseous Hydrogen Powered Industrial Trucks	12-Jun-13	Issued - Action Required
Interface	TIR J2601/4	Ambient Temperature Refueling		Being developed

<b>Interface</b>	J2719_202003	Hydrogen Fuel Quality for Fuel Cell Vehicles	18-Mar-20	Revised
<b>Interface</b>	J2799_201912	Hydrogen Surface Vehicle to Station Communications Hardware and Software	13-Dec-19	Revised
<b>Interface</b>	TIR J3219	Hydrogen Fuel Quality Screening Test of Chemicals for Fuel Cell Vehicle		Being developed
<b>Safety</b>				
<b>Safety</b>	J1766_201401	Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing	10-Jan-14	Revised - Action required
<b>Safety</b>	J2578_201408	Recommended Practice for General Fuel Cell Vehicle Safety	26-Aug-14	Revised - Action required
<b>Safety</b>	J2579_201806	Standard for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles	15-Jun-18	Revised
<b>Safety</b>	J2594_201611	Recommended Practice to Design for Recycling Proton Exchange Membrane (PEM) Fuel Cell Systems	15-Nov-16	Reaffirmed
<b>Safety</b>	J2990/1_201606	Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice	3-Jun-16	Issued
<b>Safety</b>	J3089_201810	Characterization of On-Board Vehicular Hydrogen Sensors	43382	Issued
<b>Fuel Economy</b>				
<b>Fuel Economy</b>	TIR J3202	Recommended Practice for Measuring and Simulating Fuel Consumption and Range of Heavy Duty Fuel Cell Hybrid Road Vehicles Fueled by Compressed Gaseous Hydrogen		Being developed
<b>Fuel Economy</b>	J2572_201410	Recommended Practice for Measuring Fuel Consumption and Range of Fuel Cell and Hybrid Fuel Cell Vehicles Fuelled by Compressed Gaseous Hydrogen	16-Oct-14	Revised - Action required
<b>Performance</b>				
<b>Performance</b>	J2615_201110	Testing Performance of Fuel Cell Systems for Automotive Applications	20-Oct-11	Stabilized
<b>Performance</b>	J2616_201108	Testing Performance of the Fuel Processor Subsystem of an Automotive Fuel Cell System	12-Aug-11	Stabilized
<b>Performance</b>	J2617_201108	Recommended Practice for Testing Performance of PEM Fuel Cell Stack Sub-system for Automotive Applications	12-Aug-11	Stabilized

<b>Safety</b>	J2574_201109	Fuel Cell Vehicle Terminology	6-Sep-11	Stabilized
<b>Safety</b>	J2760_201106	Pressure Terminology Used in Fuel Cells and Other Hydrogen Vehicle Applications	1-Jun-11	Stabilized

## CSA

<b>Technical Committee Meetings</b>		
Hydrogen Transportation Technical Committee (WebEx) – October 6, 2021 from 1:00 - 3:30 PM Eastern.		
Fuel Cell Technical Committee (WebEx) – November 17, 2021 from 12:00 - 3:00 PM Eastern.		
<b>Active / Recently Published Projects</b>		
<b>TSC</b>	<b>Designation/Title</b>	<b>Status</b>
HGV 4.3	HGV 4.3, Test methods for hydrogen fueling parameter evaluation	This project is a revision of an existing standard, and will include content related to MC formula. The TSC completed review of comments, and the draft document is being prepped for Technical Committee Ballot.
HGV 4.2	HGV 4.2, Hoses for dispensing compressed gaseous hydrogen	This project is a revision of an existing standard, and will update to align with current hose technology, and remove requirements for on-board vehicle hoses (content will be transferred to HGV 3.1). The TSC completed review of comments, and the draft document is being prepped for Technical Committee Ballot.
HGV 5	HGV 5.2, Compact hydrogen fueling systems	This project is to develop a NEW standard for Compact Hydrogen Fueling Systems (HGV 5.2). The TSC continues to meet for content development.
HGV 3	HGV 3.1, Onboard vehicle components for hydrogen gas vehicles	This project is a revision of an existing standard for technology updates, as well as inclusion of the on-board vehicle hose requirements (transferred from HGV 4.2). The draft will be available for public review in mid-October.
HGV 4.1	HGV 4.5, Priority and sequencing equipment for hydrogen vehicle fueling	This project is to develop a standard to REINSTATE an updated edition of a Priority and Sequencing standard. A seed document draft has been prepared and a kickoff meeting with the HGV 4.1 TSC is being scheduled for Fall 2021.
C22.2 No. 22734	Hydrogen generators using water electrolysis	The CSA technical subcommittee has initiated work on a binational adoption of ISO 22734. Contact Mark Duda ( <a href="mailto:mark.duda@csagroup.org">mark.duda@csagroup.org</a> ) with questions or for additional information.
FC 3	Portable Fuel Cell Power Systems	The 2004 edition of FC 3 document was recently reaffirmed.

## Compressed Gas Association (CGA)

Rob Early

Status of current and future publications:

Standard	Current edition	Status
CGA G-5, <i>Hydrogen</i>	8 <sup>th</sup> (2017)	Deadline to submit proposed changes for next edition is 7/7/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-019">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-019</a>
CGA G-5.3, <i>Commodity specification for hydrogen</i>	7 <sup>th</sup> (2017)	Deadline to submit proposed changes for next edition is 6/4/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013</a>
CGA G-5.4, <i>Standard for hydrogen piping systems at user locations</i>	6 <sup>th</sup> (2019)	Deadline to submit proposed changes for next edition is 12/22/2024. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54</a>
CGA G-5.5, <i>Hydrogen vent systems</i>	3 <sup>rd</sup> (2014)	The 5 <sup>th</sup> edition has been published and can be found at <a href="https://portal.cganet.com/Publication/Details.aspx?id=G-5.5">https://portal.cganet.com/Publication/Details.aspx?id=G-5.5</a> Deadline to submit proposed changes for next edition is 03/04/2026. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3</a> Heat radiation testing at Chart Industries in New Prague, MN date is planned for this fall. The goal is for the task force to review test results this fall.
CGA G-5.6, <i>Hydrogen pipeline systems</i>	1 <sup>st</sup> (2005 – reaffirmed 2013)	Deadline to submit proposed changes for next edition is 8/1/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018</a>
CGA H-1, <i>Service conditions for portable, reversible metal hydride systems</i>	2 <sup>nd</sup> (2011)	Deadline to submit proposed changes for next edition is 2/3/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-033">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-033</a>
CGA H-2, <i>Guideline for classification and labeling of hydrogen storage systems with hydrogen absorbed in reversible metal hydrides</i>	2 <sup>nd</sup> (2018)	Deadline to submit proposed changes for next edition is 6/4/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-012">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-012</a>
CGA H-3, <i>Standard for cryogenic hydrogen storage</i>	3 <sup>rd</sup> (2019)	Deadline to submit proposed changes for next edition is 12/1/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-036">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-036</a>
CGA H-4, <i>Terminology associated with hydrogen fuel technologies</i>	3 <sup>rd</sup> (2020)	Deadline to submit proposed changes for next edition is 12/1/2024. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59</a>
ANSI/CGA H-5, <i>Standard for bulk hydrogen supply</i>	3 <sup>rd</sup> (2020)	The deadline to submit proposed changes for the next edition is 2/26/2024.



Standard	Current edition	Status
<i>systems</i>		<a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010</a>
CGA H-10, <i>Combustion safety for steam reformer operation</i>	2 <sup>nd</sup> (2018)	Deadline to submit proposed changes for next edition is 12/1/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038</a>
CGA H-11, <i>Safe start-up and shutdown practices for steam reformers</i>	2 <sup>nd</sup> (2020)	Deadline to submit proposed changes for next edition is 8/11/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30</a>
CGA H-12, <i>Mechanical integrity of syngas outlet systems</i>	1 <sup>st</sup> (2016)	Deadline to submit proposed changes for next edition is 3/1/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016</a>
CGA H-13, <i>Hydrogen pressure swing adsorber (PSA) mechanical integrity requirements</i>	1 <sup>st</sup> (2017)	Deadline to submit proposed changes for next edition is 8/1/2022. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027</a>
CGA H-14, <i>HYCO plant gas leak detection and response practices</i>	1 <sup>st</sup> (2018)	Deadline to submit proposed changes for next edition is 12/8/2023. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045</a>
CGA H-15, <i>Safe catalyst handling in HYCO plants</i>	1 <sup>st</sup> (2020)	Deadline to submit proposed changes for next edition is 9/1/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59</a>
CGA H-XXX (TBD), <i>Small scale hydrogen production and delivery</i>	New publication not released yet	Task force has created the first draft that will then go to the CGA membership for review.
CGA P-28, <i>OSHA process safety management and EPA risk management plan guidance document for bulk liquid hydrogen supply systems</i>	4 <sup>th</sup> (2014)	The ad hoc committee reviewed and updated the draft of the 5 <sup>th</sup> edition on September 10. The draft will go to Standards Council for final balloting.
CGA PS-31, <i>Position statement on cleanliness for proton exchange membranes hydrogen piping / components</i>	1 <sup>st</sup> (2007 – reaffirmed 2019)	Deadline to submit proposed changes for next edition is 6/12/2025. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16</a>
CGA PS-33, <i>Position statement on the use of LPG or propane tanks as compressed hydrogen storage buffers</i>	1 <sup>st</sup> (2008 – reaffirmed 2020)	Deadline to submit proposed changes for next edition is 12/10/2026. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41</a>
CGA PS-46, <i>Position statement on roofs over</i>	1 <sup>st</sup> (2017)	Deadline to submit proposed changes for next edition is 3/6/2023.

Standard	Current edition	Status
<i>hydrogen storage systems</i>		<a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012</a>
CGA P-48, <i>Position statement on clarification of existing hydrogen setback distances and development of new hydrogen setback distances in NFPA 55</i>	1 <sup>st</sup> (2016)	Deadline to submit proposed changes for next edition is 2/12/2021. <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-062">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-062</a>
CGA work item 21-126, <i>Hydrogen system siting and personnel exposures distances</i>		CGA will support the work on liquid hydrogen new setback distances proposed to NFPA 2 and NFPA 55 by Sandia. The NFPA 55 second draft web conference is scheduled for November 3-5. The NFPA 2 second draft meeting has not yet been scheduled.
CGA work item 21-127, <i>Transfer and unloading of hydrogen at near-consumer use points</i>	New publication not released yet	Develop new standard to update traditional hydrogen delivery practices for industrial users to improve practices for retail applications.
CGA work item 21-128, <i>Noise from hydrogen venting and hydrogen systems operations</i>	New publication not released yet	Develop new standard to reduce the noise from hydrogen system operations, including venting, particularly at retail applications where hydrogen system noise is greater than ambient noise

### American Society for Testing & Materials (ASTM)

Jennifer Hamilton

D03 workshop is coming along nicely. Will be a half-day workshop both remote and in-person at the Anaheim Marriott on December 8<sup>th</sup>. This is in conjunction with the Committee and Subcommittee meetings on December 7<sup>th</sup> and 8<sup>th</sup>.

There is a small fee for non-members unless you are presenting.

### American Society of Mechanical Engineers (ASME)

Ray Rahaman

B31.12 met on 16<sup>th</sup> of September. Have a number of items working on and being validated by the Committee. There is a large international presence and interest now. We are seeking new members.

The next meeting should be held in the Spring of next year. It is expected to be a virtual meeting at this time.

## VI. Discussion Topics

### Facilitating Deployment

All

None at this time.



**Center for Hydrogen Safety**

**Nick Barilo**

None at this time.

**Regulatory Matrix Review and Comment**

**Karen Quackenbush**

Please direct any updates, questions, or comments to Karen Quackenbush by email at [kquackenbush@fchea.org](mailto:kquackenbush@fchea.org).

September 30, 2021 version was published and available online at <https://www.fchea.org/s/FCHEA-Regulatory-Matrix-Markup-September-30-2021.pdf>.

**Permitting and Installation of Hydrogen Fueling Stations**

**California Station Implementation**

**Jennifer Hamilton**

Hoping to see a few more stations come online.

An updated notice was provided on the SOSS page.

**California Div. of Measurement Standards/Fuel Quality / Metrology** **Christina Daniels**

No update at this time.

**Legal Metrology Standards Hydrogen Fuel  
Quality and Measurement**

**Juana Williams/Ralph Richter**

No updates at this time.

**VII. Open Discussion & Other Issues**

The ICBS event was held over four days recently. There were over 100 papers provided. Presentations will be available on the ICBS 2021 website.

**VIII. Next Meeting – Wednesday, November 10 at 2:00 PM US Eastern.**