

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

**Wednesday, January 11, 2023  
TIME: 2:00 PM EDT**

**Minutes**

**Shawn Cole  
Brian Ehrhart  
John Eihusen  
Jennifer Hamilton  
Kelvin Hecht  
Owen Hopkins  
Jay Keller**

**Chris LaFleur  
Ian MacIntire  
Eric Nelson  
Norm Newhouse  
Douglas Olenick  
Haboon Osmond  
Jeff Puckett**

**Karen Quackenbush  
Ray Rahaman  
Mike Steele  
Christine Watson  
Juana Williams**

**I. Welcome and Housekeeping Items**

- a. The NHFCCSCC reviewed FCHEA's anti-trust guidelines, approved previous minutes, and approved the meeting agenda.

**II. DOE/HQ Update**

**Christine Watson**

- [Notice of Intent \(NOI\)](#) to issue Hydrogen and Fuel Cell Technologies Office Funding Opportunity Announcement in Support of Hydrogen Shot. May include Areas of Interest:
  - Hydrogen Carrier Development
  - Onboard Storage Systems for Liquid Hydrogen
  - Liquid Hydrogen Transfer/Fueling Components and Systems
  - M2FCT: High Performing, Durable Membrane Electrode Assemblies for Medium- and Heavy-duty Applications
- [Notice of Intent \(NOI\)](#) to issue Bipartisan Infrastructure Law Funding Opportunity Announcement "Clean Hydrogen Electrolysis, Manufacturing, and Recycling." May include Areas of Interest:
  - Low Cost, High-Throughput Electrolyzer Manufacturing
  - Electrolyzer Component and Supply Chain Development
  - Advanced Electrolyzer Technology and Component Development
  - Fuel Cell MEA and Stack Manufacturing and Automation
  - Fuel Cell Supply Chain Development
  - Recycling and Recovery Consortium
- [H2Hubs Applicant Informational Webinar](#) | Department of Energy, January 12th, 10:30 AM - 12:00 PM EST
- [DOE Building Technologies Office issued FOA on Bipartisan Infrastructure Law: Resilient and Efficient Codes Implementation.](#) The activities to be funded under this FOA support the BIL, as well as a broader government-wide approach to advance building codes and support their successful implementation. The primary focus centers around updating to more efficient building energy codes that save money for American homes and businesses, reduce greenhouse gas (GHG) emissions, and encourage more resilient buildings.

### III. Codes & Standards Events and Fuel Cell Safety Information Karen Quackenbush

- Calendar of events: <https://www.hydrogenandfuelcellsafety.info/safety-report-calendar>
- Any committee members with materials they would like hosted on the website can send them to Karen Quackenbush ([kquackenbush@fchea.org](mailto:kquackenbush@fchea.org)) or Haboon Osmond ([hosmond@fchea.org](mailto:hosmond@fchea.org)).

### IV. Global Technical Regulations Ian MacIntire

- GTR 13 Phrase 2 has been approved by GRSP. It may be voted on by WP 29 at their June 2023 meeting.
- <https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202210&RIN=2127-AM40>

### V. Codes and Standards Organization Updates

#### Institute of Electrical and Electronics Engineers Mark Siira

- IEEE 1547's revision process started on January 9<sup>th</sup>.

#### International Electrotechnical Commission IEC TC 105 Kelvin Hecht

- In February, the US delegation will comment and vote on the Committee Drafts for the following Micro Fuel Cell Power Systems:
  - CDV IEC 62282-6-101
    - *Fuel cell technologies - Part 6-101: Micro fuel cell power systems - Safety - General requirements*
  - CDV IEC 62282-6-106
    - *Fuel cell technologies - Part 6-106: Micro fuel cell power systems - Safety - Indirect Class 8 (corrosive) compounds*
  - CDV IEC 62282-6-107
    - *Fuel cell technologies - Part 6-107: Micro fuel cell power systems - Safety - Indirect water-reactive (Division 4.3) compounds*

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

- WG 21 (Gaseous hydrogen fueling station compressors) is meeting January 17-19 near Philadelphia, PA. The goal is to look through the internationally recognized compressor standards to identify suitable references.
- The language of TR 15916 has undergone some editorial changes (e.g., the removal of the word "should"). TR 15916 has been voted to be kept as a technical report.
- WG 24's task force activity had been delayed due to waiting for the delivery of PRHYDE documents. However, Task Groups 2 and 3 can now start back up with the arrival of the documents.
- The US TAG administration has recommended Jennifer Hamilton to become the new US TAG chair for ISO/TC 197, Hydrogen Technologies, following Glenn Scheffler's announced retirement as TAG chair.
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#### National Fire Protection Association NFPA 2 Chris LaFleur

- The 2023 edition of NFPA 2 is now available. The 2023 edition is open for public input.

**International Codes Council (ICC)**

**Gabriel Maser/Matt Sigler**

- No updates.

**Society of Automotive Engineers (SAE)**

**Mike Steele**

<b>Task Force</b>	<b>Document</b>	<b>*</b>	<b>Title</b>	<b>Date</b>	<b>Status</b>
<b>Interface</b>	J2600_201510	S	Compressed Hydrogen Surface Vehicle Fueling Connection Devices	21-Oct-15	Being revised in conjunction with ISO 17268
<b>Interface</b>	J2601_202005	S	Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles	29-May-20	Being revised
<b>Interface</b>	J2601/2_201409	TIR	Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles	24-Sep-14	Discussing Stabilization of content
<b>Interface</b>	J2601/4	TIR	Ambient Temperature Refueling	21-Nov-16	Being developed. Anticipate voting on draft 1Q23.
<b>Interface</b>	J2601/5	TIR	MC Formula High Flow General (MCF-HF-G) <i>(title may change)</i>	1-Jul-22	Draft posted
<b>Safety</b>	J1766_201401	RP	Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing	10-Jan-14	Revised - Action required. Awaiting GTR 13 Phase 2
<b>Safety</b>	J2990/1_201606	RP	Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice	3-Jun-16	WIP - draft posted
<b>Fuel Economy</b>	J3202	RP	Recommended Practice for Measuring and Simulating Fuel Consumption and Range of Heavy Duty Fuel Cell Hybrid Road Vehicles Fueled by Compressed Gaseous Hydrogen	25-Apr-19	Being developed. No draft posted
<b>Fuel Economy</b>	J2572_201410	RP	Recommended Practice for Measuring Fuel Consumption and Range of Fuel Cell and Hybrid Fuel Cell Vehicles Fuelled by Compressed Gaseous Hydrogen	16-Oct-14	Needs affirmation ballot of existing content

**CSA**

**Sara Marxen**

<b>Active Projects</b>		
<b>TSC</b>	<b>Designation/Title</b>	<b>Status</b>
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). Working with the TC and TSC Chairs to disposition. Meeting will be planned with TSC to discuss.

HGV 5	HGV 5.1, Residential hydrogen fuelling appliances	This project is to develop a NEW standard for Residential fueling appliances. Project was kicked off in October. Content development continues.
HGV 2	HGV 2, Compressed hydrogen gas vehicle fuel containers	This project is a revision of an existing standard. The TSC is dispositioning comments and ballot to Technical Committee is being planned.
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. The document has been sent out for industry review and the TSC will be meeting soon to discuss the comments received.
HGV 4.3	HGV 4.3, Test methods for hydrogen fueling parameter evaluation	This project is a revision of an existing standard. A Task Force was put together to develop text to transition from a testing standard to a standard that can be used for certification. The TSC will proceed with this project and discuss lower boundary prior to publication.
B22734	Hydrogen generators using water electrolysis	The first edition draft is being finalized for publication. Contact Mark Duda ( <a href="mailto:mark.duda@csagroup.org">mark.duda@csagroup.org</a> ) with questions or for additional information.
B107	Enclosed Hydrogen Equipment	Work has begun on a new standard that will address safety requirements related to hydrogen equipment use inside an enclosure. Contact Mark Duda ( <a href="mailto:mark.duda@csagroup.org">mark.duda@csagroup.org</a> ) with questions or for additional information.
SPE-701	SPE-701 – Hydrogen fuel storage containers for aviation applications	The project is to develop a new document for requirements and recommendations for the material, design, manufacture, marking, and testing of serially produced, refillable hydrogen fuel storage containers intended only for the storage of compressed hydrogen gas or liquid hydrogen fuel for aviation applications. Contact Mark Duda ( <a href="mailto:mark.duda@csagroup.org">mark.duda@csagroup.org</a> ) with questions or for additional information.

## Compressed Gas Association (CGA)

Rob Early

*Updates from last month's report are highlighted.*

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 was 7/7/2022. CGA has started working on resolving the proposed changes and will issue G-5 as an ANSI standard. For

Standard	Current edition	Status
		updates on the work item progress see <a href="https://portal.cganet.com/WorkItem/Details.aspx?id=22-019">https://portal.cganet.com/WorkItem/Details.aspx?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 5/1/2023. <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 ongoing. The goal is for the task force to review test results as soon as they are completed.
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 8/1/2023. <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-3, <i>Standard for cryogenic hydrogen storage</i>	3 <sup>rd</sup> (2019)	Deadline to submit proposed changes for next edition was 12/1/2022. CGA has started the process of designating this as an ANSI standard. Please contact Rob Early at <a href="mailto:rearly@cganet.com">rearly@cganet.com</a> if interested in joining the ANSI committee. <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 systems</i>	3 <sup>rd</sup> (2020)	The deadline to submit proposed changes for the next edition is 2/26/2024. <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>

<b>Standard</b>	<b>Current edition</b>	<b>Status</b>
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 3/1/2023. <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 11/12/2022. <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-17, <i>Small scale hydrogen production and delivery</i>	New publication not released yet	Task force has created the first draft that is out for proposed changes; the deadline to submit proposed changes is 12/15/2022. <a href="https://portal.cganet.com/WorkItem/Details.aspx?id=18-093">https://portal.cganet.com/WorkItem/Details.aspx?id=18-093</a>
CGA P-28, <i>OSHA process safety management and EPA risk management plan guidance document for bulk liquid hydrogen supply systems</i>	5 <sup>th</sup> (2022)	Deadline to submit proposed changes for next edition is 08/01/2027 <a href="https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-49">https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-49</a>
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</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>



Standard	Current edition	Status
<i>compressed hydrogen storage buffers</i>		
CGA PS-46, <i>Position statement on roofs over hydrogen storage systems</i>	1 <sup>st</sup> (2017)	Deadline to submit proposed changes for next edition is 3/6/2023. <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 was 2/12/2021. Standard has been on hold until NFPA 2:2023 has been issued. Now that NFPA 2:2023 has been issued, work will restart on updates to PS-48 to point to NFPA 2 for hydrogen. For updates see the link below: <a href="https://portal.cganet.com/WorkItem/Details.aspx?id=21-062">https://portal.cganet.com/WorkItem/Details.aspx?id=21-062</a>
PS-69, <i>Liquid Hydrogen Supply Systems Separation Distances</i>	1 <sup>st</sup> (2022)	CGA has developed a position statement pointing users to the new liquid hydrogen system distances that will be in NFPA 2:2023 and are not yet released. The position statement covers the process of requesting a variance to use the numbers from the NFPA 2 section of the NFPA web site. PS-69 is free for downloading at <a href="https://www.cganet.com/wp-content/uploads/PS-69_1.pdf">https://www.cganet.com/wp-content/uploads/PS-69_1.pdf</a>
CGA work item 21-127, <i>Transfer and unloading of hydrogen at near-consumer use points</i>	New publication not released yet	Develop a 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 a 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. The task force held a meeting November 1 and is working on developing content for the publication.
CGA work item 22-107, <i>Hydrogen system best practices</i>	New publication not released yet	Develop a new standard to capture recommended best practices for handling hydrogen, filling containers, starting up systems, maintaining hydrogen systems, and similar topics to ensure safe practices for those new to the hydrogen space and to share best practices with those already experienced with hydrogen. Planned date for the first draft is March 2023. The task force has met twice to

Standard	Current edition	Status
		collect and organize best practices from members.

### Upcoming events:

CGA is working a hydrogen seminar in November 2023 with support from CGA members and partners. More details and a call for papers will be out soon.

CGA has established a new hydrogen membership category for those interested in hydrogen activities and not the whole range of industrial gases. The new membership category has a lower fee structure. More details can be found at <https://www.cganet.com/cga-announces-formation-of-hydrogen-membership/>. Those who are interested are encouraged to review the material at the CGA website and/or contact Rob Early at [rearly@cganet.com](mailto:rearly@cganet.com).

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

Jennifer Hamilton

- ASTM D7653 – 18: Standard Test Method for Determination of Trace Gaseous Contaminants in Hydrogen Fuel by Fourier Transform Infrared (FTIR) Spectroscopy has a Proposed revision (WK 61780).
- ASTM D7941/7941M-14: Standard Test Method for Hydrogen Purity Analysis Using a Continuous Wave Cavity Ring-Down Spectroscopy Analyzer is awaiting the ballot results at the subcommittee level.
- There is a collaboration area for aviation hydrogen; if interested, please reach out to Jennifer Hamilton or Christina Daniels.
- Jennifer Hamilton is stepping down from the subcommittee, so Christine Daniels may start being the member to share ASTM updates with the committee.

#### American Society of Mechanical Engineers (ASME)

Ray Rahaman

- The publication of B31.12 has been pushed back due to the finalizing of several last-minute records that require approval.
- The B31.12 European International Working Group is currently in the training phase.

## VI. Discussion Topics

### Facilitating Deployment

All

#### Center for Hydrogen Safety

Jennifer Hamilton

- A two-hour laboratory hydrogen safety course is now available and is free for everyone. The URL is <https://www.aiche.org/academy/courses/ela210/hydrogen-laboratory-safety>.
- A 90-minute webinar titled “Liquid Hydrogen: Safety and Design Considerations” will be hosted by CHS on Thursday, January 26, 2023, at 10 AM US-EST. The link for registration is <https://www.aiche.org/academy/webinars/liquid-hydrogen-safety-and-design-considerations>.



- The CHS Europe conference will be held in Rotterdam, Netherlands, May 9-11, 2023. CHS is taking abstracts for presentation. See <https://www.aiche.org/chs/conferences/european-hydrogen-safety-conference/2023> for more information and links for submitting an abstract.
- A questionnaire has been made available to assess the safety culture of organizations working with hydrogen. The questionnaire will help inform an international IEA activity and lead to the development of safety culture resources. Please consider taking the questionnaire at <https://h2tools.org/form/hydrogen-safety-culture-question>.

#### **Regulatory Matrix Review and Comment**

**Karen Quackenbush**

- This Matrix is updated quarterly and keeps FCHEA members up-to-date in the development of codes, standards, and regulations.
- As of December 31, 2022:  
<https://static1.squarespace.com/static/5668416ddc5cb4375e2a9ef8/t/63b7029b035a2d2b4a51609b/1672938139529/FCHEA+Regulatory+Matrix+Markup+December+31+2022.pdf>
- Please direct any updates, questions, or comments to Karen Quackenbush via email at [kquackenbush@fchea.org](mailto:kquackenbush@fchea.org) or Haboon Osmond at [hosmond@fchea.org](mailto:hosmond@fchea.org).

#### **Permitting and Installation of Hydrogen Fueling Stations**

- There has been a focus on the technical issues of existing stations.

#### **California Station Implementation**

**Jennifer Hamilton**

- No updates.

#### **California Div. of Measurement Standards/Fuel Quality / Metrology**

**Christina Daniels**

- No updates.

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

**Juana Williams**

- There is no update due to the National Conference on Weights and Measures (NCWM) concluding its January 8-11, 2023 Interim Meeting in Savannah, GA, at noon today. A report will be provided in February 2023 on the decisions of the NCWM Specifications and Tolerances and Laws and Regulations Committees who are addressing the proposals for including a hydrogen dispenser fueling safety protocol into NIST Handbook (HB) 44 and recognizing a second hydrogen fuel quality standard and filter requirements (i.e., for particulates & liquids) in NIST HB 130.

### **VII. Open Discussion & Other Issues**

- There might be a need to update the national and international SDOs templates in order to be more inclusive of new technologies.  
<https://www.energy.gov/eere/fuelcells/standards-development-organizations>
- The deadline for abstracts for ICHS 2023 is January 31<sup>st</sup>:  
<http://conference.ing.unipi.it/ichs2023/openconf.php>

### **VIII. Next Meeting – Wednesday, February 1<sup>st</sup> at 2:00 PM US Eastern Time**