

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

**Wednesday, September 7, 2022
TIME: 2:00 PM EDT**

Minutes

**Claire Behar
Raghukumar Bommenahalli
Bob Boyd
Joe Brady
Christina Daniels
Jennifer Gangi
Kelvin Hecht
Laura Hill
Alan Lang
Mark Luth
Ian MacIntire
Sara Marxen
Gabriel Maser
Eric Nelson**

**Haboon Osmond
Stella Papasavva
Heath Plagmann
Eric Prause
Jeff Puckett
Karen Quackenbush
Spencer Quong
Ray Rahaman
Antonio Ruiz
Matt Sigler
Mike Steele
Christine Watson
Juana Williams
Yuk Wong**

I. Welcome and Housekeeping Items

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

II. DOE/HQ Update

Laura Hill/Christine Watson

- HFTO has issued ["Funding Opportunity in Support of the Hydrogen Shot and a University Research Consortium on Grid Resilience"](#)
 - Key Dates:
 - Aug 23rd FOA Issue Date
 - Sept 23rd Submission Deadline for Concept Papers
 - Dec 1st Submission Deadline for Full Applications
 - Topic Areas:
 - AOI1: Hydrogen & Fuel Cell Technologies in Support of Hydrogen Shot
 - HydroGEN: Solar Fuels from Photoelectrochemical and Solar Thermochemical Water Splitting
 - Development and Validation of Sensor Technology for Monitoring and Measuring Hydrogen Losses
 - Materials-based H₂ Storage Demonstrations
 - M2FCT: High Performing, Durable, Low-PGM Catalysts and Membrane Electrode Assemblies for Medium- and Heavy-Duty Applications
 - AOI2: Improving Electricity Grid Resilience
 - The University Research Consortium for Grid Resilience

- JRC has published a [summary report](#) of the “Clean Hydrogen Joint Undertaking Expert Workshop on the Environmental Impacts of Hydrogen”.
- HFTO is hiring! EERE is hosting a weekly Virtual Clean Energy Career Fair; careers in HFTO will be featured in the [Sustainable Transportation session](#) on September 8, 12-2pm ET.

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) or Haboon Osmond (hosmond@fchea.org).

IV. Global Technical Regulations Ian MacIntire

- GTR 13 Phase 2 is finishing/cleaning up editorial changes.
- A list of items for consideration for Phase 3 is included in the current draft, and will be provided in a future update.

V. Codes and Standards Organization Updates

Institute of Electrical and Electronics Engineers Mark Siira

- IEEE 1547 will open for revision soon and is seeking IEEE members who want to help with the revision review. If interested in participating in the revision of IEEE 1547, please contact Karen Quackenbush via email at kquackenbush@fchea.org.

International Electrotechnical Commission IEC TC 105 Kelvin Hecht

- On Sept. 7th, there will be a meeting regarding the next edition of the international safety standard for stationary power plants (IEC 62282-3-100 ED3 - Fuel cell technologies - Part 3-100: Stationary fuel cell power systems – Safety is starting its revision process); the US is the convenor. The meetings occur monthly.
- On Sept. 9th, the US TAG will comment on a committee draft pertaining to the fuel cells operating in reverse. The standard focuses on power to methane and is based on solid oxide technology.
- The WG 402 virtual meeting to advance IEC 62282-6-101 ED1 is scheduled for Monday, September 26, 2022.

International Standards Organization ISO/TC 197 Karen Quackenbush/Jay Keller

- TC 197 Plenary Meeting will be held in Sydney, Australia, from Dec. 8 to Dec. 9
 - Also includes WG 21 and 23.
- A final PRHYDE (a European funding project to develop a refueling protocol approach for heavy-duty applications) dissemination webinar will take place on 22nd September 2022, 1-5 CEST.
- WG 24 (Gaseous hydrogen – fueling protocols for hydrogen-fueled vehicles) will be held in Ulm, Germany from Sept. 26 to Sept. 28. If you are in WG 24 and would like to participate in the PRHYDE dissemination meeting, please contact Antonio Ruiz via email at antonio.ruiz@nikolamotor.com
 - WG 5 will also meet in Ulm, Germany on Sept. 29, 8:00-17:00 CEST, but there will be virtual meeting capabilities.
 - There is limited in-person space, so only open to members of WG; if not a member, please register through US TAG.

- ISO TR 15916 2015 (Basic considerations for the safety of hydrogen systems) document is under revision. Comments from the CD circulation are being addressed, as well as editing to reflect new ISO guidance for Technical Reports (e.g., sentences with “should” are being revised to become statements of fact).

National Fire Protection Association NFPA 2

Chris LaFleur

- Everything has passed ballot regarding NFPA 2. The second draft of NFPA 2 will be posted on October 5, 2022. An announcement of the second draft release will be sent out to Hydrogen Codes Task Force members. If you are not a member, please contact Karen Quackenbush via email at kquackenbush@fchea.org to receive the announcement.

International Codes Council (ICC)

Matt Sigler and Gabriel Maser

- The International Codes Council (ICC) is a global source of modern codes and standards for the built environment. Also, ICC focuses on product evaluation, accreditation, and technology training/certification.
- ICC currently has 456 references of hydrogen gas in ICC codes and wants to focus on keeping codes and standards up-to-date and addressing any code gaps regarding hydrogen technology.
 - FCHEA hosts a website that tracks the worldwide development of about 400 hydrogen and fuel cell standards, and its matrix can be searched, using the TABS above, by applications or geographic areas: <http://www.fuelcellstandards.com/>

Society of Automotive Engineers (SAE)

Mike Steele

Task Force	Document	Title	Issue/Revised/WIP Date	Status
Interface	J2600_201510	Compressed Hydrogen Surface Vehicle Fueling Connection Devices	21-Oct-15	Being revised in conjunction with ISO 17268
Interface	J2601_202005	Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles	29-May-20	Being revised
Interface	TIR J2601/2	Fueling Protocol for Gaseous Hydrogen Powered Heavy Duty Vehicles	24-Sep-14	Considering Stabilization
Interface	TIR J2601/3	Fueling Protocol for Gaseous Hydrogen Powered Industrial Trucks	12-Jun-13	Ballot passed. Comment reconciliation process underway.
Interface	TIR J2601/4	Ambient Temperature Refueling	21-Nov-16	Being developed.
Interface	TIR J2601/5	HD Fueling using the MC Method (title may change)	July 2022	Being developed
Safety	J1766_201401	Recommended Practice for Electric, Fuel Cell and Hybrid Electric Vehicle Crash Integrity Testing	10-Jan-14	Revised - Action required. Awaiting GTR 13 Phase 2
Safety	J2578_201408	Recommended Practice for General Fuel Cell Vehicle Safety	26-Aug-14	Revised - Action required. Awaiting GTR 13 Phase 2
Safety	J2579_201806	Standard for Fuel Systems in Fuel Cell and Other Hydrogen Vehicles	15-Jun-18	Will be selectively revised with material compatibility revisions.

Safety	WIP J2990/1_201606	Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice	2-Dec-19	Being revised?
Fuel Economy	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	25-Apr-19	Being developed

CSA

Sara Marxen

Technical Committee Meetings

CSA Group will host its 2022 U.S. Committee Week in Phoenix, Arizona the week of October 3. For those not able to attend in person, virtual participation will be offered.

The Transportation Strategic Steering Committee meeting is October 3.

The HGV 5 TSC to review HGV 5.1, Residential Hydrogen Fueling Appliances meeting is October 4.

The B107 TSC to review Enclosed Hydrogen Equipment TSC meeting is October 4.

The HGV 4.1 TSC to review HGV 4.5, Priority and Sequencing Equipment meeting is October 5.

The Hydrogen Transportation Technical Committee meeting is October 6.

REGISTRATION

LINK: https://csagroup.formstack.com/forms/2022_us_committee_week_registration

Active Projects

TSC	Designation/Title	Status
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 Technical Committee Ballot closed on July 12 with negative votes and comments. Working with the TC and TSC Chairs to disposition.
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). A recirculation ballot to the Technical Committee closes September 9.

HGV 2	HGV 2, Compressed hydrogen gas vehicle fuel containers	This project is a revision of an existing standard. Content development meetings have concluded and the public review period closed July 11. 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. A seed document draft has been prepared and will be sent to the HGV 4.1 TSC members for review prior to a kickoff meeting.
C22.2 No. 22734	Hydrogen generators using water electrolysis	The CSA technical subcommittee continues to work on a binational adoption of ISO 22734. Contact Mark Duda (mark.duda@csagroup.org) with questions or for additional information.

Compressed Gas Association (CGA)

Rob Early

Status of current and future publications:

Standard	Current edition	Status
CGA G-5, <i>Hydrogen</i>	8 th (2017)	Deadline to submit proposed changes for next edition is 7/7/2022. CGA has started the process of designating this as an ANSI standard. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-019
CGA G-5.3, <i>Commodity specification for hydrogen</i>	7 th (2017)	Deadline to submit proposed changes for next edition is 6/4/2022. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-013
CGA G-5.4, <i>Standard for hydrogen piping systems at user locations</i>	6 th (2019)	Deadline to submit proposed changes for next edition is 12/22/2024. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-54
CGA G-5.5, <i>Hydrogen vent systems</i>	3 rd (2014)	The 5 th edition has been published and can be found at https://portal.cganet.com/Publication/Details.aspx?id=G-5.5 Deadline to submit proposed changes for next edition is 03/04/2026. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=26-3

Standard	Current edition	Status
		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 st (2005 – reaffirmed 2013)	Deadline to submit proposed changes for next edition is 8/1/2022. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=19-018
CGA H-3, <i>Standard for cryogenic hydrogen storage</i>	3 rd (2019)	Deadline to submit proposed changes for next edition is 12/1/2023. CGA has started the process of designating this as an ANSI standard. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-036
CGA H-4, <i>Terminology associated with hydrogen fuel technologies</i>	3 rd (2020)	Deadline to submit proposed changes for next edition is 12/1/2024. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-59
ANSI/CGA H-5, <i>Standard for bulk hydrogen supply systems</i>	3 rd (2020)	The deadline to submit proposed changes for the next edition is 2/26/2024. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=24-010
CGA H-10, <i>Combustion safety for steam reformer operation</i>	2 nd (2018)	Deadline to submit proposed changes for next edition is 12/1/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-038
CGA H-11, <i>Safe start-up and shutdown practices for steam reformers</i>	2 nd (2020)	Deadline to submit proposed changes for next edition is 8/11/2025. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-30
CGA H-12, <i>Mechanical integrity of syngas outlet systems</i>	1 st (2016)	Deadline to submit proposed changes for next edition is 3/1/2022. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-016
CGA H-13, <i>Hydrogen pressure swing adsorber (PSA) mechanical integrity requirements</i>	1 st (2017)	Deadline to submit proposed changes for next edition is 8/1/2022. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=22-027
CGA H-14, <i>HYCO plant gas leak detection and response practices</i>	1 st (2018)	Deadline to submit proposed changes for next edition is 12/8/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-045
CGA H-15, <i>Safe catalyst handling in HYCO plants</i>	1 st (2020)	Deadline to submit proposed changes for next edition is 9/1/2025.

Standard	Current edition	Status
		https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-59
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>	5 th (2022)	Deadline to submit proposed changes for next edition is 08/01/2027 https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-49
CGA PS-31, <i>Position statement on cleanliness for proton exchange membranes hydrogen piping / components</i>	1 st (2007 – reaffirmed 2019)	Deadline to submit proposed changes for next edition is 6/12/2025. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-16
CGA PS-33, <i>Position statement on the use of LPG or propane tanks as compressed hydrogen storage buffers</i>	1 st (2008 – reaffirmed 2020)	Deadline to submit proposed changes for next edition is 12/10/2026. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=25-41
CGA PS-46, <i>Position statement on roofs over hydrogen storage systems</i>	1 st (2017)	Deadline to submit proposed changes for next edition is 3/6/2023. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=23-012
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 st (2016)	Deadline to submit proposed changes for next edition is 2/12/2021. https://portal.cganet.com/Publication/Workspace/Outline.aspx?work_id=21-062
CGA work item 21-126, <i>Hydrogen system siting and personnel exposures distances</i>		CGA is developing a position statement pointing users to the new liquid hydrogen system distances that will be in NFPA 2:2024 and are not yet released. The position statement will cover the process of requesting a variance to use the numbers from the NFPA 2 section of the NFPA web site. PS-69 will be issued within the next month.
CGA work item 21-127, <i>Transfer and unloading of</i>	New publication not released yet	Develop new standard to update traditional hydrogen delivery practices for industrial users to improve practices for retail applications.

Standard	Current edition	Status
<i>hydrogen at near-consumer use points</i>		
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

Upcoming events:

- CGA to make two safety presentations at the Center for Hydrogen Safety Americas conference and one presentation at the Renewable Energy Plus conference, both in Anaheim in September.
- CGA Hydrogen Seminar – fall of 2023 (2 days planned).

American Society for Testing & Materials (ASTM) Jennifer Hamilton

- A potential workshop in June 2023 on hydrogen blending with natural gas.

American Society of Mechanical Engineers (ASME) Ray Rahaman

- B31.12 in the final balloting process; the document may be out for public review within the next two months.
- B31.12 European International Working Group is in the works.
- The B31.12 fall meeting will take place Sept. 8th from 1 PM to 5 PM US Eastern Time.

VI. Discussion Topics

Facilitating Deployment All

- This item aims to discuss separation distances for high or large-capacity storage.

Action: FCHEA will follow up on OSHA communications.

Center for Hydrogen Safety Jennifer Hamilton

- Three conferences will occur concurrently during the week of September 19-22 in Anaheim, California.
 - The 2022 Center for Hydrogen Safety Americas Conference will be held in the Anaheim Convention Center from September 20 to September 22. Please visit this link to learn more and register: <https://www.aiche.org/chs/conferences/center-hydrogen-safety-conference/2022>
 - The 2022 International Zero Emission Bus Conference will be held in the Anaheim Convention Center from September 19 to September 21. Please visit this link to learn more and register: <https://www.zebconference.com/>
 - RE+ will be held in the Anaheim Convention Center from September 19 to September 22. Please visit this link to learn more and register: <https://www.re-plus.com/>

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.
 - We are working on creating specialized matrixes that fall under the purview of each of FCHEA’s five technical affairs Working Groups to reflect the realignment of the WGs.
- As of June 30, 2022:
 - <https://static1.squarespace.com/static/5668416ddc5cb4375e2a9ef8/t/62c5d3f5f956bc4964022777/1657132022012/FCHEA+Regulatory+Matrix+Markup+June+30+2022.pdf>
- The next version will come out at the end of September. Please contact Karen Quackenbush via email at kquackenbush@fchea.org or Haboon Osmond at hosmond@fchea.org to address priorities and/or address gaps within the Matrix.

Permitting and Installation of Hydrogen Fueling Stations

- No updates

California Station Implementation

Jennifer Hamilton

- No updates

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

- The Sacramento lab is open now. The Anaheim lab is expected to reopen at the end of September.
- Section 4002.9. Hydrogen Gas-Measuring Devices (3.39).
UR. 2.4. Safety Requirement – All hydrogen gas-measuring devices subject to this code shall maintain verification of testing demonstrating conformance with the latest version of SAE J2601 Fueling Protocols for Light Duty Gaseous Hydrogen Surface Vehicles as determined by the latest version of ANSI/CSA HGV 4.3, Test Methods for Hydrogen Fueling Parameter Evaluation.

Legal Metrology Standards Hydrogen Fuel Quality and Measurement

Juana Williams

- The 2023 U.S. Weights and Measures Standards Development Process began early with the Central Weights and Measures Association holding its Interim Meeting August 29 – September 1, 2022 in Wisconsin Dells, WI.
- The Specifications and Tolerances (S&T) Committee and Laws and Regulations (L&R) Committee for all four U.S. regional weights and measures associations will consider three industry proposals shown below which will modify legal metrology standards for hydrogen gas-measuring devices used to refuel vehicles.
 - The S&T Committees will address a single proposal to modify the 2023 edition of NIST Handbook 44 *Specifications, Tolerances, and Other Technical Requirement for Weighing and Measuring Devices*, Section 3.39.
 - The L&R Committees will address two separate proposals to modify the 2023 edition of NIST Handbook 130 *Uniform Laws and Regulations in the Areas of Legal Metrology and Fuel Quality*, Section IV.F.
 - Comments on the proposals are encouraged early in the standards development process and welcomed up through July 2023. NIST OWM plans to prepare and submit comments in a technical analysis of the proposals.
- Those proposals are summarized in the table below:

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Committee	Committee Agenda Item No.	Agenda Item Title	Submitter's Stated Purpose	Submitter's Proposed Modification to the Code
S&T	HGM-23.1	UR.3.8. Safety Requirement	Add safety requirement for hydrogen gas measuring devices.	Add a new user requirement UR3.8. to read: <u>UR 3.8 Safety Requirement –All hydrogen gas-measuring devices subject to this code shall maintain verification of testing demonstrating conformance with the latest version of SAE J2601 Fuel Protocols for Light Duty Gaseous Hydrogen Surface Vehicles, as determined by the latest version of ANSI/CSA HGV 4.3 “Test Methods for Hydrogen Fueling Parameter Evaluation. (Nonretroactive as of January 1, 10XX)</u>
L&R	FLR-23.3	Section 2.20. Hydrogen Fuel	Add equivalent hydrogen quality standard, ISO 14687 to 2.20.	Modify Section 2 Standard Specification 2.20 as follows: 2.20. Hydrogen Fuel. – Shall meet the latest version of SAE J2719, “Hydrogen Fuel Quality for Fuel Cell Vehicles.” or ISO 14687 “Hydrogen fuel quality — Product specification”. (Added 2012) (Amended 20XX)
L&R	FLR-23.4	Section 4.3. Dispenser Filters	Add a filter requirement for hydrogen commercials.	Modify Section 4.3.1 Engine Fuel Dispensers Filters to include a new subparagraph (c) as follows: 4.3. Dispenser Filters 4.3.1 Engine Fuel Dispensers (a) All gasoline, gasoline-alcohol blends, gasoline-ether blends, ethanol flex fuel, and M85 methanol dispensers shall have a 10 micron or smaller nominal pore-sized filter.

				<p>(b) All biodiesel, biodiesel blends, diesel, and kerosene dispensers shall have a 30 micron or smaller nominal pore-sized filter.</p> <p><u>(c) All gaseous hydrogen dispensers shall have a 5 micron or smaller nominal pore-sized filter, and a filter to protect the vehicle from liquid contamination.</u></p> <p>(Amended 2014 <u>and 20XX</u>)</p>
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- The three remaining U.S. Regional Weights and Measures Association regional meetings are detailed below:
 - Western Weights and Measures Association 65th Annual Technical Conference: <https://westernwma.org/event-4686549> | September 25 – 29, 2022 | Garden Grove, CA
 - Southern Weights and Measures Association Annual Meeting: <https://www.swma.org/event-4937057> | October 9 – 12, 2022 | Raleigh, North Carolina
 - Northeastern Weights and Measures Association Interim Meeting: <https://newma.us/event-4918541> | October 25 – 26, 2022 | Virtual

VII. Open Discussion & Other Issues

- 2023 Hydrogen & Fuel Cell Seminar Call for Abstracts open until September 14th! See list of topics and subtopics here - <https://www.fuelcellseminar.com/call-for-abstracts>. Seminar is February 7-9, 2023, in Long Beach, California.

VIII. Next Meeting – Wednesday, October 12th at 2:00 PM US Eastern Time