Fuel Cell & Hydrogen Energy Association Codes and Standards Support

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Fuel Cell and Hydrogen Energy Association (FCHEA)

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Project ID #SCS022

Overview

Timeline

- Project start date: 09/12/19
- Project end date: 08/31/21*

* Project continuation determined annually by DOE

Barriers

- F. Enabling National and International Markets Requires Consistent RCS
- H. Insufficient Synchronization of National Codes and Standards
- J Limited Participation of Business in the Code Development Process

Budget

- FY19 DOE Funding: $145,842
- Planned FY19 DOE Funding: $395,000**
- Total DOE Project Value: $790,518*

** Note project scope expansion FY 2020

Partners

- Interactions/ collaborations: FCHEA Members; CDOs & SDOs through NHFCCSCC and direct participation
- Project Lead -ORNL- Prime Contract

Relevance

- As the national trade association for the fuel cell and hydrogen energy industry, FCHEA utilized a Working Group structure to facilitate focused effort in each of the three following applications: Portable Power, Stationary Power, and Transportation, which includes vehicles and the infrastructure to support them.
- FCHEA project contributes directly to achievement of four of the seven objectives outlined in the Fuel Cell Technologies Office Multi-Year Research, Development and Demonstration Plan, Chapter 3.7, Hydrogen Safety, Codes, and Standards:
    - Support and facilitate development and promulgation of essential codes and standards to enable widespread deployment and market entry of hydrogen and fuel cell technologies and completion of all essential domestic and international RCS by 2020.
    - Ensure that best safety practices underlie research, technology development, and market deployment activities supported through DOE-funded projects.
    - Conduct R&D to provide critical data and information needed to define requirements in developing codes and standards.
    - Develop and enable widespread sharing of safety-related information resources and lessons learned with first responders, authorities having jurisdiction (AHJs), and other key stakeholders.

Relevance - Objectives

- Support and facilitate development and promulgation of essential codes and standards to enable widespread deployment and market entry of hydrogen and fuel cell technologies and completion of all essential domestic and international RCS by 2020.
    - FCHEA participates directly in key domestic and international RCS technical committees; and encourages members to participate directly in technical committees, working groups or discussions. Member companies can also participate indirectly through FCHEA WGs to staff who participate on US Technical Advisory Groups.
        - ISO/TC 197 – developing standards to support gaseous hydrogen refueling; as well as revisions to published standards. ISO work items are reviewed and tracked by the appropriate FCHEA WGs..
        - IEC/TC 105 – fuel cell requirements with efforts to harmonize with national standards and international regulations. Our stationary power and portable power working groups review and track IEC/TC 105 documents and work to promote harmonization with national codes, standards and regulations.
        - CSA Fuel Cell Standards Committee – Staff participates on this committee and takes items to the appropriate FCHEA WGs for discussion and action. CSA develops national standards and serves as secretariat for the US TAG on IEC/TC 105.
        - NFPA 2: Hydrogen Technologies- staff serves on the NFPA Hydrogen Technologies Committee and acts as proponent for FCHEA member public input developed through our Transportation Working Group Hydrogen Codes Task Force.
        - SAE Fuel Cell Vehicle Safety Task Force – Staff participates in the quarterly meetings of the SAE FCV Safety Task Force and has recently applied for Liaison membership on the SAE Fuel Cell Standard Committee (TEVFC). .
        - Others as needs arise

Relevance to DOE Objectives

- Ensure that best safety practices underlie research, technology development, and market deployment activities supported through DOE-funded projects.
  - FCHEA supports information-sharing of pre-competitive safety information
    - Open discussions during FCHEA Working Group and Task Force meetings between codes and standards development organizations, researchers, government and industry. Aids harmonization of requirements and enhances collaboration. Provides mechanisms for industry to contribute to the development of requirements.
    - Identify and schedule Topical Discussions during monthly meetings of the National Hydrogen and Fuel Cell Codes & Standards Coordinating Committee (NHFCCSCC) which FCHEA administers. Topics are then discussed within the appropriate FCHEA WGs to broaden awareness and participation in development of activities to address identified topics.
    - Posting and/or linking data, workshop proceedings, and other informational resources online at www.hydrogenandfuelcellsafety.info.
    - Posting status and resources for codes, standards and regulations for fuel cells and hydrogen energy infrastructure at www.fuelcellstandards.com. This facilitates access to available resources as well as a providing a mechanism for reaching out to others working on similar activities. Also integrating this data with synergistic international efforts through DOE.

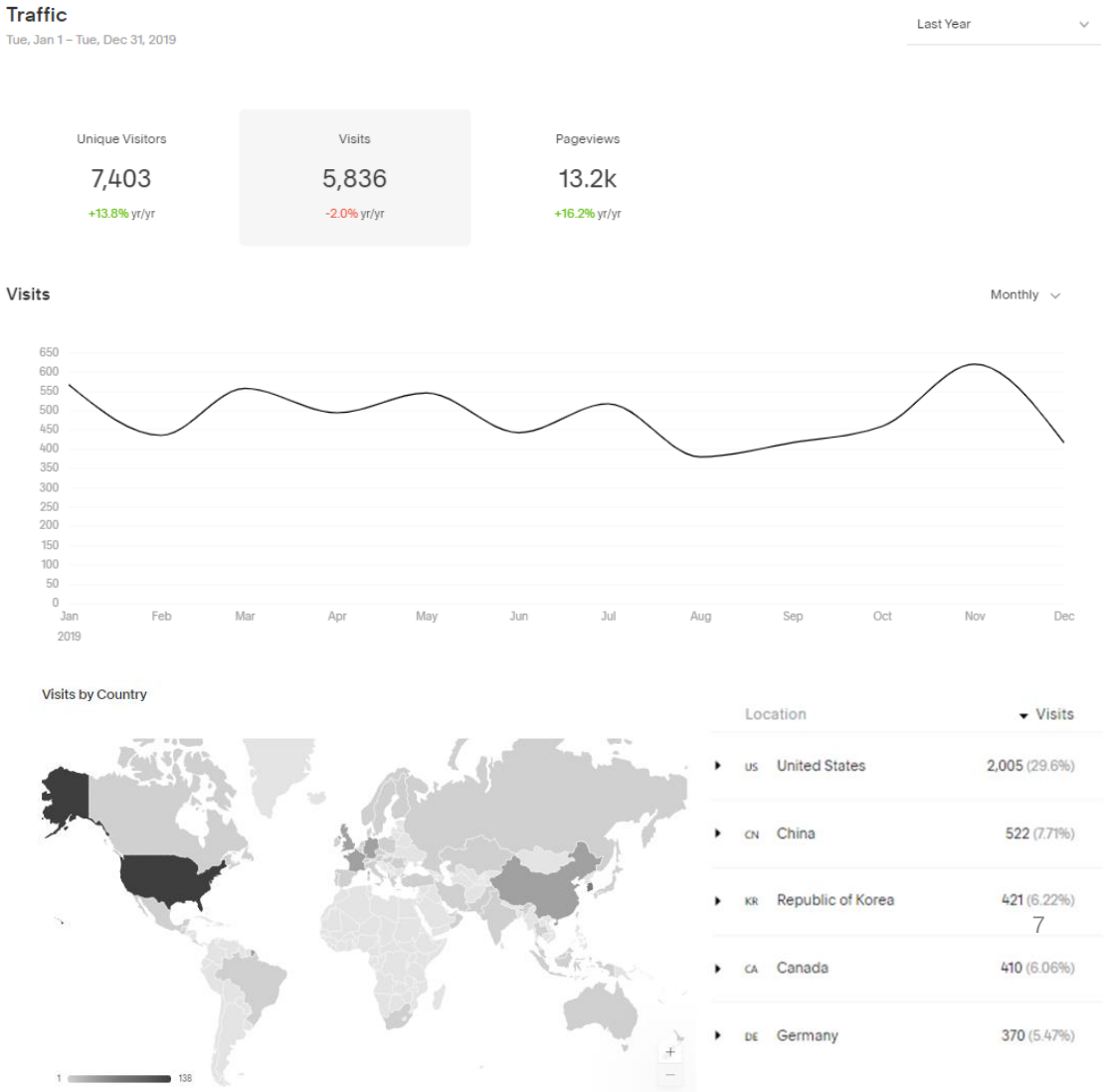
Relevance to DOE Objectives – Cont'd

- Conduct R&D to provide critical data and information needed to define requirements in developing codes and standards.
  - FCHEA conducts forums to identify R&D needs and engages in dialog with DOE; providing a mechanism for input and feedback into DOE R&D plans and activities.
    - FCHEA Board of Directors sets broad overall priorities. Working Groups set specific RCS industry priorities and engage in related activities with outside organizations.
    - Direct participation in National CDO/SDO Technical Committees with opportunities for FCHEA members to review and comment on developing draft documents.
      - Examples include SAE, CSA standards development, model code development, engagement with NIST, ASTM, ASME
    - Direct participation in US TAG for ISO/TC 197 and IEC/TC 105 with opportunities for FCHEA members to review and comment on developing draft documents.
    - Facilitation and documentation of monthly NHFCCSCC meetings
    - Monthly summary reports
    - Strategic meetings of FCHEA Board of Directors and Executive Committee
      - DOE is invited to engage with industry in discussions of accomplishments and challenges.

Relevance to DOE Objectives – Cont'd

HydrogenAndFuelCellSafety.info

- Develop and enable widespread sharing of safety-related information resources and lessons learned with first responders, authorities having jurisdiction (AHJs), and other key stakeholders.
- *The Hydrogen and Fuel Cell Safety Report* is read by thousands of interested parties all over the world.
- 2,200 people, including AHJs and first responders, have signed up to receive E-mail notification when new issues are posted.
- 2019 saw a 13.8% increase in unique visitors to the site and a 16.2% increase in pageviews.
- Top geographies of our visitors are from the United States, China, Korea, Canada, and Germany.

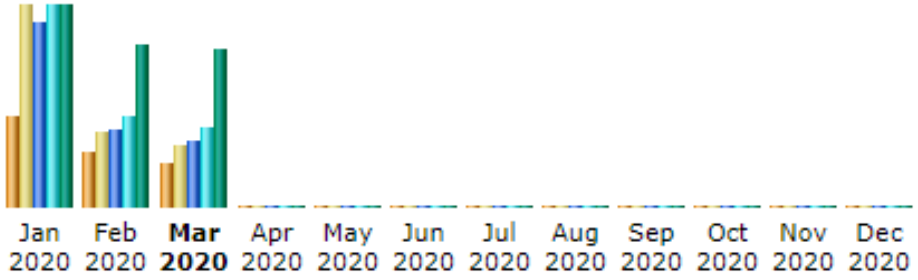


Relevance to DOE Objectives – Cont'd

FuelCellStandards.com

- FuelCellStandards.com tracks the world-wide development of hundreds of industry standards with an easily searchable breakdown by application and region of origin.
- Launched at the end of November 2019.
- As of March 17, 2020, the FuelCellStandards.com website has already attracted a lot of interest online including:
  - Nearly 4,000 unique visitors,
  - Over 6,500 website visits,
  - Almost 15,000 separate page views, and
  - More than 16,000 file requests (hits)

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Nov 2019	407	521	909	909	7.96 MB
Dec 2019	920	1,563	3,925	4,100	80.53 MB
Total	1,327	2,084	4,834	5,009	88.49 MB



Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2020	1,207	2,676	5,527	5,997	119.27 MB
Feb 2020	739	1,006	2,315	2,727	95.68 MB
Mar 2020	575	813	1,934	2,383	93.72 MB
Total	2,521	4,495	9,776	11,107	308.68 MB

Relevance - Impact

- Enabling National and International Markets Requires Consistent RCS (Barrier F)
  - Lack of consistency limits international trade and markets.
    - FCHEA Board Priorities for our RCS efforts focuses on efforts to advocate for removal of regulatory and policy barriers; as well as efforts to harmonize codes, standards, and regulations

- Insufficient Synchronization of National Codes and Standards (Barrier H)
  - The codes and standards development and revision cycles established by SDOs vary and are difficult to coordinate or synchronize even under a consensus national agenda.
    - FCHEA facilitates the monthly meetings of the NHFCCSCC, where CDOs/SDOs can share information about timing and issues; and where industry and researchers can engage in the discussion and provide essential linkages. Organizations that report out during the calls include: DOE, DOT, IEC, NFPA, ICC, CSA, SAE, ASTM, ASME, and NIST.
    - FCHEA staff participates directly in the key national and international codes and standards technical committees to provide consistency – ensuring the industry is engaged and requirements are harmonized with industry best practices.

Relevance – Impact (Continued)

- Limited Participation of Business in the Code Development Process (Barrier J)
  - Businesses, particularly small businesses, do not always have the resources to participate fully in the codes and standards development process.
    - Participation in FCHEA RCS Working Groups allows these businesses opportunities to be briefed on the RCS efforts of interest; to weigh in on issues that arise; and to review documents in order to develop a FCHEA comment or position.
      - Recent example – Outreach to WG members on recent revisions to IEC/TC 105 International Standards for fuel cells led to comments from member experts who are not directly engaged in those Technical Committees
      - Recent example – Outreach to WG members on a new work item proposal from China on fuel cell drones resulted in one manufacturer joining the US TAG for IEC/TC 105, and put forward the name of an expert for a resulting new WG.
    - The Hydrogen and Fuel Cell Safety Report, the FCHEA Regulatory Matrix, and FuelCellStandards.com provide quick overview information, making it easier for organizations to track and engage in key efforts.

Sample Page from Matrix

Significance to Commercialization
⇦ More Critical
Highest Effort

Significance

A. Essential To or Enables Commercialization	B. Important to Commercialization	C. Supports Commercialization	
ISO 19880-1 Gaseous Hydrogen Filling Stations. The document has ~~been circulated for~~passed FDIS vote unanimously. Editorial issues are being addressed prior to publication. Future plans are to remove annexes and turn them into stand-alone docs through NWIPs. However this would not necessarily be through the existing WG 24.	**ISO 19880-2: Gaseous hydrogen filling station dispensers** Now that ISO 19880-1 has reached the FDIS stage, WG19 ~~will~~ continues to work to address the comments on their DIS, and prepare a document for a CIB within ISO TC 197. **ISO 17268 Gaseous Hydrogen Land Vehicle Refuelling Connection Devices** Revision 3 has been published. ~~-~~This document defines the design, safety and operation characteristics of gaseous hydrogen land vehicle (GHLV) refuelling connectors. GHLV refuelling connectors consist of the following components, as applicable: — receptacle and protective cap (mounted on vehicle); — nozzle; — communication hardware. This document is applicable to refuelling connectors which have nominal working pressures or hydrogen service levels up to 70 MPa. This document is not applicable to refuelling connectors dispensing blends of hydrogen with natural gas ~~however,~~ ISO/TC 197 agrees to extend the work of WG 5 to work toward the next revision and agrees to limit the focus of the revision to H70 high flow. CSA HGV 4.4 – Breakaway Devices, HGV 4.6 Manual Valves, and HGV 4.7 Automatic Valves – The Technical Subcommittee continues to meet for content development for the next revision of these documents.	**CSA HPRD1: Thermally activated pressure relief devices – The Technical Subcommittee continues to meet for content development ~~Work on the next revision of Pressure Relief Devices has begun.~~** **NFPA 55: Compressed Gases and Cryogenic Fluids Code:** Latest edition of document has been issued 4/28/19. Public input is being solicited. **CSA HGV 4.1 Hydrogen dispensing systems-** All TSC / Public Review comments have been dispositioned and the draft has been finalized for the Technical Committee ballot. It was posted and closed February 21, 2020.~~TSC has completed disposition of industry review comment. The document is being finalized for a final Technical Subcommittee review and then Technical Committee Ballot. Expect to ballot 1Q 2020.~~ **CSA HGV 4.9 Hydrogen Fueling Stations -** The Technical Committee ballot closed. The standard is being finalized and will be published in February/ March 2020. ~~Comments were dispositioned and the document has gone to ballot.~~	INFRASTRUCTURE

Level of Effort

1

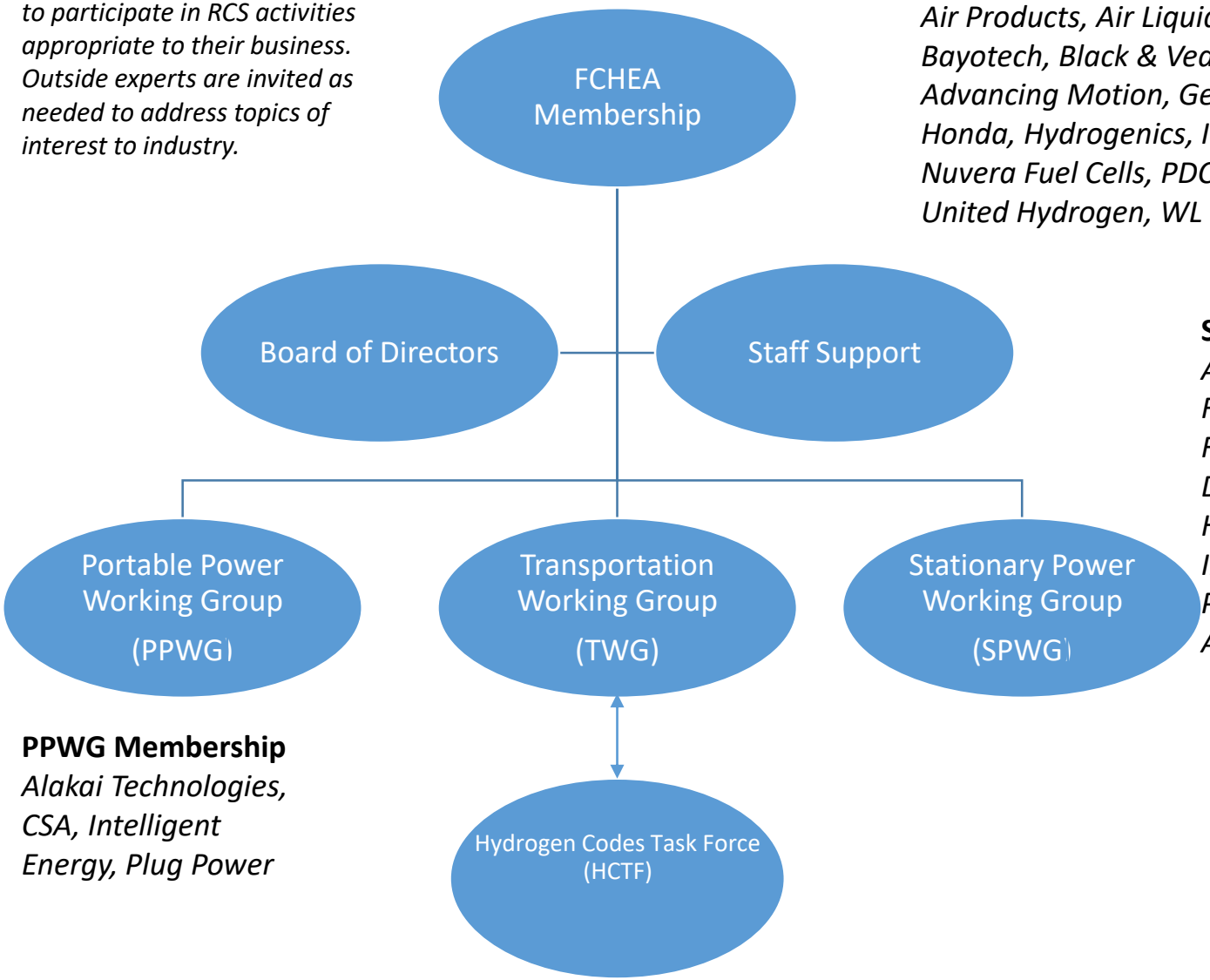
Through the use of "Track Changes" software, users can quickly identify what has changed during the past quarter. The "track changes" version is reviewed by our WGs and the NHFCCSCC, and provided to ORNL each quarter. Clean copies are available upon request and archived, and form the basis of the next quarters mark-up.

Approach: FCHEA WGs

- FCHEA Working Groups provide regular opportunities to engage industry in developing RCS, assess RCS priorities and needs, and identify opportunities to harmonize requirements:
  - **Transportation WG**
    - Transportation Infrastructure standards, R&D, deployment.
    - Hydrogen Codes Task Force
      - In process of reviewing recently-published editions of NFPA 2/NFPA 55 to determine whether code change proposals are needed for the current code cycle.
      - Plan to look at I-Codes when open for public input for harmonization opportunities with NFPA 2.
  - **Stationary Power WG**
    - Supports RCS relating to Stationary Power.
      - Recent topics include new work item proposals and opportunity to comment on draft revisions to International Standards on stationary fuel cells from IEC/TC 105 and National Deviations through CSA Group.
  - **Portable Power WG**
    - Complete regulatory framework to ship and to allow consumer transport of FCs and FC cartridges to be regulated in parity with similar technologies.
    - Work with stakeholders to create ruleset for fuel cells in Unmanned Aerial Vehicles (Drones)

FCHEA RCS Activities Flow

** All members are encouraged to participate in RCS activities appropriate to their business. Outside experts are invited as needed to address topics of interest to industry.*



TWG Membership

Air Products, Air Liquide, Anglo American, Audi, Bayotech, Black & Veatch, BMW, CAFCP, CSA, Garrett Advancing Motion, General Motors, Heaxagon Lincoln, Honda, Hydrogenics, Ionomr, NEL Hydrogen, Nissan, Nuvera Fuel Cells, PDC Machines, Plug Power, Toyota, United Hydrogen, WL Gore

SPWG Membership

Air Liquide, Air Products, Altergy Fuel Cells, Bloom Energy, FuelCell Energy, Fuji Electric, Doosan Fuel Cells America, Hexagon Lincoln, Hydrogenics, Intelligent Energy, Plug Power, Power Innovations, Solid Power / Aris Energy

PPWG Membership

Alakai Technologies, CSA, Intelligent Energy, Plug Power

HCTF Membership

CAFCP, CSA, Air Liquide, Air Products, General Motors, Honda, Plug Power, Toyota, Nuvera Fuel Cells

Approach: Coordination and Outreach

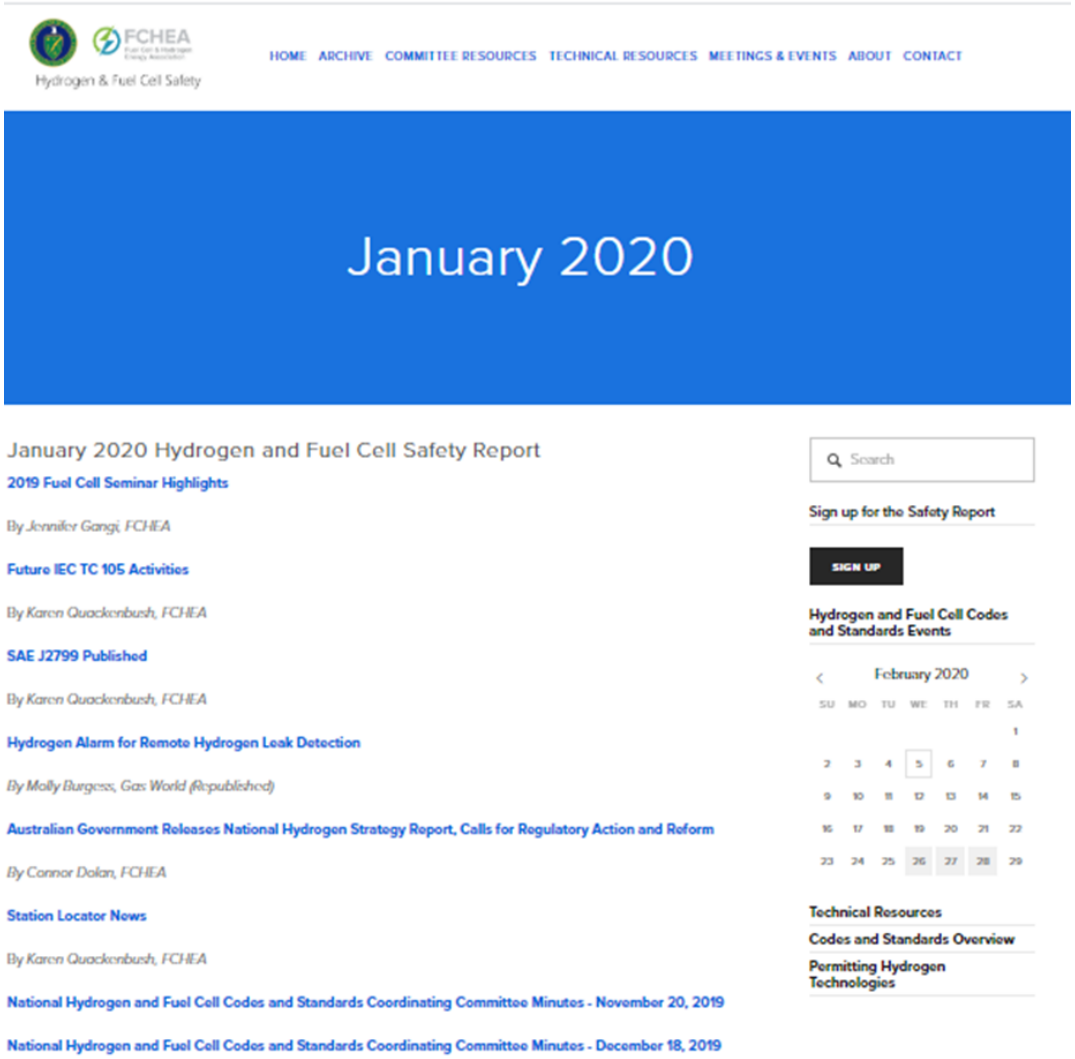
NHFCCSCC (monthly)

- Forum for effective communication and collaboration
- Facilitates the development of the consensus-based C&S
- Identifies critical gaps and makes recommendations to address them.

Safety Report (bi-monthly)

- Central source of information on RCS
- Improves coordination and information transfer
- Meetings of the NHFCCSCC
- Summarizes key domestic and international RCS issues
- List key upcoming events and issues

Note – this is NOT an incident report



Approach to Resolve Technical Challenges

- **Challenge: Development and Harmonization of Regulations, Codes and Standards**
  - Facilitate the development of clear and comprehensive codes and standards to ensure consistency and facilitate deployment of hydrogen and fuel cell technologies
  - **APPROACH**: Technology and application-specific forums to identify issues and discuss progress and needs in developing RCS; open dialog between CDOs/SDOs, government and research organizations, industry and users; Direct Participation in RCS-development activities; and information dissemination and outreach to develop consensus requirements to ensure consistency.

- **Challenge: Dissemination of Data, Safety Knowledge, and Information**
  - General lack of understanding of hydrogen and fuel cell safety needs among local government officials, fire marshals, and the public. Failure to comprehensively consider the properties and behavior of hydrogen may lead to overly restrictive policies that preclude or delay deployment of hydrogen and fuel cell technologies.
  - **APPROACH**: FCHEA publishes, maintains, and disseminates key safety information through the *Hydrogen and Fuel Cell Safety Report* website at www.hydrogenandfuelcellsafety.info; and works with stakeholders to disseminate FCV and infrastructure-deployment activities. Beginning this year, we also relaunched www.FuelCellStandards.com, enhancing access to codes, standards, and regulations worldwide.

- **Milestones: Monthly summaries, bi-monthly Safety Report**
  - Aligned with the Go/No-Go Decisions in DOE's current plans. Provides regular mechanism to identify and address industry priorities.

Accomplishments and Progress: Working Groups

- **Transportation WG**: Infrastructure RCS review. Administers Hydrogen Codes Task Force to review and develop public input for NFPA 2. Continued participation in NFPA to track code change proposals and decisions taken in current revision cycle for next editions of NFPA 2 and NFPA 55 model codes.
  - Hydrogen Codes Task Force develops harmonized public inputs for the next development cycles of key model codes. The public inputs are solicited from business and experts with operational experience and focus on harmonizing requirements with other industry-accepted standards and codes.
  - Significance: Supports Objective from MYRDD – Provides consistent RCS and synchronization of national codes and standards.
  - Take Home Message: FCHEA WGs and TFs work collaboratively with others to effectively make changes to developing RCS

- **Stationary Power WG**: Forum for engaging in the development of RCS for stationary applications. WG reviews and provides feedback on draft documents, including New Work Item Proposals and National Deviations for International Standards. Activities include domestic and international standards development, as well as NFPA 853: Standard for the Installation of Stationary Fuel Cell Power Systems.
  - Significance: Supports Objective from MYRDD – Develop and enable widespread sharing of safety-related information resources and lessons learned with first responders, authorities having jurisdiction (AHJs), and other key stakeholders. Provides consistency in requirements and reduces duplication of effort.
  - Take Home Message: FCHEA identifies industry experts and other key stakeholders and facilitates opportunities to weigh in on developing RCS and ensure national adoption activities are harmonized with industry best practices.

- **Portable Power WG:** Standards and Regulations for micro fuel cells. Working to ensure International Standards are inclusive of all fuel types. IEC 62282-6-101 Edition 2 and associated “fuel specific” Part 2 documents. Serving as IEC/TC 105 WG 8 Convenor to advance these documents. Once published to Draft International Standard level, will work with US DOT PHMSA and ICAO to ensure harmonized requirements. Also tracking the myriad activities relating to UAVs (drones), with emphasis on those issue directly relevant to fuel cells.
  - Significance: Supports Objective from MYRDD - Enabling National and International Markets Requires Consistent RCS by ensuring national and international standards for micro fuel cell applications are harmonized, then adopted by International Regulations.
  - Take Home Message: Regular dialog in FCHEA WGs and consistent messaging and participation in relevant RCS forums can result in consistent RCS.
    - Recent example – Convening meeting of IEC/TC 105 WG 8 led to commitment to develop a Part-2 document for methanol fuel cell cartridges.

Accomplishments and Progress

- **Coordination** (Note: The following tools are open and available to any interested party.)
  - **NHFCCSCC** – Monthly facilitated discussion of key topics of broad interest, such as “Facilitating Deployment”, and “Legal Metrology Standards Hydrogen Fuel”. Progress in the development of RCS is reported and captured for the FCHEA Regulatory Matrix, providing an up-to-date overview of current industry priorities and recent progress in RCS. Recent examples: In the second half of 2019, rulemaking comments for metrology standards in California and nationwide were solicited, with monthly reminders and links, to ensure stakeholders had ample opportunity and means to comment in a timely manner.
  - **Hydrogen & Fuel Cell Safety Report** – Published every two months, keeping readers informed of the progress and issues encountered in the development of RCS. Has introduced industry to the many new WGs in ISO/TC 197 and the call for participation in US standards committees. Calendar of events aids in planning and scheduling.
  - **FuelCellStandards.com** - This website tracks the world-wide development of about 400 hydrogen and fuel cell standards, and its matrix can be searched by application or geographic areas, with expansive information available for each. This data is being used to inform other efforts such as IPHE’s Regulations, Codes and Standards Working Group.
- **Significance**: Contributes to DOE goal to develop and enable widespread sharing of safety-related information resources and lessons learned with first responders, authorities having jurisdiction (AHJs), and other key stakeholders. Increases participation of stakeholders in development of harmonized RCS.
- **Take-Home Message**: FCHEA makes useful, informative resources available to all interested stakeholders in order to ensure consistency in RCS and facilitate deployment of hydrogen and fuel cell technologies.

Responses to Previous Year Reviewers' Comments

- Define Acronyms:
  - CD - Committee Draft
  - CDO – Code Development Organization (such as NFPA, ICC)
  - CDV - Committee draft for vote (term used by IEC to distinguish between a document out for comment only and one ready for vote)
  - CSA – The CSA Group which develops North American standards for a variety of alternative fueled vehicles and components.
  - DIS - Draft International Standard (achieved consensus to move from CD phase)
  - FCHEA – Fuel Cell and Hydrogen Industry Association
  - FDIS - Final Draft International Standard (passed DIS vote)
  - IEC - International Electrotechnical Commission - the international standards body for electrochemical devices, including fuel cells, which is covered by Technical Committee 105 (TC 105)
  - ISO – International Organization of Standardization – the international standards body that includes Technical Committee (TC) 197, which covers Hydrogen Technologies
  - NHFCCSCC - National Hydrogen and Fuel Cell Codes & Standards Coordinating Committee
  - RCS – Regulations, Codes & Standards
  - SAE – The Society of Automotive Engineers – a Standards Development Organization developing recommended practices and standards for fuel cell vehicles and interface technologies.
  - SDO – Standards Development Organization (such as ISO. IEC, SAE, CSA, etc.)
  - TC - Technical Committee
  - WG - Working Group
- Map to tangible outcomes that are moving toward DOE goals; cite in the slides what affected the industry when addressing potential impacts. (DONE – see page 10 for examples).
- The FCHEA website could be improved to help the industry, especially in the area of tracking the codes and standards, which is currently disabled. (DONE – Expanded scope for FY 2020 includes updating, enhancing, and relaunching of FuelCellStandards.com.

Responses to Previous Year Reviewers' Comments (Continued)

- The project approach has merit in assisting the development of codes and standards, although the effectiveness of creating separate working group forums is unclear. If an FCHEA member has the time to attend these working group meetings, then that member could attend the codes and standards meeting directly and influence the direction of a standard directly.
  - **Response**: Many member companies are smaller companies looking to provide products or services for a large variety of uses. These companies are typically unable to participate directly in all of the codes and standards activities that may potentially impact them. Instead, they rely on industry associations such as FCHEA to keep abreast of these activities, alert them when a potential new activity may be of direct relevance to their business and provide easy ways to review and provide input to developing codes and standards that relate to their business.
- What about engagement outside of FCHEA? The team is likely overlooking other business entities who could have pressing SCS needs or who could provide valuable insight, but who are being overlooked simply because they are not FCHEA members. This is especially a problem given that one of the barriers that this project intends to overcome is the lack of business participation.
  - **Response**: Our outreach efforts go beyond FCHEA membership. We offer relevant stakeholders a myriad ways to engage directly in the development of codes and standards, including but not limited to:
    - Connecting any stakeholder to their national member body for joining the national TAG or working group directly;
    - Links to the CDO/SDO project website, particularly when a document is open for public review
    - Posting of NHFCCSCC minutes online, in publicly-available areas.
    - Write-ups of codes and standards activities in our bi-monthly Hydrogen and Fuel Cell Safety Report, available to all interested parties, with links for direct access.
    - Public access to FuelCellStandrds.com, which allows anyone to drill down for information on any listed activity to useful points of contact to purchase a published document directly from the CDOs/SDOs, or to join a technical committee or working group.
  - Engagement that is "limited" to FCHEA members is development of FCHEA positions on documents. Absolutely prevents any interested party, whether an FCHEA member or not, to weigh in on documents directly, and this project ensues that information to facilitate such engagement is available to all who seek it.

Collaborations

- FCHEA performs this work with ORNL.
- FCHEA members represent the full global supply chain, including universities, government laboratories and agencies, trade associations, fuel cell materials, components and systems manufacturers, hydrogen producers and fuel distributors, utilities and other end users. Members direct our activities, provide input to RCS through FCHEA involvement in RCS development; review and prioritize our efforts.
- CDOs/SDOs through direct participation on RCS activities, participation in the NHFCCSCC, and participation in appropriate FCHEA WGs. This facilitates information-sharing and synchronization.
  - Reporting organizations include ASME, ASTM, NIST, SAE, CSA Group, CGA, NFPA, and others.
- FCHEA works with the full range of stakeholders, including industry, state and local officials, and others to address RCS and outreach needs and facilitate deployment.
  - Non-SDOs engaged in the NHFCCSCC include the Center for Hydrogen Safety, the California Fuel Cell Partnership, the California Div. of Measurement Standards
- FCHEA works closely with DOE to facilitate productive dialog on industry priorities, R&D needs, and deployment barriers; as well as to promulgate R&D results and information and data resources available through DOE-funded projects.

Remaining Challenges and Barriers

- The four objectives supported by this project are ongoing and tied to DOE Goals.
- Easy access to guidelines for AHJs to facilitate adoption of NFPA 2 and withdrawal of regional restrictions (such as FCEVs in tunnels, over bridges, in parking garages, etc.)
- US harmonization with IEC 62282-6-100 for inclusion of division 2.1 and 4.3 fuel cartridges for checked baggage following completion and publication of updated IEC standards..
- International standards need to develop in a coordinated fashion to ensure they reflect the needs of industry and consistency with accepted practices.
  - Significant progress: ISO/TC 197 WGs on hydrogen fueling stations and components.
  - Published standards being updated to reflect advances and learnings. Ex: Dispensing hoses for gaseous hydrogen fueling stations, valves and fittings for high-pressure hydrogen uses.
  - Efforts are underway to ensure technical harmonization between national and international requirements. Ex: Now that ISO/TC 197 standards for hoses and fueling stations are published, work is underway to update the equivalent national standards through the CSA Group. U.S, experts are analyzing similarities and differences between U.S. best practice and developing international requirements.
- Significant revisions in new editions of NFPA 2 and NFPA 55 will be analyzed and harmonized with I-Codes as applicable. References to recently published standards will be added.

Proposed Future Work

- **Portable Power WG**: To ensure harmonization with international standards for fuel cells as carry on and checked baggage. FCHEA is Convening IEC/TC 105 WG 8 to ensure resulting revisions are coordinated with ICAO and US DOT PHMSA.
- **Transportation WG**: Complete NFPA 2 revision cycle and conduct thorough review of 2020 edition. Ensure any remaining concerns are addressed through code change proposals for the following revision cycle. Ensure requirements are consistent throughout NFPA and ICC codes. Identify any remaining gaps and recommend how to address them.
- **Stationary Power WG**: Continue to review international standards and US as well as state regulations to ensure consistency with accepted US requirements and best practices.
- **Coordination**
  - **NHFCCSCC** – continue to administer, identify key issues, and document discussions and outcomes. Provide industry feedback and other input to the Department of Energy (DOE) on RCS development needs and priorities; outreach needs and priorities; R&D needs and priorities to support RSC development activities.
  - **Safety Report and FuelCellStandards.com** – continue to report on the developing RCS to improve coordination of activities and improve information transfer to facilitate industry engagement in RCS.
- **Technology Transfer Activities**: We develop consensus and information rather than technologies. These are shared openly at www.hydrogenandfuelcellsafety.info and www.FuelCellStandards.com. We also hold regular working group meetings and monthly coordination webinars to reach beyond our membership.

Any proposed future work is subject to change based on funding levels.

Summary

Relevance:

- FCHEA project contributes directly to achievement of four of the seven objectives outlined in the Fuel Cell Technologies Office Multi-Year Research, Development and Demonstration Plan. Project facilitates industry participation in essential codes and standards to meet DOE goals.

Approach:

- Multi-tiered approach: forums to identify issues and discuss progress and needs in developing RCS; facilitating open dialog; participating directly in national and international RCS-development activities to address industry needs; information dissemination & outreach tools.

Technical Accomplishments:

- Significant progress in conducting information exchange and data transfer to improve harmonization in domestic and international RCS; maintained central point of information for RCS activities; identified and communicated needs in RCS, R&D, and outreach.
- Success in engaging industry to participate in codes and standards development process. Some participate directly, while others take the opportunity to review draft codes and standards when out for review. FCHEA staff then represents these comments and concerns on the Technical Committees of CSA, SAE, ISO/TC 197, IEC/TC 105, ICC, NFPA, and others as appropriate.

Proposed Future Work:

- Continued focus on harmonization of requirements to facilitate deployment; ensure international standards are consistent with US practices; continue building relationships with key stakeholders, including outside associations; continue dialog with industry to facilitate deployment of hydrogen vehicles infrastructure; complete code inputs for 2020 code revision cycle. Determine RCS priorities and needs for the next round of code revisions.

Technical Backup Slides

Safety Report Traffic

Traffic

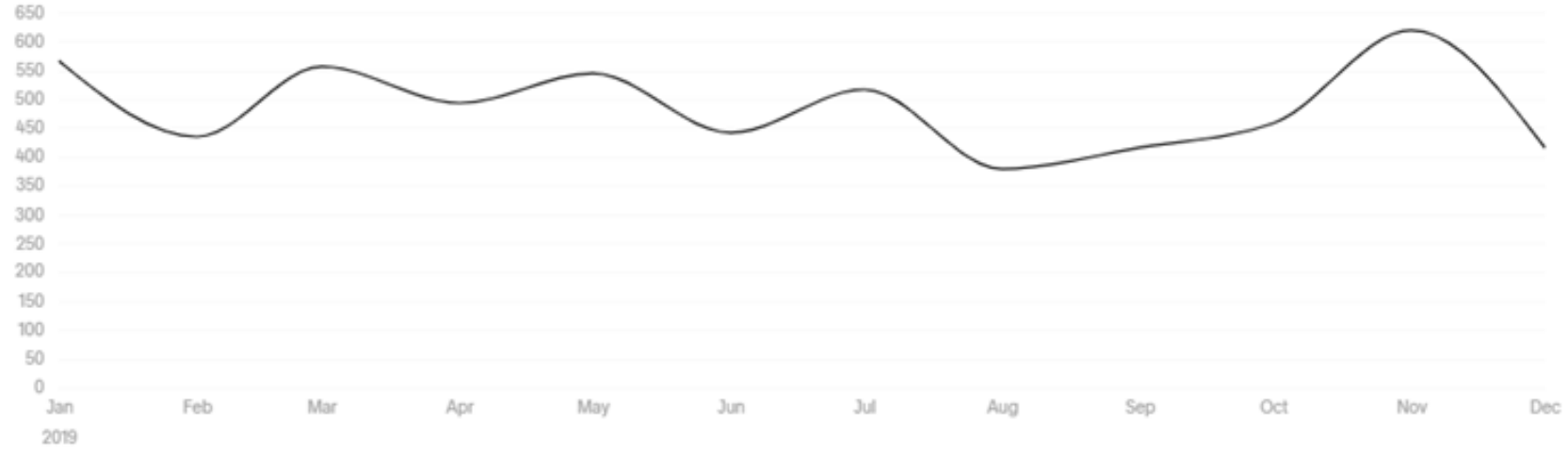
Tue, Jan 1 – Tue, Dec 31, 2019

Last Year

Unique Visitors	Visits	Pageviews
7,403	5,836	13.2k
+13.8% yr/yr	-2.0% yr/yr	+16.2% yr/yr

Visits

Monthly



Safety Report Visitors by Geography

Location	Visits
US United States	2,005 (29.6%)
CN China	522 (7.71%)
KR Republic of Korea	421 (6.22%)
CA Canada	410 (6.06%)
DE Germany	370 (5.47%)

FCHEA Members

FCHEA represents members throughout the global supply chain of the fuel cell and hydrogen energy industry, including fuel cell manufacturers and component suppliers, industrial gas suppliers, automakers, energy companies, non-profits, national laboratories, associations, and others. Our members as of 2/29/2020 are:

- 3M
- Air Liquide
- Air Products and Chemicals
- Alakai Technologies
- Altergy Systems
- American Honda Motor Company
- Anglo American Platinum
- Aris Energy Solutions
- Audi
- BayoTech
- Black & Veatch
- Bloom Energy
- BMW of North America, Inc.
- California Fuel Cell Partnership
- CSA Group
- Doosan Fuel Cell America
- Fuel Cell Seminar & Energy Exposition
- FuelCell Energy
- Fuji Electric
- Garrett Advancing Motion
- General Motors
- Gore Fuel Cell Technologies
- Hexagon Purus
- Hydrogenics
- Intelligent Energy
- Ionomr Innovations
- Johnson Matthey Fuel Cells
- Nebraska Public Power District
- NEL Hydrogen
- Nissan Technical Center North America
- Nuvera Fuel Cells
- Ohio Fuel Cell Coalition
- PDC Machines
- Plug Power
- Power Innovations
- PowerCell Sweden
- Toyota Motor North America
- United Hydrogen