

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Center for Hydrogen Safety (CHS): A Global Resource for the Safe Use and Handling of Hydrogen

Nick Barilo, Center for Hydrogen Safety

This presentation does not contain any proprietary, confidential, or otherwise restricted information

Fuel Cell Technologies Office Webinar

June 19, 2019



This presentation is part of the monthly webinar series provided by the U.S. Department of Energy's Fuel Cell Technologies Office (FCTO) within the Office of Energy Efficiency and Renewable Energy (EERE). Funding for research, development and innovation to accelerate progress in hydrogen and fuel cell technologies is provided by EERE FCTO.

During Q&A session:

Please type your questions to the chat box. <u>Send to: (HOST)</u>

∨ Chat			×
Send to:	Everyone	\sim	



Center for Hydrogen Safety Connecting a Global Community

Nick Barilo

Director, Center for Hydrogen Safety



Enabling Widespread Success: Addressing Safety

- Safety issues must be addressed for successful hydrogen technology acceptance and deployment
- Safety issues can be a 'deal breaker'
- Hydrogen technology stakeholders may not be able to identify and effectively address all safety issues
- Stakeholders benefit from an independent and experienced hydrogen safety review resource involved in early design and safety planning activities





Acific Northwest Hydrogen Safety Resources

Hydrogen Safety Panel (HSP)

- Identify Safety-Related Technical Data Gaps
- Review Safety Plans and Project Designs
- Perform Safety Evaluation Site Visits
- Provide Technical Oversight for Other Program Areas

Hydrogen Tools Web Portal (http://h2tools.org)

- Hydrogen Facts, Training, Forums, HyARC Tools
- Hydrogen Lessons Learned, Best Practices, Workspaces

Emergency Response Training Resources

- Online Awareness Training
- Operations-Level Classroom/Hands-On Training
- ► National Hydrogen and Fuel Cell Emergency Response Training Resource



Hydrogen Safety Resources Timeline





Introducing the Hydrogen Safety Panel (HSP)

Experienced, Independent, Trusted Expertise

The HSP promotes safe operation, handling, and use of hydrogen

- Formed in 2003
- 14 members with 400+ yrs combined experience
- Hydrogen safety reviews hydrogen fueling, auxiliary power, backup power, CHP, portable power, and lab R&D
- White papers, reports, and guides
- Provides support on the application of hydrogen codes and standards
- H₂ safety knowledge shared through the H₂ Tools Portal (h2tools.org)



Some of the fire officials and hydrogen experts that comprise the Hydrogen Safety Panel (25th meeting, 2019, New Orleans, LA)



Since 2003

506

Reviews

Impact of the HSP

- Serves as a non-regulatory, objective, and neutral resource
- Sees the "big picture"
 - Shares learnings
 - Identifies gaps
- Can help reduce costs
 - Over-engineering resulting in unnecessary features
 - Delayed approvals
 - Missed safety considerations/features
- A group with diverse experience can:
 - Respond with a balanced solution to questions, problems, and issues
 - Aid in avoiding repeating costly mistakes among disparate project proponents
 - Help project proponents avoid industry-impacting incidents
 - Help establish stakeholder and public confidence





Involvement in Hydrogen Fueling Station Rollouts

Contracted by the California Energy Commission (CEC) to support the construction of new hydrogen fueling stations through the following services

- Provided guidance for preparing safety plans
- Participated in pre-award safety consultation for applicants
- Reviewed safety plans submitted by 12 applicants to California's GFO-605
- Provided comments to the CEC in support of award decisions
- Follow-up interviews and stations tours were conducted in March 2017 to identify safety learnings from station deployments





Supporting Rollout of Hydrogen Technologies

Connecticut Center for Advanced Technologies (CCAT) CY18-19

- The objectives include:
 - Raising awareness of the HSP among state/local officials and project developers
 - Establishing working relationships with key state and local organizations to enable seamless incident response and development of safety lessons learned
 - Identifying types of projects that would benefit from HSP involvement
 - Identifying methods to facilitate outside organizations paying for HSP

California Energy Commission CY19-21

- Activities will be performed in support of the California fueling structure infrastructure including renewable hydrogen production facilities
 - Provide safety planning webinars and consultations
 - Review funding opportunity applicant safety plans
 - Participate in funded project design reviews
 - Perform site safety reviews
 - Provide outreach to code officials and stakeholders
 - Review hydrogen incidents
 - Conduct post startup project team interviews

Learnings from these activities are brought back to California, DOE, and the hydrogen community



Building Blocks

While hydrogen has been used safely in industrial applications for nearly a century, a substantial expansion of its use as a fuel involves a wider and more diverse group of stakeholders

Communication of hydrogen specific safety guidance will be critical to the success of hydrogen as a part of the global energy transition

Establishing and communicating best practices from a trusted, independent safety resource is a valuable part of the hydrogen safety ecosystem





Building Blocks

While hydrogen has been used safely in industrial applications for nearly a century, a substantial expansion of its use as a fuel involves a wider and more diverse group of stakeholders

A fundamental need...

Communication of hydrogen specific safety guidance from a trusted, independent safety resource





... communicating knowledge to enable the safe and timely transition to hydrogen and fuel cell technologies

Disclose	Announce		Transfer	Publish	Advise
Unfold	Impart		Connect	Inforn	n Make Known
Broa	dcast	Declare	Divulge	Proclaim	Enlighten
Network	Cor	nvey	Disseminate	Spread	Reveal





AIChE The Global Home of Chemical Engineers American Institute of Chemical Engineers (AIChE)



AIChE* has partnered with PNNL to establish a Center for Hydrogen Safety (CHS). CHS will expand the HSP's access to new customers by:

- Making the HSP more readily available to industry, state, and federal government agencies (national and international)
- Enabling less cumbersome/time-consuming contracting efforts

PNNL will transfer its first responder hydrogen safety training resources to AIChE to enable broader access to online and inperson training resources (with continued subject matter support from PNNL and CaFCP)

* AIChE is the world's leading organization for chemical engineering professionals, with more than 60,000 members from more than 110 countries. AIChE has the breadth of resources and expertise to support industries or emerging areas, such as hydrogen and fuel cell technologies.



Safely Fueling Our Future...

...by building and enabling a global community



An AIChE Technical Community • A Global Resource On Hydrogen Safety

A global, neutral and nonprofit resource



- Supports and promotes the safe handling and use of hydrogen across industrial and consumer applications in the energy transition
- Provides assurance that groups of experts have a common communication platform with a global scope to ensure safety information, guidance and expertise is available to all stakeholders



Safely Fueling Our Future...

...by building on a strong foundation of resources built through collaboration



Safety Knowledge Resources

- Hydrogen Tools Web Portal
- Hydrogen Lessons Learned
- Best Safety Practices



- Hydrogen Safety Panel
- Reviews Projects and Facilities
- Identifies Gaps and Shares Learnings

First Responder Training Resources

- Online Awareness Training
- Operations-Level Classroom Training
- National Training Resource





Membership Levels

Government (\$25K USD/per year)

((((())))) Large Industry (\$15K USD/per year)

(ii) Small Industry (\$5K USD/per year)



 \mathbf{m}

- National Laboratory (\$5K USD/per year)
- University (\$2K USD/per year)



Executive Board (\$50K USD/per year)

Training and Education Resources

Coming soon...



Online Training

- First Responders
- Researchers
- Technicians



Focused Webinars

- Project Safety and Safety Planning
- Researchers
- Technicians
- Others (based on customer needs)

Information Materials

- First Responders
- Public (anticipated in 2020)

Language Support

- English
 - French (late 2019)
 - Dutch (current First Responder)
 - Japanese (legacy First Responder)





Support for the Safe Implementation of Hydrogen Technologies



* Support for AHJ and code officials can bridge the gap for inexperienced staff, facilitate faster approvals, support a greater confidence in project safety and provide more technically justified safety features or alternate means and methods







Fall 2019 October 14-15, 2019 • Sacramento, CA

Spring 2020 March/April 2020 • East Asia

Fall 2020 September 2020 • Germany





Incident Response Resources



Connecting a Global Community

Member-only resources

- An online site sharing timely information on incidents, causes and final public reports developed by either CHS or third-parties
- Hydrogen and fuel cell technology safety fact sheets for a variety of audiences
- A guide to quickly identify what resources are available to help with your investigation and factfinding activities



Picture source: NBC Los Angeles



Membership will:

- Demonstrate that safety is a fundamental principle for those deploying the technology
- Ensure that neutral and trustworthy hydrogen safety resources will be sustained and have global impact
- Ensure safety is not a significant impediment to stakeholder and public acceptance of hydrogen technologies



CHS will facilitate a safe and timely transition to hydrogen and fuel cell technologies, contribute to stakeholder and public acceptance of hydrogen technology, and help assure the safe operation of hydrogen facilities



Our growing list of **Members and Strategic Partners**



23

Join Our Global Community and Get Involved

Become a member

- Utilize the resources to remove barriers and safeguard your mission
- Participate in task groups and conferences
 - Network
 - Share knowledge
 - Help plan conferences and other events





Concluding Thoughts

- The future will likely see an increase in the use of hydrogen and fuel cell technologies
- Because hydrogen as a fuel is still relatively new, best methods of handling, storage, transport, and use may not be well understood by participants
- Safe practices for production, storage, distribution, and use of hydrogen are essential for deployment of hydrogen and fuel cell technologies
- The Center for Hydrogen Safety, HSP and Hydrogen Tools portal (<u>http://h2tools.org</u>) are available to help project participants to understand and apply safe practices for successful use





My Contact Information:

Nick Barilo

Director of the Center for Hydrogen Safety, AIChE 120 Wall Street, FL 23 New York, NY 10005-4020

Tel: 509-371-7894

nickb@aiche.org http://www.aiche.org/chs http://h2tools.org





Question and Answer

Please type your questions to the chat box. Send to: (HOST)

∽ Chat		×
Send to:	Everyone 🗸	
Enter d	hat message here	Send



Thank you

Nick Barilo nickb@aiche.org Eric Parker DOEFuelCellWebinars@ee.doe.gov

Laura Hill Laura.Hill@ee.doe.gov

Sign up to receive hydrogen and fuel cell news and updates



www.energy.gov/eere/fuelcells/fuel-cell-technologies-office-newsletter

