CENTER FOR Hydrogen SAFETY

Update on Hydrogen Safety Panel Sustainability and the AIChE Center for Hydrogen Safety

Nick Barilo

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Washington, DC

PNNL-SA-139915

The Safety Challenge

- 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 (ISR) resource involved in early design and safety planning activities

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

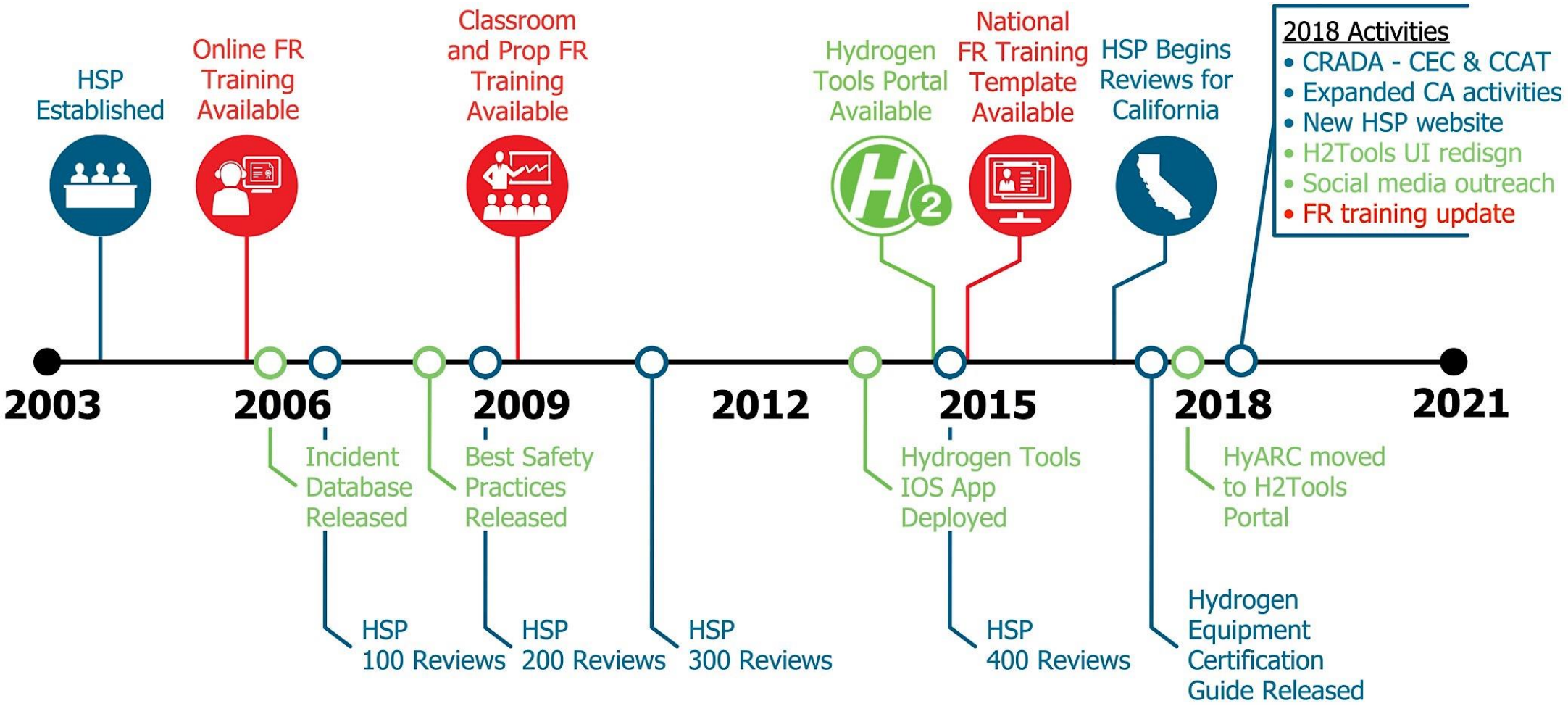
Hydrogen Tools *Web Portal* (*http://h2tools.org*)

- 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

Project Timeline



Introducing the Hydrogen Safety Panel (HSP)

Experienced, Independent, Trusted Expertise

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

- Formed in 2003
- 15 members with **400+ yrs** combined experience
- **495 hydrogen safety reviews completed** – 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
- **H_2 safety knowledge shared through the H_2 Tools Portal** (h2tools.org)

Some of the fire officials and hydrogen experts that comprise the Hydrogen Safety Panel (24th meeting, 2017, Cambridge, MA)

HSP Activities

Since 2003

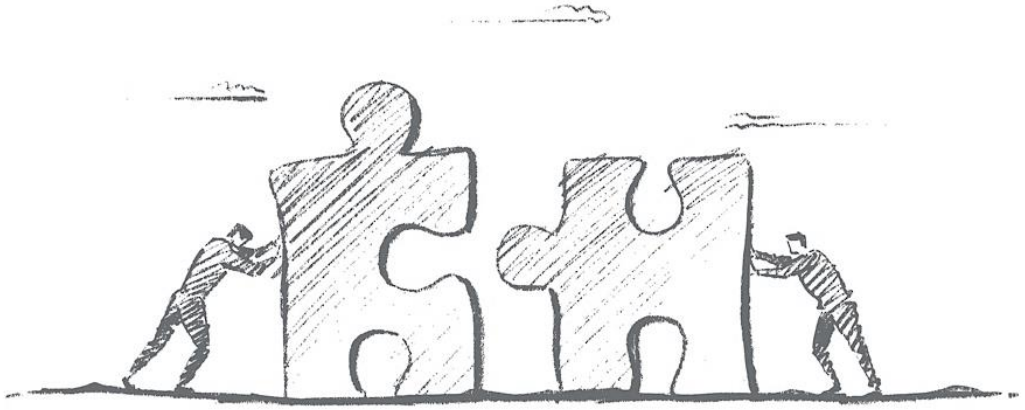
495	335	80	12
Reviews	Projects	Presentations	Guides

- CRADAs
  - Connecticut Center for Advanced Technologies – Outreach efforts in the Northeast to familiarize stakeholders with the HSP and identify opportunities for safety reviews
  - California Energy Commission – Safety plan and design reviews for stations and renewable production facilities, incident fact finding and outreach
- Non-DOE opportunities for reviews
  - Private industry/laboratories
  - DOD
  - South Australia
- Task group on mobile applications
- ERG revision and fueling station support

Impact of the HSP's Activities

Involving the HSP in hydrogen project and program activities will have these beneficial impacts:

- Serves as a non-regulatory, objective and neutral expert resource
- Responds with a balanced solution to questions, problems and issues
- Sees the "big picture"
  - Shares learnings
  - Identifies gaps
- Helps reduce costs by avoiding
  - Over-engineering and unnecessary features
  - Delayed approvals
  - Missed safety considerations/features
- Aids in avoiding repeating costly mistakes among disparate project proponents
- Helps project proponents avoid industry-impacting incidents
- Helps establish stakeholder and public confidence and receptivity



Support for the Safe Implementation of Hydrogen Technologies

Activities that can Benefit from HSP Involvement

Early Concept Support

Pre-Project

- **Safety planning webinars**
- Pre-project outreach to stakeholders
- ***H_2 Safety training and orientation for code officials**
- Project team safety planning consultations

Early Design

- Safety plans reviews
- ***Review project/facility early designs**
- Participate in risk analyses development
- **Review risk analyses**
- *Address AHJ safety questions

Early Operation

- Evaluate safety features of completed facilities
- **Onsite safety evaluations**
- Provide first responder H_2 safety training

Program Support

- **Identify safety gaps**
- Develop industry guides
- ***Expert support for incident fact-finding and investigations**
- Bolster stakeholder and public confidence

Successful Project Implementation

* 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

Future Direction and Sustainability

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

Streamlined access to HSP

HYDROGEN
Safety Panel

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 in-person 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.*

Introducing the Center for Hydrogen Safety

CENTER FOR Hydrogen SAFETY

An AIChE Technical Community • A Global Resource On Hydrogen Safety

The Center for Hydrogen Safety (CHS) is a not-for-profit, non-bias, membership organization within AIChE that promotes the safe operation, handling, and use of hydrogen and hydrogen systems across all installations and applications. The CHS identifies and addresses concerns regarding the safe use of hydrogen:

- As a sustainable energy carrier
- In commercial and industrial applications
- In hydrogen and fuel cell technologies

Membership and Benefits

- Membership Levels
  - Government ($25K USD/per year)
  - Large Industry ($15K USD/per year)
  - Small Industry ($5K USD/per year)
  - University ($2K USD/per year)
  - Executive Board ($50K USD/per year)
- Benefits
  - Tangible
    - Access to the U.S. Hydrogen Safety Panel for reviews and support
    - Accredited education, training and outreach materials
    - Participation in setting the direction and priorities for the CHS (Executive Board membership)
    - Conferences and networking opportunities
  - Intangible
    - **Messaging: Membership in CHS can demonstrate commitment to stakeholders and the public that safety is a priority for your organization** (organization logos can be added to the CHS website and members can use the CHS member logo)
    - Participate in a global community addressing safety issues and barriers

Announcement and Membership

Official Announcement April 1, 2019 at the AIChE Spring Meeting in New Orleans, LA

- Looking for 12+ inaugural members
- Potential members
  - Industry
  - Government
  - Laboratories
- Potential strategic partners
  - California Fuel Cell Partnership
  - Hydrogen Mobility Australia
  - Dechema, SCEJ and IChemE
  - International Association on Hydrogen Safety (HySAFE)

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FY19 PNNL-AIChE Activities

- Hydrogen Safety Panel
  - AIChE contract with PNNL to allow access to PNNL resources and HSP reviews
  - Those needing a timely review will be directed to the Center for Hydrogen Safety for accessing the HSP
- First Responder Training Resources
  - PNNL contracting with AIChE to move the online awareness training to the AIChE Academy
    - Updated content
    - Accreditation
  - Props transferred to AIChE (and may be housed at the University of Delaware)
  - PNNL will work with AIChE to establish in-person training capabilities
- Hydrogen Tools Portal
  - Possible transfer of researcher hydrogen safety training to AIChE
    - Updated content
    - Accreditation

Help This Effort Be Successful

- **Join us… Your membership and support will help ensure sustainability and broader impact of key hydrogen safety resources**
- Encourage others to join
- Share your suggestions for making CHS beneficial and impactful

Thanks for Your Attention!

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