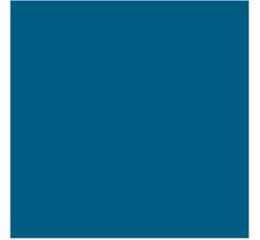


CENTER FOR
Hydrogen SAFETY
Connecting a Global Community

Nick Barilo
Director, Center for Hydrogen Safety
HTAC Meeting
March 10, 2020 - Washington, DC



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



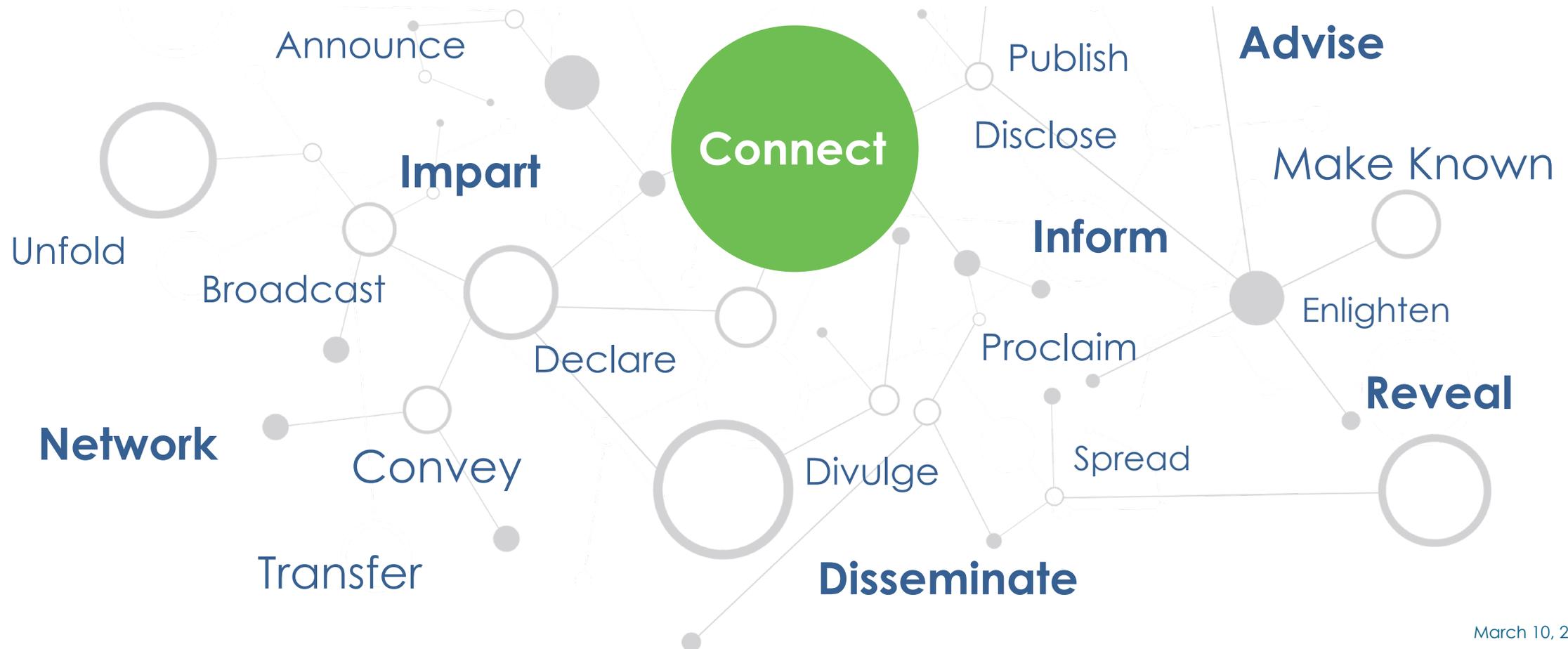
Building Blocks

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

Our Greatest Need, and Our Greatest Opportunity

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



Safely Fueling Our Future...

by building and enabling a global community

The Center for Hydrogen Safety:

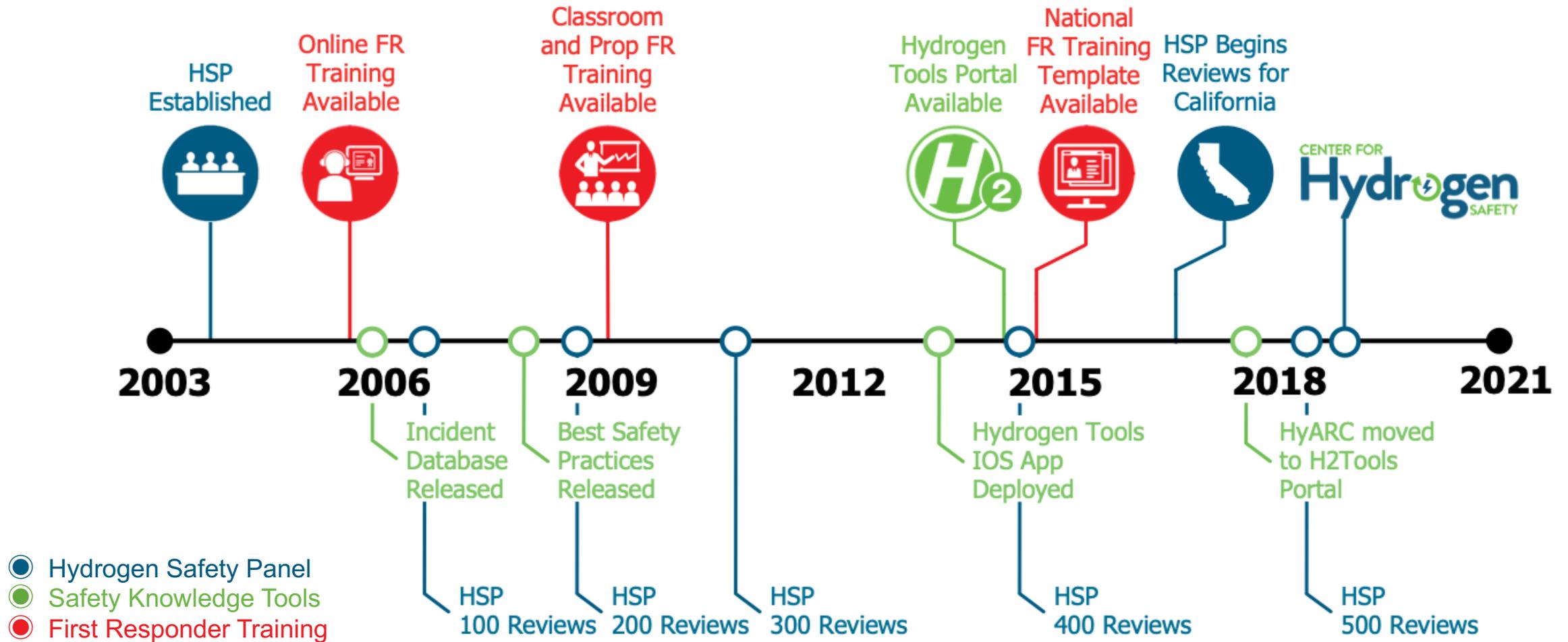
- ▶ A global, neutral and nonprofit resource
- ▶ Supports and promotes the safe handling and use of hydrogen across industrial and consumer applications in the energy transition
- ▶ Provides assurance that groups of experts have a common communication platform with a global scope to ensure safety information,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



*The Center for Hydrogen Safety is an
AIChE Technical Community*



Resources Timeline



Safely Fueling Our Future...

by building on a strong foundation of resources built through collaboration

Safety Knowledge Resources

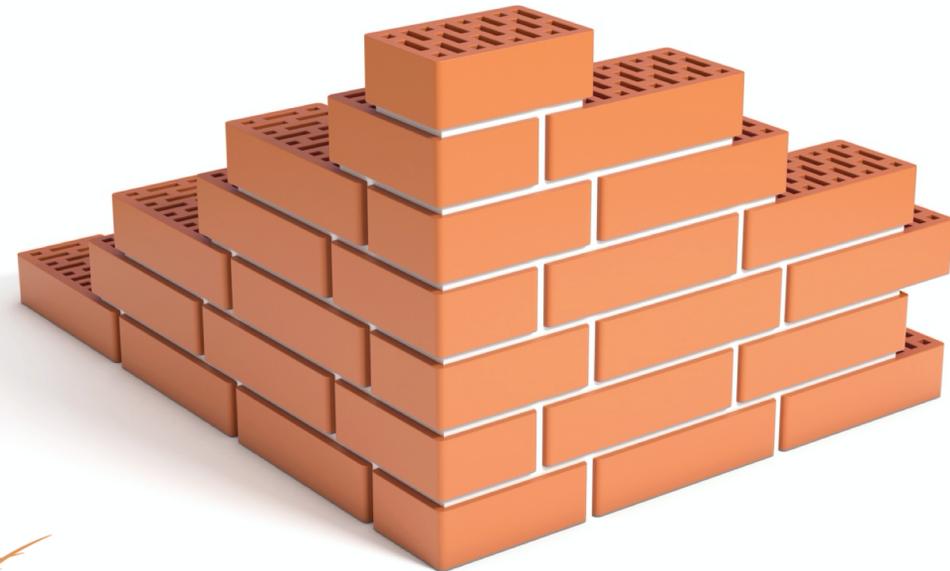
- ▶ Hydrogen Tools Web Portal
- ▶ Hydrogen Lessons Learned
- ▶ Best Safety Practices

First Responder Training Resources

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

Hydrogen Safety Panel

- ▶ Reviews Projects and Facilities
- ▶ Identifies Gaps and Shares Learnings



Membership Benefits



Project/facility support

- ▶ Design Reviews
- ▶ Hazard Analysis Support
- ▶ Facility/Site Reviews



Outreach

- ▶ Stakeholders
- ▶ Code Officials
- ▶ Communities



Networking

- ▶ H₂ Safety Conferences
- ▶ Collaborative Teaming



Training & Education

- ▶ First Responders
- ▶ Researchers
- ▶ Technicians



Incident Response Resource

- ▶ Timely Information on Incidents
- ▶ Facts Sheets
- ▶ Resource Guides

Early Training and Education Resources



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)



Introducing the Hydrogen Safety Panel (HSP)

THE HSP PROMOTES SAFE OPERATION, HANDLING, AND USE OF HYDROGEN

- ▶ Formed in 2003
- ▶ 17 members with 500+ 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)

17 Years

517 Reviews

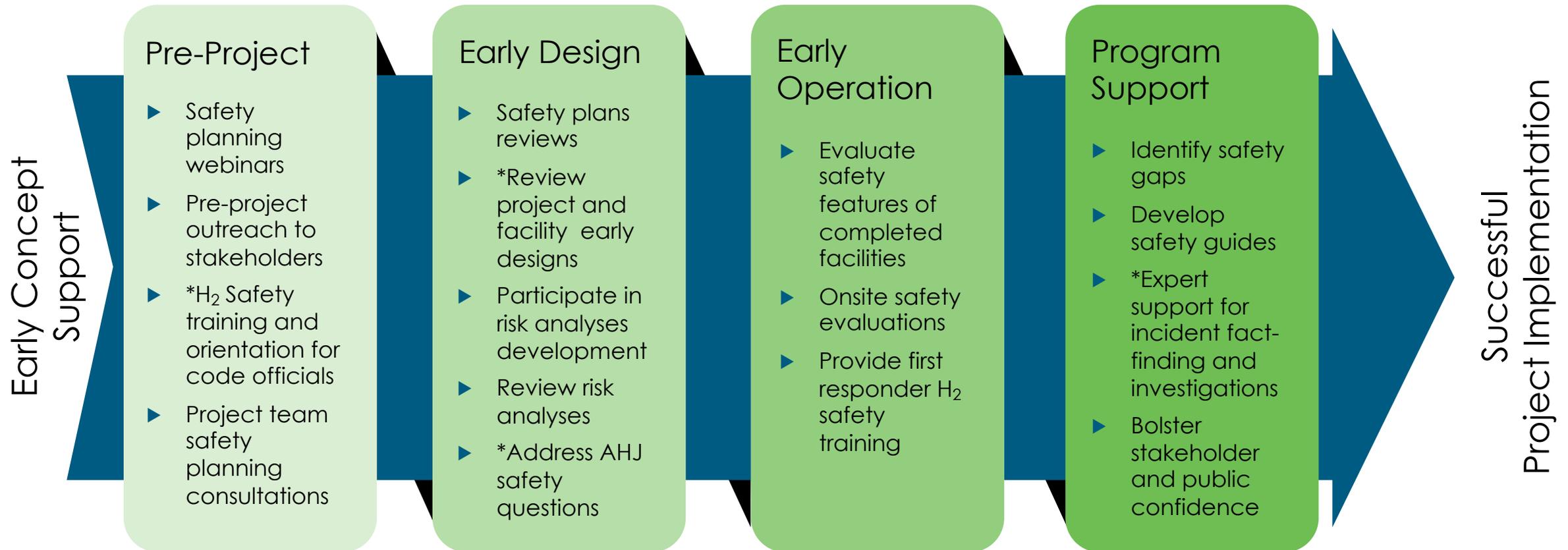
352 Projects

100+ Presentations

12 Guides

Support for the Safe Implementation of H₂ Technologies

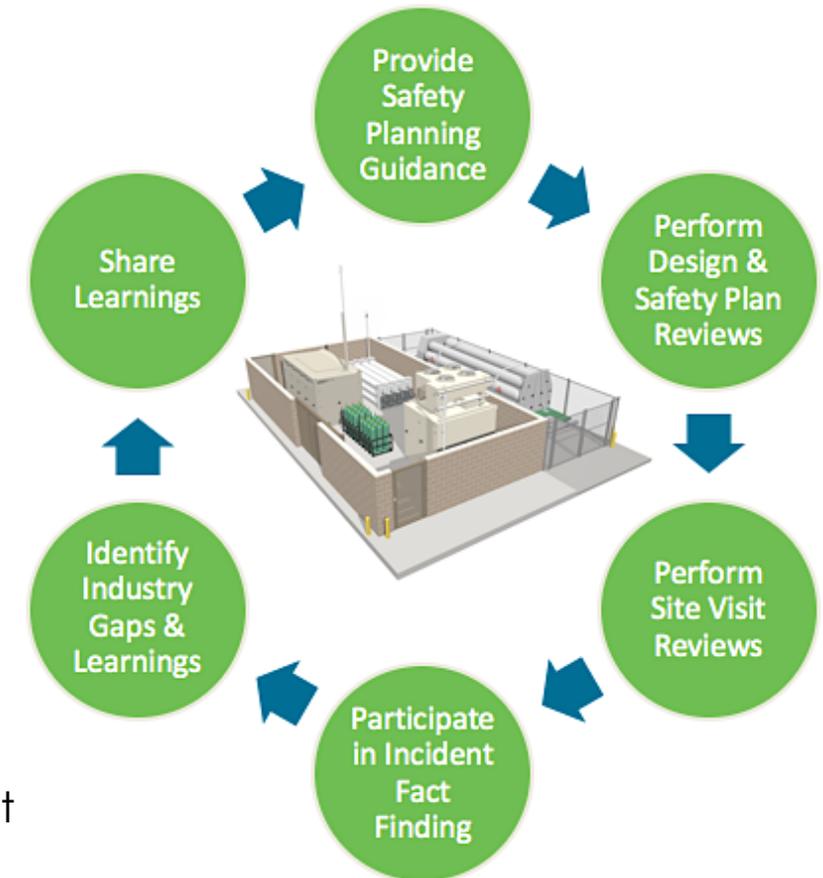
Activities that can Benefit from Project/Facility Support



* 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

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



Hydrogen Safety Conferences

October 2019

Sacramento, CA – 75 attendees

June 2020

*South Korea – Up to 175 attendees

September 2020:

Anaheim, CA, USA – Up to 150 attendees

October 2020:

Frankfurt, Germany – Up to 150 attendees

* May be rescheduled due to coronavirus travel restrictions



Membership Levels



Government (\$25K USD/per year)



Industry (\$15K USD/per year)



Small Business/Startups (\$5K USD/per year)



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



University (\$2K USD/per year)



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

For more info: www.aiche.org/chs

Impact of Membership

Membership will:

- ▶ Demonstrate that safety is a fundamental principal 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

Industry Members (15)



Small Business Members (8)



University Members (4)



National Labs
Members (6)



Government (2)



Executive Board (5)



Strategic Partners (5)



CHS Goals for 2020

Program	Goals
Networking	<ul style="list-style-type: none">• Hold two global conferences• Develop plan for engagement with global H2 community through speaking opportunities
Communication	<ul style="list-style-type: none">• Deliver 10 newsletters to CHS members• Create and deploy 3 technical bulletins
Education and Training	<ul style="list-style-type: none">• Create a second version of the First Responder course with enriched content• Develop strategy for translating CHS materials into non-English languages by Q2• Create Hydrogen Safety for Researchers/Technicians course• Create many hydrogen safety courses based on Best Safety Practices from H2Tools.org
Capabilities	<ul style="list-style-type: none">• Stand up incident response resource guide by end of Q2• Enhanced website for incident tracking by end of Q1• Perform seven Hydrogen Safety Panel reviews• Launch members only section of website for resources
New Opportunities	<ul style="list-style-type: none">• Submit proposal for creating a Hydrogen Academy and identify funding options
Administration	<ul style="list-style-type: none">• Expand CHS membership — 50 members• Hold 3–4 executive committee meetings this year with one being face-to-face• Meet overall budget — \$300K net

Thanks for Your Attention!

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