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Hydrogen Safety Outreach to Expedite Hydrogen Fueling and Energy Project Deployment and Promote Public Acceptance for Zero Emission Vehicles and Reliable Distributed Power Generation

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Overview

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Hydrogen Safety Outreach to Expedite Hydrogen Fueling and Energy Project Deployment and Promote Public Acceptance for Zero Emission Vehicles and Reliable Distributed Power Generation

Project Timeline

- Project start date: February 2019
- Project end date: December 2021[1]

Budget

- Total CRADA funding: $600K
  - Total DOE share: $540K
  - Total match (CEC) share: $60K
- Funding spent as of January 2019: $0

Barriers Addressed[2]

A. Safety data and information — limited access and availability

C. Safety is not always treated as a continuous process

D. Lack of hydrogen knowledge by authorities having jurisdiction (AHJs)

Partners

- California Energy Commission (CEC)

[1] Project continuation and direction determined annually by DOE.

[2] Technical Plan – Hydrogen Safety, Codes and Standards, Section 3.7, Multi-Year Research, Development and Demonstration Plan, 2015, pp. 21-22 (updated June 2015), https://www.energy.gov/sites/prod/files/2015/06/f23/fcto_myrdd_safety_codes.pdf.

Hydrogen Safety Resources

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HYDROGEN
Safety Panel

- 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

- Hydrogen Lessons Learned
- Hydrogen Best Practices
- Hydrogen Tools web portal (http://h2tools.org)

HYDROGEN
Emergency Response Training Resources

- Online awareness training
- Operations-level classroom/hands-on training
- National hydrogen and fuel cell emergency response training resource

PNNL Hydrogen Safety Program Timeline

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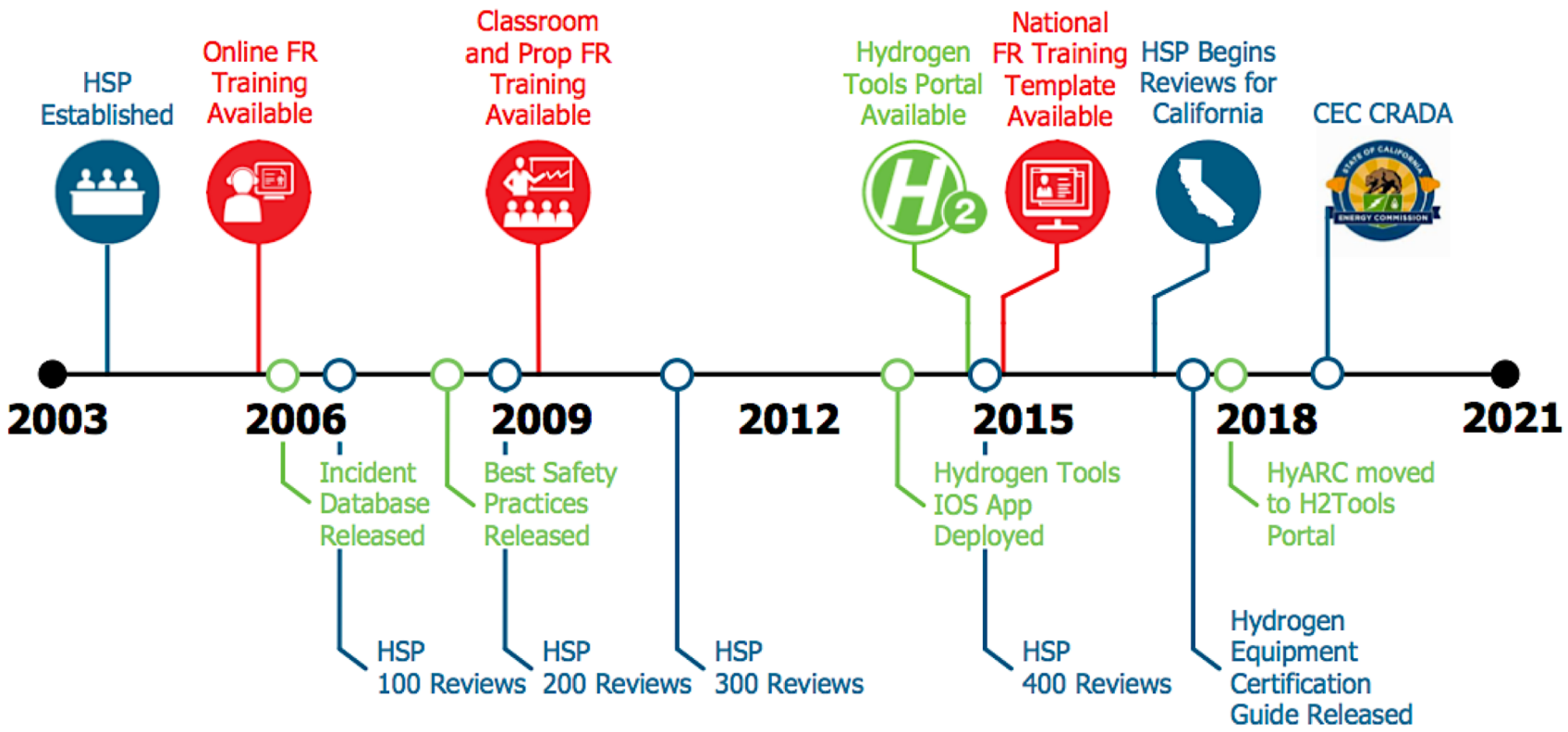
- Hydrogen Safety Panel
- Safety Knowledge Tools
- First Responder Training



Hydrogen Safety Panel Membership

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The HSP is a multidisciplinary team of engineers, code officials, safety professionals, equipment providers, and testing and certification experts. The Panel provides guidance for hydrogen projects and facilities, including design and process safety reviews, support/review of risk analyses, onsite safety presentations, and training.

Name	Affiliation
Nick Barilo, Manager	Pacific Northwest National Laboratory
Richard Kallman, Chair	City of Santa Fe Springs Fire Dept.
Ken Boyce	UL
David Farese	Air Products and Chemicals
Donald Frikken	Becht Engineering
Livio Gambone	Nikola Motors
Aaron Harris	Air Liquide
Brian Ladds	Calgary Fire Department
Chris LaFleur	Sandia National Laboratories
Miguel Maes	NASA-JSC White Sands Test Facility
Steve Mathison	Honda Motor Company
Larry Moulthrop	Proton OnSite (retired)
Andrei Tchouvelev	A.V. Tchouvelev & Associates Inc.
Tom Witte	Witte Engineered Gases
Robert Zalosh	Firexplo

Relevance

HSP's overall purpose and objectives

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The purpose of the HSP is to share the benefits of extensive experience by providing suggestions and recommendations pertaining to the safe handling and use of hydrogen.

Objective: Enable the safe and timely transition to hydrogen technologies by:

- Participating in hydrogen projects to ensure safety is adequately considered
- Providing expertise and recommendations to stakeholders and assisting with identifying safety-related gaps, best practices, and lessons learned

Relevance

Highlighting the impact of HSP past activities

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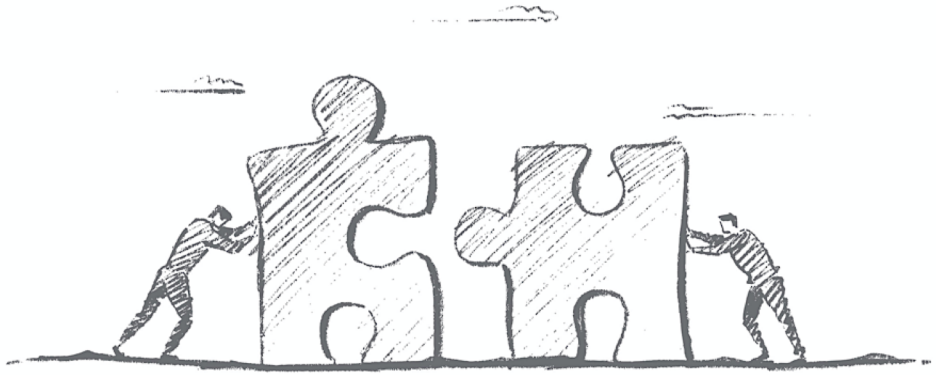
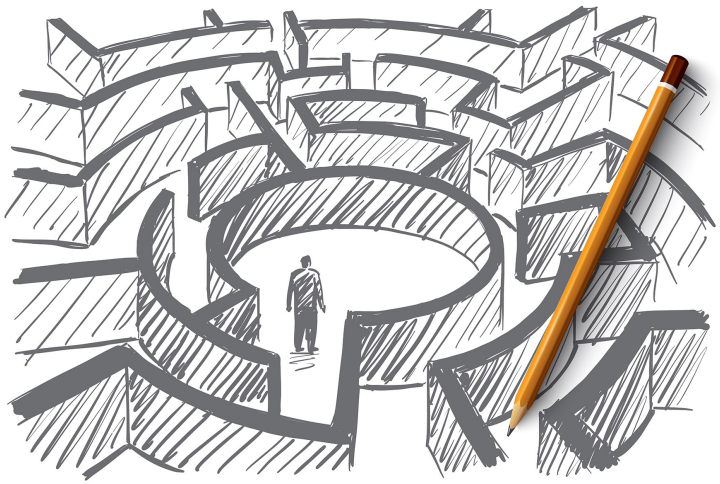
- Serves as a non-regulatory, objective, and neutral resource
- Sees the "big picture"
  - Shares learnings
  - Identifies gaps
- Can help reduce costs
  - Over-engineering resulting in unnecessary features
  - Delayed approvals
  - Missed safety considerations/features
- A group with diverse experience 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



Relevance – 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 experienced, independent safety review (ISR) resource involved in early design and safety planning activities
- HSP feedback and learnings help individual projects and the entire industry remove barriers and ease future deployments



Relevance – Public Acceptance

- Demonstrated safety in the production, distribution, dispensing, and use of hydrogen is critical to the successful implementation of a hydrogen refueling infrastructure and the widespread use of fuel cell technologies in transportation
- Commercial hydrogen fuel technologies are starting to be deployed, which amplifies the attention paid to such new technologies because of public unfamiliarity
- Loss of public confidence at an early stage of development could significantly delay or even preclude further progress in development and deployment of hydrogen and fuel cell technologies as zero-emission solutions

Approach

The PNNL HSP will work with CEC to ensure that proposed California renewable hydrogen central production facilities and the light duty hydrogen refueling infrastructure meet the highest standards of safety. The HSP's activities cover key safety planning and implementation aspects of these CEC projects and are directed toward project proponents and stakeholders. HSP activities will include:

- Providing safety planning webinars and consultations
- Reviewing funding opportunity applicant safety plans
- Participating in funded project design reviews
- Performing site safety reviews
- Providing outreach to code officials and stakeholders
- Reviewing hydrogen incidents
- Conducting post-startup project team interviews

Other Information and Summary

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- Accomplishments and progress, proposed future work, and remaining challenges and barriers are not provided as project activities and were not started until March 2019
- The primary collaboration of this activity will be with the CEC. Other collaborations may take place based on actual project work

Summary

- Demonstrated safety in the production, distribution, dispensing, and use of hydrogen is critical to the successful implementation of a hydrogen refueling infrastructure and the widespread use of fuel cell technologies. The CEC will use the HSP to ensure that hydrogen infrastructure for the transportation sector funded by the CEC meets the highest standards of safety, thus reducing the likelihood of industry impacting incidents. The completion of this project will also enable the PNNL HSP to continue to promote the safety of hydrogen infrastructure in California, and other parts of the United States

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Thank You!

- U.S. Department of Energy
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- California Energy Commission
  - Jean Baronas
  - Sebastian Serrato
- All of my colleagues at Pacific Northwest National Laboratory, the Hydrogen Safety Panel, and other collaborators
- AMR Reviewers – your comments and perspectives are important to helping us identify areas for improvement and be more impactful