U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

International Hydrogen Infrastructure Workshop Agenda

September 11-12, 2018
Boston Convention and Exhibition Center
Meeting Level 2, Room 257A
415 Summer St
Boston, MA 02210

Objectives:

- Identify areas of hydrogen infrastructure wherein early-stage R&D is necessary to reduce cost and improve reliability.
- Facilitate collaboration between laboratory researchers and industry stakeholders to inform R&D.
- Leverage accomplishments of projects from key stakeholders in infrastructure to accelerate R&D.
- Discuss operational experiences to prioritize systems / processes / techniques that can improve the availability and performance of hydrogen refueling stations.
- Prioritize areas for international collaboration on hydrogen infrastructure.
- Identify regulatory and codes & standards barriers that must be addressed to advance hydrogen infrastructure.

Day 1

7:30 a.m. **Breakfast and Registration**

8:00 a.m. **Assemble**

8:15 a.m. **Opening Remarks**

8:20 a.m. **Country Overviews**
Moderator: Ms. Neha Rustagi, U.S. Department of Energy (DOE)

Representatives from Germany *(Mr. Philipp Braunsdorf, National Organisation Hydrogen and Fuel Cell Technology [NOW])*, the European Union *(Ms. Beatriz Acosta, European Commission)*, Japan *(Mr. Katsumi Yokomoto, New Energy and Industrial Technology Development Organization [NEDO]),* China *(Jimmy Li, National Institute of Clean and Low-Carbon Energy [NICE])*, Scandinavia (*Mr. Vegard Frihammer, Greenstat*), and the U.S. (*Ms. Neha Rustagi, U.S. DOE*) will present:

- Status of fueling stations and future plans, including capacities, footprint, methods of supply, regional coverage, fueling protocol used, vehicle types served, and integration with gasoline infrastructure
- Status of vehicles (light-duty/medium-duty/heavy-duty), and expected growth
- Status of mobile and/or emergency roadside fuelers
- Key challenges in cost and reliability of hydrogen infrastructure.

9:50 a.m. **Hydrogen Fueling Methods and Technologies Session**
Moderator: Mr. Philipp Braunsdorf, NOW

9:50 a.m. European Union Overview on Hydrogen Fueling Methods
Beatriz Acosta (European Commission) and Pietro Caloprisco (FCH-JU)

10:05 a.m. H_2 Storage and Transport at 50 MPa: Improving Infrastructure Cost and Performance
Johannes Lorenz, E&MS

10:20 a.m. R&D Challenges for Medium- and Heavy-Duty Filling in China
Jimmy Li, National Institute for Clean and Low Carbon Energy

10:35 a.m. Methods of Hydrogen Fueling for Home and Fleet Applications
Chris O'Brien, IVYS Energy Solutions

10:50 a.m. Multi-physics Modeling of Hydrogen Fueling Methods
Mike Peters, National Renewable Energy Laboratory, and Paul Sorensen, Shell Oil Company

10:50 a.m. **Break**

11:10 a.m. **Hydrogen Safety, Codes, and Standards Session**
Moderator: Mr. Katsumi Yokomoto, NEDO

11:10 p.m. Harmonization of Station Acceptance Procedures in Germany with SAE and ISO by Clean Energy Partnership (CEP)
Thomas Brachmann, Honda

11:25 a.m. Standardization and Listing of Hydrogen Fueling Equipment
Jørn Rosenlund, Nel

11:40 p.m. Validation of Hydrogen Meter Testing Device in Europe
Joachim Schütte, Air Liquide

11:55 p.m. **Lunch**

1:00 p.m. Example Tube Trailer Incident Debrief
David Farese, Air Products

1:15 p.m. **Hydrogen Fueling Station Technologies**
Moderators: Ms. Beatriz Acosta, European Commission and Elizabeth Connelly, U.S. DOE

1:15 p.m. Status of Hydrogen Fueling Station Technologies in Japan
Ikeda-san, HySut

1:30 p.m. Accelerating the Construction of Hydrogen Stations to Promote Widespread Use of Fuel Cell Vehicles in Japan
Tomonari Komiyama, Japan H_2 Mobility, LLC

1:45 p.m. Key Barriers to Station Performance in Germany, and Implications for Next-Generation Stations
Mike Hutmacher, H2 Mobility

2:00 p.m. Challenges to Integrate Hydrogen Refueling stations in Existing Gasoline Stations
Benjamin Coiffier, Air Liquide

2:15 p.m. Quantitative Risk Analysis to Guide Station Design
Gabriela Bran-Anleu, Sandia National Laboratories

2:30 p.m. Key Technology Needs for 70 MPa Medium- and Heavy-Duty Stations, and Current Constraints
Jesse Schneider, Nikola Motors

2:45 p.m. Key Technology Needs for 35 MPa Medium- and Heavy-Duty Stations, and Current Constraints
Amgad Elgowainy, Argonne National Laboratories

3:00 p.m. **Break**

3:15 pm. Electrochemical Concepts for Hydrogen Compression
Monjid Hamdan, Giner

3:30 p.m. Total Cost of Ownership Based Approach to Determining Standards for Heavy-Duty Vehicles
Paul Karzel, Shell

3:45 p.m. Database of Polymeric Materials for Hydrogen Gas seals and Dispensing Hoses
Shin Nishimura, Kyushu University

4:00 p.m. R&D Needs to Enable On-site Production of Hydrogen at Fueling Stations
Nick Hart, ITM Power

4:15 p.m. Guided Open Discussion
Moderator: Mike Peters, National Renewable Energy Laboratory

- What are some key areas wherein international collaboration (e.g. data sharing) can advance hydrogen infrastructure technologies? What are examples of collaborations that could be effective?
- What are key barriers (R&D, policy, market, regulatory, etc.) to the deployment of stations for medium- and heavy-duty applications?
- What fueling methods other than J2601 / ISO 19880-1 are currently in use, and in what applications?
- What are key requirements for hydrogen fueling methods and station technologies for buses?
- What are key technological barriers to reliable performance of fueling stations (e.g. nozzle freeze lock, meter accuracy)? What R&D do you have ongoing in this space?
- What approaches are being considered for footprint reduction?
- How is cyber security of hydrogen fueling stations being managed today?

5:45 p.m. Adjourn

7:00 p.m. No-host dinner at Olive Garden: 11 Allstate Rd B, Dorchester, MA 02125; (617) 989-1371

Day 2

7:30 a.m. **Breakfast and Registration**

8:00 a.m. **Assemble**

8:15 a.m. **Hydrogen Quality Session**
Moderator: Mr. Anthony Belvin, U.S. DOE

8:15 a.m Development of an Optimized Sampling Device for 70 MPa Hydrogen Refueling Stations
Christof Gränitz, Hydac / Christian Spitta, The Hydrogen and Fuel Cell Center ZBT

8:30 a.m. Electrochemical Approaches to Hydrogen Contaminant Detection
Mukund Mukundan, Los Alamos National Laboratory

8:45 a.m. **Hydrogen Distribution Infrastructure R&D Session**
Moderator: Ms. Shukhan Chan, U.S. DOE

8:45 a.m. Industry-driven Innovation for Growth of Widescale Hydrogen Infrastructure
Olivier Machet, *Engie*

9:00 a.m. Green H_2 Production and Delivery for Transportation Applications in Wind Regions
André Steinau, GP Joule

9:15 a.m. Evaluation of Chemical Carrier Concepts for Hydrogen Delivery
Rajesh Ahluwalia, Argonne National Laboratory

9:30 a.m. Introduction of Liquid Organic Hydrogen Carrier and the Global Demonstration Project
Daisuke Kurosaki, Chiyoda Corporation

9:45 a.m. Potential for Liquid Organic Hydrogen Carriers to be used in Large-Scale Distribution of Hydrogen
Jonas Obermeier, Hydrogenious

10:00 a.m. Status and R&D Needs of Hydrogen Distribution Technologies in Scandinavia
Kevin Harris, Hexagon Lincoln

10:15 a.m. **Break**

10:30 a.m. **Guided Open Discussion**
Moderator: Amgad Elgowainy, Argonne National Laboratory

- What R&D activities do you have in contaminant detection?
- What are the costs and challenges with current onsite contaminant detection?
- What are the costs, turnaround times, and frequency of sampling today?
- What methods of large-scale (thousands of tonnes) of storage do you currently utilize, and what are barriers (technological, policy, or investment) to growth?
- What other concepts of high-volume storage and distribution are you currently considering?
- What concepts are you considering to reduce the costs or increase the efficiency of hydrogen liquefaction?

- What research do you currently have ongoing to explore the use of chemical carriers for large-scale hydrogen distribution?

12:00 p.m. Closing Remarks, Boxed Lunch, and Tours of Nearby Facilities

Tours will include Fiba Tech vessel manufacturing facility, Air Liquide tube trailer terminal, and Nuvera Fuel Cells.

12:00 p.m. - 1:00 p.m. Lunch

1:00 p.m. – 2:00 p.m. Drive to Fiba Tech/Air Liquide

2:00 p.m. – 3:00 p.m. Tour of Fiba Tech/Air Liquide

One bus will depart for Boston Logan International Airport at 3:00, and the other will continue to Nuvera Fuel Cells.

3:00 p.m. - 4:00 p.m. Drive to Boston Logan International Airport or Nuvera Fuel Cells

4:30 p.m. - 5:30 pm. Second bus drives from Nuvera Fuel Cells to Boston Convention Center

5:30 p.m. Return to Boston Convention Center and Adjourn