INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update November 2015: U.S.

The IPHE Secretariat requests each IPHE member submit a one-page narrative update on hydrogen and fuel cell (HFC) activities. Please only report actions and developments since the last Country Update and leave Sections blank if there have been no new developments.

Please complete this form and send to secretariat@iphe.net by 19 November 2015.

Name	Sunita Satyapal/Mike Mills
Contact Information	Sunita.satyapal@ee.doe.gov, 202 586-2336 Michael.Mills@ee.doe.gov
Covered Period	2015

1. New Policy Initiatives on Hydrogen and Fuel Cell

Report on the introduction of new policy initiatives on HFCs. You may also report significant policy decisions, the release of new strategic papers and/or roadmaps, hydrogen-related organizational changes in the government, etc.

- ***Policy Decisions since last meeting:***

None
However, note that President Obama's Fiscal Year 2016 Revenue Proposal includes language that would make the current plug-in electric vehicle (PEV) tax credit available to a wider range of technologies (including FCEVs), remove the cap placed on the number of vehicles per manufacturer that can receive the credit, allow for a scalable credit up to a maximum of $10,000, and make the credit more flexible to enable the seller or person financing the sale to offer a point-of-sale rebate to consumers. To increase awareness and visibility of the proposed changes, EERE has posted a factsheet that outlines President Obama's proposed changes to advanced vehicle tax credits as part of the Administration's Fiscal Year 2016 Revenue Proposals on EERE's website. (Link to factsheet: http://energy.gov/eere/fuelcells/downloads/fact-sheet-accelerating-development-and-deployment-advanced-technology)

- ***New Publications since last meeting:***

  - 2**015 IEA Technology Roadmap on Hydrogen and Fuel Cells** includes input from international stakeholders and makes it clear that hydrogen holds promise for some of the key challenges facing emissions reduction in sectors such as transport, industry and buildings, as well as the electricity system. Link to the report: http://www.iea.org/publications/freepublications/publication/TechnologyRoadmapHydrogenandFuelCells.pdf
  - **The California Air Resources Board (CARB)** released the 2015 Annual Evaluation of FCEV Deployment and Hydrogen Fuel Station Network Development report (often called the "June AB 8 report."). Report findings show that FCEV deployment in California is anticipated to accelerate more rapidly than previously projected pointing to the need to increase the pace at which H2

infrastructure is built out. (Link to the report: http://www.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2015.pdf)
- **The Department of Energy's Quadrennial Technology Review (QTR)** examines the most promising research, development, demonstration, and deployment (RDD&D) opportunities across energy technologies to effectively address the nation's energy needs and recognizes hydrogen and fuel cell as technologies as part of the portfolio to meet that goal.
- **Note- High level reports listed above (numerous technical reports not included)**

2. Hydrogen and Fuel Cell R&D Update

Provide R&D progress against plans since the last member update. For example, information on cost reductions and enhanced performance of hydrogen and fuel cell technologies. However, please report demonstration and deployment activities separately in the following section.

Minimal updates since last meeting

3. Demonstration and Deployments Update

Provide information on the progress of current demonstration projects and any newly introduced demonstration projects since the last country update. Also, please highlight any deployment decisions made by stakeholders.

- Progress continues towards 100 stations in California and 12 privately funded stations in the Northeast U.S. ~ 65 stations as of 11/25/15 (open, constructed, or planned). ~10 public retail stations.
- Over 13,000 fuel cell forklifts and backup power units (combined) deployed or on order
- Early market applications being launched:
    - Launched the world's first fuel cell airport tow tractor demonstration at the Memphis International Airport in Tennessee. This marks the start of a deployment covering a fleet of 15 fuel cell tow trucks at the FedEx hub with the potential to save to over 175,000 gallons of diesel and 1,700 metric tons of carbon dioxide.
    - New projects underway on medium duty vehicles

4. Events and Solicitations

Provide information on upcoming hydrogen-related events that will include international participants. Also, please provide any information regarding solicitations[1] that can lead to collaboration among IPHE members.

- ***International Hydrogen Infrastructure Workshops:*** DOE, NOW and NEDO recently organized the 3rd H2 Infrastructure Workshop to enable international

[1] Can include *Requests for Information* and *Calls for Proposals* and other requests that may or may not involve funding support but looks to address issues that may be of interest to IPHE members

information exchange on hydrogen infrastructure challenges four key areas—metering, fuel quality, fuel protocol validation and station hardware reliability & performance. Collaboration in this area will continue. FCHJU has offered to host the 4th in June 2016 in the Netherlands.

- ***H2Sense****:* This will be the first common project with common objectives between DOE (NREL) and the FCH-JU (BAM, JRC). The initiative will facilitate the safe use and implementation of hydrogen as an alternative fuel by ensuring correct use of effective hydrogen detection devices.
- ***IPHE International Safety and Reliability Data Sharing:*** IPHE initiative with two member countries currently participating (Japan and the U.S.) to gather information with a focus on safety and incident data as well as on station maintenance and reliability. Data will be share through NREL's National Fuel Cell Technology Evaluation Center.

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

Provide recent government, and, government with industry collaborative funding for hydrogen and fuel cell R&D, Demonstrations, Deployments and Infrastructure (in domestic currency and U.S. dollars). Please only include government funding for activities directly related to hydrogen and fuel cells.

- DOE recently announced up to 35 million to support hydrogen production, delivery, and storage research and development; demonstration and deployment of infrastructure components; consortia topics for fuel cell performance and durability and advanced hydrogen storage materials research; and cost and performance analysis for hydrogen production, storage, and fuel cells. It will include opportunities for projects that support two of the program's recently established consortia: the Hydrogen Materials Advanced Research (HyMARC) and the Fuel Cell Performance and Durability (FC-PAD) Consortia. Below is the detailed breakdown of topics that will be covered:

  - **Research and Development (R&D)**
    - Hydrogen Production R&D: Advanced High-Temperature Water Splitting
    - Advanced Compression
    - Advanced Vacuum Insulation for Automotive Applications
  - **Demonstration and Deployments**
    - Component Manufacturing and Standardization for Hydrogen Infrastructure (e.g., hose/piping, dispenser/station technologies)
    - Crosscutting: America's Climate Communities of Excellence
  - **Consortia Topics**
    - Fuel Cell – Performance and Durability (FC-PAD)
    - Hydrogen Storage Materials – Advanced Research Consortium (HyMARC)
  - **Analysis**
    - Cost and Performance Analysis for Fuel Cells; Hydrogen Storage; Hydrogen Production and Delivery

INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

Summary Country Update November 2015: U.S.

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
Fuel Cell Vehicles[2]	No target	As of 10/2015, >225 (state registered)	• 2015 vehicle roll-out in California • Partnering with California Air Resources Board (CARB) and California Energy Commission (CEC)	• ZEV state mandate (e.g. CA); state subsidies (rebates in CA, MA, CT etc.)
FC Bus	No target	~25 (in service)	Federal Transit Authority (Department of Transportation); CARB; CEC	• ZEV state mandate (e.g. CA)
Fuel Cell Trucks	No target	In development	TBD	ZEV state mandate (e.g. CA)
Forklifts	No target	As of 5/2015, >8300 (including on order)	Early market applications strategy	• Recovery Act (2009) • Investment Tax Credit (lower of 30% or $3,000/kW, 2016 expiration)
H_2 Refueling Stations	**Target Number**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
70 MPa On-Site Production	No Target	~ 65 stations as of 11/25/15 (open, constructed, or planned) ~ 10 public retail	State partnerships	• California - $100M to 2023 or until 100 stations are built (includes O&M grants) • ZEV mandate
70 MPa Delivered	No Target			

35 MPa Delivered		stations include 35 MPa		
Stationary	**Target Number[3]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
Small[4]	No Target	Negligible	-N/A	• Investment Tax Credit (lower of 30% or $3,000/kW, 2016 expiration)
Medium[5]	No Target	As of 10/23/2015, system capacity installed ~370 kW	-Commercial (limited govt involvement beyond tax credit)	Investment Tax Credit (lower of 30% or $3,000/kW, 2016 expiration)
Large[6]	No Target	As of 10/23/2015, system capacity installed ~170 MW	--Commercial (limited govt involvement beyond tax credit)	Investment Tax Credit (lower of 30% or $3,000/kW, 2016 expiration)
District Grid[7]	No Target	As of 10/23/2015, system capacity installed ~25 MW	--Commercial (limited govt involvement beyond tax credit)	• Investment Tax Credit (lower of 30% or $3,000/kW, 2016 expiration)
Regional Grid[8]	No Target	As of 10/23/2015, system capacity	-Limited govt involvement beyond tax credit)	Investment Tax Credit (lower of 30% or $3,000/kW, 2016 expiration)

[3] Targets can be units installed and/or total installed capacity in the size range indicated
[4] <5 kW (e.g., Residential Use)
[5] 5kW – <100 kW (e.g., Distributed Residential Use)
[6] 0.1MW – <10 MW (e.g., Industrial Use)
[7] 10MW – <30 MW (e.g., Grid Stability, Ancillary Services)
[8] 30MW plus (e.g., Grid Storage and Systems Management)

		installed 30 MW		
Telecom backup	No target	~6,500 (including on order)	-Commercial (limited govt involvement beyond tax credit)	Investment Tax Credit (lower of 30% or $3,000/kW, 2016 expiration)
H_2 Production	**Target[9]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
Fossil Fuels[10]	$4/kg (produced, delivered, dispensed)	~$5/kg (at high volume from distributed natural gas) $13-$16/kg (low volume)	Limited govt partnerships (commercial/industry focused)	Limited
Water Electrolysis[11] (PEM, Alkaline, SOEC)	44 kWh/kg	~50 kWh/kg	Continued govt funding/cost share	Limited (e.g. state dependent; e.g. 33% renewables in CA)
By-product H_2	N/A			
Energy Storage from Renewables	**Target[12]**	**Current Status**	**Partnership, Strategic Approach**	**Policy Support**
Power to Power[13] Capacity	N/A		In process	

[9] Target can be by quantity (Nm^3, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target
[10] Hydrogen produced by reforming processes
[11] Please indicate if targets relate to a specific technology (PEM, Alkiline, SOEC)
[12] Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity
[13] Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

Power to Gas[14] Capacity	N/A		In process	

[14] Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)