INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update April 2018: United States

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1. New Policy Initiatives on Hydrogen and Fuel Cells

- The Bipartisan Budget Act of 2018 reinstated the federal Business Investment Tax Credit (ITC) for several technologies including fuel cells. The ITC rebate is 30% for solar, fuel cells and wind, and 10% for geothermal, microturbines and combined heat and power (CHP). The fuel cell ITC will undergo a phased reduction from 30 per cent to 26 per cent in 2020 and a further reduction to 22 per cent scheduled for 2021, expiring in 2022. The credit amount for fuel cells is capped at $1,500 per 0.5 kilowatt (kW) of capacity. Eligible property includes fuel cells with a minimum capacity of 0.5 kW that have an electricity-only generation efficiency of 30% or higher.
- The 2018 federal budget package also included a one-year retroactive reinstatement for 2017 for Sections 30B and 30C provisions for fuel cell vehicles and hydrogen infrastructure. The base credit is $4,000 for a fuel cell motor vehicle weighing up to 8,500 pounds and $10,000 - $40,000 for heavier vehicles.
- In January 2018, Governor Edmund G. Brown of California signed an executive order to increase Zero Emission Vehicles (ZEVs) and charging/refueling stations in the state. The $2.5 billion initiative will fund over 250,000 charging stations and a total of 200 hydrogen fueling stations (HRS) by 2025.

2. Hydrogen and Fuel Cell R&D Update

- DOE is developing an H2@scale roadmap with stakeholder input, planned for publication in the next year. H2@Scale is a DOE initiative to enable low cost, large scale production and use of hydrogen across sectors (transportation, stationary power, energy storage, grid services, industrial applications, etc.), enabling intermittent renewables (e.g. solar, wind) as well as nuclear and other baseload power generation and avoiding curtailment or stranded assets.
- DOE is also updating its Multi-Year Research, Development and Demonstration Plans and technical targets.
- Over 20 partnerships between industry, non-profits, state governments and DOE national laboratories were announced in November of 2017, to collaborate on research in advanced hydrogen production concepts, quantitative analysis of fueling, hydrogen fueling components, and integration of hydrogen production with the electricity grid – all as part of H2@Scale.
- DOE initiated 19 new projects in collaboration with FCTO's HydroGEN Energy Materials Network Consortium. This collaboration consists of 10 National Labs, 22 Universities, and 6 companies focused on early-stage R&D to accelerate discovery and development of innovative materials for water-splitting technologies for

electrochemical, photo-electrochemical and thermochemical processes. In addition to the early stage R&D efforts, one project is focused on the development of standardized protocols and best practices for evaluation of the materials innovations covering all water-splitting pathways.

- The U.S. DRIVE Partnership (Driving Research for Vehicle efficiency and Energy sustainability) released the ***2017 Highlights of Technical Accomplishments Report***, which summarizes key technical accomplishments in the development of advanced automotive and related energy infrastructure technologies achieved in 2017. Some of the DOE project funding recipients have surpassed the DOE 2020 target for power output per gram of precious metal (8 kW/gPt).

3. Demonstration and Deployments Update

- Progress continues towards 200 stations in California. As of April 2018, nearly 35 retail stations are open in California and an additional 28 are in development. Also, 12-25 retail stations are currently planned for the Northeast U.S.
- At the beginning of April 2018, nearly 4,500 FCEVs had been purchased or leased. (In August 2017, there were 1,600 fuel cell vehicles registered in California.)
- Currently, there are more than 30 fuel cell buses in operation, mostly in California, with over 30 additional buses planned, and more likely based on state funding grants and tranist agency plans.
- Northeast States continue to make progress related to industry plans for hydrogen fuelling stations and infrastructure.

4. Events and Solicitations

- ***U.S. DOE Hydrogen and Fuel Cells Program 2018 Annual Merit Review, Peer Evaluation Meeting***: Hydrogen and fuel cell projects funded by DOE will be presented and reviewed for their merit. This will be held in Washington, D.C. on June 13 – 15, 2018. Office of Fossil Energy's National Energy Technology Laboratory's 19th Annual Solid Fuel Cell (SOFC) Project Review Meeting will be held in conjunction with FC Program AMR.
- ***2018 National Fuel Cell and Hydrogen Forum***: The Fuel Cell and Hydrogen Energy Association (FCHEA) will be hosting a full-day forum and exposition on Tuesday, June 12 in Washington, D.C. with leading executives, experts, and policymakers on fuel cell and hydrogen technology.
- Hydrogen and Fuel Cell Technical Advisory Committee (HTAC): The next biannual meeting will take place in mid-December in Washington, D.C.
- Several regional events including both federal, state and local entities and regional associations are planned throughout the year.

- **Requests for Information (RFI) planned:**
- Identifying Priorities for Reducing Barriers to Deployment of Hydrogen Infrastructure
- H2@Scale (Hydrogen at Scale): Determining Opportunities to Facilitate Wide-Scale Hydrogen Adoption for Sustainable Energy Security and Economic Growth

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

- On April 17th, the U.S. Department of Energy (DOE) announced up to $39 million in available funding to support early stage research and development (R&D) of innovative hydrogen and fuel cell technologies. The work supported through this investment will address key early-stage technical challenges for fuel cells and for hydrogen fuel production, delivery, and storage related to hydrogen infrastructure.

6. Regulations, Codes & Standards Update

- Based on industry feedback, the stakeholder community has been exploring the potential for standard permits to streamline the permitting process for hydrogen fueling stations and reduce barriers.
- The first draft of the National Fire Protection Association (NFPA) NFPA 2 and NFPA 55 Codes are posted on the NFPA website and open for public comment until May 9th. Second draft meetings are scheduled for both Technical Committees in July and August.
- Phase II of the Global Technical Regulation 13 kicked off in 2017. The third meeting of the committee is in June. Several task groups that have been formed under the committee on the following topics: heavy duty vehicles and buses, fueling receptacle requirements, recommendations for test procedures, fire test, and recommendations from ISO TC197.

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Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles[1]	No target	Nearly 4,500 as of March 2018	• Partnering with California Air Resources Board (CARB) and California Energy Commission (CEC), CCAT, NYSERDA, MA, LI	• ZEV state mandate (currently implemented in CA, CT, MA, ME, MD, NJ, NY, OR, RI, and VT); state subsidies (rebates in CA, MA, CT etc.) The target is 4.5% of sales in 2018 and increases to 22% in 2025 $5,000 rebate for FCEVs for qualified income applicants.
FC Bus	No target	More than 25 (in service in the US) 32 funded for CA in 2018	Federal Transit Authority (Department of Transportation); CARB; CEC, State of CA, State of OH	
Fuel Cell Trucks	No target	Prototype testing	CTE, FedEx Express, UPS, CEC, SCAQMD	ZEV state mandate (e.g. CA)
Forklifts	No target	As of 5/2017, >16,000 (including on order, preliminary analysis)	Early market applications strategy	

[1] Includes Fuel Cell Electric Vehicles with Range Extenders

H_2 Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
70 MPa On-Site Production	No target	~ 80 stations as of 11/17 (open, constructed, or planned) 31 open public retail in CA	• State and private sector partnerships	• California - $2.5 billion to build ZEV charging/refueling stations including 200 hydrogen stations (includes O&M grants) • ZEV mandate
70 MPa Delivered	No target			
35 MPa On-Site Production	No target	2 as of 5/2016 (bus only stations). 70 MPa stations include 35 MPa	2 stations for bus refuelling (California)	
35 MPa Delivered	No target			
Stationary	**Target Number[2]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Small[3]	No target	Negligible	N/A	
Medium[4]	No target	As of 5/2016, system capacity installed ~555 kW		

[2] Targets can be units installed and/or total installed capacity in the size range indicated
[3] <5 kW (e.g., Residential Use)
[4] 5kW – 400 kW (e.g., Distributed Residential Use)

Large[5]	No target		Overall more than 235 MW of large stationary (100 kW to multi-megawatt) fuel cells currently operating in the U.S.	
District Grid[6]	No target	As of 5/2016, system capacity installed ~25 MW		
Regional Grid[7]	No target	As of 10/23/2015, system capacity installed 30 MW		
Telecom backup	No target	As of 5/2017 >8,000 (including on order)		
H_2 Production	**Target[8]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Fossil Fuels[9]	$4/kg (produced, delivered,	~$5/kg to $7.5 (at high volume	• Limited government partnerships (commercial/industry focused)	Limited

[5] 0.3MW – 10 MW (e.g., Industrial Use)
[6] 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)
[7] 30MW plus (e.g., Grid Storage and Systems Management)
[8] Target can be by quantity (Nm^3, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target
[9] Hydrogen produced by reforming processes

	dispensed) $7/kg for early market target	from distributed natural gas) $13-$16/kg (low volume)		
Water Electrolysis[10] (PEM, Alkaline, SOEC)	44 kWh/kg	~50 to 55 kWh/kg	Continued government 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[11]**	**Current Status**	**Partnership, Strategic Approach**	**Support Mechanism**
Power to Power[12] Capacity	N/A		In process	
Power to Gas[13] Capacity	N/A	60-kW demonstration at UC Irvine began in 2016	In process	California Low Carbon Fuel Standard creates credits for use of low-carbon fuels. Blends of H2 and natural gas could receive credits under this regulation.

[10] Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)
[11] Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity
[12] Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity
[13] 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)

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