INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update June 2020: United States

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1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

- The 2020 budget for the U.S. Department of Energy (DOE) Hydrogen and Fuel Cell Technologies (HFTO) Office is $150M (compared to $120M for 2019) covering hydrogen and fuel cells R&D infrastructure, technology acceleration, systems analysis and safety, codes & standards activities (note that the official name of the DOE office leading hydrogen and fuel cell efforts reverted closer to a former name- HFTO, rather than Fuel Cell Technologies Office (FCTO) to be consistent with its congressional budget chapter nomenclature).For future reference, HFTO is the correct name. Additional congressional appropriations included $30M for fossil energy, including solid oxide fuel cells and $11M for nuclear energy (along with $10M from HFTO for a nuclear to hydrogen demonstration).
- The U.S. DOE HFTO is currently updating its strategic plan ("Multiyear Plan") which will set strategic priorities and key R&D area to focus on for the next several years. The plan will be released in the Fall 2020 timeframe. A major focus will be on heavy duty transportation as well as industrial end use applications.
- The US Industry Hydrogen Roadmap was released in early 2020. Industry stakeholders developed this report using McKinsey's analysis team, similar to Hydrogen Council documents and it projects the potential for hydrogen across applications across the United States.
- Mr. Dan Brouillette was sworn in as Secretary of Energy upon departure of Secretary Perry. He had attended the first Hydrogen Energy Ministerial in 2018 and has also had an opportunity to drive FCEVs at DOE.
- California is developing a medium and heavy-duty zero-emission fleet regulation with the goal of achieving a zero-emission truck and bus California fleet by 2045. Other efforts are also underway focused on heavy duty vehicles. The current proposal (as of May 2020) would require truck manufacturers sell zero-emission electric trucks as an increasing percentage (from 5% to up to 50%, depending on the truck class) of their California sales from 2024 to 2030.

2. Hydrogen and Fuel Cell R&D Update

- The U.S. DOE continues to focus on enabling innovation through lab-led consortia related to hydrogen production, storage, fuel cells and enabling materials.
- Through substantial industry input, the U.S. DOE released performance targets for hydrogen fuel cell trucks to help guide R&D activities in this area.
- The U.S. DOE released a Program Record on the cost of hydrogen produced electrolyzers if manufactured at high volumes. The projected, high-volume, untaxed cost of hydrogen from electrolyzers, which splits water into hydrogen and oxygen, can range from approximately $2 to $7 per kilogram of hydrogen.

3. Demonstration, Deployments, and Workforce Developments Update

- Four demonstration projects selected by the U.S. DOE for funding are finalizing their siting plans for MW scale demonstrations in Texas, Florida, and the Midwest and will include use of solar, wind, and nuclear power to produce hydrogen for both stationary and transportation applications.
- The U.S. DOE and Hyundai Motor Company announced a partnership to assess and validate the current status and performance of hydrogen and fuel cell technologies. This collaboration will include data collection and validation on five Hyundai NEXO fuel cell cars, as well as the installation of the H-Prize H2Refuel winner's small scale refueler (SimpleFuel Unit) to support refueling and identify infrastructure R&D gaps.
- The U.S. DOE and U.S. Army issued a solicitation to develop and demonstrate H2Rescue, a hydrogen fuel cell-powered emergency relief truck. The solicitation can provide up to $1 million in federal funds and requires an equal match of industry contributions.
- The U.S. DOE HFTO's most recent funding opportunity announcement included topics to demonstrate integrated hydrogen production, storage, distribution and utilization systems for maritime applications and data centers. An additional topic focused on workforce development and training programs to support the emerging hydrogen and fuel cell industry.

4. Events and Solicitations

- U.S. DOE hosted an H2@Scale workshop on Nov 5 and in conjunction with the Fuel Cell Seminar in Long Beach, CA.
- U.S. DOE held various H2IQ hours, including one highlighting hydrogen and fuel cell stakeholders that have contributed to COVID-19 relief efforts in the U.S.
- U.S. DOE Nuclear Energy and Hydrogen and Fuel Cell Offices participated in a webinar organized by the Clean Energy Ministerial's Hydrogen Initiative (NICE) to identify opportunities from coupling nuclear and hydrogen.
- The 2020 U.S. DOE Annual Merit Review and Peer Evaluation Meeting was cancelled due to concerns about the COVID-19 pandemic. Presentations prepared will be posted online.
- The 2021 AMR will be held from June 8-10, 2021 in Crystal City, Virginia

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

- On Jan 23, U.S. DOE announced its Fiscal Year 2020 H2@Scale New Markets FOA, making available up to $64 million in federal funding for projects that demonstrate ways to scale up affordable hydrogen and fuel cell technology options.
- The U.S. DOE's Energy Efficiency and Renewable Energy (EERE) and Nuclear Energy (NE) Offices are funding up to $21 million under the U.S. Industry Opportunities for Advanced Nuclear Technology Development Funding Opportunity to projects aimed at leveraging synergies between nuclear and hydrogen technologies.
- The U.S. DOE announced nearly $20 million in small business awards which included projects that will focus on hydrogen R&D challenges and advance progress in hydrogen production from offshore wind.

6. Regulations, Codes & Standards, and Safety Update

- The Center for Hydrogen Safety plans to hold two conferences in the coming months. The first is planned for September 15-16 in Anaheim, CA. The second is planned for

October 20-21 in Frankfurt, Germany. The timing of these events is subject to change due to COVID-19.

- The Global Technical Regulation (GTR) Phase II is ongoing. Recent in-person meetings have been cancelled but remote meetings of the individual task forces have taken place.
- Sandia National Laboratories recently released a report, “Alternative Fuel Vehicles in Tunnels.”

Summary Country Update June 2020: United States

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles[1]	1,000,000 by 2030 in CA	>8,500	Multiple state efforts and industry stakeholders	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.)
FC Bus	No target	>60	Federal Transit Authority (Department of Transportation); CARB; CEC, and multiple states	
Fuel Cell Trucks[2]	$80/kW by 2030 (Interim) $60 k/W (Ultimate)	Prototypes by industry being developed and tested.	CTE, FedEx Express, UPS, CEC, SCAQMD, Nikola	ZEV state mandate (e.g., CA)
Forklifts	No target	>33,000	Early market applications strategy	
H_2 Refueling Stations	**Target Number**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
70 MPa On-Site Production	1,000 by 2030 in CA	>40 retail stations	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	12-20 in Northeast			

[1] Includes Fuel Cell Electric Vehicles with Range Extenders

[2] https://www.hydrogen.energy.gov/pdfs/19006_hydrogen_class8_long_haul_truck_targets.pdf

35 MPa On-Site Production	No target	N/A	2 stations for bus refuelling (California)	Solicitations from state and local agencies (e.g., South Coast Air Quality Management District, Air Quality Standards Attainment U.S. DOE in California)
35 MPa Delivered	No target			
Stationary	**Target Number[3]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Small[4]	$1,000/kW for backup units running directly on hydrogen $1,500/kW for combined heat and power units running on natural gas	Installed stationary power (including large, medium and small units) is over 500 MW.	Industry-led	State/regional
Medium[5]	$1,000/kW for combined heat and power units running on natural gas		Industry-led	State/regional

[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 – 400 kW (e.g., Distributed Residential Use)

Large[6]	No target	N/A	Industry-led	State/regional
District Grid[7]	No target	N/A	Industry-led	State/regional
Regional Grid[8]	No target	N/A	Industry-led	State/regional
Telecom backup	No target	N/A	Industry-led	State/regional
H_2 Production	**Target[9]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Fossil Fuels[10]	<$2/kg produced	Target already met and surpassed		
Water Electrolysis[11] (PEM, Alkaline, SOEC)	<$2/kg produced	Projected, high-volume, untaxed cost ranges from $2 to $7 per kg of H2	Continued government funding/cost share	State/regional (e.g., 33% renewables in CA)
By-product H_2	N/A	N/A		

6 0.3MW – 10 MW (e.g., Industrial Use)
7 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)
8 30MW plus (e.g., Grid Storage and Systems Management)
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, Alkaline, SOEC)

Energy Storage from Renewables	Target[12]	Current Status	Partnership, Strategic Approach	Support Mechanism
Power to Power[13] Capacity	N/A	N/A		
Power to Gas[14] Capacity	N/A	Project in CA is injecting H2 into NG pipeline		California Low Carbon Fuel Standard creates credits for use of low-carbon fuels. Blends of H_2 and natural gas could receive credits under this regulation.

[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
[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)