INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update April 2019: United Kingdom

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

In December 2018, the UK government launched a new mission under the Clean Growth Grand Challenge, which is set out in the 2017 Industrial Strategy. The new Clean Growth Mission is to establish the world's first net-zero carbon industrial cluster by 2040 and at least one low-carbon cluster by 2030. This mission will support the cost-effective decarbonisation of our industrial sector, which accounts for around a quarter of all UK GHG emissions. Up to £170M funding through the Industrial Strategy Challenge Fund will support delivery of the Mission.

Work to deliver the UK Government's commitment to decarbonising heat is ongoing. In December 2018, the UK government published the report 'Clean Growth: Transforming Heating' which invites views on priority areas to be taken forward over the next 2 – 5 years across government, industry and academia to inform strategic decisions on decarbonising heat in the first half of the next decade. Technologies that have the potential to play an important role include electric heat pumps, hydrogen conversion of gas grid, heat networks, hybrid heat pumps and biogas. In November 2018, the UK government also published a study on the 'Logistics of Domestic Hydrogen Conversion" which explores the logistical challenges associated with transitioning UK domestic properties from natural gas to hydrogen.

In January 2019, the UK government published the strategy paper 'Maritime 2050: Navigating the Future' which outlines the government's vision and ambitions for the future of the British maritime sector. The paper details current use of hydrogen vessels in the UK. It also references the Clean Maritime Plan, due to be published in 2019, which will outline a number of medium term zero-emission shipping ambitions which could include hydrogen or ammonia powered vessels.

In March 2019, the UK announced its Offshore Wind Sector Deal which builds on the UK's global leadership position in offshore wind and seeks to maximise the advantages for UK industry from the global shift to clean growth, consistent with the Clean Growth Grand Challenge.

Legislative amendments that came into force in April 2018 mean that renewable hydrogen is now eligible for support under the Renewable Transport Fuels Obligation (RTFO). In March 2019, the RTFO guidance was amended to ensure that the net GHG effects of hydrogen production are fully accounted for.

The UK continues to participate in other international initiatives on hydrogen, including the recent Mission Innovation workshop, which took place in Antwerp in March 2019.

2. Hydrogen and Fuel Cell R&D Update

Nothing new to report.

3. Demonstration, Deployments, and Workforce Developments Update

The HyDeploy project announced in November 2018 that it had received funding from the UK energy regulator, Ofgem, for HyDeploy2 - the second phase of its work to demonstrate the safety case for blending up to 20% hydrogen into the grid. Field trials in the private network as part of phase 1 of HyDeploy are expected to commence during summer 2019.

As part of the UK Government's £25M Hy4Heat programme to establish if it is technically possible, safe, and convenient to replace natural gas with hydrogen in residential and commercial buildings, 16 proposals were selected to develop a range of hydrogen fuelled boilers, cookers, gas fires and novel appliances. Phase 1 of this work has now been completed and successful participants are moving on to deliver their first prototypes in 2020 and fully certified products in 2021.

4. Events and Solicitations

No new developments.

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

In January 2019, the UK government launched Storage at Scale: a £20M competition for demonstrating innovative large-scale energy storage solutions. Power-to-X technologies (for example power-to-gas) with a target minimum input power of 5 MW are in scope. The competition will support up to 3 demonstration projects with build completion by March 2021 and operational testing to be completed December 2021.

In January 2019, the UK government also launched Phase II of the Industrial Fuel Switching competition, which will fund up to £300K for feasibility studies looking into developing technologies (TRL 4-7) to enable the use of a low carbon fuel, which can include hydrogen, for a particular industrial process or across an entire site.

In February 2019, the UK government announced the winners of the 2018 Ultra-low emissions bus scheme competition, which provided funding for buses and infrastructure to local authorities and bus operators. £4.4M was awarded to Brighton and Hove to deploy 20 hydrogen buses and refuelling infrastructure.

In February 2019, the UK Government also announced details of the second stage of its Hydrogen for Transport programme. It committed £14M funding to five projects which will serve to enhance and expand the UKs refuelling network and increase station utilisation with new vehicles. Collectively, these projects will lead to the creation of 5 additional hydrogen refuelling stations and deployment of 73 hydrogen cars and 33 hydrogen buses.

In the 2018 Budget, the UK government announced it will invest £315M to a new Industrial Energy Transformation Fund, to support businesses with high energy use to transition to a low carbon future and reduce their bills through increased energy efficiency. In March 2019, the UK government launched a public consultation on the scope of the fund, which could include supporting technologies that are strategically important to long-term emissions reductions such as hydrogen.

In April 2019, the UK government announced four smart energy systems demonstrator projects, which are part of the Prospering from the Energy Revolution Challenge and are supported by £102.5M from the Industrial Strategy Challenge Fund. Two projects reference hydrogen technologies. ReFlex Orkney is a £28.5M project will demonstrate a first-of-its-kind Virtual Energy System (VES) interlinking local electricity, transport, and heat networks into one controllable, overarching system. The project aims to create a 'smart energy island', demonstrating the energy system of the future, which will reduce and eventually eliminate the need for fossil fuels. Technologies that might be rolled-out as part of the project include domestic batteries for homes, larger batteries for businesses and public buildings, vehicle to grid chargers, electric vehicles, hydrogen fuel cells, and smart heating systems. Smart Hubs SLES will integrate energy management across council housing, private residential properties, transport infrastructure and commercial properties. The project will deploy a number of innovative technologies (a hybrid hydrogen/electric vehicle filling station and mesh networks for power management) alongside more established but not widely deployed technologies such as heat networks. A Virtual Power Plant will be established by integrating several platforms that can dynamically monitor and respond to energy demand and generation.

6. Regulations, Codes & Standards, and Safety Update

No new developments to report.

Summary Country Update April 2019: United Kingdom

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles[1]	No target	~100 as of Dec 2018 Deployment of additional 73 cars announced in Feb 2019	Supported via UK funding programmes.	Funding via Office for Low Emission Vehicles (OLEV) for vehicles and infrastructure under the £23m Hydrogen for Transport Programme.
FC Bus	No target	20 as of Dec 2018 Deployment of additional 53 buses announced in Feb 2019	Additional buses being supported via UK and European funding programmes	£48m of Ultra-Low Emissions Bus Scheme (ULEBs) funding is available for the purchase of ULEBs and the infrastructure to support them between 2018/19 and 2020/21. Funding via Office for Low Emission Vehicles (OLEV) for vehicles and infrastructure under the £23m Hydrogen for Transport Programme. Further circa 50 buses to be deployed under the European Jive funding programme

[1] Includes Fuel Cell Electric Vehicles with Range Extenders

Fuel Cell Trucks[2]	No target	None	No activity	No support policy
Forklifts	No target	Unknown	Some deployment e.g. at Honda UK manufacturing	No support policy
H_2 Refueling Stations	**Target Number**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
70 MPa On-Site Production	No target	13 publicallly accessible Hydrogen Refuelling Stations (HRS) as of December 2018, includes both 35 and 70 MPa sites 5 additional stations announced in Feb 2019	Stations to built and operated by private developers with support offered via UK and European infrastructure programmes	Additional new HRS to be built and upgrades to existing stations under the under the £23m Hydrogen for Transport Programme.
70 MPa Delivered				
35 MPa On-Site Production	No target		Stations generally developed and operated by private developers with a proportion of EU funding. For example Aberdeen's HRS owned by local authority, operated by BOC	None
35 MPa Delivered				
Stationary	**Target Number[3]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Small[4]	No target			

[2] As above

[3] Targets can be units installed and/or total installed capacity in the size range indicated

[4] <5 kW (e.g., Residential Use)

Medium[5]		Various demonstrations and commercial installations, however no formal process to track their introduction	Various approaches adopted from pure commercial to funding through innovation support programmes	Government support provided through existing mechanisms e.g. CHP feed-in-tariffs and more targeted innovation support through UKRI and BEIS
Large[6]				
District Grid[7]				
Regional Grid[8]				
Telecom backup				
H_2 Production	**Target[9]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Fossil Fuels[10]	No target	Methane reformation occurring in the UK		
Water Electrolysis[11] (PEM, Alkaline, SOEC)	No target	Electrolysers operating in the UK		
By-product H_2	No target	By-product H2 being generated in the UK		

[5] 5kW – 400 kW (e.g., Distributed Residential Use)
[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	No target			
Power to Gas[14] Capacity	No target			

[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)