UK HFCA

# Fuel cells: The forgotten force in the fight against climate change

## UK Hydrogen and Fuel Cell Association Position Paper

# Key messages:

Hydrogen is essential to the UK Government's net zero ambitions and fuel cell technology is highly complementary with the storage of cheap hydrogen and the generation of electricity on demand.

The UK has a world-leading electrochemical research base and leading companies in fuel cell and electrolyser technology.

The market for fuel cells is global. UK companies across the fuel cell value chain should be supported to maximise the market opportunity.

The UK has not yet offshored the manufacturing of fuel cells, as with the wind industry, but the sector needs commitment to create the market and scale up to access a global opportunity expected to be worth £9.7 billion in five years, and with the potential to create 136,000 jobs in the UK by 2035.

The dialogue of battery versus fuel cells is unhelpful. They are very compatible and lots of both will be required to reach net zero.

We recommend mirroring the success of the Faraday Institute with the creation of an institute for electrochemical technologies to create coordination and collaboration – to be in place by 2023. The Institute will take a key role in bringing research, industry and commercial partners together to address outstanding challenges, including manufacturing scale up and performance improvements.

# The Case for Fuel Cell Technology

**An essential but often overlooked element of the route to a cost-effective energy transition is efficiency, and fuel cells offer a range of opportunities to deliver efficient use of decarbonised fuels in a variety of applications that could make the transition more affordable and therefore deliverable.** Hydrogen fuel cells generate electricity at high efficiency and produce no emissions or waste, except water.

## A multi-faceted technology ideally suited to the challenging path to Net Zero

Fuel cells are highly complementary to hydrogen as a key component in our decarbonisation journey and will strengthen its reach and impact. They are also complementary to battery technologies and to the electrification of our energy system.

As shown below, fuel cell delivers against all the objectives in the Prime Minister's Ten Point Plan for a Green Industrial Revolution[1]. Moreover, in certain industries and sectors, fuel cells are absolutely pivotal to the Net Zero transition. This applies particularly across a range of heavy transport modes, including Heavy Goods Vehicles (HGVs), shipping and buses. Fuel cells can also play an important role in grid balancing and reinforcement due to their capability to provide electricity on demand.


1 https://www.gov.uk/government/news/pm-outlines-his-ten-point-plan-for-a-green-industrial-revolution-for-250000-jobs

| | The PM's 10 Point Plan | Fuel cell applications |
|---|---|---|
| 1 | Advancing offshore wind | Supporting 'multi-day balancing' through generation of electricity on demand |
| 2 | Driving the growth of low carbon hydrogen | Producing hydrogen via electrolysis and stimulating demand through increasing fuel cell deployment |
| 3 | Delivering new and advanced nuclear power | Enabling hydrogen production from thermal energy of nuclear power via electrolysis |
| 4 | Accelerating the shift to zero emission vehicles | Delivering zero carbon heavy and light goods vehicles |
| 5 | Green public transport, cycling and walking | Delivering zero carbon train and bus travel |
| 6 | Jet Zero and greener maritime | Delivering zero carbon aviation, shipping and inland water vessels |
| 7 | Greener homes and buildings | Providing electricity and heating for buildings and urban districts via combined heat and power fuel cells; providing independence from grid for energy-hungry data centres and similar where this is important |
| 8 | Investing in carbon capture, usage and storage | Forming a key market for hydrogen produced via CCUS |
| 9 | Protecting our natural environment | Supporting decentralised power supply, removing the need for significant expansion and impact on the environment from centralised grid networks. |
| 10 | Green finance and innovation | Attracting foreign direct investment into the UK via the quality of UK fuel cell innovation: Companies such as ITM Power and Ceres are recognised by the Green Economy Mark of the London Stock Exchange. |

Fuel cells are increasingly recognised as the best option to decarbonise a range of transport modes. Fuel cell powered buses, HGVs and trains could become the most competitive low carbon option by 2030[2] and, for maritime vessels operating shorter distances, the use of electric propulsion combined with fuel cells could rapidly become cost competitive thanks to the rapid decrease in the price of renewable power and fuel cells[3]. Unlike electric vehicles, the overall user experience in road-based vehicles is similar to diesel powered transport - meaning no range anxiety, short refuelling times and no payload reduction (important in commercial applications), with the added benefit of quiet operation and zero emissions[4]. The development of refuelling infrastructure is also less disruptive than with electrification.

2 On a TCO basis when compared with other zero-emission options
3 https://www.globalmaritimeforum.org/content/2020/11/The-First-Wave-%E2%80%93-A-blueprint-for-commercial-scale-zero-emission-shipping-pilots.pdf
4 When based on renewably produced hydrogen.

As the UK moves to a 100% renewable electricity system, intermittency will become a bigger challenge requiring more grid balancing services and greater energy storage. Affordable low carbon hydrogen could be the breakthrough we need in storing electricity over time, naturally coupled with fuel cells to generate power on demand in any location and supporting a move towards greater electrification of our energy system.

Alongside this, fuel cells also offer a route to utilising existing fuels more efficiently, as well as future fuels such as ammonia for shipping or synthetic fuels for industry. Furthermore, whilst fuel cells are not currently used in buildings and homes in the UK, there is significant potential for them to play a role in the future. The ~40%[5] contribution of heat to carbon emissions in the UK is a substantive challenge and we believe that both hydrogen and fuel cells will be a key part of the solution. Hydrogen can be stored until needed and then run through a fuel cell to create zero carbon heat and power. In combined heat and power fuel cells, efficiencies of well over 90% are achievable[6].

**90%**
efficiencies are achievable in combined heat and power fuel cells

**£9.7bn**
potential worth of the global fuel cells market within five years

It is no surprise therefore that in five years, the global fuel cells market opportunity could be worth £9.7 billion[7]; By 2050, the overall hydrogen market is predicted to be worth £7.8 trillion, two thirds of which is in hardware - fuel cells and electrolysers[8]. This is a substantial increase from the current 82,000 units sold globally today, mostly supplied to Germany, Japan and South Korea. Indeed, South Korea has announced a £46 billion Green New Deal which should help it achieve its goals of 15GW of fuel cell power by 2040 - equivalent of nearly five Hinckley Points – as well as 5.9 million fuel cell cars, 60,000 fuel cell buses and 1,200 hydrogen refuelling stations, also by 2040.[9]

While there are pockets of excellence, there is currently no single country leading the development, commercialisation and export of fuel cells.

## The opportunity for the UK to take a global leadership position on fuel cells

The UK has a world-leading electrochemical research base and a number of leading companies in low and high temperature fuel cell and electrolysis technology, making it well placed to capitalise on the opportunities of this sector. Though advantaged through early development, advanced manufacturing and electrochemistry, the UK presently lacks capability to develop technology at scale, in part because the academic and industrial strengths are not always focused and coordinated on achieving a clear single set of objectives.

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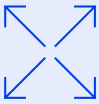
5 https://es.catapult.org.uk/brochures/decarbonisation-heat/
6 https://committees.parliament.uk/publications/6975/documents/72817/default/
7 Market Study Report LCC, *Fuel Cell Market Share, Size, Trends, & Industry Analysis Report By Type (Solid Oxide Fuel Cells, Phosphoric Acid Fuel Cells, Proton Exchange Membrane Fuel Cells, Molten Carbonate Fuel Cells); By Application; By Region: Segment Forecast, 2019 – 2026* (calculated from US Dollars, based on 8 June 2021 exchange rates)
8 https://www.bofaml.com/en-us/content/esg-research/green-hydrogen-market-importance.html
9 https://www.intralinkgroup.com/Syndication/media/Syndication/Reports/Korean-hydrogen-economy-market-intelligence-report-January-2021.pdf

If we are to create a leading UK industry that stretches from R&D and production, to its commercialisation around the world, then it requires Government support to make that happen. This requires two steps:

**STEP 1**



**Support the scale up of the fuel cells industry in the UK:**
This should take the form of a challenge-led fund where Government facilitates collaboration between industry and academia. Such a fund will fill the need to better link and coordinate the UK's scientific power with the practical focus of industry. A model similar to The Faraday Institute for battery technology could work well and the Government's plans to establish the Advanced Research & Invention Agency are also relevant.

**STEP 2**

**Implement policy levers that help the deployment of fuel cells in the UK:**
This flexible technology will support the UK's clean growth and decarbonisation ambitions in the power, industry, transport and buildings sectors; and its domestic promotion provides the scale up and export platform for UK companies. To capitalise on this opportunity for the UK, Government should implement the following: direct public procurement of fuel cell technology; establish subsidy mechanisms that support the generation of power through a fuel cell or support its consumption, with mechanisms to encourage UK content along the supply chain; commit to the phasing out of fossil fuelled trucks; and taper the grants for bus operators running diesel vehicles.

The UK fuel cells' industry could support 136,000 jobs by 2035[10], predominantly in highly skilled roles and across the country, as the UK takes its share of the growing global market - anticipated to be worth £9.7 billion by 2026. The prize is there to be won and the UK is in a good place to win it. We call on the Government to ensure that the UK leads the world on the production and deployment of this adaptable, multi-faceted and critical decarbonisation technology.

10 MBA project "The Business Case for Commercialising FCs in the UK Midlands" by Adam Abdullah, submission Sept 2021

# Why fuel cells?

First invented in 1838 by Welsh scientist William Robert Grove, fuel cells[11], like batteries, are a mix of technologies which can be applied to a number of uses as devices for generating electric power and heat.

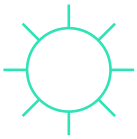
Fuel cells, some of which can run on a variety of fuels[12], are highly efficient at converting fuels into electricity. For example, whereas an internal combustion engine converts fuel into kinetic energy at roughly 25 per cent efficiency, a fuel cell can produce electricity at up to 60 per cent efficiency[13]. In shipping, fuel cells help to improve efficiency by 50 per cent compared to an internal combustion engine[14].

Like electric batteries, fuel cells are silent in operation, can be easily scaled and emit no harmful particulates. Indeed, launched in 2018, Hyundai's hydrogen fuel cell electric vehicle, Nexo, not only filters out 99.9% of fine dust and particulates, but is also claimed to be able to purify 26.9kg of air for every hour of driving[15].

Unlike a battery, fuel cells need no recharging and will run indefinitely when supplied with fuel. Fuel cells are also increasingly seen as the ultimate decarbonisation solution for a range of heavy transport modes.

**60%**

efficiency electricity can be produced by a fuel cell



**50%**

improvement in efficiency for shipping from fuel cells

11 For more detail on how a fuel cells works, visit http://www.ukhfca.co.uk/the-industry/fuel-cells/
12 Common fuels include hydrogen, methanol, ethanol, methane, carbon monoxide and hydrides. Hydrogen can fuel any fuel cell.
13 https://www.power-technology.com/comment/standing-at-the-precipice-of-the-hydrogen-economy/
14 https://committees.parliament.uk/publications/6975/documents/72817/default/
15 https://www.driving.co.uk/news/hyundai-nexo-hydrogen-car-includes-filers-clean-londons-air/

### Fuels cells can be used to[16]:

Power transport such as cars, vans, trucks, trains, planes, ships and inland waterway vessels

Provide electricity and heating / cooling in homes, offices, commercial premises and industrial plants.

Provide grid-reinforcement for predicted growth in electricity demands from large consumers like data centres and EV charging infrastructure.

Power portable appliances and mobile homes, from camper vans and off-road machinery to laptops.

Help to balance electricity supply and demand based on use of stored hydrogen.

The added value that they offer includes greater range and greater power to weight ratio for road transport than batteries, with quicker and more infrequent refuelling – so an enhanced user experience, and cost savings in commercial operations due to more efficient use of fleets. There is also no need for local grid reinforcement to support local charging stations.

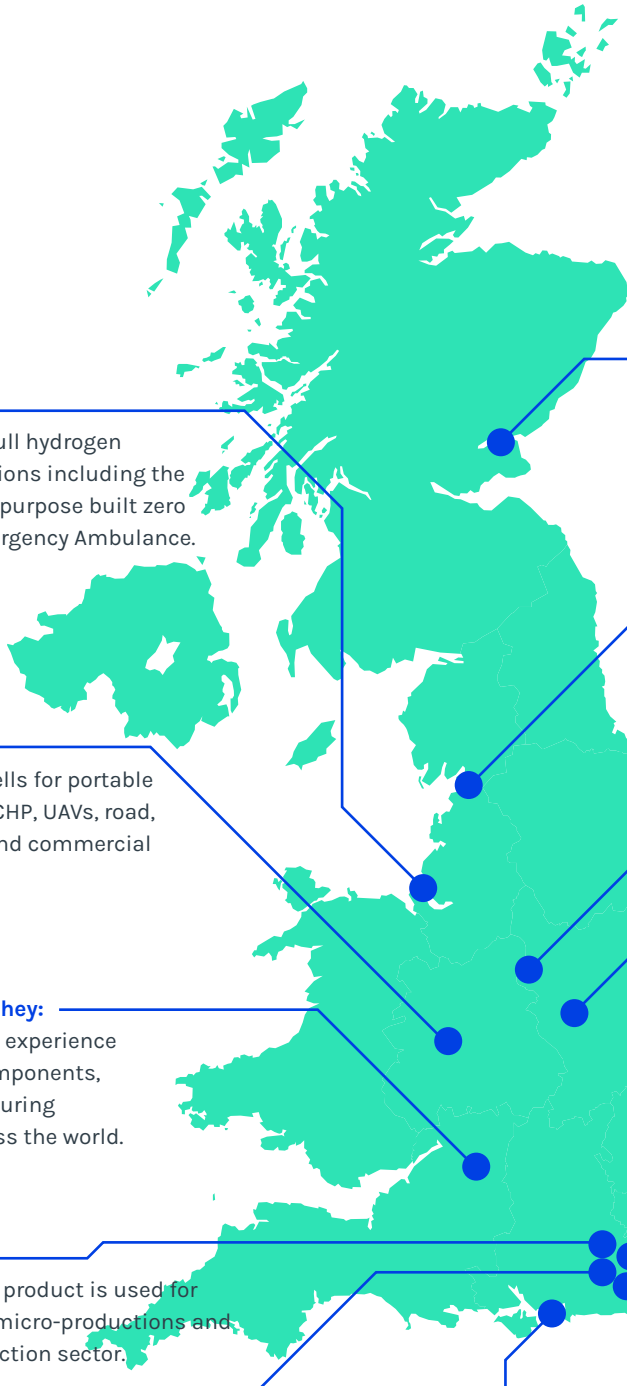
In rail applications, fuel cell trains are smoother, quieter and more efficient, and are anticipated to be easier and cheaper to maintain than diesel equivalents. Whilst more expensive than diesel and electric trains, they are cheaper than electrifying a line, less vulnerable to extreme weather events (which are particularly problematic for electric trains due to overhead or third rail damage) and have no electrocution hazard[17].

In marine applications, many ports have poor air quality and, so, adopting fuel cells in marine applications would greatly reduce air pollutant emissions. Furthermore, as mentioned above, over shorter distances the use of electric propulsion combined with fuel cells could rapidly become cost competitive thanks to the rapid decrease in the price of renewable power and fuel cells.

On the aviation side, the UK's ATI FlyZero programme has identified fuel cell powered aircraft as an option for true zero carbon flight. There is an opportunity for the UK to develop a lead in the integration of electrical propulsion systems and fuel cells through this programme, with transfer across into other transport sectors.

16 http://www.platinum.matthey.com/about-pgm/applications/fuel-cells
17 http://www.h2fcsupergen.com/wp-content/uploads/2020/04/2020_04_H2FC_Supergen_Hydrogen_Fuel_Cells_P_Dodds_DIGITAL_W_COVER_v05.pdf

The UK boasts several leading fuel cell technology companies working up and down the value chain from specialist materials to fuel cell technology, system component and applications-engineering experts. Some directly manufacture, while others have adopted a licensing model. These include:



**ULEMCo:**
Developer of full hydrogen vehicles solutions including the "world's first" purpose built zero emission Emergency Ambulance.

**Adelan:**
Provide fuel cells for portable power, micro CHP, UAVs, road, recreational and commercial vehicles.

**Johnson Matthey:**
With 20 years' experience in fuel cell components, and manufacturing facilities across the world.

**BOC:**
BOC's Hymera product is used for film lighting, micro-productions and in the construction sector.

**AFC Energy:**
A leading provider of alkaline fuel cell systems serving vehicle, construction, mining, industrial and data centre needs.

**TP Group:**
An engineering and consulting firm which supplies fuel cell systems for trains.

**Ames Goldsmith Ceimig:**
manufacturing platinum group metal (PGM) based electrocatalysts for use in fuel cells

**Technical Fibre Products:**
Active in fuel cell materials manufacture for over 30 years.

**Rolls-Royce:**
Collaborating with Daimler Truck AG on fuel cells for stationary applications.

**Intelligent Energy:**
A fuel cell engineering business focused on the automotive, stationary power and Unmanned Aerial Vehicle (UAV) markets.

**Ceres:**
A unique fuel cell and electrolysis technology being deployed globally with partners including Bosch, Doosan, Weichai and Miura. Listed on the London Stock Exchange, it has attracted more than £180 million of foreign direct investment and is now valued at ~£2 billion.

**Bramble energy:**
A manufacturer of fuel cell systems covering a variety of power uses.

# The current market situation

## The UK is in a strong position but risks lagging internationally

The UK has a strong tradition in fuel cells and remains at the forefront of technology and materials development. It has leading companies in both high and low temperature fuel cell technologies, spun out of university research 20 years ago and collectively worth £6 billion today. The UK has some established manufacturing; Johnson Matthey has been operating scaled fuel cell fabrication for some years now and Ceres has invested £10 million in manufacturing capacity.

However, the UK is experiencing real-time technology loss as global appetite for fuel cells soars. In 2020, 1.3GW of fuel cells were sold globally - this equates to about 82,5000 units, around 50,000 of which were fuel cell micro-CHP units deployed in Germany and Japan, with South Korea looking set to deploy more. In terms of power capacity, over half is going into transportation uses in cars, buses and trucks in Asia[18].

**£6bn**
collective worth of
UK fuel cell companies

Today, the contribution from fuel cells in the UK is small by comparison. There are some demonstration projects of fuel cell buses running in Scotland and London, a small number of demonstration units providing heat and power in homes and a six-seater aircraft funded under the HYFlyer project[19].

Most fuel cells operating in the UK are imported. In March 2021, the Government announced £11.2 million to develop and manufacture low-cost hydrogen fuel cell technology for buses and to create a hydrogen centre of excellence with Wrightbus in Ballymena, Northern Ireland – utilising Ballard fuel cell technology from Canada[20]. Other companies active both in the UK and abroad, but reliant on overseas technology, including ULEMCO, CMB.TECH and Arcola. Growth in both the availability of home-grown fuel cell technology and the UK market for fuel cells will help these and similar UK companies to contribute increasingly to clean growth and exports.

UK public sector funding of fuel cell research and development is very low compared to international competitors and has fallen in recent years. The sector received only £8 million in 2021–22, which equates to 0.14% of the portfolio of the Engineering and Physical Sciences Research Council (EPSRC)[21].

Without intervention, the UK is set to be overtaken by countries with more global ambition and ultimately the UK will be economically compelled to import technology as happened in the wind industry[22]. For example, South Korea has already installed over 300MW of fuel cells

18 The Fuel Cell Industry Review 2020, E4Tech, https://fuelcellindustryreview.com/.
19 http://www.emec.org.uk/press-release-hyflyer-project-achieves-world-first-hydrogen-electric-flight/
20 https://www.gov.uk/government/news/emissions-cutting-trucks-and-next-gen-hydrogen-buses-closer-to-hitting-the-road-with-54-million-government-led-funding?utm_medium=email&utm_campaign=govuk-notifications&utm_source=3613682f-f4ac-418e-b295-52a9ff60acb1&utm_content=daily
21 https://committees.parliament.uk/publications/6975/documents/72817/default/
22 Note also our position that industry can deploy 20GW of hydrogen capacity in the UK by 2030, and the Government's target, reconfirmed in the Hydrogen Strategy, of 5GW by 2030.

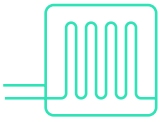
for power, including the world's largest hydrogen fuel cell power plant, installed by Doosan. The country's £46 billion green stimulus package features 15GW of fuel cell power by 2040. That is the equivalent of nearly five Hinckley Points, but with more flexibility and without the challenge of disposing of waste.

UK fuel cell companies are making a key contribution in other parts of the world. For example, Ceres Power is deploying its technology in everything from homes (Honda) to shipping (Doosan) and businesses (Bosch and Miura) to buses and trucks (Weichai), where the appetite for the technology is greater and industrialisation through "giga-factories", strategic investment and widespread deployment of fuel cells is happening. The global fuel cell market is predicted to be worth £9.7 billion by 2026[23]. Longer term, the global hydrogen market is predicted to be worth £7.8 trillion by 2050[24], two-thirds of which will be in hardware (electrolysers and fuel cells).

With the UK's strengths in electrochemistry, advanced manufacturing and early development, its fuel cell ecosystem holds a distinct advantage, but it needs the right support now to build the entire value chain, from skills, R&D, innovation, commercialisation through to investment if it is to capture a substantial share of the global market for the technology.

**300MW**

of fuel cells for power installed in South Korea



**2/3**

of the hydrogen market is expected to be in hardware (electrolysers and fuel cells)

The figure below shows how the evolving global fuel cell opportunity maps onto the newly published UK Hydrogen Strategy. With a growing suite of fuel cell applications expected to become mainstream in the coming years, plans for the UK Hydrogen Economy offer the UK a springboard from which to build an internationally leading fuel cell industry including the creation of 136,000 jobs by 2035.[25]

23 Market Study Report LCC, Fuel Cell Market Share, Size, Trends, & Industry Analysis Report By Type (Solid Oxide Fuel Cells, Phosphoric Acid Fuel Cells, Proton Exchange Membrane Fuel Cells, Molten Carbonate Fuel Cells); By Application; By Region: Segment Forecast, 2019 – 2026 (calculated from US Dollars, based on 8 June 2021 exchange rates)

24 Bank of America, 2020 (calculated from US Dollars, based on 8 June 2021 exchange rates)

25 MBA project "The Business Case for Commercialising FCs in the UK Midlands" by Adam Abdullah, submission Sept 2021

# How the global fuel cell opportunity maps onto plans for a UK hydrogen economy

UK HFCA

## THE GROWING GLOBAL FUEL CELL OPPORTUNITY
(date at which mass market acceptability achieved)

### 2021–2025

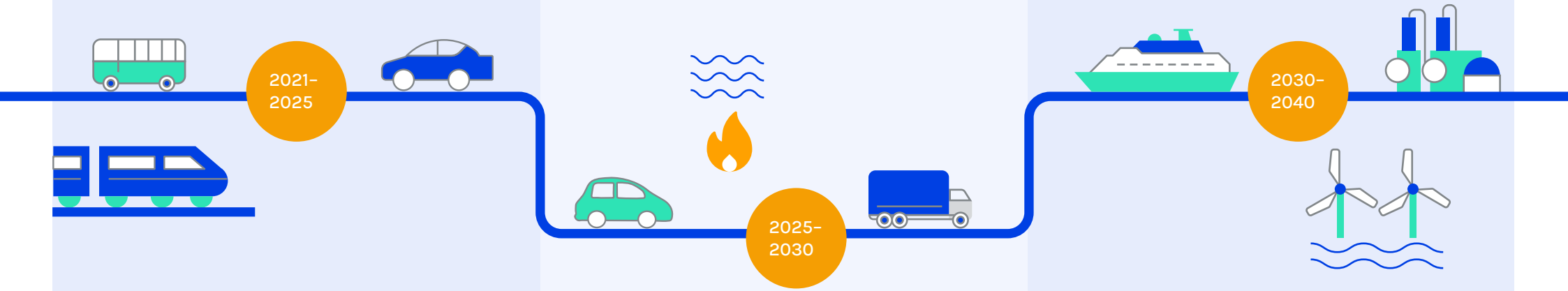
- Mid-sized and large cars and city buses
- Railway
- Building heat and power

### 2025–2030

- Road transport: vans, coaches, HGVs, small cars, mini-buses
- High grade industrial heat
- Blended hydrogen heating

### 2030–2040

- Passenger ships
- Pure hydrogen heating
- Power generation in renewably constrained countries



## UK HYDROGEN STRATEGY ROADMAP

### 2021–2025

- Some transport: buses, HGV and rail and aviation trials);
- Industry demonstrations
- Neighbourhood heat trials
- Small scale green hydrogen production
- Net Zero Hydrogen Fund
- Aim of 1GW production capacity and 2 CCUS clusters

### 2025–2030

- Transport: HGVs and shipping
- Wide use in industry
- Power generation and flexibility
- Heat pilot town TBC
- Several large scale blue and green hydrogen production projects
- Potential pilot hydrogen town
- Aim of 5GW production capacity

## CCC RECOMMENDATIONS

### 2030–2040

- Sales of gas boilers to all homes and business phased out by 2033
- Phase-out of unabated combustion of fossil gas for electricity generation by 2035


Sources:1. UK Hydrogen Strategy, August 2021: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011283/UK-Hydrogen-Strategy_web.pdf
2. Committee on Climate Change, Policies for the 6th Carbon Budget and Net Zero: https://www.theccc.org.uk/publication/sixth-carbon-budget/
3. McKinsey – The next wave for electric vehicles: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/hydrogen-the-next-wave-for-electric-vehicles

# What needs to happen

The UK actively shaped early hydrogen energy economics from the 1990s, but technological success did not stimulate immediate commercialisation of fuel cells. For the fuel cell industry to compete globally today, we need to be capable of putting product out at the right price with the right warranties, and that comes with manufacturing scale and innovation.

The UK science base is very strong in electrochemistry, which underpins fuel cell, electrolyser and battery technology. However, it requires a stronger coupling of science and practical implementation to capture a greater share of the addressable market. UK policy has historically prioritised imports, so sustainable UK fuel cell technology companies secured inward investment from foreign companies and governments, and have increasingly looked overseas for market deployment opportunities.

A further barrier to deployment is the lack of a cohesive whole system strategy for fuel cells which encompasses transport, power and heat, and complements the Hydrogen Strategy. In a sense, the multi-faceted nature of fuel cells - whereby they have a contribution to make across all ten of the Prime Minister's 10 Point Plan objectives - could be arguably said to hold their active sponsorship back. A recent report from Ballard and Deloitte found that "UK Government support for hydrogen and the fuel cell market was less consistent and coordinated compared with other European countries" [26].

The perfect storm of climate action, air quality, the need to balance renewables and increase electrical efficiency has created strong market demand for fuel cell technology.

So, the question is: what share of the £9.7 billion global market by 2026 does the UK want to secure and what can Government do to support it?

> "Transitioning to the use of fuel cells offers opportunities for countries that are developing these technologies"
>
> *House of Lords*[25]

26 https://info.ballard.com/deloitte-vol-1-fueling-the-future-of-mobility
25 https://publications.parliament.uk/pa/ld5802/ldselect/ldsctech/53/5302.htm

# What is the role that Government should be playing?

We support the Government's 2020s Roadmap statement in the newly published Hydrogen Strategy [27] - '*The UK builds on its strengths in electrochemical technologies (fuel cells and electrolysers). British companies are exporting these technologies to markets in Europe and SE Asia*' – and look forward to working with them on making that a reality. More specifically, there are two distinct steps where we believe Government support is required to catalyse the UK fuel cells industry and the opportunity that fuel cells present in helping the economy and society to decarbonise: helping to scale up; and activating the market.

**STEP 1**

## Support the scale up of the fuel cells industry in the UK

- We recommend the establishment of a challenge-led fund where Government facilitates collaboration between industry and academia. Areas of support should include developing the processes to manufacture at scale and further performance improvements (for example, in fuel quality tolerance). This will deliver benefits across the whole supply chain. Such a structure will fill the need to better link and coordinate the UK's scientific power with the practical focus of industry. A model similar to The Faraday Institute for battery technology could work well and the Government's plans to establish the Advanced Research & Invention Agency are also relevant. To be operational by 2023, this structure will fill an identified need to ensure the coordination of academic research, shaped by the industry that will enable the output to be scaled and commercialised.
- As part of this new agency, or utilising the existing public funds for sponsoring innovation, we call on Government to support and facilitate large scale fuel cell trials.
- Care should be taken to avoid introducing unnecessary barriers to the further development and deployment of fuel cells[28].
- We would like to work with Government to ensure that we have both access to highly skilled international talent, such as scientists and those studying for PhDs, in what is a global industry; and that we can recruit and nurture UK candidates with STEM skills, particularly with a background in electrochemistry.

27 https://www.gov.uk/government/publications/uk-hydrogen-strategy

28 One example is the proposed European ban on polyfluoroalkyl substances (PFAs). This group includes Fluoropolymers, which are key to the performance of both fuel cells and electrolysers. Fluoropolymers are distinctly different from PFAs and meet the OECD's criteria for "polymers of low concern," as they do not present significant toxicity concerns and cannot degrade into other PFAS under normal conditions of use (https://fluoropolymers.plasticseurope.org/application/files/2316/2211/7847/The_Fluoropolymers_Product_Group_Fluoropolymers_and_Fuel_Cells-Enabling_the_Transformation_of_Hydrogen_into_Electricity_May_2021.pdf).

STEP 2

### Implement policy levers that help the deployment of fuel cells in the UK

- Alongside supporting the scale up of the sector, enabling a larger domestic market will provide the platform for companies to expand, invest and export. We recommend the following, which will also support other emerging technologies:
    - Government direct procurement of fuel cell products – which will support the whole fuel cell supply chain.
    - Meaningful long-term support mechanisms that either support the generator of power held and released in a fuel cell, or which incentivise consumer purchasing, and include measures to stimulate UK content along the supply chain (linking back to Step 1).
    - As with cars and vans, commitment to the phasing out of new petrol and diesel trucks by 2040 or earlier; this will create the drive for manufacturers and operators to make it happen.
    - Reduction or removal of the bus operator grants for those buses that run on diesel.

Taken together, these two steps will enable an already well-placed UK to take a genuine leadership position in developing, producing, commericalising and exporting fuel cells -a technology for which there is great untapped and multi-faceted potential in helping to meet the decarbonisation challenge.

# Annex A: About the UK HFCA

The UK Hydrogen and Fuel Cell Association (UK HFCA) aims to ensure that hydrogen and fuel cell solutions can realise the many benefits offered across economic growth, energy security, carbon reduction and beyond. Through the breadth, expertise and diversity of our membership, we work to trigger the policy changes necessary for the UK to fully deliver the opportunities offered by emerging clean energy solutions and their associated supply chain requirements. We promote and represent our members' interests across the hydrogen and fuel cells space, and work to make the UK the best possible place for hydrogen and fuel cells across the full range of applications and opportunities.

Our members include the leading UK hydrogen and fuel cell players, as well as companies with wider energy interests, supply chain businesses, and materials and components suppliers, as well as service providers and universities.

# Our members


ITM POWER
Energy Storage | Clean Fuel
Ingersoll Rand
JM Johnson Matthey
AngloAmerican
AIR PRODUCTS
Burges Salmon
ceres
BOC
Member of The Linde Group
AVL
BAKER BOTTS
CPH2
CLEAN POWER HYDROGEN
conrad
Statkraft
FUEL CELL SYSTEMS
HiiROC
AMES GOLDSMITH CEIMIG
HYDROGEN LONDON
Imperial College London
HYDAC
C2T
CLEAN ENERGY
TECHNOLOGY
DCA
JREPrecision
kiwa
Logan Energy
LOW DEE
LUXFER
GAS CYLINDERS
SAFI
Thermoplastic Valve Solutions
FAUN ZOELLER
Marubeni
Europower
NanoSUN
NET ZERO
ENERGY DEVELOPMENTS LIMITED
Northern Gas Networks
NFCL
www.NVFCL.com
Petrofac
POWERHOUSE
ENERGYGROUP
PRESSURE TECH
PROTIUM
AURIGA energy
tfp H2
Rolls-Royce
SCOTTISH Hydrogen & Fuel Cell ASSOCIATION
SIEMENS
Ingenuity for life
Gen2 Energy
Swagelok
Swagelok Manchester
Sustainable Working And Living Environments Ltd
T>E
BUSINESS DEVELOPMENT
CMB .TECH
Thornton Tomasetti
ALCAZAR
tpgroup
UCL
ULEMCo
UNIVERSITY OF BIRMINGHAM
FUEL CELLS GROUP
The University of Nottingham
Ulster University
Reynolds
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