



HYDROGEN
TASKFORCE

Economic Impact Assessment

Hydrogen is ready to power the UK's Green Recovery

12 August 2020



HYDROGEN TASKFORCE

Economic impact assessment (EIA) of the hydrogen value chain on the UK by 2035

OVERALL TOTALS

Upstream

Jobs total: 28,218
GVA total: £3,923m

Midstream

Jobs total: 15,437
GVA total: £5,264m

Downstream

Jobs total: 31,171
GVA total: £8,750m

DOWNSTREAM (END USE)

Transport

Jobs total: 9,033
GVA total: £1,708m



Industry

Jobs total: 1,862
GVA total: £2,941m



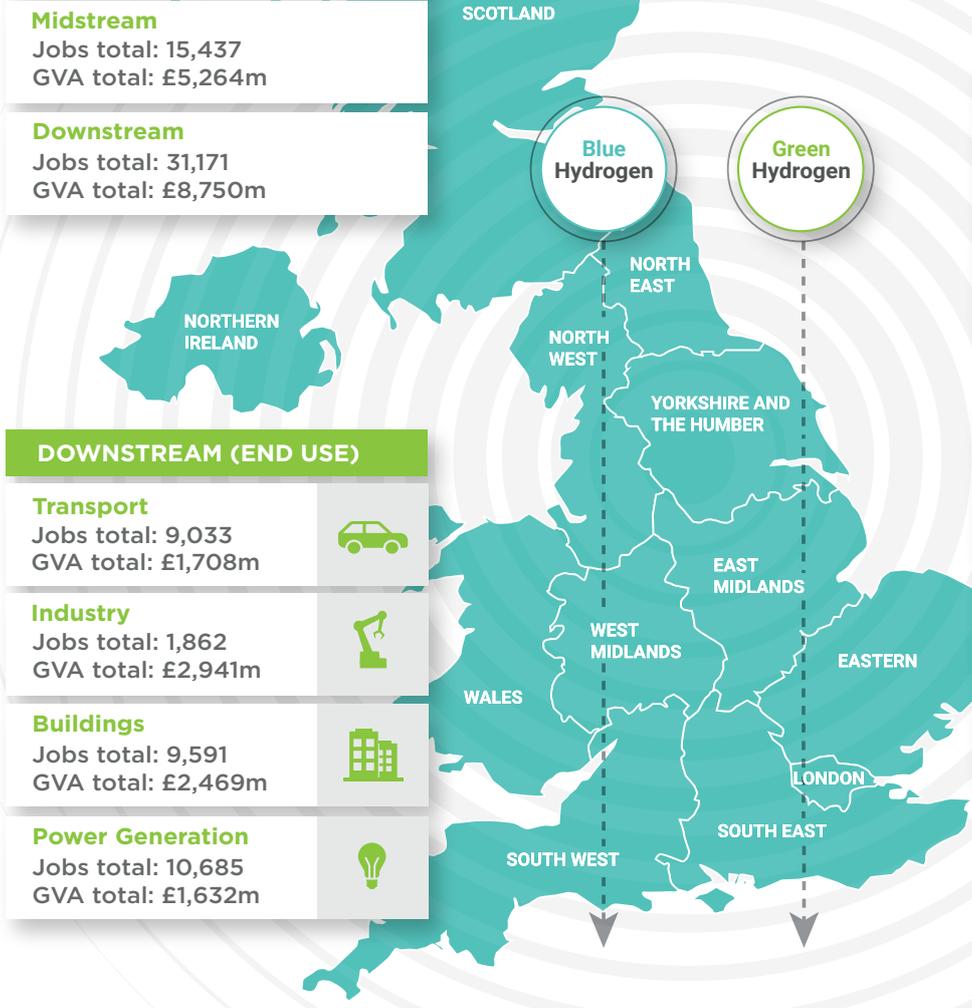
Buildings

Jobs total: 9,591
GVA total: £2,469m



Power Generation

Jobs total: 10,685
GVA total: £1,632m



UPSTREAM

Blue H₂ Production

Jobs total: 9,847
GVA total: £2,574m



Green H₂ Production

Jobs total: 18,370
GVA total: £1,349m



MIDSTREAM

Transmission

Jobs total: 3,838
GVA total: £1,416m



Distribution

Jobs total: 5,997
GVA total: £1,554m



Energy Storage

Jobs total: 5,602
GVA total: £2,294m



KEY POINTS



Investing in hydrogen could unlock **£18bn** in GVA by 2035 and support **75,000** additional jobs.



Around **11.3 TWh** of hydrogen would be required to support end-use sectors such as heat, transport, power and industry by 2035 annually.



Of this annual demand, **20%** could be met by green hydrogen (electrolysis) and **80%** by blue hydrogen (ATR plus CCUS).



This would unlock **28,200** jobs in hydrogen production, including **11,239** jobs in electrolyser manufacturing and **9,847** jobs in ATR.



Many of these jobs would be concentrated in the north-west and north-east.



£5.3bn in GVA cumulatively by 2035 and **15,437** total jobs could be created in the storage, distribution and transmission of hydrogen across the UK.



By 2035 annually:
1.5 TWh support transport.
4.7 TWh support heat. (residential and commercial)
4.8 TWh support industry.
0.3 TWh support power generation.



This would create **31,171** total jobs across downstream (end-use) sectors such as vehicles, boilers and industrial equipment.

ARUP



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Executive summary

Hydrogen solutions have a critical role to play in the UK, not only in helping the nation meet its net-zero target, but in creating the economic growth and jobs that will kickstart the green recovery.

The Government must act now to ensure that the UK capitalises on the opportunity presented by hydrogen and builds a world-leading industry.

COVID-19 has caused significant economic upheaval across the country, with unemployment expected to reach up to 14.8 per cent by the end of 2020¹. The UK must identify those areas of the economy which have significant economic growth potential and can deliver long-term and sustainable increases in GVA and jobs. It will be important to consider regional factors and ensure that investment is targeted in those areas that have been hardest hit by the crisis.

Many major economies have identified hydrogen as a key part of both decarbonisation and economic recovery. As part of its stimulus package, Germany announced a €9billion investment in green hydrogen solutions, aiming to deploy 5GW by 2030. The Hydrogen Council estimates a future hydrogen and equipment market worth \$2.5 trillion globally by 2050, supporting 30 million new jobs.

Hydrogen offers the UK a pathway to deep, cost-effective decarbonisation while delivering economic growth and job creation. It should therefore be at the heart of the Government's green recovery programme, ensuring that the UK builds back better and greener.

Scaling up hydrogen solutions in the UK could unlock £18bn in GVA and 75,000 jobs by 2035².

Scope and approach

This report looks at the role of hydrogen in supporting economy-wide decarbonisation across a range of sectors by 2035: production, storage, transmission and distribution, power generation, transport, heat and industry. Investment in supply, demand and infrastructure is likely to unlock significant economic potential, in terms of the contribution to the UK economy

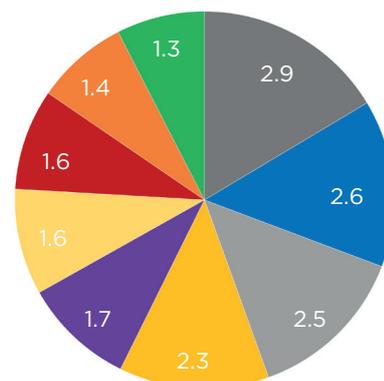
and the creation of jobs. This report will estimate the impact that the scaling up of hydrogen solutions could have to the UK economy by 2035.

Economic contribution and job creation

As the UK looks to bounce back from the COVID-19 crisis, investment in hydrogen offers a sustainable economic growth opportunity that would kickstart the green recovery. Scaling up hydrogen solutions will allow the UK to build on existing areas of expertise and global leadership. With a value chain that spans production, storage, transmission and distribution, and downstream appliances, this growing global market could support thousands of jobs in the UK for decades to come.

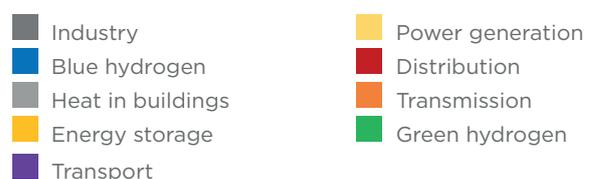
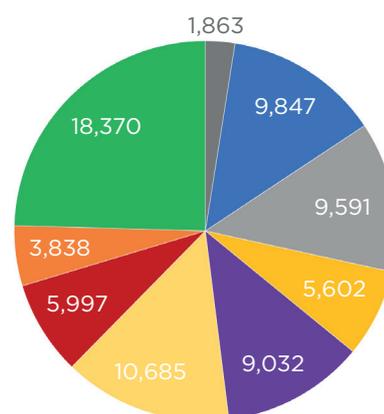
GVA by sector - £bn

Total: 17,938



Jobs by sector

Total: 74,825



*Ecuity Economics

¹Employment Outlook 2020 (2020) - Organisation for Co-operation and Development (OECD)

²Note: All GVA, jobs, capex and opex figures are cumulative to 2035, unless otherwise stated. UK economy employment impact is in gross rather than net terms.

Upstream

The UK is well placed to take a global leadership position in hydrogen production.

The European Union is targeting 10 million tonnes of green hydrogen by 2030³. Germany aims to create hydrogen demand of up to 110 TWh in 2030 and a domestic green hydrogen production of just 14 TWh⁴. By investing now in scaling up hydrogen production solutions, the UK could be well placed to meet the substantial demand for hydrogen, not only in the UK, but across Europe.

The two major production pathways that have been considered in this report are:

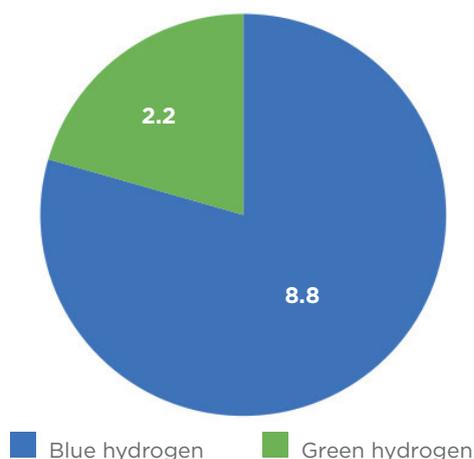
- Blue – Autothermal reforming with carbon capture and storage
- Green – Renewables coupled with electrolyzers

For the purposes of this work, we have assumed that by 2035 there will be a 20 per cent green and 80 per cent blue mix in the UK.

Green

The UK has an opportunity to build a world-leading green hydrogen production industry, supplying domestic and European demand. The UK has a greater installed capacity of offshore wind than any other country in the world, with costs of new offshore wind falling by 50 per cent since 2015⁵. With domestic champions leading the global electrolyser markets, there is significant potential for the value created by the roll-out of green hydrogen production to be realised in the UK.

Annual hydrogen demand in 2035 by production method – TWh



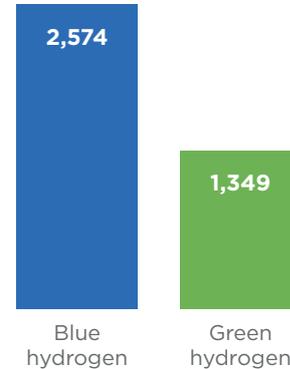
Blue

The oil and gas sector currently supports over 300,000 jobs in the UK. Over decades this industry has developed a workforce with unparalleled knowledge and expertise in the production, handling and distribution of gas. This, coupled with the UK's natural CO₂ storage assets, means that the UK is well placed to develop a strong blue hydrogen production supply chain that would leverage existing expertise and protect the jobs of thousands of people in the sector.

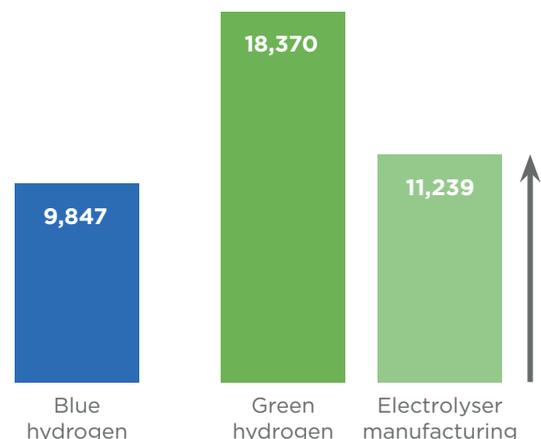
Regional impact

Offshore wind and CO₂ storage assets are currently concentrated in the north, meaning that investment in hydrogen production is likely to create and protect more jobs in areas that have been hit hardest by the COVID-19 crisis. The existing pipeline of hydrogen production projects has a strong regional spread and will support the Government's levelling up agenda.

Blue and green hydrogen GVA - £bn



Jobs by production type



*Ecuity Economics

³A hydrogen strategy for a climate-neutral Europe (2020) – European Commission

⁴The National Hydrogen Strategy (2020) – German Federal Ministry for Economic Affairs and Energy (BMBF)

⁵Wind Energy – Renewable UK

Midstream

Transmission and distribution

Over 80 per cent of UK homes and businesses are connected to the gas network, giving the UK a world-leading level of gas grid coverage.

This high-performing industry has delivered 99.9 per cent reliability across its assets. The gas grid represents not only a highly valuable asset, but also a highly valuable industry that develops and maintains it. It is important that we leverage the gas grid and the industry that supports it as the UK decarbonises.

Hydrogen offers the UK a pathway to decarbonise the gas grid, protecting and creating jobs while delivering clean energy to homes and businesses across the country. In the 1960s, the UK gas industry converted the local gas distribution network from towns gas to North Sea gas and constructed a national transmission distribution network. This represented one of the greatest feats of engineering this country has ever delivered. The conversion of the gas grid to hydrogen would represent a similar achievement and, with its unparalleled track record, the UK gas industry is uniquely positioned to deliver once again.

Energy storage

Centralised salt caverns can be used for storing excess hydrogen that could be produced at times of high renewable electricity output. Underground cave-like structures have historically been used for storing gases, and provide a well-established and relatively cheap way of storing hydrogen. This hydrogen can then be dispatched to support demand, particularly during winter demand peaks. The construction of hydrogen storage facilities in salt caverns would create jobs, as well as exportable technology and expertise.

	GVA - £M	JOBS
Transmission	1,416	3,838
Distribution	1,554	5,997
Storage	2,294	5,602

*Ecuity Economics

Downstream

Hydrogen has a key role to play in decarbonising energy sectors in the UK, including transport, heat, power and industry.

The development, deployment, operation and maintenance of these end-use technologies could make a significant contribution to the UK economy and create thousands of jobs.

	ANNUAL DEMAND IN 2035 - TWH	GVA - £M	JOBS
Transport	1.5	1,709	9,032
Heat	4.8	2,469	9,591
Industry	4.7	2,941	1,863
Power generation	0.3	1,632	10,685

*Ecuity Economics

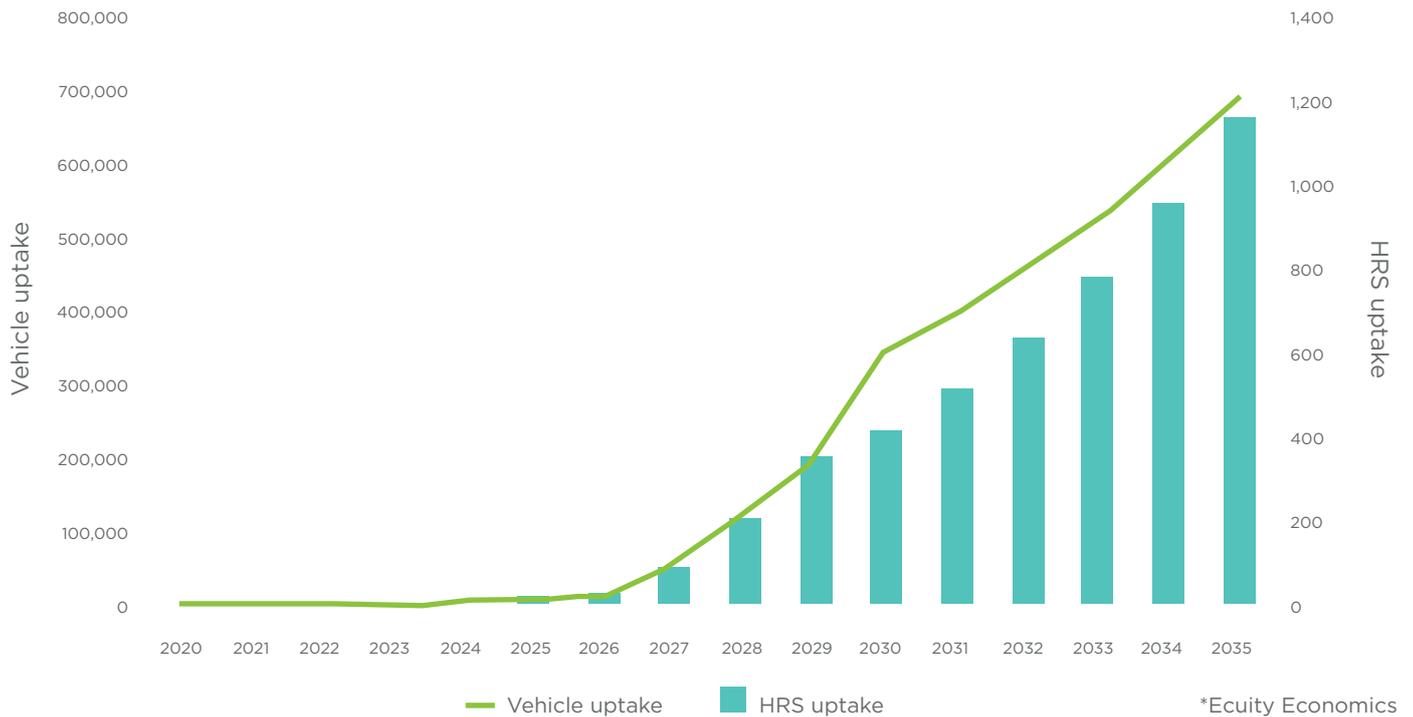
Transport

The UK has a long history of leadership in transport innovation and manufacturing. As the world moves towards a decarbonised energy system, it will be critical that zero-emission vehicles and infrastructure are deployed. While other global economies have outpaced the UK in the development of battery electric vehicles, the UK has an opportunity to take a leadership position in hydrogen mobility solutions – which are strategically important and the leading decarbonisation solution for several vehicle types. Investment in this area could protect current manufacturing jobs while creating new ones.

	GVA - £M	JOBS
Transport - HRS	1,474	4,233
Transport - vehicle manufacturing	234	4,800

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H2 vehicle and HRS uptake by 2035

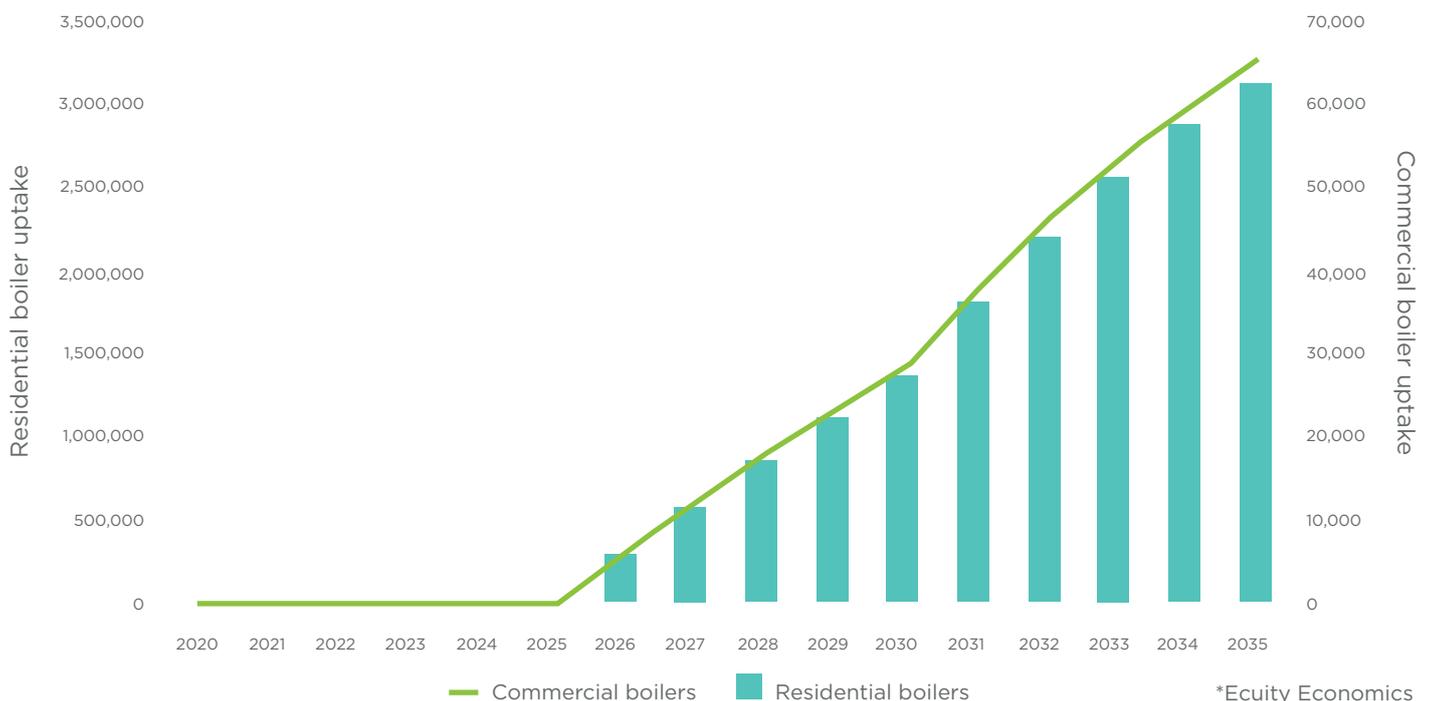


Heat

Decarbonising heat is arguably the biggest challenge facing the UK, as it attempts to meet its net-zero target by 2050. Hydrogen will have a key role to play, alongside electrification, in delivering low-carbon and zero-carbon heating.

The UK supply chain is well positioned to deliver hydrogen heating. Gas boiler manufacturing centres can easily transition to hydrogen boilers. The existing installer networks have the necessary expertise and experience to install and service hydrogen boilers with the minimum amount of additional training. A high uptake of hydrogen heating would protect jobs with minimal disruption to the workforce.

Residential and commercial boiler uptake by 2035



⁶Net Zero – Technical Report (2019) – Committee on Climate Change

⁷Industrial Fuel Switching Market Engagement Study (2018) – Element Energy & Jacobs

Industry

The characteristics of the industrial sector make it particularly well suited to a hydrogen-based decarbonisation pathway. This has been identified by both the Committee on Climate Change⁶ and BEIS⁷. If the UK is going to meet its net-zero target, then industrial processes must be decarbonised; the alternative is for these operations and jobs to be lost in the UK. Many of these jobs are concentrated in areas that have been hit hardest by COVID-19. The development and scaling of hydrogen solutions for industrial decarbonisation is therefore essential for protecting jobs, as well as creating new ones.



Power generation

Between 2020 and 2035, ageing and fossil fuel-based generation plants will be phased out and replaced with zero-emission alternatives. Hydrogen offers a solution to complement and support the roll-out of renewable generation assets.



*Ecuity Economics

Independent review

Imperial College Consultants were commissioned to undertake an independent review of the methodology and results for the economic impact assessment of hydrogen uptake to 2035 in the UK for the Hydrogen Taskforce. The results of this review can be found by double-clicking on the icon to the right.

**Imperial College
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Consultants

The Hydrogen Taskforce


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