

LGIM article:

From hydrogen boom to carbon bust: the key to reaching net zero



We believe the commitments to the hydrogen economy being made by governments and businesses around the world are creating a long-term investment opportunity with short-term catalysts.

Hydrogen is the most abundant chemical element in the universe; it constitutes approximately 75% of the universe's mass, but recently has seemed to account for an even greater proportion of public interest in clean energy. "The time is right to power up hydrogen", declared the editorial board of the Financial Times in July 2020.

Policymakers are already taking action. The EU published a hydrogen strategy in July¹, in November the UK made "driving the growth of low-carbon hydrogen" the second of its 10-point plan for a 'Green Industrial Revolution'², and Joe Biden campaigned on a pledge to "rapidly commercialize" renewable hydrogen³. The enthusiasm isn't limited to developed regions either: China, for example, has plans to make Wuhan a 'world hydrogen city' by 2025.⁴



Driving the growth of low carbon hydrogen could deliver:

Support for up to
8,000 jobs
by 2030, potentially unlocking up to
100,000 jobs
by 2050 in a high hydrogen
net zero scenario

Over
£4 billion
of private investment in the period
up to 2030

Savings of
41MtCO₂e
between 2023 and 2032, or **9%**
of 2018 UK emissions

Source: UK government, November 2020,
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

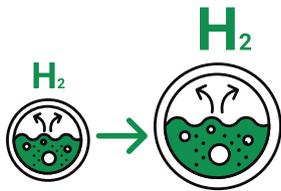
¹ https://ec.europa.eu/commission/presscorner/detail/en/FS_20_1296

² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936567/10_POINT_PLAN_BOOKLET.pdf

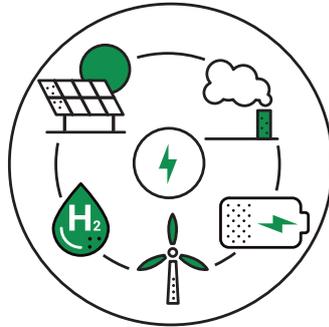
³ <https://joebiden.com/clean-energy/>

⁴ http://www.xinhuanet.com/english/2018-01/21/c_136913339.htm

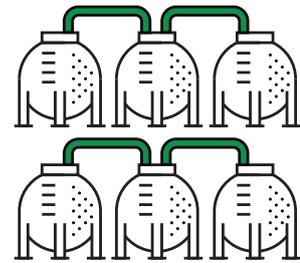
The EU's path towards a European hydrogen eco-system step by step



From now to 2024, we will support the **installation of at least 6GW of renewable hydrogen electrolyzers in the EU**, and the production of **up to 1 million tonnes** of renewable hydrogen.



From 2025 to 2030, hydrogen needs to **become an intrinsic part of our integrated energy system**, with at least 40GW of renewable hydrogen electrolyzers and the production of **up to 10 million tonnes** of renewable hydrogen in the EU.



From 2030 onwards, renewable hydrogen will be deployed at a large scale across all hard-to-decarbonise sectors.

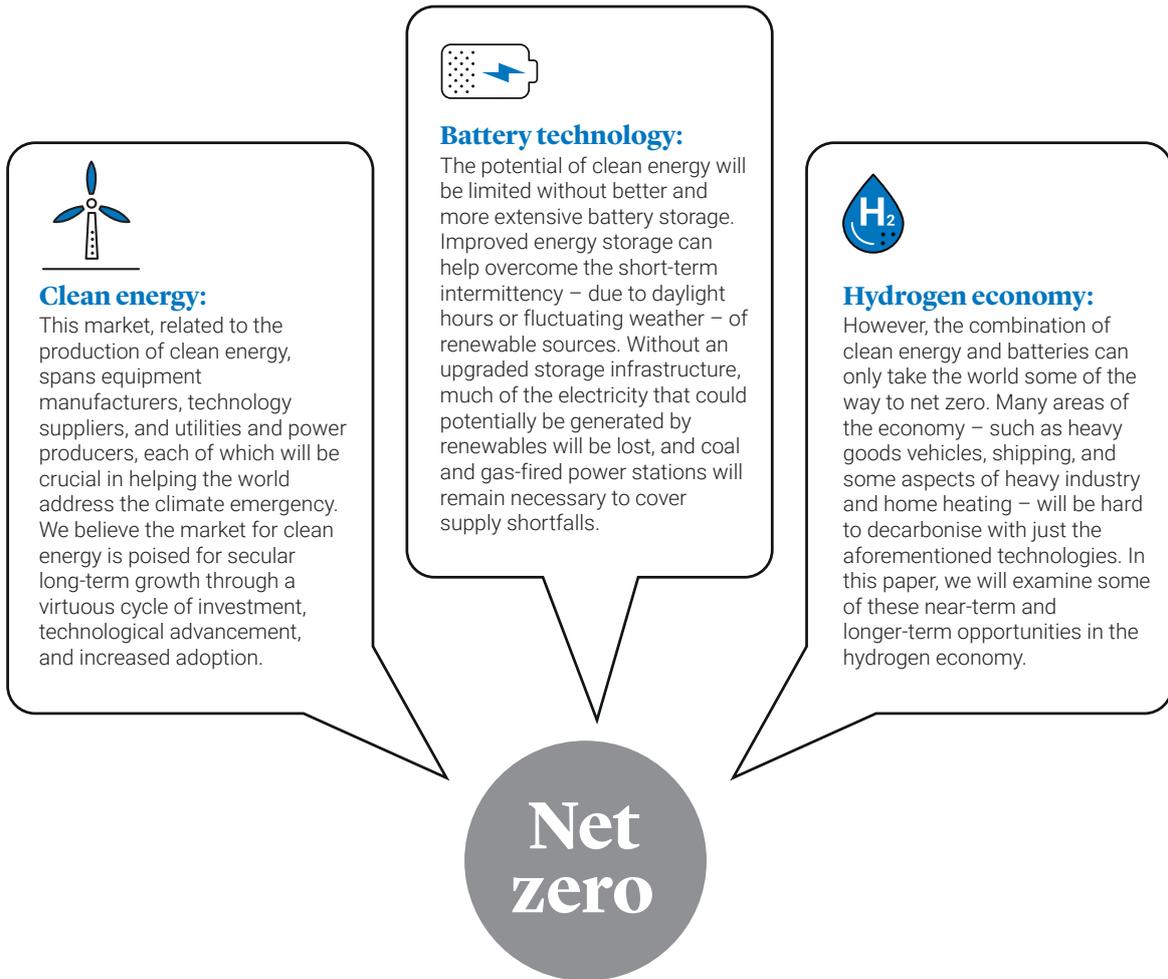


Source: European Commission, July 2020, https://ec.europa.eu/commission/presscorner/detail/en/FS_20_1296. For illustrative purposes only.

The market has evidently taken note of this emphasis on hydrogen technology, with many companies specialising in hydrogen seeing their share prices surge recently.

So amid the heightened interest, what makes us think the hydrogen economy is a compelling and sustainable investment opportunity? Put simply, along with improving economics and scientific advances, it is the commitment by more and more countries and businesses to net zero. Electrification through clean energy and battery technology can get us most of the way to net zero, but **hydrogen is the key to lowering emissions in industries where electrification alone is not enough.**





Biden Promises 100% Clean Energy, Net-Zero Emissions by 2050

Bloomberg, June 2019

<https://www.bloomberg.com/news/articles/2019-06-04/biden-promises-100-clean-energy-net-zero-emissions-by-2050>

EU ministers to agree to make climate neutrality by 2050 binding

Reuters, October 2020

<https://www.reuters.com/article/climate-change-eu-law/eu-ministers-to-agree-to-make-climate-neutrality-by-2050-binding-idUKL4N2HB204>

China pledges to be 'carbon-neutral' by 2060

Financial Times, September 2020

<https://www.ft.com/content/730e4f7d-3df0-45e4-91a5-db4b3571f353>

UK becomes first major economy to pass net zero emissions law

UK government, June 2019

<https://www.gov.uk/government/news/uk-becomes-first-major-economy-to-pass-net-zero-emissions-law>

Shades of grey

First, we must acknowledge that hydrogen is not necessarily ‘clean’. At present, according to the IEA, over 99% of hydrogen is made using fossil fuels. Hydrogen production today accounts for 2.2% of global greenhouse emissions – more than the airline industry. That is partly why governments, particularly in Europe, are seeking to incentivise the transition from so-called grey hydrogen towards blue or green hydrogen.

Grey hydrogen: hydrogen that is produced from fossil fuels without any carbon capture and/or storage.

Blue hydrogen: hydrogen that is produced from fossil fuels with the carbon emissions captured and stored.

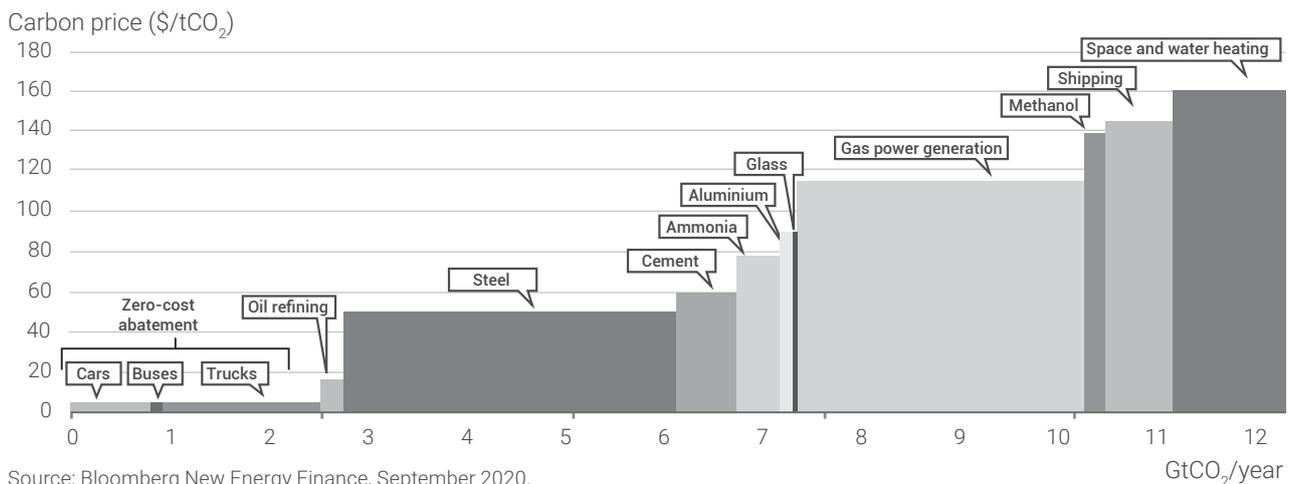
Green hydrogen: hydrogen that is produced with renewable power through electrolysis.

So how can the transition towards a hydrogen economy be accelerated? The answer is simple and is down to basic economics: we need cheaper green hydrogen! Thankfully, the required technology already exists – but it just needs further R&D and improvement, which is now increasingly being supported by government policy.

The key is that the cost of the electrolyzers used to produce green hydrogen needs to fall. This is in motion: the price of the wind and solar energy that will power the electrolyzers has decreased by 70-90% over the past decade, according to Bank of America Research (September 2020), while the cost of electrolyzers has fallen by up to 50% in the past five years and is projected to become a further 40-60% cheaper by 2030.

As the price of green hydrogen continues to come down, we believe industries such as fertiliser producers, oil refineries and steel producers will be the first for whom the economics of hydrogen will become attractive. The chart below shows the carbon price that needs to be imposed across various sectors to make green hydrogen (at \$1/kg) as competitive as conventional sources of energy.

Marginal abatement cost curve by sector (2050) Assuming \$1/kg hydrogen for emission reductions



Downstream applications

In a [previous paper](#), we discussed the use of hydrogen within the light motor vehicle sector and compared battery-powered electric vehicles and fuel-cell electric vehicles. While we expect batteries to dominate in light motor vehicles (two, three and four wheelers) and grid storage, we see healthy demand for hydrogen in areas where batteries can't compete.

In our view, the near-term demand for hydrogen is likely to come from the two key areas below. At current hydrogen prices and carbon penalties, green hydrogen is either relatively closer to breaking even with grey hydrogen for these two applications or serves as a viable or better alternative when compared with existing technologies.

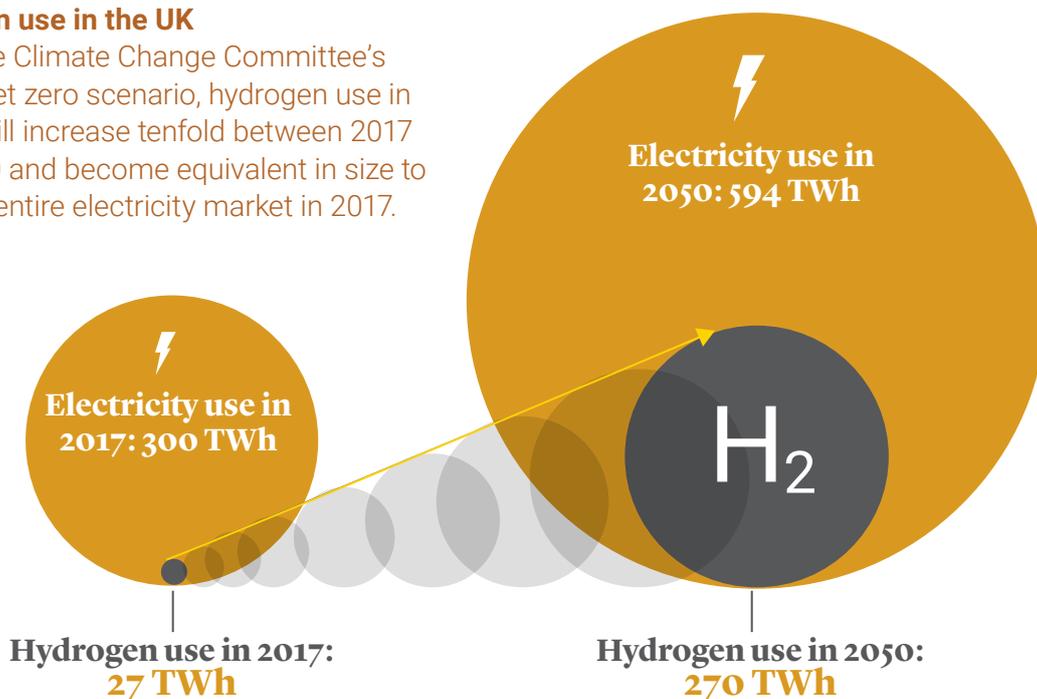
- 1 Industries such as fertiliser production, steelmaking, and refining that already depend on hydrogen but have a high carbon footprint due to their consumption of grey hydrogen.
- 2 Long haul and industrial mobility applications such as heavy trucks, forklifts, mining trucks, and potentially large passenger vehicles.

Hydrogen use in the UK

Under the Climate Change Committee's central net zero scenario, hydrogen use in the UK will increase tenfold between 2017 and 2050 and become equivalent in size to the UK's entire electricity market in 2017.

Medium- to long-term demand could then be sustained by other applications such as transportation (car fleets, shipping, railways and aircrafts), heating applications, and power generation.

To give just one example of the potential growth, the Climate Change Committee (the UK government's independent adviser) sees the country's hydrogen use reaching 270 TWh by 2050 under its central net zero scenario.⁵ To put that in perspective, the UK's entire electricity use in 2017 was 300 TWh. That is the scale of the expansion and investment in the hydrogen economy likely to be required worldwide to deliver net zero.



⁵<https://www.theccc.org.uk/publication/net-zero-technical-report/>

Investing in the hydrogen economy

In our L&G Hydrogen Economy UCITS ETF, we focus on technologies and firms that we believe will enable the production of cheaper clean hydrogen, those that are developing and investing in fuel-cell technologies, and those that we expect to play an integral role in the hydrogen economy.

In our view, the hydrogen value-chain can be broadly split into three main categories (as well as integrated supply-chain players) and then several sub-categories:

Production

- hydrogen producers including certain utility companies
- electrolyser manufacturers
- electrolyser component suppliers

Distribution

- hydrogen storage, transportation and distribution
- infrastructure providers

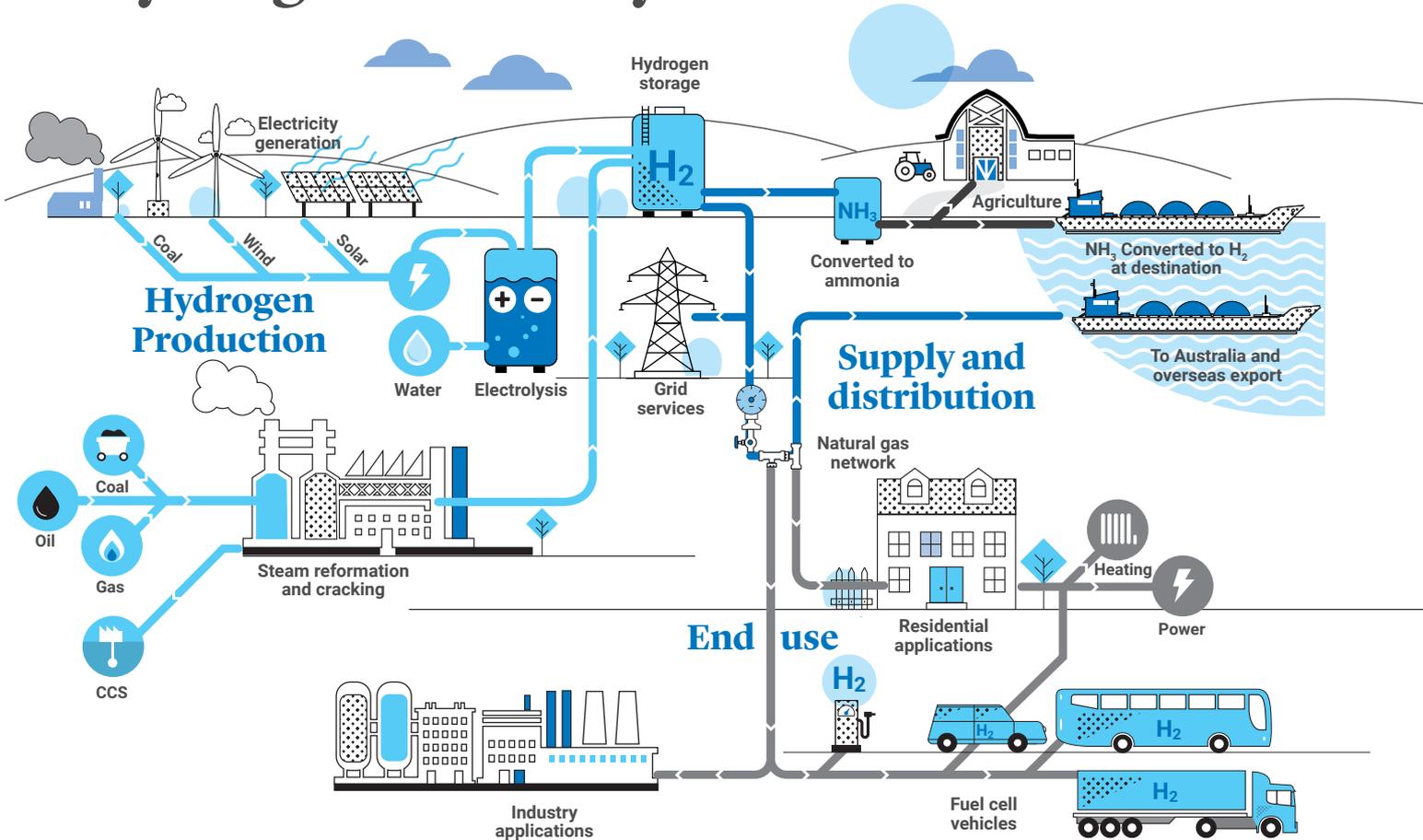
Application

- fuel-cell manufacturers
- fuel-cell component suppliers
- mobility providers (with and without their own fuel-cell technology)
- key industrial technology owners

Integrated supply-chain players



Understanding the hydrogen economy



For illustrative purposes only.

As the industry currently stands, we believe that the key contributors and beneficiaries in the first wave of growth will be those who are engaged in the production of green hydrogen, those innovating technologies to make green hydrogen production more efficient, those playing a critical role in the hydrogen supply chain, and those catering to specific mobility applications.

The hydrogen economy is not yet truly clean, but the ground is being prepared for its evolution into a green economy – and that journey is exactly what we seek to track in our strategy. For the reasons given above, we and others believe the size of the resulting hydrogen economy will be significant. As the economics, technology and applications line up, Bank of America, for example, expects that the hydrogen economy will generate nearly \$2.5 trillion of direct revenues and \$11 trillion of indirect infrastructure potential by 2050.⁶

\$2.5 trillion
in revenues

\$11 trillion
in infrastructure potential

Bank of America forecasts for size of the hydrogen economy by 2050, as at December 2020

⁶Source: Bank of America, December 2020

An interlinked green economy

At LGIM, we believe that clean power production should not be confused with power storage and distribution, as these two areas – although closely connected – have different supply and demand drivers. We therefore seek to provide access to these segments through targeted exposures.

The **L&G Clean Energy UCITS ETF** primarily focuses on the first segment of this broad industry, i.e. clean power generation. The **L&G Battery Value-Chain UCITS ETF** focuses on energy storage technology providers working to address the problem of renewable energy's intermittency through grid storage and in electric-vehicle applications. Finally, in the **L&G Hydrogen Economy UCITS ETF** we focus on hydrogen as an energy vector that is used to convert and store electricity in the form of green hydrogen and on its related applications.



Contact us

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