H2 News Hub

Issue 11

H$_2$ East

October 2021

Top stories

In issue 11 of **Hydrogen East**'s Sector Review, we take a look at important publications and developments over the month of September (2021).

ING has taken a closer look at the power price spike observed in the UK recently, warning it is unlikely to go away as the UK continues transitioning towards net zero electricity, and cited hydrogen as offering potential long-term mitigation.

In a new position paper, the **UK Hydrogen and Fuel Cell Association** has made the case for fuel cell technology as a "forgotten force in the fight against climate change", drawing on how it delivers against all objectives in the 10-point plan and can strengthen the impact of hydrogen.

Despite the hydrogen economy being in its infancy, the **World Energy Council** has explored national hydrogen strategies, which continue to be published worldwide, while **Rystad Energy** released analysis, warning a majority of the green hydrogen project pipeline are in water stressed areas, meaning an additional desalination market is required.

September also saw **DNV** release its latest **Energy Transition Outlook**, where it stressed hydrogen has a key part to play in the climate fight, with electrification alone not enough,

Contents

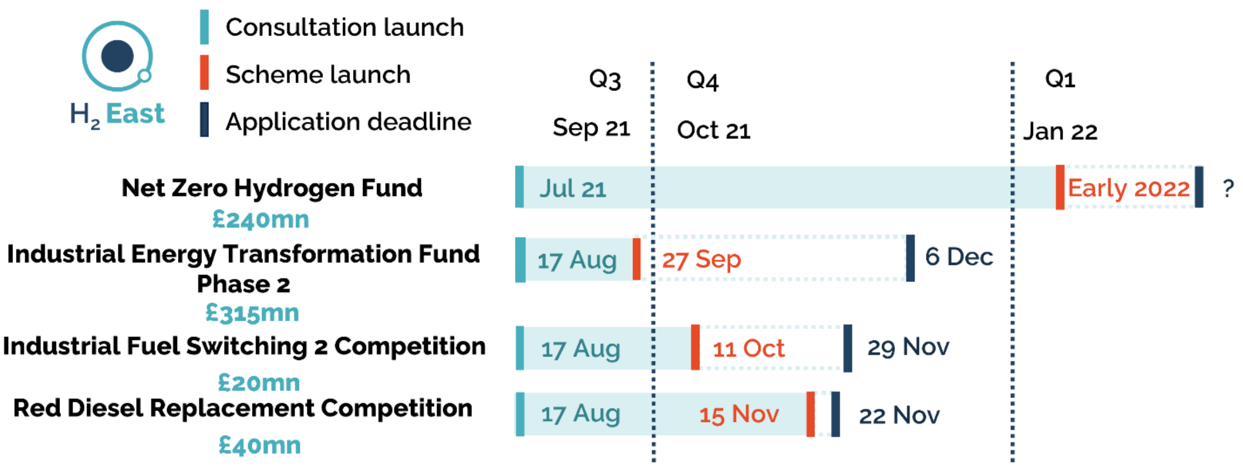
Upcoming webinars

4-6 Oct – **Smart Energy:** The 2nd Annual World Hydrogen Congress | **4-8 Oct** – **All-Energy**: Decarbonise Week | **8 Oct** – **Mission Hydrogen GMBH:** Hydrogen Online Conference | **12-14 Oct** – **CCS Association:** CCUS 2021 Conference | **13-14 Oct** – **SHFCA:** SHFCA2021 Scaling Up Hydrogen | **20 Oct** – **Arena Ocean Hyway Cluster:** International Conference on Maritime Hydrogen and Marine Energy | **27-28 Oct** – **GL Events:** HyVolution 2021

Funding tracker

There are a number of funds already available for developers, local authorities and innovative organisations. These cover both feasibility studies and demonstrator projects.

The **Net Zero Hydrogen Fund**, expected to be consulted on in July 2021, has been promised for early 2022. This will be the primary area of government funding for hydrogen projects in the near-term, with up to £240mn on offer.



Policy tracker

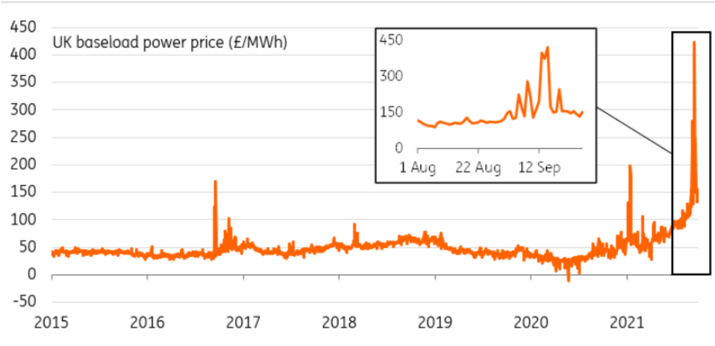
A number of consultations and strategies are in development and are expected to be issued in 2021. Following the launch of the **UK Hydrogen Strategy** on 17 August 2021, government as opened a number of consultations, outlined below.

Hydrogen a long-term solution to UK power price volatility

The challenge of power price volatility in the UK will not go away, ING has warned, with easy solutions unlikely in the short-term.

Figure 1: UK power prices have surged through September

(Source: Refinitiv)



On 29 September, it **published** an article, drawing on how the UK power price spike has exposed the challenges posed by the transition to net zero electricity. This presents an economic and political challenge for the coming years, especially when it comes to maintaining current high levels of public support for net zero. Long-term mitigations include hydrogen, grid investment and tweaks to power pricing, however these, especially hydrogen, will rely on technological gains as much as capital investment.

The two vulnerabilities in the UK's energy system highlighted by the recent power price spike include its reliance on natural gas and increasing reliance on variable renewables. A recent shortage in natural gas has coincided with a poor few months for UK wind.

It is also unlikely to be the last time power prices spike due to unseasonal weather or volatility in gas supply. Over the short-term, a fall in gas prices will be dependent on winter temperatures, while there is the recurring risk of cost of living spikes, though it did stress the longer-term impact of not taking action would be far greater than the near-term costs to be faced by the energy transition.

The UK has made significant progress decommissioning coal power, though this has left it with fewer ways to substitute for poor wind and solar generation. ING's global energy transition scenarios, **published** last year, found gas demand globally is unlikely to peak until the next decade as countries seek a backup for variable renewables. ING highlighted its own estimates, which found a 50% short-term increase in UK wind generation would lower British electricity prices by 6.6% and vice versa.

This makes finding effective ways to store renewable energy crucial, especially in Britain where capacity for storing natural gas has shrunk significantly over the past few years. This is where hydrogen can play a role, with the Hydrogen Strategy recently published and industry waiting on details for how contracts-for-difference auctions could be used to unlock the £4bn private investment government is targeting.

Quick hydrogen deployment would not see all of it generated from renewables, with blue hydrogen likely needed and set to increase the UK's dependency on gas in the short-term. It would also call for further technological advances in storing emissions, though the UK is at a more advanced stage when it comes to making preparations for the first carbon capture and storage (CCS) clusters. Over the longer-term, it would then be able to smooth the UK's volatility in renewables production and act as a key component in the net zero journey.

Fuel cells can be key force in climate fight, strengthen hydrogen's impact

With hydrogen essential to net zero, fuel cell technology can be highly complementary, storing cheap hydrogen and generating electricity on demand, a paper has set out.

Figure 2: How fuel cells deliver against the objectives of the PM's Ten Point Plan

(Source: UK HFCA)

	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.

On 14 September, the UK Hydrogen and Fuel Cell Association (UK HFCA) **published** its latest position paper, making the case for fuel cell technology as a "forgotten force in the fight against climate change". With efficiency an essential, though overlooked part of a pathway towards a cost effective energy transition, it set out how fuel cells can offer a range of opportunities to deliver efficient use of decarbonised fuels in a variety of applications.

This would make the transition more affordable and, as a result, deliverable. It noted that fuel cells also deliver against all the objectives set out within the Prime Minister's Ten Point Plan for a Green Industrial Revolution, further highlighting their ability to rise to the challenge of meeting net zero.

It went on to set out how fuel cells are highly complementary to hydrogen and can strengthen its reach and impact. As the UK moves to a 100% renewable electricity system, intermittency will become a bigger challenge, increasing the need for more grid balancing services and energy storage, which is where affordable low carbon hydrogen could be a breakthrough in terms of storing electricity over time. Paired with fuel cells to generate power on demand in any location, this would support a move towards greater electrification of the energy system.

There is also potential to use them in buildings and homes in future, with UK HFCA stating hydrogen and fuel cells can help to reduce the substantial contribution of heat to carbon emissions in the UK. This would see hydrogen stored until needed, before being run through a fuel cell to create zero carbon heat and power. Efficiencies of "well over" 90% could be achievable in a combined heat and power fuel cell, it added.

As well as the advantages to the energy transition, there is also an economic opportunity to be had, with the report noting the global fuel cells market could be worth £9.7bn in five years. 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 opportunity, but lacks capability to develop technology at scale.

Therefore, to create a leading UK industry, the UK HFCA outlined two steps government must take to make it happen, beginning with supporting the scale up of the fuel cells industry in the UK. It recommended this takes the form of a challenge-led fund where government facilitates collaboration between industry and academia, suggesting a model similar to the Faraday Institute for battery technology.

Secondly, it called for government to implement policy levers to help the development of fuel cells in the UK, specifically recommending direct public procurement of fuel cell technology; establishing subsidy mechanisms to support generation of a fuel cell or support its consumption, with mechanisms to encourage UK content along the supply chain; committing to phase

Figure 3: Leading fuel cell technology companies working across the value chain in the UK

(Source: UK HFCA)

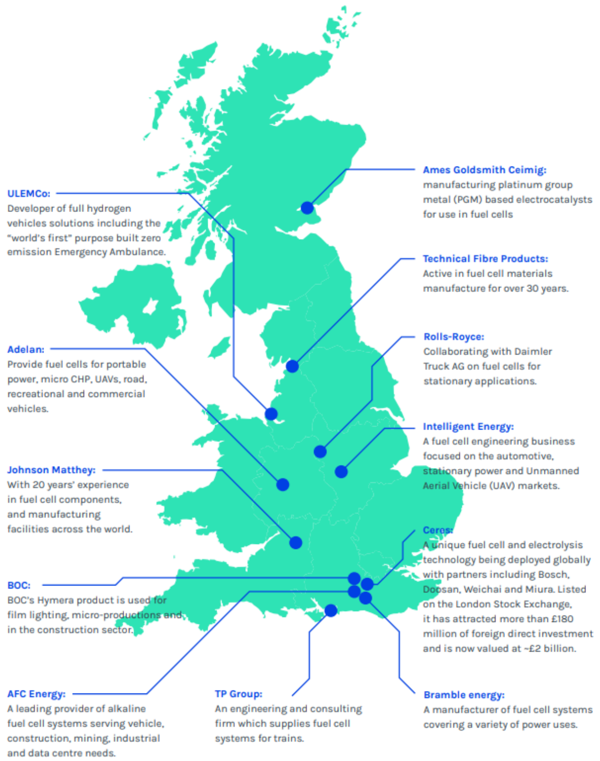
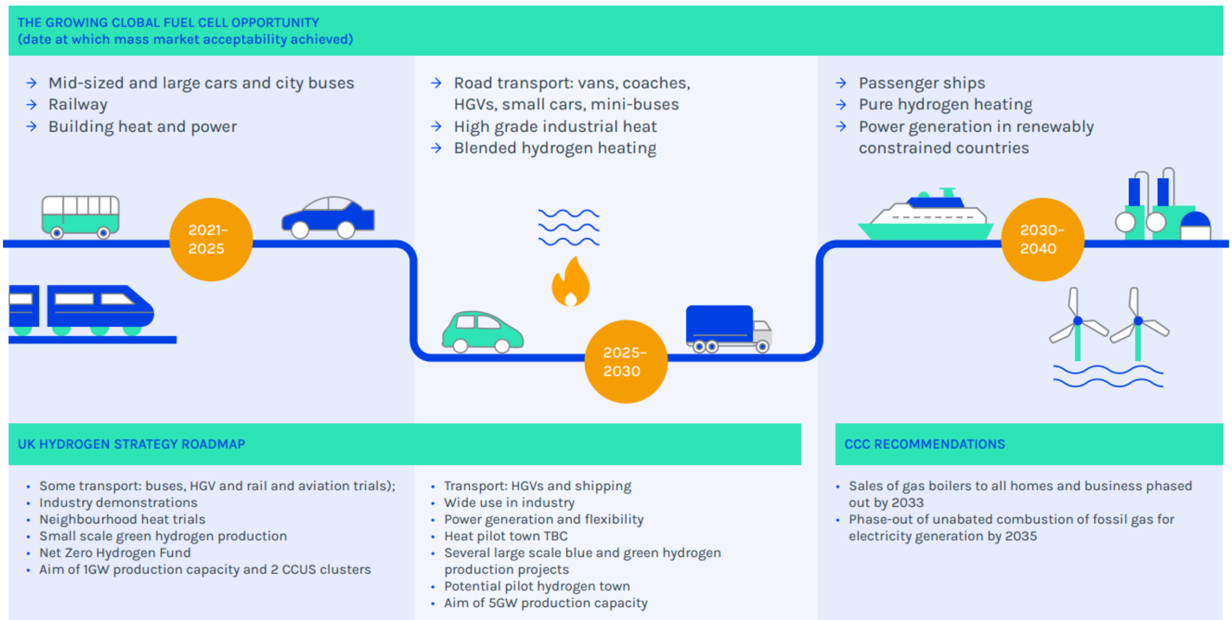


Figure 3: How the global fuel cell opportunity maps onto plans for a UK hydrogen economy

(Source: UK HFCA)



Hydrogen innovation pipeline could deliver tens of thousands of jobs

Planned hydrogen innovation projects could create 25,000 skilled green jobs across Britain over the next 10 years, including 17,000 in Britain's industrial heartlands, a report has said.

On 14 September, the Energy Networks Association (ENA) **published** a report, outlining how Britain's five gas network companies are planning to invest a total of £6.8bn in proposed hydrogen innovation projects, directly creating 13,300 jobs while another 11,400 would be generated through supply chain partners in these projects. The proposals have been submitted to Ofgem as part of the companies' business plans.

The majority of this investment (£4.4bn) is being proposed to reduce emissions in Britain's industrial clusters. This includes Southampton Water's work to decarbonise local industry and transport, with the project investigating the feasibility of developing a hydrogen superhub at the Port of Southampton, and HyNet North West, which will produce, store and distribute hydrogen while capturing and storing carbon from industry across the region from 2025.

It also includes efforts to ensure the entire network can deliver hydrogen to homes and businesses (£2.2bn), creating 6,700 jobs, including projects such as SGN's H100 Fife, and action to accelerate Britain's hydrogen economy (£150mn), generating over 700 jobs through projects such as HyDeploy. Elsewhere, £19.5mn has been committed to transport and other projects, exploring how hydrogen can reduce emissions from cars and goods vehicles, as well as how it can be used in a way that it is integrated with other green technologies and gases. These projects are set to create close to 100 jobs.

Winners of zero emission flight aviation competition revealed

A number of hydrogen projects have secured funding through the Department for Transport's latest Transport Research and Innovation Grant (TRIG) programme.

On 29 September, the DfT **announced** the 15 projects to secure funding through TRIG: Zero Emission Flight, which falls under the wider Zero Emissions Flight Infrastructure project and is being **delivered** by the Connected Places Catapult. The latest TRIG programme was launched to address the feasibility of integrating hydrogen and electric infrastructure system in airfields, with grants of up to £50,000 on offer.

The programme targeted three priority areas: hydrogen storage, handling, aircraft refuelling/defueling, distribution and associated technologies; electric charging, storage, handling, batteries, electric distribution, and associated technologies; and research into future demand scenarios for airside use of green hydrogen and electricity at UK airports.

The successful projects with a hydrogen focus include Cranfield University's Hydrogen Safety in Aviation, which is an immersive XR training scenario for airport personnel; the University of Warwick's evaluation of safety zones and mitigation measures for hydrogen refuelling infrastructure at airports; Ultima Forma's flexible electroformed twin-walled hydrogen fuel hoses; and Protium Green Solutions' development of a digital twin for the fast refuelling process and procedure for gaseous hydrogen aircraft.

Others to receive backing are Hive Composites' next-generation thermoplastic composite pipe for hydrogen distribution in airports; Stratospheric Platforms' development of a safety zonal tool for the operation of liquid hydrogen powered aircraft at airfields; EGB Engineering Consultant's modelling of electricity and green hydrogen scenarios to meet future airport demand; Zero Avia's liquid hydrogen airport refuelling ecosystem; and UltraCompHy from the School of Mechanical and Aerospace Engineering at Queen's University in Belfast, which is an ultra-lightweight composite pressure vessel for safe and cost-effective hydrogen storage.

HyDeploy trial a success, opens way to larger demonstration

The first phase of a project to blend hydrogen into a natural gas network in the UK has been deemed a success.

On 8 September, Cadent **published** a report into the first phase of the HyDeploy project, which saw 100 homes and 30 university buildings on a private gas network at Keele University receive blended gas for 18 months.

Running from October 2019 to March 2021, the project successfully demonstrated for the first time in UK history that natural gas hydrogen blends can be safely distribution and used within live gas networks. It saw over 42,000 cubic metres of hydrogen delivered, with over 27 tonnes of CO2 abated.

If rolled out to all GB homes, it forecast hydrogen blending could unlock 29TWh of low carbon gas, resulting in carbon savings equivalent to removing 2.5mn cars from the roads.

Other key outcomes from the project have included successful achievement of the first regulatory approval from the Health and Safety Executive (HSE) to operate a live gas network above the current hydrogen limit of 0.1%; the design, fabrication, installation and operation of the UK's first hydrogen grid entry unit; and integration of novel hydrogen production and blending technologies to create the first hydrogen delivery system, based on electrolytic generation into a live gas grid.

It has also provided evidence for the suitability of hydrogen blends with domestic appliances, as well as larger commercial appliances including catering equipment and boilers up to 600kW; evidence for the suitability of hydrogen blends with medium and low-pressure distribution systems; promotion of supply chain innovation; and the establishment of a robust social science evidence base to understand the attitudes and experience of consumers actually using hydrogen blends.

With the project marking the first practical steps of demonstrating the safety and operational feasibility of hydrogen blends, a larger pilot project is now underway at Winlaton near Gateshead, with 668 homes, a school and a handful of smaller businesses receiving hydrogen blended gas on a network operated by Northern Gas Networks (NGN).

5G network powered by sustainable hydrogen could cover whole of UK

Stratospheric Platforms is proposing complete 5G coverage powered by sustainable hydrogen across Scotland, with the potential to cover the whole of the UK.

On 17 September, it **revealed** its plans for high-altitude, hydrogen-powered aircraft (HAP) that can provide uninterrupted 5G connectivity direct to consumer smart phones across areas as wide as 140km, as well as direct broadband connectivity to properties. It is proposing that a small fleet of aircraft operating from Prestwick could provide complete coverage of the UK and prove particularly well suited to the challenging terrain of Scotland.

In Scotland, a fleet of 21 aircraft could provide 100% coverage, requiring just eight offshore wind turbines to generate the power needed to produce hydrogen from seawater.

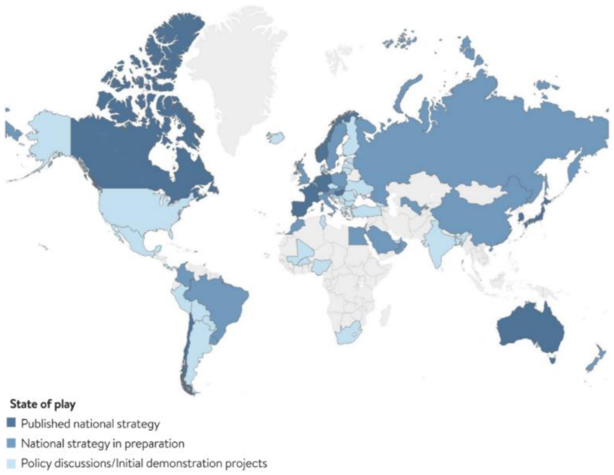
It further mapped out how the Stratomast systems is particularly beneficial to remote and rural regions, drawing on how it provides a communications service that only requires standard mobile phones for mobile connectivity and a low cost, low power MiFi device for home broadband services. It also does not require any expensive additional infrastructure or towers on the ground, nor any costly, fibre optic cables laid across the seabed to island or rural communities.

Hydrogen strategy momentum advancing worldwide

There is growing global interest and support in hydrogen, despite a hydrogen economy being in the early stages of development, according to research.

Figure 5: Overview of country activities towards developing a hydrogen strategy

(Source: World Energy Council)



On 14 September, the World Energy Council [published](#) a working paper, examining national hydrogen strategies, which continue to be published worldwide in support of the development of hydrogen. To date, 12 countries and the European Union have published national hydrogen strategies, while a further 19 are drafting theirs with many aiming to have them published in 2021.

It went on to highlight the countries that have proven influential with their hydrogen strategies, noting how Japan's early commitment has catalysed interest in the Asian-Pacific region; Germany's early movement in Europe and how it pushed the EU hydrogen strategy during its EU presidency; and Chile being among the quick movers in Latin America, with neighbouring countries now in the process of developing their own strategies.

Exploring these further, it found different country contexts mean sectoral priorities vary significantly across the strategies. The likes of Japan and South Korea, for example, are focused on developing hydrogen economies, Australia is focused on exports, Europe is aiming to decarbonise the industrial and transport sectors, while Chile and Canada are targeting the production, consumption and export of clean hydrogen.

A variety of policy instruments and tools are being considered to drive the development, such as targeting public and private investment to support pilot projects and achieve economies of scale – Japan has committed €1.5bn to support zero emission hydrogen production locally and overseas, while France is set to invest €7bn by 2030 – as well as financial measures including tax policy and subsidies to drive the development of hydrogen value chains.

To build an international hydrogen market, various countries are also developing bilateral agreements to coordinate R&D programmes, explore harmonising standards and encourage the emerging global hydrogen trade. The Mission Innovation initiative, for example, involves 24 countries and the European Commission and is aiming to increase government investment in clean energy R&D involving the private sector and encouraging international collaboration for hydrogen innovation.

To create conditions for market development, the focus to date has been on rapidly enabling hydrogen projects by simplifying existing frameworks and reducing potential barriers and administrative burdens. Legislation and regulation is yet to be fully developed. Standardisation may also be needed, helping to harmonise processes important for hydrogen development, but at this stage they differ substantially between countries which makes collaboration more difficult, delaying developing hydrogen demand and investment.

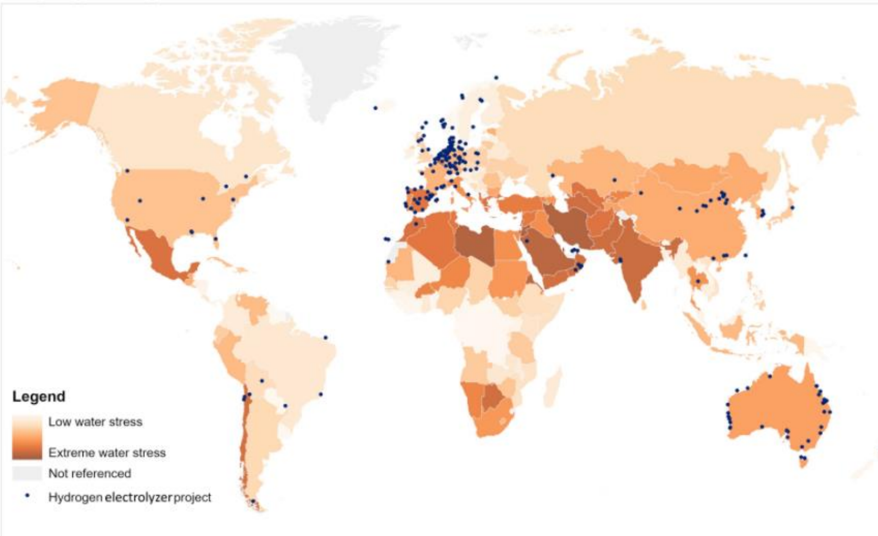
Desalination market key to enabling green hydrogen projects

Green hydrogen projects risk staying dry, unless a parallel desalination market is put in place to provide fresh water, according to analysis.

On 17 September, Rystad Energy warned that a majority of the pipeline for green hydrogen projects – 206GW in installed electrolyser capacity is targeted for 2040 – are in areas where water is in short supply. This means an additional desalination market, producing most of the 620mn cubic meters of water these projects will require, is needed.

Figure 6: Heat map of global green hydrogen projects pipeline by water-stress level (planned projects by mid-2021)

(Source: Rystad Energy)



Over 70% of hydrogen electrolyser projects are set to be located in water-stressed areas, meaning close to 85% of the hydrogen capacity earmarked for 2040 faces having to potentially source water supply through desalination.

To ensure the hydrogen produced is green, additional renewable energy capacity could be needed for the desalination process as well, considering just 1% of global desalination projects are currently renewably powered.

Four of the five regions by planned green hydrogen capacity – Australia, Central Asia, West Africa, and the Middle East – have medium or higher water-stress levels. There are also several hydrogen electrolyser projects in countries outside of these regions that also face high levels of water stress, such as Spain and Chile, which have a collective 42 planned.

Overall, Rystad's analysis found 14 green electrolyser projects planned in countries with extremely high levels of water stress, 53 in countries with high water stress and 162 in regions with medium to high levels of water stress. Those in high to extremely high water-stressed countries will almost certainly require desalination for their water supply, equating to a potential demand of 125.7mn cubic meters of water annually for desalination by 2040.

Furthermore, if all hydrogen projects in regions with water stress levels above medium are realised, demand for desalination could grow fivefold, reaching 526mn cubic meters by 2040. It noted the UN is expecting freshwater demand to increase globally by 60% by 2025 for agriculture alone, meaning regions with water stress levels exceeding medium will likely need to develop additional desalination capacity to support green hydrogen facilities.

Some projects in regions of low water stress are located near shore and could take offshore wind as feedstock. Should they add sweater desalination, the total desalinated water demand for green hydrogen could rise as high as 620mn cubic meters by 2040.

Research uncovers "gamechanger" for clean hydrogen production

A new, cheaper and more efficient electrocatalyst to make green hydrogen from water has been identified by Curtin University in Australia.

Detailing its findings on 17 September, it set out how typically, scientists have used catalysts such as platinum to accelerate the reaction to break water into hydrogen and oxygen. However, through its research, Curtin found that adding nickel and cobalt to cheaper, previously ineffective catalysts can enhance their performance, lower the energy required to split the water and increase the yield of hydrogen as a result

It said its discovery could open new avenues for large-scale clean energy production in future broadening the existing "palette" of possible particle combinations, while introducing a new, efficient catalyst that could be useful in other applications.

Lead researcher, Dr Guohua Jia, from Curtin's School of Molecular and Life Sciences, explained how small amounts of nickel and cobalt ions were added to two-dimensional iron-sulfur nanocrystals which, usually, do not work as catalysts for getting hydrogen from water. However, through the addition of nickel and cobalt, Jia said the poor-performing iron-sulfur was "completely transformed", becoming a viable, efficient catalyst.

New partnership strives to show benefits of thriving green hydrogen sector

A group of different organisations from industry and academia have come together to show the benefits of a thriving green hydrogen sector would bring to Scotland and the UK.

Launched on 13 September, the Hydrogen Skills Partnership consists of ScottishPower, ITM Power, Arcola Energy, Robert Gordon University, Energy Transition Zone, Skills Development Scotland, Aberdeen University, North East Scotland College and the Hydrogen Accelerator.

It will see the partners collaborate to assess the readiness of the UK supply chain when it comes to supporting green hydrogen projects and highlight the potential economic value for the domestic supply chain. They will also seek to show the potential for green, sustainable skills and high-value jobs emerging from a future hydrogen sector.

Live projects will be used as case studies, while commercial insights from this work will support academic, public and private sectors to maximise the positive impacts emerging from the growth of a green hydrogen economy.

Anglian Water wins funding for hydrogen project

Anglian Water has secured funding for both projects it submitted to Ofwat's Water Breakthrough Challenge.

On 30 September, it **announced** that £7.5mn has been awarded to its Safe Smart Systems project, set to use artificial intelligence and mathematical optimisation to improve long-term operational resilience in the face of climate change and rapid population growth, and £3.5mn to its Triple Carbon Reduction project, which features hydrogen.

The Triple Carbon Reduction solution is set to use novel technologies to target a step change reduction in greenhouse gas emissions and electricity use in water treatment and provide a new renewable energy source through green hydrogen production. It will lead to "triple carbon" synergy and contribute to achieving net zero by 2030.

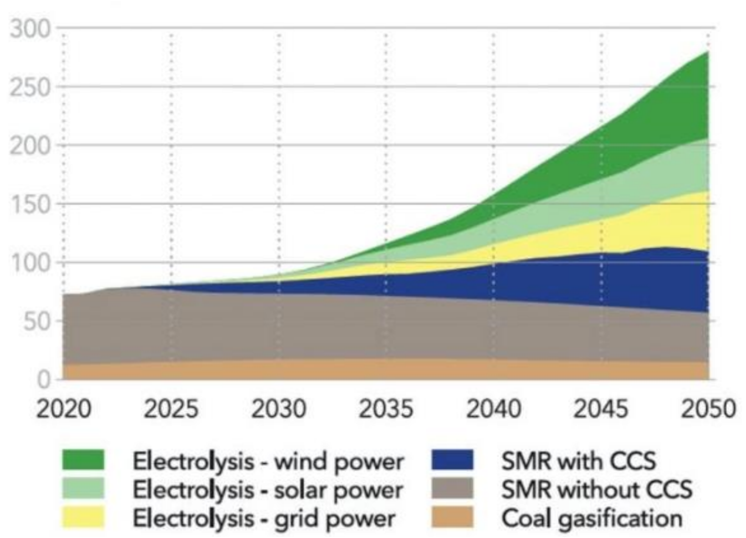
The project will see Anglian Water team up with Oxymen, Element Energy, Jacobs, Cranfield University, the University of East Anglia, Brunel University, Severn Trent Water, Scottish Water, Northern Ireland Water and United Utilities.

Hydrogen with key part to play in climate fight, electrification not enough

The world would fall a "long way short" of achieving 2050 net zero ambitions, even if all electricity was green from today onwards, a report has warned.

Figure 7: World hydrogen production by source (Mt/year)

(Source: DNV)



On 1 September, DNV **published** its latest *Energy Transition Outlook*, where it referred to the global pandemic as a "lost opportunity" for speeding up the energy transition, considering that the majority of Covid-19 recovery packages have focused on protecting, instead of transforming existing industries. Global emissions likely peaked in 2019, with Covid-19 driving an unprecedented 6% drop in 2020. However, emissions are now rising sharply again and will continue growing for the next three years, before falling.

While reductions in fossil fuel use has proven to be "remarkably quick", these sources – especially gas – will account for around 50% of global energy mix by 2050. This means that investing in and scaling the likes of carbon capture and storage and hydrogen has been made all the more important. Come 2050, around 69% of grid-connected power will be wind and solar. Indirect electrification, such as hydrogen and e-fuels, as well as biofuels will remain critical, yet none of these sources are scaling rapidly enough.

Hydrogen was cited as the energy carrier with the highest potential to tackle hard to abate emissions, though DNV forecast that it will only start to scale from the mid-2030s and build to 5% of the energy mix by 2050. Government incentives, such as those given to renewables, will be needed to stimulate technology development and accelerate the uptake of both hydrogen and e-fuels.

It further mapped out how the current production of hydrogen as an energy carrier is negligible when compared with the 75mn tonnes of grey and brown hydrogen that is produced every year for fertiliser and chemicals production. Blue hydrogen will replace some of this in the coming decades, accounting for 18% of supply for energy purposes by 2050, though green hydrogen from electrolysis will be the main solution long-term for decarbonising the hardest to abate sectors.

It did warn, however, that electrolysis powered by grid electricity is disadvantaged by the limited number of hours of low-priced electricity. Its CO_2 footprint will improve as more renewables enter the power mix, with electrolysis set to dominate the future production of hydrogen for energy purposes, using dedicated off-grid renewables such as solar and wind farms. In 2050, 18% of hydrogen will be grid-based and 43% will come from dedicated capacity, including solar PV (16%), onshore wind (16%) and fixed offshore wind (9%).

Derby sets sights on hydrogen future

Hydrogen could prove a major driver for new jobs and skills in Derby, a study has found.

On 1 September, Derby City Council **published** a report commissioned from Arup, exploring the potential of hydrogen as an energy source for the region, deeming it to be well-placed to be a national front-runner for establishing a hydrogen economy. Reasons for this include its strong cluster of advanced manufacturing and engineering excellence; wealth of large scale sites with high development potential as green hubs; network of research institutions and collaborators; and large potential users with strong transport infrastructure.

It stressed the next five years are an "opportune time" for Derby and the D2N2 region to use its unique energy eco-system, with the report mapping out how hydrogen can ensure the region can achieve mutually reinforcing goals of decarbonisation, economic growth and skills development.

Notably, hydrogen will be a key driver for retaining and upskilling the region's substantial and aligned workforce and supply chain in its productive advanced manufacturing, engineering and energy sectors. It forecast that by 2030, it could account for at least 800 new jobs in the D2N2 area. There are also significant opportunities for secondary industries associated with the region's growing focus on clean growth industries, such as East Midlands Airport and Ratcliffe Power Station, to benefit from a hydrogen economy, while it could also be used to help decarbonise the region's highest carbon emitting sites.

It forecast that around 8.5TWh of hydrogen could be consumed in Derby and the wider D2N2 region by 2050. This would predominantly be through industry, though transportation would also play a role. By 2030, it tipped local demand to exceed what could be produced locally, while at least 16 sites with high potential for both, or either, hydrogen production and end-use capability were identified.

It went on to set out a roadmap, made up of recommendations up to 2035 and beyond, to establish a regional hydrogen economy and capitalise on the clear opportunity, including that a Derby region hydrogen taskforce is established; for there to be a focus on vocational skills training and educational outreach programmes related to hydrogen; and for hydrogen supply to be established, initially through blending.

INEOS to convert Grangemouth refinery to hydrogen

INEOS has announced further investment in excess of £1bn to move its Grangemouth site forward on the next phase of its journey to reaching net zero by 2045.

On 22 September, it **revealed** how the next phase of its INEOS Grangemouth Road Map will reduce greenhouse gas emissions by over 60% by 2030 through a series of investments, partnerships and innovative engineering. All businesses at the site will move to production and use of hydrogen, alongside carbon capture and storage of at least 1mn tonnes of CO2 per annum by 2030. CO2 will be captured from existing hydrogen production, while a world-scale carbon capture enabled hydrogen production plant will also be built.

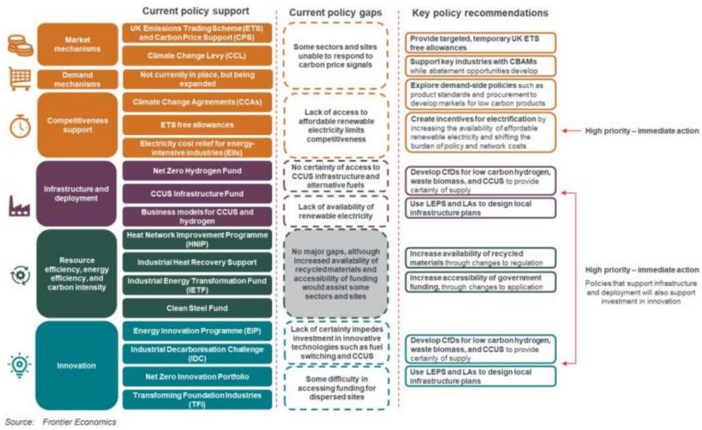
Additional emissions reduction contributions will come from further investments in energy reduction and optimisation, along with electrification of key equipment. It will also shift its polymer product portfolio to include higher levels of post-consumer recycled content in an effort to contribute to a growing circular economy. This next stage of the Road Map will build on the 37% reduction in net CO2 emissions delivered since INEOS acquired the site in 2005. It has already invested £500mn on projects currently approved and being implemented at Grangemouth.

Industrial clusters and dispersed sites need certainty on hydrogen availability

While welcome commitments have been made in the industrial decarbonisation and hydrogen strategies, a more comprehensive, ambitious plan of action is "urgently needed" to cut industrial emissions at the pace and scale demand by net zero, a report has warned.

Figure 8: Summary of the report's policy recommendations

(Source: Frontier Economics)



On 9 September, the Aldersgate Group published a report from Frontier Economics, centred around accelerating the decarbonisation of industrial clusters and dispersed sites. Industrial clusters and dispersed sites contributed an estimated 37.6MtCO2e and 33.6MtCO2e of emissions respectively in 2018 and, despite having differences in their net zero journeys and technological solutions, the industries located within each will require similar policy solutions to decarbonise.

Heavy industrial sectors, such as steel, chemicals, cement, glass and ceramics, are set to be fundamental building blocks for low carbon infrastructure, goods and services. Therefore, there is a unique opportunity to develop new competitive advantages and expand into new markets during the net zero transition. To scale up innovation, roll out supporting infrastructure and accelerate low carbon investment in industrial clusters and dispersed sites, it made a series of recommendations, including providing certainty to industry on the future availability of low carbon hydrogen, biomass and carbon capture usage and storage (CCUS) through using contracts for difference (CfD) and government matchmaking.

It explained how producers in both dispersed sites and industrial clusters need confidence hydrogen and carbon capture infrastructure will be available to them in order to invest in demonstrating and deploying these technologies. CfDs for key alternative fuels and CCUS would provide clear revenue streams for investors in these technologies and have proven successful in the past at supporting a significant increase in renewable electricity capacity and generation in the UK. The long-term certainty this would provide would support network deployment, with the report further noting policymakers should carefully consider the benchmark price and implementation of these CfDs to ensure they created the desired incentives. It also stressed the need to develop and establish standards for low carbon hydrogen in the UK as part of this process.

It further suggested that the government could also complement such policies by directly legislating hydrogen production and CCUS targets to create a clear signal to the infrastructure which will be available by a given date, providing further certainty of supply.

Elsewhere, it recommended close collaboration with Local Enterprise Partnerships, local authorities and devolved governments to design local infrastructure plans to help connect dispersed industries to the infrastructure being deployed in the clusters.

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