Hydrogen East

H2 News Hub

Issue 20

H2 East

July 2022

Top stories

Welcome to issue 20 of **Hydrogen East**'s Sector Review, where we take a look back at some of the most important publications and developments over the month of June (2022).

This month saw **Hydrogen East** unveil our vision for what a first-of-its-kind hydrogen cluster, centred around six core electrolyser projects in Norfolk and Suffolk could look like, as part of efforts to realise the East of England's potential as a major producer, user and exporter of hydrogen. This would pave the way for further development and improved infrastructure to be implemented, with Hydrogen East now keen for others to join our consortium.

As well as taking a look at the **Climate Change Committee's** latest Progress Report, specifically through a hydrogen lens, this issue also covers the **UK Hydrogen and Fuel Cell Association's** paper on nuclear enabled hydrogen (NEH), where it called for government to use legislation, financial backing and ensure more nuclear sites are available to support the potential of NEH.

Elsewhere, **Siemens** explored how renewable energy and green hydrogen can serve as the backbone for a decarbonised and more secure European energy supply. With Europe having grown increasingly dependent on imported fossil fuels, it has also become increasingly susceptible to political uncertainty, as evidenced by Russia's invasion of Ukraine. Green hydrogen, therefore, can play a critical role in guaranteeing energy security on the continent.

Contents

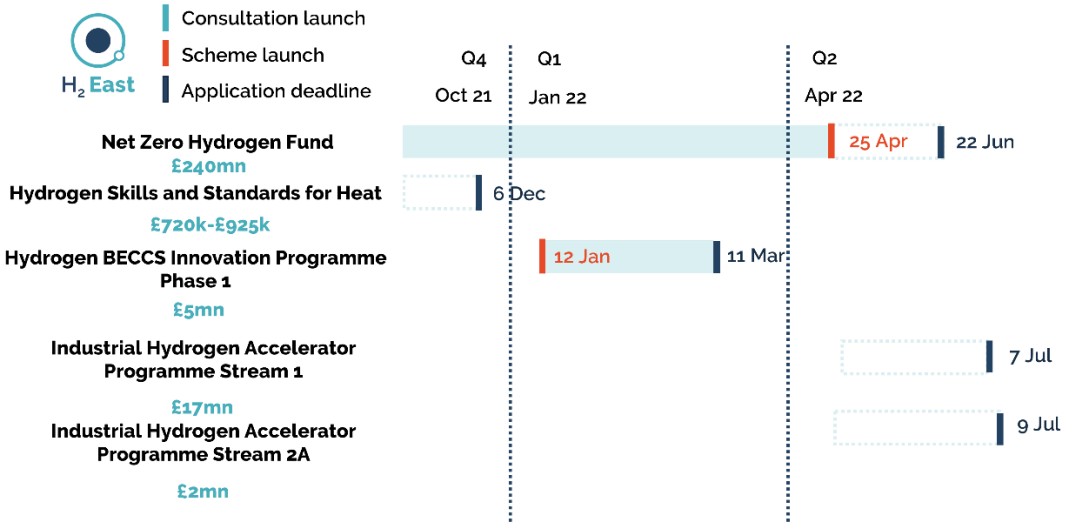
Upcoming webinars

5 Jul – **ETP:** Launch of £10mn EETF Hydrogen innovation Scheme | **5 Jul** – **Freeths:** Hydrogen: what's all the buzz? | **13 Jul** – **Innovate UK & KTN:** Zero Emission Road Freight Demonstrations: battery electric and hydrogen fuel cell trucks | **20 Jul** – **Siemens:** Solve hydrogen ecosystem challenges using system simulation | **17 Jun** – **Network-H2:** Hydrogen Transport Standards and Applications | **25 Jul** – **SEGEC, Scotland Europa & Innovate UK:** Horizon Europe Funding: Hydrogen and CCUS

Funding tracker

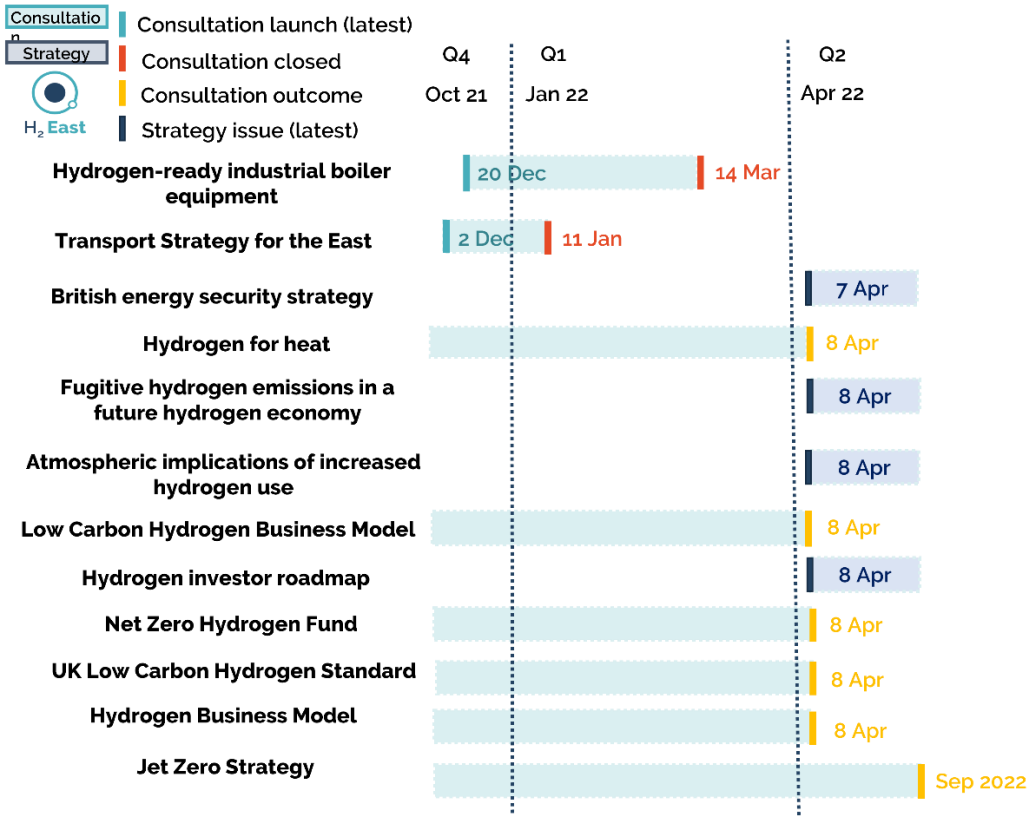
There are a number of funds available for developers, local authorities and innovative organisations. These cover both feasibility studies and demonstrator projects.

The application window for Strand 1 **Net Zero Hydrogen Fund** closed on 23 June and Strand 2 will close on 13 July, This is the primary area of government funding for hydrogen projects in the near-term, with up to £240mn on offer.



Policy tracker

The government has launched a number of strategies and published a number of consultation outcomes on 8 April 2022, outlined below.



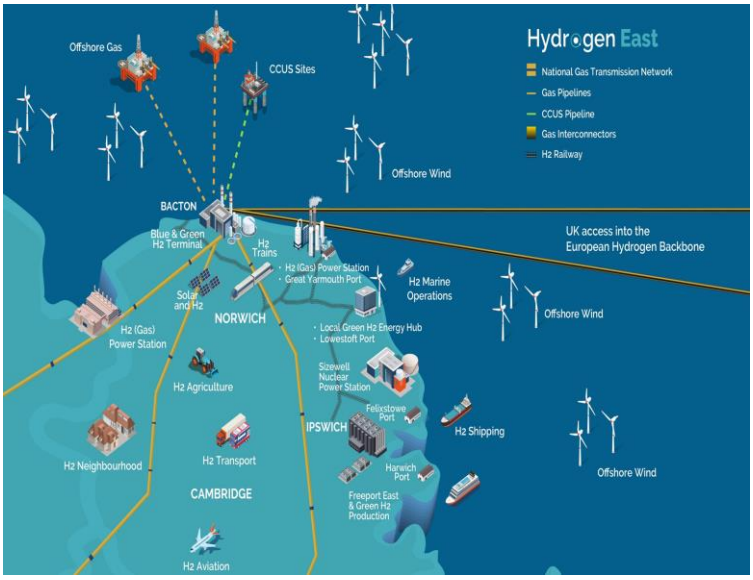
Vision unveiled for first-of-its-kind hydrogen cluster

As hydrogen looks set to play a key part in the government's policies for delivering net zero by 2050, the East of England is aiming to take a central role through a first-of-its-kind hydrogen cluster centred on core electrolyser projects.

In late June, Hydrogen East unveiled a vision for what this cluster may look like, detailing how Norfolk and Suffolk in particular have the credentials to make a substantial contribution when it comes to realising clean hydrogen's potential, achieving the aims of the Hydrogen Strategy and the increased ambitions as laid out in the Energy Security Strategy, published earlier this year.

Figure 1: Hydrogen East's vision for clean hydrogen cluster in the East of England

(Source: Hydrogen East)



The east's hydrogen capabilities have already been discussed in Westminster, notably when Peter Aldous, MP for Waveney, delivered a speech during a debate on "The Future Hydrogen Economy" on 14 June.

Aldous said: "Whilst I understand the rationale behind the government's cluster-driven approach to the hydrogen economy, the regulatory framework must be sufficiently flexible to ensure that smaller scale projects in decentralised areas like the East of England are able to realise their full potential."

Aldous emphasised that East Anglia has a "real opportunity to be a major producer, user and exporter of hydrogen."

Going on to list some of the notable characteristics of the region, Aldous noted "an abundance of resources, infrastructure – both on land and at sea – that can be readily retrofitted, and developers keen to step up to the plate, provided that the right policies are in place." This is key, continued Aldous, as that way not only can the East of England realise its decarbonisation goals but also create "new and exciting" jobs for local people.

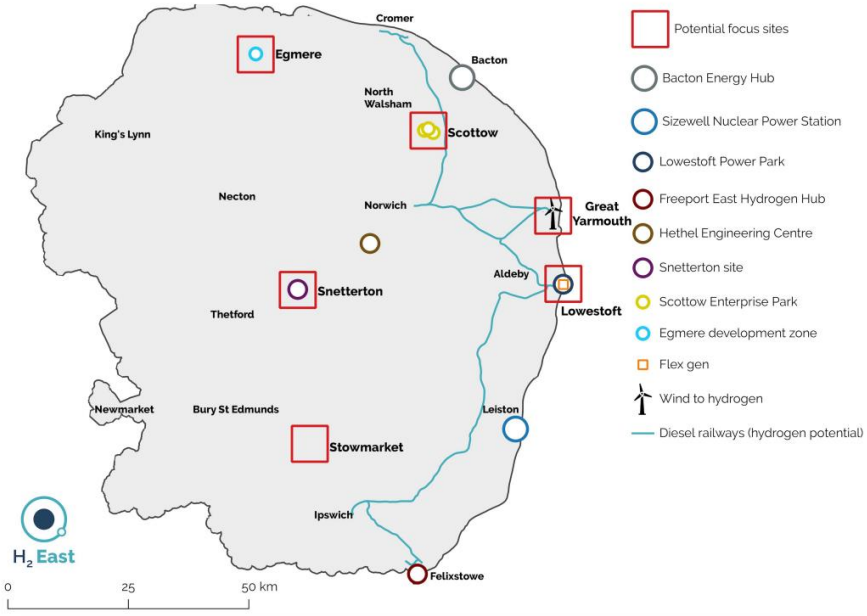
The Local Industrial Strategy has already signalled the region's aspirations to become the UK's Clean Growth Region, while energy giants, including the likes of ScottishPower Renewables and Vattenfall, have received the green light for projects in the offshore wind sector. There is also, of course, new nuclear under development from EDF at Sizewell C.

All of these are set to deliver a wealth of opportunities, investment and further energy integration to the region.

Now, Hydrogen East is striving to lead the development of a clean hydrogen cluster in the East of England. This will strengthen the foundation of an attractive region, already primed and ready for the development of diverse hydrogen projects.

Figure 2: Hydrogen East and potential selected hydrogen projects in Norfolk and Suffolk

(Source: Hydrogen East)



The initial plan, as outlined in the proposal, is for six "core" electrolyser sites across Norfolk and Suffolk. This will then pave the way for further development and improved infrastructure to be implemented, before being further scaled as the demand for clean hydrogen grows.

Nigel Cornwall, Director for Hydrogen East, said: "Hydrogen is such a versatile element and, with the ability to be deployed across a variety of sectors, we should be looking to it as a powerful tool that can aid us in the transition to Net Zero.

"It should be considered as a complement to electrification and increased roll-out of renewable generation. Already, a number of demonstrator projects are on-going around the country testing hydrogen for heat, power and transport in regions such as Aberdeen and Teesside. Here in the east, we need to establish our hydrogen pathway in a way that aligns with its distinct characteristics, including pathways into nuclear power, offshore wind and major energy hubs like Bacton."

Andy Holyland, General Manager for Hydrogen East, further drew on how the East of England has always been a key contributor when it comes to delivering the UK's energy requirements, with the integration of hydrogen set to only further bolster this position, providing energy flexibility and security.

Discussing what a proactive hydrogen cluster in the east could deliver, Holyland explained: "Through analysis of local assets and data and continued engagement with local stakeholders, a cluster could identify opportunities whereby concept designs illustrating viability can be produced. Supply and demand could be balanced and add real value. In addition, projects will be de-risked through the establishment of multi-stakeholder collaboration, engineering studies and demonstration projects. Cluster commitments and guidance would support further research, developing business models, raising investment and sourcing appropriate funding. Through the clean hydrogen cluster, the hydrogen economy could be scaled and grown over time to maximise potential and build bespoke energy networks."

Developing a hydrogen cluster could create "touchpoints" with a variety of sectors, supply chains and organisation types, enabling the East of England to lead the way and not accept the prospect of being "an adopter of second or third generation technology and assets".

Hydrogen East would like to invite anyone interested in joining a consortium to contact us and explore how our vision for the East of England can align with your organisation. If interested, contact Andy Holyland on andy.holyland@netzeroeast.uk.

UK launches first ever carbon storage licensing round

The North Sea Transition Authority (NSTA) has launched the UK's first ever carbon storage licensing round.

On 14 June, the NSTA announced that 13 areas of potential have been made available through the round. These areas included here are off the coast of Aberdeen, Teesside, Liverpool and Lincolnshire in the Southern North Sea, Central North Sea, Northern North Sea and East Irish Sea. They involve a mix of saline aquifers and depleted oil and gas field storage opportunities. Alongside the six already issued, they have the ability to make a substantial contribution to the goal of storing 20-30mn tonnes of carbon dioxide by 2030.

The six carbon storage licenses already on the UK Continental Shelf could meet up to a fifth of storage needs, assuming they hit their maximum potential of up to 40mn tonnes per annum injection rates by the mid-2030s. The capacity estimates of the areas being offered in this round carry uncertainty at this stage but do offer the potential to make a very significant contribution to the decarbonisation of the UK, according to the NSTA.

The round is envisaged as being the first of many, with up to 100 CO2 stores potentially needed for net zero to be reached by 2050. It has been launched as a response to "unprecedented levels of interest" from companies eager to enter the market. The areas up for grabs feature a combination of attributes, including the right geological conditions, proximity to existing infrastructure which could be repurposed, and links to industrial clusters targeting carbon storage as a way of meeting their decarbonisation goals.

In selecting the areas to be made available for licensing, the NSTA considered issues such as co-location with offshore wind, whether there are known challenges and mitigations around existing or future offshore wind developments, environmental issues, potential overlaps with existing or future petroleum licenses, and other activities to ensure that key technologies can be taken forward.

The application window is set to run for 90 days, closing on 13 September. The NSTA will then make evaluations based on technical and financial criteria, ahead of new licenses being awarded in early 2023. The size and scale of the licensed stores will mean they are likely to proceed at different paces. The first injection of CO2 could come as early as four to six years after the licence award.

What does the CCC's Progress Report say on hydrogen?

The Climate Change Committee (CCC) has now published its assessment of the UK's climate progress, uncovering "major failures" in delivery programmes towards the achievement of the UK's climate goals.

Releasing the report on 29 June, the CCC noted how last year it had praised the government for setting ambitious targets and launching a new Net Zero Strategy. With policies now in place for most sectors of the economy, it revealed that following a "thorough review of progress", it has uncovered "scant evidence" of delivery against the UK's headline goals thus far. It noted strong progress in the deployment of renewable electricity and electric cars, though cited energy efficiency in homes and agriculture and land use to be among the weakest areas.

Overall, it found the current strategy will not deliver net zero. While credible plans exist for a third of the UK's required emissions reductions to hit the Sixth Carbon Budget in the mid-2030s, and a further quarter can feasibly be reached, a third cannot be relied upon to deliver the necessary reductions. The government should look to develop contingency plans to deal with risks to delivery and make efforts to tackle skills gaps and potential planning consent barriers for infrastructure early.

Throughout the 600-page assessment, hydrogen features, most prominently in sections on fuel supply and manufacturing. The fuel supply chapter notes fossil fuel supply emissions have decreased 3% a year, on average, since 1990, though this has been driven primarily by the decline of activity in fossil fuel extraction, not active efforts to decarbonise the sector. It also identified risks to delivery in policies put forward in the Net Zero Strategy.

With the government ramping up ambition for hydrogen in the Energy Security Strategy – 10GW of production by 2030, up from 5GW, with at least half from electrolysers – it noted the future mix of hydrogen supply remains uncertain. Prospects for hydrogen from fossil fuel gas with carbon capture and storage (CCS), for example, are dependent on a relatively quick return to more moderate international gas prices. On green hydrogen, meanwhile, question marks remain as to whether it could fill the gap sufficiently by 2030 if blue hydrogen is unable to be delivered at scale.

Considering the nascent state of the hydrogen sector and the fact increasing demand for electrolysers in the UK will require an acceleration of the development of the electrolyser supply chain, strong government policy support is needed to provide additional funding, ensuring that mechanisms will be in place to deliver hydrogen production at both the necessary pace and scale. This is especially as market signals for investment will likely be weak while hydrogen demand is gradually established across different sectors.

Hydrogen also features in the CCC's chapter on buildings, where it highlights the steps being taken by the UK and devolved governments to evaluate the potential of hydrogen as an energy source for buildings. Up to £300mn has been committed until 2024 on various pilot programmes and innovation schemes for hydrogen, ahead of a decision being taken on its role in buildings by 2026, while it also noted work across the devolved nations, such as the Scottish government's Hydrogen Action Plan and ongoing support for H100 Fife.

It did also point out several recommendations made previously that have not been sufficiently addressed in the past year, including requirements for all new gas boilers to be hydrogen ready by 2025. This has not been put in place, despite the value of such an initiative being recognised within the Heat and Buildings Strategy.

As previously mentioned, manufacturing and construction is the other chapter where hydrogen features prominently, particularly when it comes to fuel switching.

With manufacturing and construction sites contributing 14% of UK emissions in 2020, the government has increased its medium-term ambition with clear policy plans, though the CCC found these to be unlikely to deliver its ambition and also noted signs that delivery timelines are starting to slip.

On fuel switching, it outlined how government has consulted on its hydrogen business model which should help incentivise its production and, as a result, encourage use of hydrogen in manufacturing and construction. There will also be a need for additional supporting policies to ensure this. For example, it noted no clear plan for hydrogen infrastructure, especially for dispersed sites, while considering the government's intention to finalise its hydrogen business model in 2022 and allocate first support contracts for production projects reaching final investment decisions from 2023, further detail is lacking.

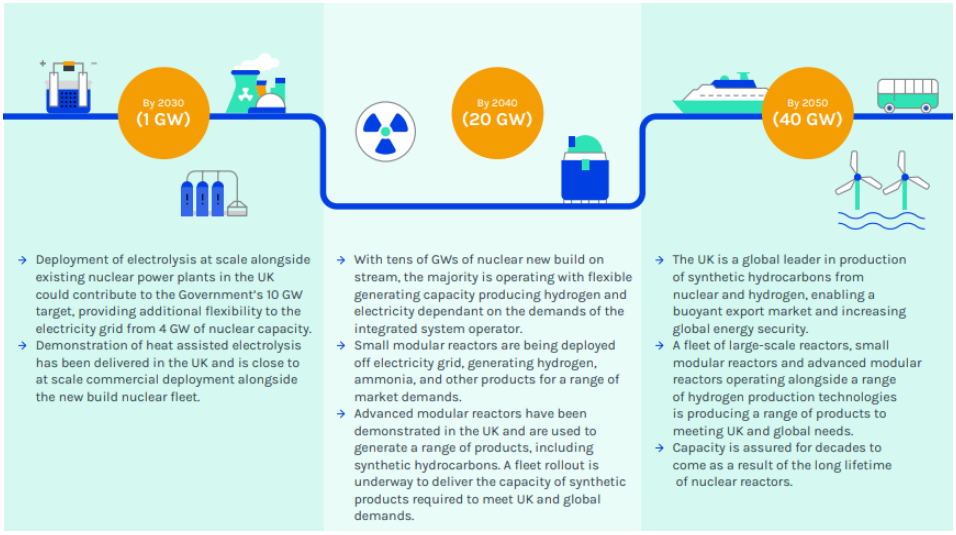
It went on to make a series of recommendations, stressing government must finalise the design of the hydrogen business model and Industrial Decarbonisation and Hydrogen Revenue Scheme in 2022, ensuring that the policy does not create an unlevel playing field for industrial electrification in the medium-term.

Government urged to empower nuclear enabled hydrogen

Nuclear enabled hydrogen (NEH) has considerable potential, though decisive and early government action is needed to realise it, a report has said.

Figure 3: A vision for Nuclear-Enabled Hydrogen roll-out in the UK

(Source: UK Hydrogen and Fuel Cell Association (UK HFCA))



On 7 June, the UK HFCA published a paper, calling for government to use legislation, financial backing and make more nuclear sites available to support NEH's potential and allow it to become a future energy player in the delivery of net zero.

It set out how 3GW of nuclear power paired with today's technology could meet 22.5% of the government's 10GW low carbon hydrogen target for 2030. It could heat 1mn homes with low carbon hydrogen, remove over 10% of all UK aviation emissions, decarbonise 50% of UK shipping emissions, deliver 10% of 2050 predicted hydrogen demand, fuel 40,000 hydrogen buses, and created 25,000 high value jobs.

It highlighted forecasts from the National Nuclear Laboratory that cost reductions for nuclear energy will rapidly make NEH cost competitive with renewables enabled hydrogen. By securing another low-cost energy input for low carbon hydrogen, it will mean the 2030 target can not only be met but can be done so affordably.

The co-location of NEH with industrial clusters could also bring strong synergies between the nuclear electricity generation and the industries that are served by the cluster, while there are roles for NEH in providing fuel cells for surface transport, decarbonising the gas grid, providing ammonia for shipping and synthetic aviation fuels.

Looking ahead, with 24GW of nuclear power now being targeted as coming online by 2050, the report called for decisive early action. With projects reaching final investment decisions each year until 2030, the role for nuclear enabled hydrogen in these proposed plants must be considered today and decided on in the near future.

It called on government to ensure more sites are made available for nuclear and allow more operator organisations in the UK to meet this need. Sites previously identified as having the potential for nuclear could provide up to 90% of 2050 zero carbon hydrogen demand, though this could be challenging for just one operator, with the UK HFCA expressing the need to ensure the UK has enough domestic organisations that can operate NEH facilities.

It should also look to promote the use of NEH in industrial clusters, considering the unique synergies nuclear enabled hydrogen can offer to the UK's hydrogen plans in this area, and extend all incentives associated with low carbon hydrogen to include NEH in their scope.

Fully decarbonised 2035 power system needs green hydrogen

RenewableUK has called for the UK to harness the power of new technologies, including creating new markets for the likes of green hydrogen, on a pathway to realising a fully decarbonised power system by 2035.

On 22 June, it published a roadmap for net zero, calling on government to accelerate the pace and scale of decarbonisation dramatically, cutting the UK's exposure to surging gas costs by maximising the benefits of the cheapest sources of renewable power and developing a new green hydrogen industry. To deliver a completely decarbonised power system by 2035, the current market framework must evolve to deliver the pace of deployment required; the way the energy system is planned and regulated must be transformed; and barriers to the development of strategic infrastructure overcome.

Part of the industry's vision for this is a green hydrogen revolution, with RenewableUK detailing how the diversity of applications and scales, such as in transport and industry, makes the creation of secure, low-cost supplies of green hydrogen a "no-regrets" option for government in the development of a hydrogen economy. Developing a hydrogen economy will also create benefits for a decarbonised power system through offering opportunities for offtake from renewable power production, leading to energy system flexibility and inter-seasonal storage.

It further cited research from the Offshore Renewable Energy Catapult, which expects significant cost reduction for renewable hydrogen by 2030, with it proving at least as competitive, or even costing less to produce than blue hydrogen. This is a trend that has been accelerated because of the current gas price spike. Accelerated deployment of electrolysis, as well as targeted research and development, and demonstration projects and technology validation at a large-scale can drive cost reductions. The UK must now develop the right framework to drive down costs and upscale production rapidly over the 2020s.

Therefore, building on the Hydrogen and Energy Security strategies, there are a number of targeted policy and regulatory actions that can be taken to put the UK at the forefront of capturing global opportunities from green hydrogen, include ensuring funding is provided to support innovation in design and manufacturing of electrolyser systems; defining a zero carbon hydrogen standard; and tailoring the Hydrogen Business Model to support green hydrogen production at different scales, including exemption from levies.

Hydrogen dual fuel set for construction sector

A world first project is set to bring hydrogen dual fuel to the construction sector.

On 8 June, ULEMCo announced that it is working with Cementation Skanska and the Building Research Establishment (BRE) on a project that will produce and evaluate a dual-fuel hydrogen and diesel piling machine. ZECHER – Zero Carbon Hydrogen Construction Equipment for Real-world use – will provide a proof of concept for converting on-site construction equipment, delivering a physical conversion of the piling rig, while exploring the potential of hydrogen fuel for construction site decarbonisation.

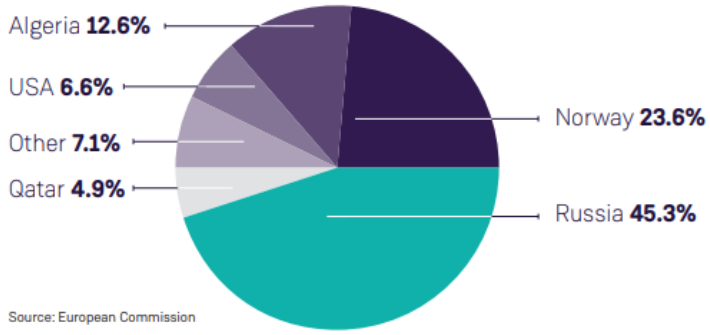
Findings from this test will be used to explore the opportunities for using hydrogen to reduce carbon and significantly improve air quality for a range of heavy-duty, non-road machinery that is typically used during the early stages of large infrastructure construction projects. The project, which has been backed by government funding through the first phase of the Red Diesel Replacement programme, will examine the range of equipment used at a construction site, create detailed energy use and duty cycle data, and investigate the requirements and options for addressing the challenges of providing hydrogen at scale, across the UK.

Green hydrogen can be European energy security "backbone"

Renewable energy and green hydrogen can serve as the backbone for a decarbonised and more secure European energy supply, according to Siemens Gamesa.

Figure 4: Share in EU natural gas imports, 2021

(Source European Commission)



Launching a paper on 7 June, Siemens laid out how clean, affordable and domestically produced renewable energy and green hydrogen will be of "pivotal importance" in guaranteeing Europe's energy security. With Europe having grown increasingly dependent on imported fossil fuels, its economies and societies have become increasingly susceptible to political uncertainty, as evidenced now in light of Russia's invasion of Ukraine.

A shift to a secure regional energy supply based on renewables will leave Europe less vulnerable to supply and pricing fluctuations; unlock the full potential of a green socio-economic shift as renewable production scales up, including 160,000 new green jobs in the EU construction industry alone by 2030; realign its international energy partnerships by sharing its expertise with nations building up their own renewable sector; and create new market forces to encourage economies based on producing and exporting fossil fuels to accelerate their own transition to net zero through adopting renewable energy.

It will also help to achieve Europe's industrial ambitions in a net zero compatible way with greater access to renewable energy at scale for the production of green hydrogen to power hard-to-electrify sectors.

Indeed, green hydrogen was highlighted as being the only viable option to reduce emissions from industries such as fertilisers, cement, iron and steel. There is also a potential energy storage role for green hydrogen too, considering stored natural gas nowadays is used to balance grids powered by renewables.

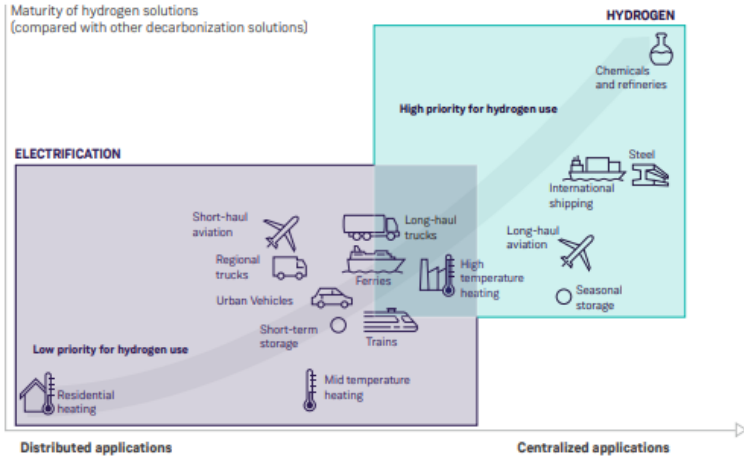
In the medium-term, this can be switched for green hydrogen, serving the same purpose, albeit in a cleaner, more competitive way.

When green hydrogen scales, the end users are expected to be the same heavy industries that are responsible for large volumes of today's emissions.

There are also potential new markets for green hydrogen-based fuels in heavy transportation, shipping and aviation.

Figure 5: Green hydrogen use cases

(Source: IRENA)



Ammonia, for example, is mainly used as fertiliser today, but can be a fuel for heavy transportation in future, making a key contribution in food production and logistics.

Then there's the steel industry, which accounts for around 8% of total emissions and is unlikely to see a fall in demand, given its importance for wind turbines, nacelles, cars, large appliances, buildings and more. Therefore, replacing fossil fuels with green hydrogen as its energy source for production would secure supply and help avoid disruptions to the wider supply chain.

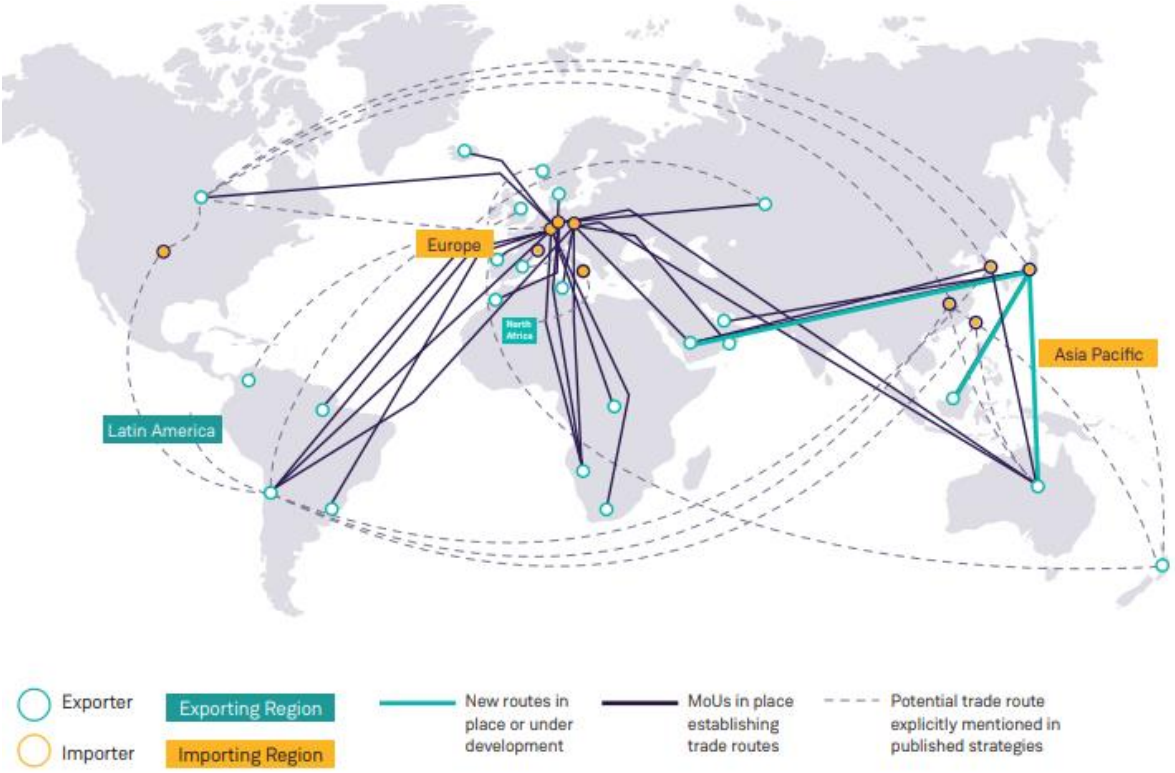
It stressed that as with renewables and wind, the EU can lead the green hydrogen revolution on a global scale by sharing the experience, knowledge, best practice and proof points in partnership with other regions.

However, action is needed to realise the benefits of a secure energy supply based on renewables and green hydrogen, with the paper setting out a series of recommendations, including speeding up the permitting process, especially for gigawatt-scale wind power plants, as a means of increasing the volume of renewable energy produced in Europe.

It also called for existing hydrogen infrastructure to be improved, making it compatible with not only regionally produced green hydrogen, but also imported green hydrogen to support demand; to innovate storage solutions and technologies to optimise how renewable energy is stored in order to guarantee continuity of supply; to introduce legislative and regulatory tools to create a market in which EU-generated green hydrogen and its by-products are guaranteed to be cost comparable with fossil fuel based imports, while fostering the open and fair trade of global renewable energy supply chains. It also made the case for collaboration across industries to scale up the production of electrolysers, supported by investments in research and development to improve reliability, output and distribution

Figure 6: An expanding network of hydrogen trade routes, plans and agreements (up to date to January 2022, with additional MoUs having since been announced)

(Source: IRENA)



New tool set to maximise infrastructure repurposing

The North Sea Transition Authority (NSTA) has unveiled a screening tool to help maximise the repurposing of oil and gas infrastructure for energy transition projects.

On 21 June, the NSTA announced that 20 companies operating a total of 120 fields, nearing or reaching the end of their production lives, will receive the tool initially. They will use it to identify which pieces of kit could be repurposed, with the process adding structure and consistency to the assessment of North Sea repurposing potential, helping industry to make the most of opportunities. Where there are no realistic alternatives, it will ensure that decommissioning work can progress without unnecessary delays.

With repurposing able to make a huge contribution to the UK's drive to net zero, it can potentially generate multibillion-pound savings across carbon capture and storage (CCS) and hydrogen schemes which, otherwise, would require all new equipment.

It noted initial analysis as suggesting opportunities for repurposing platform topsides, jackets and subsea systems for decarbonisation projects will likely be limited, whereas removal and onshore dismantling, or cleaning up and leaving in-situ are set to be the right option for most infrastructure once production draws to a close.

Pipelines, instead, are considered "the real prize" and are being prioritised. The NSTA noted that according to its analysis, more than 100 could be suitable for CCS or hydrogen projects and that finding a new life for just half of these could generate estimated savings of around £7bn. Repurposing assets would also reduce decommissioning costs.

RWE and SGN join forces for domestic heat green hydrogen partnership

RWE and SGN are set to supply Scottish towns and rural communities with sustainable hydrogen gas through a new partnership.

On 14 June, SGN announced that a Memorandum of Understanding (MoU) had been signed between itself and RWE. This will see them investigate the development of electrolysers, powered by RWE's 10 onshore windfarms in Scotland which boast a combined capacity of 213MW, to supply homes and businesses with hydrogen through Scotland's gas network.

Specifically, the partnership will be looking into decarbonising homes and businesses connected to the networks of Campbeltown, Stornoway, Oban, Thurso and Wick, which are connected to the mains gas network and currently supplied by LNG and LPG. When swapped with hydrogen, this could save 21,000 tonnes of carbon each year, potentially decarbonising as many as 9,500 properties.

It will look to define just how much hydrogen is needed, the requirements to convert these networks over to hydrogen, and the supply of green electrolytic hydrogen from RWE's nearby onshore wind farms. In doing so, the project could also unlock onshore wind farm developments in grid-constrained areas, offering a use for the green power generated.

The coming months will also see a feasibility study carried out into a 100MW electrolyser at RWE's Markinch CHP biomass plant. This could produce green hydrogen from local and grid connected renewable energy, connecting into SGN's gas network in Fife, building on the work already underway in Levenmouth as part of its H100 Fife project.

The knowledge and experience gained from these studies will allow for a better understanding of the practicalities and economics of the entire hydrogen cycle. According to SGN, it will be an important precursor to a potential funding application under the Net Zero Hydrogen Fund.

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