Hydrogen East

H2 News Hub

Issue 16

H2 East

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Top stories

Welcome to issue 16 of **Hydrogen East**'s Sector Review, where we take a look at important publications and developments over the month of February (2022).

In its Norfolk & Suffolk Economic Strategy, **New Anglia LEP** sets out an "ambitious blueprint for the UK's clean growth region" and explores emerging opportunities for hydrogen. It includes a pledge to work with Hydrogen East to deliver a viable route map for Norfolk and Suffolk to become a leading hydrogen region.

Delta-EE published a whitepaper on how 2022 can be the year that green hydrogen ambition becomes reality in Europe, explaining that the decisions made by national governments and regulators on green hydrogen this year will be crucial to determining its rate of growth from 2023.

Sticking with Europe, the **Ready4H2** alliance released a report, exploring the value of local hydrogen distribution networks in a decarbonised Europe. It stresses that local gas networks can not only enable a substantial hydrogen market, but also play an essential role in helping the continent to meet its ambitious climate targets.

Through **Vertex Hydrogen** – the joint venture between Progressive Energy and Essar – a report has been unveiled, detailing the design and development of the UK's first large-scale low carbon hydrogen production plant, which is set to sit at the heart of **HyNet North West**.

Contents

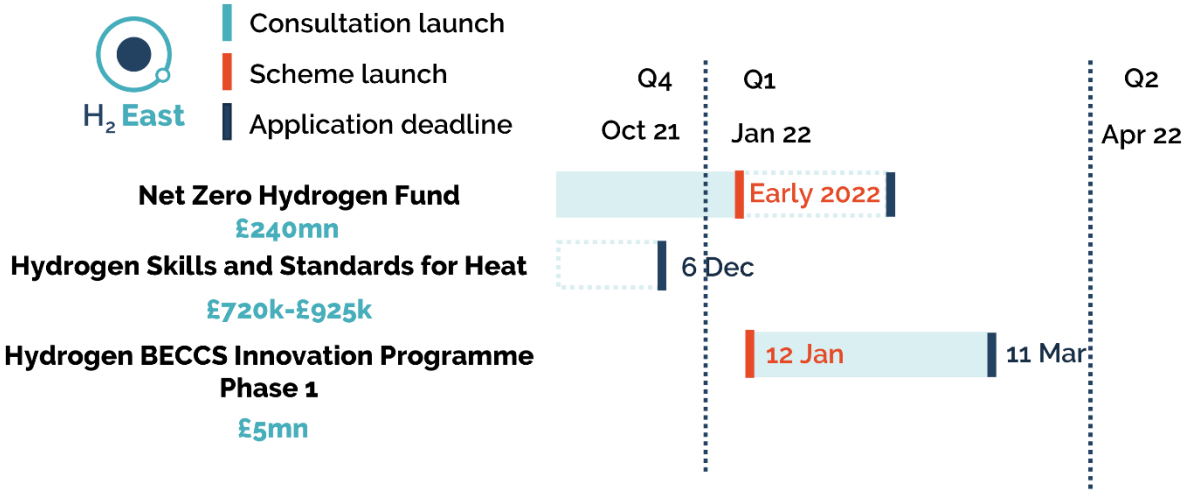
Upcoming webinars

8 Mar – **BEIS**: Industrial Hydrogen Accelerator Programme Engagement Session | **11 Mar** – **ITEG:** Clean Energy Pathways & Next Generation Hydrogen Valleys | **15 Mar** – **H2 View:** Virtual Hydrogen Summit Europe 2022 | **18 Mar** – **Network H2 Webinar:** Hydrogen engines and multi-modal applications | **29 Mar** – **HyStorPor:** Increasing confidence for hydrogen storage in porous rocks | **30-31 Mar** – **IMechE:** Engineering Challenges in the Hydrogen Economy

Funding tracker

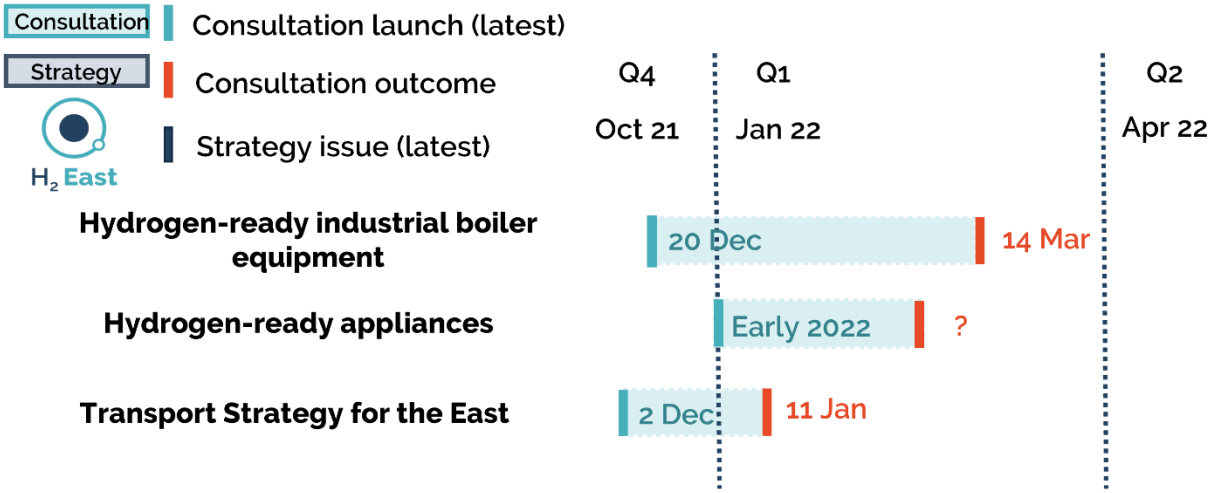
There are a number of funds already available for developers, local authorities and innovative organisations. These cover both feasibility studies and demonstrator projects.

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 has opened a number of consultations, outlined below.

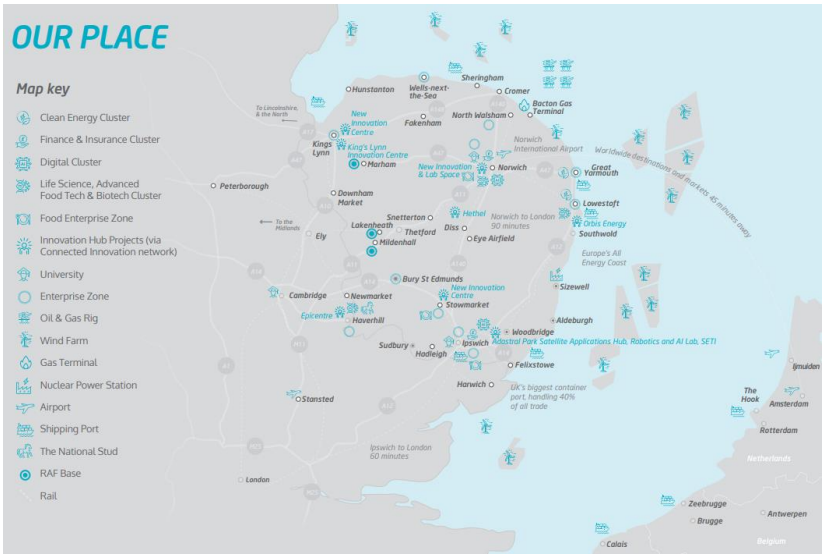


Hydrogen part of Norfolk-Suffolk economic approach

Clear investable hydrogen proposals being developed with investment secured are among the measures of success for a new *Norfolk & Suffolk Economic Strategy*.

Figure 1: An overview of Norfolk and Suffolk and assets located in both counties

(Source: New Anglia LEP)



[Launched](#) by New Anglia Local Enterprise Partnership (LEP), the strategy – an "ambitious blueprint for the UK's clean growth region" – sets out a vision of Norfolk and Suffolk becoming a centre for the UK's clean energy sector, exploiting the strength and diversity of their energy sector and supply chain, strategic location, skills base and connectivity to other regions. It focuses on actions needed over the next three to five years, as it looks to accelerate Norfolk and Suffolk's transition to a zero-carbon economy and upskill the workforce for inclusive growth, though notes it is looking to 2036.

Delving into the potential of the area, it mapped out how Norfolk and Suffolk are the UK's epicentre for energy generation, owed to its unique mix of onshore and offshore renewables, gas and nuclear, and emerging opportunities for hydrogen. Hydrogen crops up throughout the plan, with specific reference made to how Norfolk and Suffolk are the UK's leading producer of clean energy and at the forefront of the Southern North Sea transition, with thriving bioenergy, hydrogen and energy storage industries.

On the Southern North Sea, it noted that it is the UK's natural gas basin, with a third of the UK's domestic gas requirements handled at Bacton Gas Terminal. Both the Oil and Gas Authority and Hydrogen East have highlighted the potential of Bacton to become a significant hydrogen production site for London and the South East in recent reports, stimulating local markets for clean transport solutions and decarbonising the regional economy. It is pledging to work with Hydrogen East to deliver a viable route map for Norfolk and Suffolk to become a leading hydrogen region, maximising the opportunities at Bacton, as well as Sizewell C and Freeport East, among other aims.

It is further pledging to deliver new, and adapt existing infrastructure to ensure it is flexible, resilient and sustainable, supporting people, businesses and places, with this involving building on the area's strengths and expertise in clean energy, AI and emerging opportunities in hydrogen, alongside businesses such as Lotus and Anglian Water, while an Alternative Fuel Strategy and action plan is in development with Cambridgeshire and Peterborough Combined Authority. It cited clear investable hydrogen proposals being developed and having investment secured as one of its measures for success.

Green light for Lowestoft PowerPark hydrogen project

Conrad Energy has been granted planning consent for a 3MW project of three hydrogen electrolysers and associated storage at Lowestoft PowerPark.

Announcing that it had been given the green light by East Suffolk Council, Conrad outlined how the project – powered by clean electricity – will have the potential to produce up to 470 tonnes of hydrogen per year. This will be enough to heat the equivalent of 1,500 average homes, or power 60 hydrogen fuelled HGVs, travelling 50,000 miles per year. The only emissions will be oxygen, with Conrad Energy already exploring how this could be used in commercial applications. Construction has commenced on a 7MW flexible generation site that forms part of the proposal and will bring grid stability to the wider Lowestoft area at times of high demand and grid stress. It highlighted how the area is a "great choice" for a pioneering hydrogen development, citing its close proximity to essential infrastructure and businesses in the local area that could benefit from the hydrogen it produces.

It noted this potential had been assessed by Hydrogen East in a feasibility study, published in December 2021, which sought to explore and establish the viability of developing a smart local energy system in the land between the Port of Lowestoft and England's most easterly point, Ness Point, which had been suggested as the location for redevelopment into the Lowestoft PowerPark. A key objective of this study was to understand energy development opportunities in and around the site, with specific reference to green hydrogen.

It found that the PowerPark has the right conditions to help support better integration of local energy production and consumption, including green hydrogen. This would need to be based mainly on grid imports in the short-term, potentially supplemented by production and development of local PV solar from the Gulliver wind turbine. It would support an early opportunity for the development of at least an initial 2.5-5MW electrolyser stack in the PowerPark area, with good land availability and several attractive sites within, or close to, the site for both hydrogen and solar development. It also found scope to scale projects quickly in the event that a wider regional market in green hydrogen develops.

The study went on to map out potential demand and use cases that exist locally, listing First Bus conversion; port operations; a switch of RCVs by East Suffolk Council; HGVs to and from the Port of Lowestoft; and the conversion of the East Suffolk, Wherry and Bittern rail lines all as possibilities. The potential local demand of hydrogen was conservatively estimated at 700kg per day by 2025, rising to 1,500kg by 2030 and 4,800kg by 2035. Using load factor assumptions at 50%, up to 3.4MW of electrolyser capacity could be supported by 2025, 6.9MW by 2030 and 22.2MW by 2035.

2021 a record year for newly opened hydrogen refuelling stations

Last year (2021) saw more hydrogen refuelling stations "than ever before" begin operating, according to H2Stations.

On 1 February, it published its latest annual assessment, where it revealed that 142 hydrogen refuelling stations went into operation worldwide – 37 in Europe, 89 in Asia, and 13 in North America. It now means there are 685 refuelling stations operating worldwide, with concrete plans in place for a further 252 – Spain and New Zealand are among those to announce such plans for the first time. Hungary and Slovenia, meanwhile, became new countries to offer hydrogen refuelling facilities in 2021, taking the total to 33 countries.

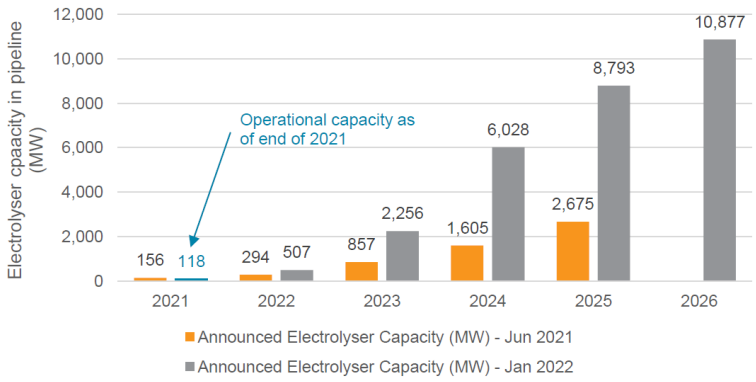
As of the end of 2021, there are now 228 hydrogen refuelling stations in Europe. Germany has the most (101), followed by France (41), the UK (19), Switzerland (12) and the Netherlands (11).

2022 can see green hydrogen ambition become reality

For the green hydrogen sector in Europe, 2022 is set to be "the year that really counts", where important decisions are made, to allow 2023 to be a "real take off", a paper has said.

Figure 2: Cumulative announced electrolyser capacity, Europe, comparing Delta-EE's project pipeline (Jun 2021 and Jan 2022)

(Source: Delta-EE)



On 10 February, Delta-EE published a whitepaper, exploring the viability of reaching the European Commission's target of 6GW of electrolyser capacity by 2024, setting out how the decisions made by national governments and regulators on green hydrogen in 2022 will be pivotal to determining its rate of growth from 2023 onwards.

As it stands, there is a disconnect between green hydrogen ambition and reality. While it has grown from being seen as a possible bit-part player to a likely pillar of the energy transition, the number of projects operational are small in number.

There were around 118MW of electrolysers in operation at the end of 2021 across Europe, equating to 0.02mn tonnes of green hydrogen. In contrast, Europe consumed over 8mn tonnes of grey hydrogen and 500mn tonnes of oil equivalent of natural gas last year, with the paper emphasising how green hydrogen is a new industry that must be built virtually from scratch.

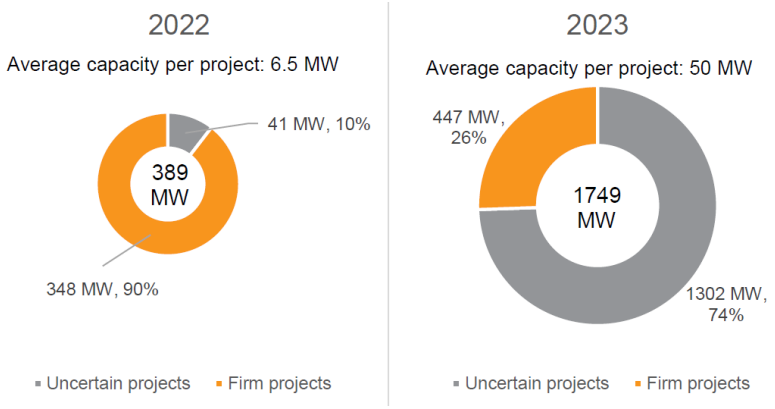
According to Delta-EE's Clean Hydrogen Projects Database, things are moving in the right direction as, just six months ago, it only foresaw 1.6GW of announced projects due to come online by the end of 2024. This has now grown to just over 6GW, meeting EU targets, and representing a 375% ramp up in announced capacity.

Despite this, there are no guarantees these projects will become operational, with those behind them needing clarity and security of policy support and subsidies to make final investment decisions (FID), neither of which currently exist.

Its project risking methodology grades projects against a series of metrics – have they gone through an FID, or been awarded public funding for construction, or signed offtake agreements? – to judge whether they are

Figure 3: Announced electrolyser capacity from "firm" and "uncertain" projects in 2022 and 2023

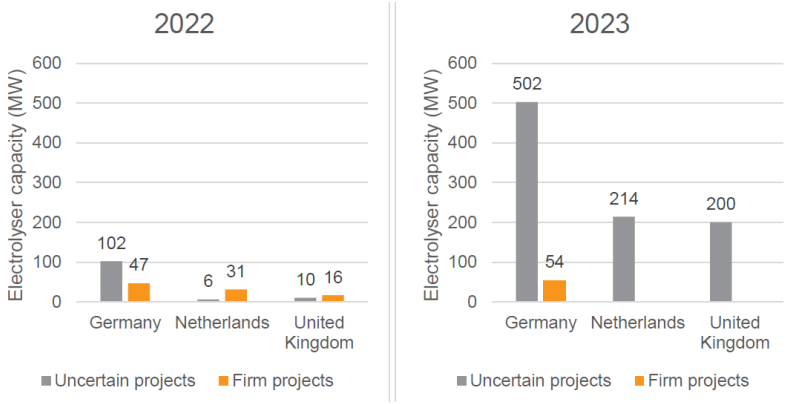
(Source: Delta-EE)



"firm" or "uncertain." While 90% of projects in 2022 were found to be firm, the picture for 2023 is very different at just 26%, with 1.3GW of capacity still deemed to be uncertain.

Figure 4: Announced electrolyser capacity in leading countries from "firm" and "uncertain" projects in 2022 and 2023

(Source: Delta-EE)



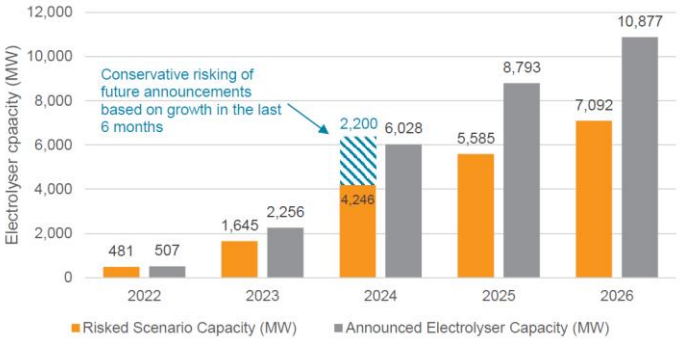
The average size of projects being announced is growing – 2.25MW in 2021, rising to an expected 50MW in 2023 – while the focus is also shifting, with a growing number aiming to sell competitive green hydrogen solutions to customers. The commercial competitiveness of these will be built on predictions from feasibility studies of what the future energy, policy and commercial environment could look like, meaning owners, operators and investors will likely wait until anticipated policy measures are finalised and implemented to reduce financial risk to an acceptable level, before making an FID.

Germany, the Netherlands and the UK account for 77% of the "uncertain" capacity announced for 2022 and 2023 – just over 1.3GW – which saw them singled out as three countries to watch. In particular, Germany and the UK have the clearest targeted policy timelines for green hydrogen.

Germany is planning to double its 2030 electrolysis capacity goal to 10GW in an update to its national hydrogen strategy, and the UK planning to have a standard for low carbon hydrogen and finalised hydrogen business model in place by the end of the year. Considering these, the flurry of activity at an EU level, and other nations, Delta-EE tipped 2022 to be a year where the political groundwork is laid to de-risk much larger projects expected for 2023, giving greater certainty for project organisers.

Figure 5: Cumulative electrolyser capacity, Europe, comparing Delta-EE's announced project pipeline as of Jan 2022 and our risked scenario based on announced projects

(Source: Delta-EE)



As it stands, Delta-EE's risked scenario sees a shortfall close to 1.8GW on announced projects by 2024, meaning the EU would miss out on its target. However, it noted this excludes any projects yet to be announced and could become operational for 2024, and with 4.4GW announced over the last six months, should similar growth be seen in 2022, the capacity becoming operational by the end of 2024 will exceed the EU's 6GW goal. It added that given the likelihood of positive announcements on national subsidies for green hydrogen in 2022, it believes meeting the 6GW target for 2024 is likely.

Feedback sought on proposed Industrial Hydrogen Accelerator Programme

The government has published plans for an Industrial Hydrogen Accelerator (IHA) Programme and is seeking feedback.

Releasing details on 28 February, it explained that the programme would provide funding for innovative projects that can demonstrate end-to-end industrial fuel switching to hydrogen, covering the entirety of the technology chain, spanning from hydrogen generation and delivery infrastructure through to industrial end-use. This would also include the integration of the components in a single project.

Demonstrations and feasibility studies would be funded through the competition. The studies would explore how systems could be designed, providing information on technical requirements and costs, while demonstration projects would construct end-to-end industrial hydrogen systems, proving their feasibility and providing evidence of real-world performance and cost. A potential design of the programme, though subject to change, would see three streams – 1, 2A and 2B. Stream 1 would be a grant funding competition for demonstration projects, aiming to open in April 2022, with applicants having to provide match funding, and projects expected to be of the order 1-10MW. Steam 2A would be an SBRI competition for feasibility studies, also aiming to open in April, with no match funding required at this point and winners then able to bid for a demonstration grant under Stream 2B.

Stream 2B, therefore, would also be a grant funding competition for demonstration projects where applicants will have to provide match funding. It would only be open to projects that completed feasibility studies in Stream 2A and once more, the government would expect projects to be of the order 1-10MW. The evidence gathered through the IHA on the use of hydrogen by industrial users will be used to help inform strategic decisions in 2026 on the role of low carbon hydrogen as a replacement for natural gas in the gas grid.

Expressions of interest are now being invited from those that wish to be kept up to date with developments regarding the IHA programme. The government stressed the announcement does not formally signify the beginning of a procurement, nor constitute a commitment from BEIS to undertake a procurement exercise, with a separate notice to be issued should this become the case.

For now, it is set to hold an online stakeholder engagement session on 8 March, allowing interested parties to find out more about the competition and provide feedback on the proposed programme design. The presentation from the event will be published online, allowing those unable to attend to provide their own feedback on the proposals.

Responses are invited by 18 March to the team at nzip.hydrogen@beis.gov.uk.

Off-road hydrogen championship set to be launched

An off-road hydrogen championship is set to be launched in 2024, marking a world-first for motorsport.

On 18 February, Extreme E – the existing electric racing series – confirmed Extreme H will sit alongside it, with the development of a prototype vehicle for the new championship already underway and set to be launched in early 2023. The car will use the same powertrain and chassis as is used in Extreme E but will use a hydrogen fuel cell as its primary energy source. The fuel cell will use green hydrogen, created using solar and water.

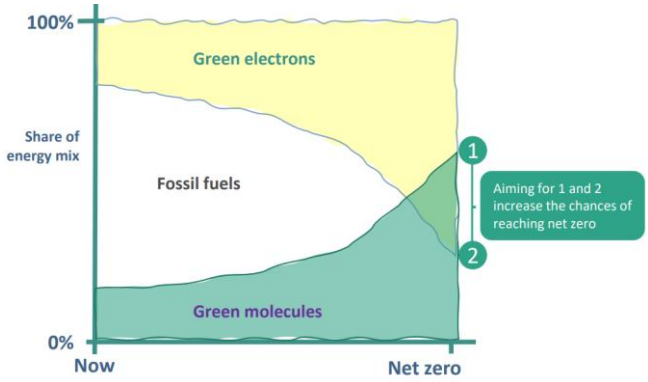
Extreme E already is using green hydrogen, alongside batteries, to power its paddock as one of several methods to keep its carbon footprint as low as possible. Others include using a refurbished ship for transporting the championship's freight and logistics equipment; using remote broadcast and digital streaming; and capping team personnel numbers.

Local gas networks set to be key to hydrogen and net zero

Local gas networks can enable a substantial hydrogen market and play an essential role in meeting Europe's climate targets, according to the Ready4H2 Alliance.

Figure 6: Illustrative net zero pathway

(Source: Ready4H2 Alliance)



On 15 February, Ready4H2 published a report, exploring the value of local hydrogen distribution networks in a decarbonised Europe. It stressed that a net zero Europe will need both green electrons and green molecules, with hydrogen and green methane playing a crucial role alongside energy efficiency and electrification. With local gas networks able to deliver reliable, cost-effective and safe pipeline distribution to millions of customers, it stated its belief they will also add value to address the challenges in achieving the huge growth and carbon reduction potential of hydrogen in Europe.

As wind and solar power grows rapidly, Europe's energy system will become increasingly reliant on non-dispatchable generation, meaning the impact of cloudy and windless winter weeks rises. Gas infrastructure will be key to managing these periods and can be repurposed to transport hydrogen from decentralised production to consumers and the European hydrogen market, strengthening the hydrogen supply chain.

It outlined how gas infrastructure can handle large seasonality in demand, ensuring reliable supply of hydrogen even in the coldest winters. Electricity infrastructure, in contrast, mostly deals with demand that is comparably flat over the course of the year, making heating electrification appear challenging. Large-scale hydrogen underground storage facilities linked to gas networks are the only fast-acting long-lasting storage capacity at enormous scale that can cope with variable power production and demand for gas among European consumers. Therefore, today's gas infrastructure, with some local changes, can meet peak demand for hydrogen and green methane, and become a pillar of sector integration.

Local gas networks, it explained, provide a flexible decarbonisation pathway for customers. They are well-positioned to distribute and manage varying local blends of molecules and well placed to convert relatively swiftly to adapt 100% hydrogen.

Furthermore, with 99% of industrial and commercial gas end-users connected to local gas networks, this makes them crucial in bringing the European hydrogen backbone to life and delivering large volumes of hydrogen to millions of customers. They will facilitate a competitive hydrogen market by connecting more users across Europe which, in turn, will help to keep industry in Europe. This is down to hydrogen being the most cost-effective decarbonisation option for local industry, meaning a local hydrogen network will reduce carbon leakage.

Specifically, its analysis found that in a decarbonisation scenario including significant volumes of hydrogen and green methane, investment in the combined power and gas infrastructure is forecast to save €41bn a year, in comparison to a power dominated one. This means a small additional investment in gas infrastructure can save tens of billions in power infrastructure development per year. It noted that local networks, both gas and power, will need investment to deliver these savings.

Green hydrogen partnership to rollout facilities across the UK

Octopus Hydrogen and BayWa r.e. have joined forces to collaborate on green hydrogen production facilities at renewable project sites throughout the UK.

On 10 February, Octopus Hydrogen announced that it had signed a Memorandum of Understanding (MoU) with BayWa, and will install electrolysers, compression and mobile hydrogen storage alongside selected solar and wind projects identified in BayWa's growing UK project pipeline. These will have the potential to produce up to 6,500kg of green hydrogen per day, with the first deliveries expected next year.

The green hydrogen produced will be stored, before being distributed to customer sites, offering an end-to-end hydrogen supply solution. This will support the decarbonisation of local sectors, including commercial transport.

Octopus Hydrogen noted it has new software which will optimise electrolyser usage, balancing the grid and driving efficiencies, with this optimisation a catalyst for new renewable capacity which, in turn, can reduce the UK's dependency on imported fossil gas, something driving the current energy crisis. The production facilities will be directly connected to onsite renewable energy generation, with around 30-40% of this directly consumed onsite by the electrolyser, leaving the remaining energy to be fed into the grid. This onsite hydrogen production helps to avoid potential curtailment of the renewable energy generation, owed to grid congestion.

Government explains approach to hydrogen-ready industrial boiler equipment

The government has explained its rationale for a call for evidence into enabling, or requiring, hydrogen-ready industrial boiler equipment.

At a webinar, held ahead of the deadline for responses on 14 March, it detailed how come 2030, industry is set to be the largest source of hydrogen demand. A range of 10-21TWh is anticipated, depending on whether hydrogen supply is limited to industrial clusters or not. This demand is set to prove vital for early development of the hydrogen economy.

The focus on industrial boilers specifically is because they could drive around 40-50% of this expected hydrogen demand from industry, with demand growing further if hydrogen becomes available nationwide. Under a cluster scenario, a switch to hydrogen for these boilers could abate 1.3MtCO2 per year, rising to 7.3MtCO2 in a national scenario. This would equate to 10% of industrial emissions in 2019. Boilers are also more standardised than other technologies. This makes them easier to target interventions, while considering hydrogen boiler technology is relatively advanced, it means they could be deployed at scale soon.

In terms of why "hydrogen-ready" is important, it set out how although hydrogen-ready equipment will involve higher upfront costs than conventional equipment, it will reduce costs for a conversion to hydrogen, increase the speed of converting to hydrogen, pull forward demand and increase cumulative carbon savings. There is a risk sites pay higher upfront costs and then do not fuel switch to hydrogen, however, it conceded.

It also highlighted some of the potential interventions the government could take, such as informing the market about the future cost and availability of hydrogen and comparable information for other ways to decarbonise; funding some, or all, of the premium for hydrogen-ready equipment, de-risking investment in higher upfront costs; defining what constitutes a hydrogen-ready boiler and encouraging voluntary deployment; and requiring new industrial boiler equipment to be hydrogen-ready, subject to potential exemptions.

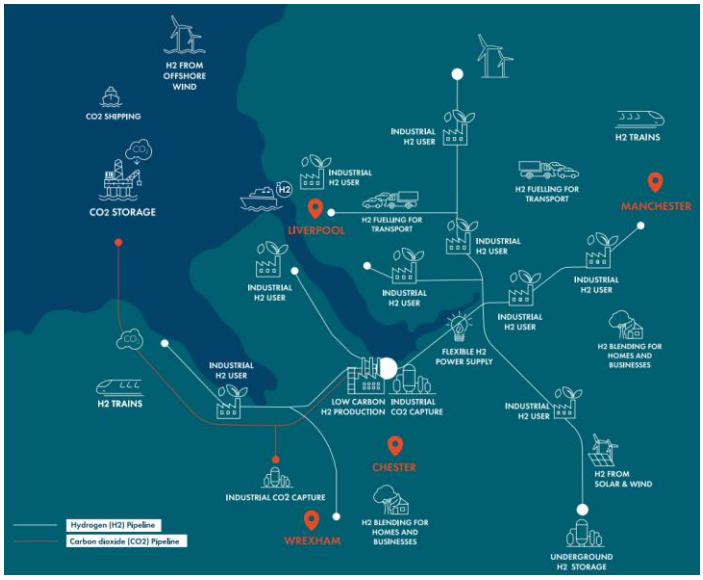
Responses to the call for evidence are invited until 23:45 on 14 March and can be sent either through the government website or by e-mailing hydrogen.industry@beis.gov.uk.

Report explores development of large-scale hydrogen plant

The UK's first ever large-scale low carbon hydrogen production hub will begin production in the mid-2020s, a report has set out.

Figure 7: HyNet North West overview

(Source: Vertex Hydrogen)



On 24 February, Vertex Hydrogen – the joint venture between Essar and Progressive Energy – published a paper, outlining the design and development process for a 1GW low carbon hydrogen production hub to decarbonise industry as part of the HyNet cluster. By 2030, the hub will deliver 30TWh of low carbon hydrogen production capacity, with its development set to progress through four stages, commencing with "Plant 1".

HyNet Hydrogen Production Plant 1 will be able to deliver 350MW of low carbon hydrogen by 2025 and has been developed to a FEED level of technical definition. All required external connections and utilities can be made available to the site at the Stanlow Manufacturing Complex – where it will be based – supporting the deployment of both Plants 1 and 2. Consenting has been progressed, with the consortium behind the project, which also includes Kent and Johnson Matthey, submitting a Hazardous Substances Consent application, Environmental Permit variation, and Planning Application, with a commercial programme of work underway to progress the necessary contractual negotiations to take place between now and a Final Investment Decision (FID).

Johnson Matthey's low carbon hydrogen technology will be used for HyNet hydrogen production, representing the "best in class" technology for high purity low carbon hydrogen production from natural gas. The report highlighted how it delivers over 85% thermal efficiency and around 97% carbon capture, representing a "substantial improvement" on the BEIS counterfactual plant. In comparison, Plant 1 will consume 20% less feedstock gas and emit 70% less CO2 for the same hydrogen output.

Co-location with the refinery within the Stanlow Manufacturing Complex underpins deliverability, it further set out, outlining how it is an established operational site with refined and proven frameworks and experienced staff to deliver well managed, safe operations. It unlocks opportunities and will help to manage risks. It sits at the heart of regional and national fuel supplies, making it well placed to unlock the transition towards low carbon energy distribution. It also highlighted appetite for private investment for both Hydrogen Production Plant 1 and 2, while stressing the need for a contracted support regime for Plant 1 in 2022, prior to an FID, to ensure delivery at pace.

Plant 2, meanwhile, can be deployed rapidly and cost effectively to increase HyNet production capacity to over 1GW by 2026. Furthermore, due to economies of scale and beneficial use of shared infrastructure established for Plant 1, it anticipates an accelerated execution timeline and significant reduction in the levelised cost of hydrogen production from Plant 2.

Airbus announces plans for hydrogen demonstration programme

Airbus and CFM International are to collaborate on a hydrogen demonstration programme.

Announced on 22 February, the purpose of the programme is to ground and flight test a direct combustion engine fuelled by hydrogen, preparing for an entry-into-service for a zero-emission aircraft by 2035. The demonstration will use an A380 flying testbed, equipped with liquid hydrogen tanks prepared at Airbus facilities in France and Germany.

Airbus will define the hydrogen propulsion system requirements, oversee flight testing and provide the A380 platform to test the hydrogen combustion engine in cruise phase. CFM International, meanwhile, will modify the combustor, fuel system and control system of a GE Passport turbofan to run on hydrogen. The engine, assembled in the US, was selected for the programme due to its physical size, advanced turbo machinery and fuel flow capability. It will be mounted along the real fuselage of the flying testbed, allowing engine emissions, including contrails, to be monitored separately from those of the engines that power the aircraft. CFM will carry out an extensive ground test before the A380 flight test.

Innovative hydrogen storage system set for demonstration

GHD will demonstrate an innovative hydrogen storage system after receiving government funding under the Longer Duration Energy Storage Demonstration competition.

On 23 February, it announced that it will work in partnership with LAVO Hydrogen Storage Technology at a demonstrator location supported by the University of Chester. The project will demonstrate an energy storage system for hydrogen driven from grid electricity using LAVO's innovative metal hydride, which has already seen an initial demonstration in Australia. Through this UK demonstration, the technology will be applied at a larger scale to explore how it can support energy storage for the UK electricity network by providing low carbon hydrogen to local users in the North West of England.

Key elements of the project include the demonstration the economics of creating hydrogen in times of excess renewable electricity generation, and storing in long-duration energy storage medium; a modular solution demonstrating scalability, providing benefits across multiple elements of an integrated energy system; a simple, stackable hydrogen energy storage device that can supply low or zero carbon hydrogen to a range of configurations and applications; and cost-effective, safe, efficient low pressure storage of hydrogen.

World-first smart hydrogen hybrid heating system trialled

Pembrokeshire has played host to a demonstration of what is being called the world's first smart hydrogen hybrid heating system.

On 22 February, Port of Milford Haven explained the trial, which was part of the UKRI funded Milford Haven: Energy Kingdom project, saw a hydrogen-fuelled boiler combined with an electric air-source heat pump, alongside smart control technology. It was carried out by the Port of Milford Haven and a collaboration of partners, including Passiv UK, Wales & West Utilities, Kiwa UK, Worcester Bosch, Offshore Renewable Energy Catapult, and Pembrokeshire County Council.

Kiwa UK delivered bottled hydrogen to the Worcester Bosch boiler, simulating periods when renewable electricity was unable to run the heat pump, or a temperature boost was needed. The smart controls, designed by Passiv UK, were integrated with the system seamlessly, automatically switching between the air source heat pump and hydrogen boiler. Every two minutes, it assesses GB energy generation mix and renewable electricity available on the local grid. Should this availability be low or non-existent, it requests the boiler runs on hydrogen.

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