Hydrogen East

H2 News Hub

Issue 1

H2 East

December 2020

Top stories

In our first issue of **Hydrogen East**'s Sector Review, we take a look at important publications and developments over the month of November (2020).

In the Prime Minister's **10-point plan for a green industrial revolution,** an ambition for 5GW of low carbon hydrogen production capacity has been set for 2030 for industry, transport and homes, potentially unlocking as much as 100,000 jobs by 2050.

In the first of two reports covering a net zero North Sea, **OGTC and ORE Catapult** made the case as to why the UK must invest now, detailing a series of different potential 2050 scenarios, including one where there is an energy system driven by offshore wind and green hydrogen.

Policy Exchange, meanwhile, urged government to bring forward a new Net Zero Strategy for the North Sea in its report, highlighting how full development of offshore wind could see it provide a third of the UK's energy needs, while fully developing low carbon hydrogen and carbon capture, utilisation and storage could grow this even further.

Hydrogen East director, Nigel Cornwall's addressed the All-Party Parliamentary Group for the East of England, summarising how the region is a frontrunner in contributing to meet the UK's net zero goal as well as highlighting what Hydrogen East's plans are for assisting the East of England in its ambition of becoming the UK's Clean Growth region.

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Upcoming webinars

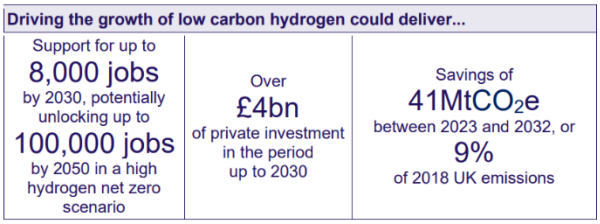
15 December – **Westminster Energy, Environment and Transport Forum:** Next steps for UK gas networks: the RIIO-2 price control framework, decarbonising assets, and preparing infrastructure for hydrogen and low-carbon heating | **16 December** – **Hydrogen East:** Suffolk Hydrogen and the Net Zero Challenge

Government lays out hydrogen ambitions in 10-point plan

Driving the growth of low carbon hydrogen is among the ambitions set out in the government's 10-point plan for a Green Industrial Revolution.

Figure 1: Overview of low carbon hydrogen benefits

(Source: UK Government)



On 18 November, Prime Minister, Boris Johnson unveiled the strategy, which aims to mobilise £12bn of government investment, and up to three times as much from the private sector, to create and support up to 250,000 green jobs. It reaffirms the government's commitment of 40GW of offshore wind by 2030, confirms a ban on the sale of new petrol and diesel cars and vans will be brought forward to 2030, pledges £1bn for funds to insulate homes and public buildings, while also promising action on nature and innovative tech.

For hydrogen, the plan claimed that with the UK already a world leader in investing in the use of hydrogen for heating, the government now wants to accelerate this work and support industry. This will include a target of 5GW of low carbon hydrogen production capacity by 2030 for industry, transport and homes, resulting in 8,000 jobs, which could rise as high as 100,000 by 2050 in a "high hydrogen net zero scenario".

The government will aim to deliver on this ambition with up to £500mn in funding, including a £240mn Net Zero Hydrogen Fund. It will set out hydrogen business models next year, alongside a revenue mechanism for them to bring through private sector investment, which could be as much as £4bn by 2030. It forecast that hydrogen could help to deliver savings of 41MtCO2e between 2023 and 2032, or 9% of UK emissions in 2018. It also mapped out a series of target milestones as work progresses. This will begin with a Hydrogen Strategy to be published in 2021 and the government consulting on its preferred business models for hydrogen, which will be finalised in 2022.

In 2023, government is to work with industry to complete the necessary testing to allow for up to 20% blending of hydrogen into the gas distribution grid for all homes in the gas grid, while supporting industry to begin heating trials in a local neighbourhood. The government hopes to see 1GW of hydrogen production capacity then in place by 2025, as well as a large village hydrogen heating trial, before a possible pilot of a "Hydrogen Town" by the end of the decade.

Furthermore, government said it will look to build on the UK's success in offshore wind and other renewables to bring forward the zero-carbon hydrogen of the future. This would develop resilient supply chains, support jobs and position UK companies at the forefront of the growing global market, while helping industrial processes, industrial heat, power, shipping and trucking to all decarbonise and reach net zero. The plan further acknowledged producing low carbon hydrogen scale is something that will only be made possible by carbon capture and storage (CCS) infrastructure. It is aiming to grow both "side by side" and will support the establishment of CCS in four industrial clusters with £1bn in funding and signalled an ambition to be capturing 10Mt of carbon dioxide a year by 2030.

It said that these clusters, in areas such as the North East, Humber, North West, Scotland and Wales, would serve as a starting point for a new carbon capture industry. This could support up to 50,000 jobs in the UK by 2030 and carry substantial export potential. As with hydrogen, a revenue mechanism to bring through private sector investment in CCS will be brought forward in 2021.

Green light for world-first hydrogen heating network

SGN's plans for H100 Fife, a project set to demonstrate 100% green hydrogen heating in homes for the first time, have been backed by Ofgem.

On 30 November, SGN confirmed the regulator will award up to £18mn from its Network Innovation Competition to the project, which it says will mark a "critical first step" as the UK targets 5GW of hydrogen production capacity and a "Hydrogen Town" by 2030. The funding will trigger a further £6.9mn investment from the Scottish government, with SGN shareholders and Britain's three other gas distribution networks also providing funds to support the project.

Work will now commence on delivering a 100% hydrogen demonstration network in Levenmouth, Fife, leading to 300 homes being supplied carbon-free heating from the end of 2022. The hydrogen will be produced locally from a dedicated electrolysis plant powered by a nearby offshore wind turbine. Customers in Fife will be given the chance to participate in the demonstration. Those who choose to opt-in will receive a free hydrogen connection, free replacement hydrogen appliances and free maintenance over the duration of the project. They will also pay the same amount for hydrogen as they would for natural gas.

House of Lords discusses support for private sector hydrogen investment

Due On 30 November, the House of Lords held a session on 'Supporting private investment in the hydrogen sector in the UK' following an oral question by Baroness Meacher.

Baroness Bloomfield of Hinton Waldrist opened with an outline of the government's commitment to 5GW of hydrogen production capacity by 2030. The support for achieving this was referenced in the recently announced £240mn Net Zero Hydrogen Fund and to-be-announced hydrogen financial support mechanisms in early 2021. The scale-up of UK hydrogen is projected to create 100,000 domestic and export jobs by 2050. On skilling up the UK workforce to obtain expertise in hydrogen industries, the Baroness referenced the wider skilling-up agenda across industry and promised more detail on this as follow-up.

When it comes to blue versus green hydrogen investment, she reaffirmed the government's commitment to supporting both forms of hydrogen production in order to effectively transition to Net Zero.

With regards to rolling out heat pumps in case of hydrogen proving unfeasible, reference was made to the extensive work being carried out in respect of proving the safety case for hydrogen. Alongside this, the commitment to developing the Future Homes Standards and meeting a 2028 target of 600,000 heat pump installations per year was referenced. The Baroness noted that all technologies would be needed to meet the task of Net Zero.

As for the level of funding committed by the UK in comparison to other European countries, it was noted that many other international funding pledges are not underpinned currently by policy. It was made clear that the government's priority is to develop appropriate supporting policy alongside the level of funding committed currently in the first instance.

On becoming a world leader in hydrogen bus manufacturing, reference was made to the £23mn Hydrogen for Transport programme and £2mn Fuel Cell Electric Vehicles (FCEVs) Fleets Support Scheme aiming to increase hydrogen refuelling access and FCEV uptake across the UK. Meanwhile, on the application of hydrogen in Wales, the Baroness commented on the establishment of the Welsh Hydrogen Reference Group in supporting Wales' hydrogen development along with the potential for Welsh industry to access the Net Zero Hydrogen Fund for capital support and increase low-carbon hydrogen uptake across the region

Coalition aims to place Europe as world leader in renewable hydrogen

A new coalition has been launched to support the uptake of renewable hydrogen solutions in Europe.

On 23 November, WindEurope and SolarPower Europe, supported by Breakthrough Energy, announced the launch of the Renewable Hydrogen Coalition, which they say will play a decisive role in positioning Europe as a world leader in renewable hydrogen. It will set out to build a high-level and interdisciplinary network of innovators, entrepreneurs and corporate leaders from the rapidly growing renewable hydrogen community.

Coinciding with the first EU Hydrogen Week, the coalition declared the importance of renewable hydrogen in achieving the objectives of the European Green Deal and reaching climate neutrality. It will also help to unlock the full decarbonisation potential of Europe's economies, including in end use markets such as aviation, shipping, and heavy industry.

It will strive to support Europe in developing a world-class electrolyser industry, while devising the business models and markets to make renewable hydrogen mainstream. It will seek to inform policy debate with concrete proposals for the scaling up and market uptake of renewable hydrogen, such as traceability, infrastructure investments, market design and incentives. It also urged leaders to "redouble their efforts" when it comes to research and demonstration, while scaling up investments to bring new technologies to the market faster.

Hydrogen alliance calls for independent net zero body

The North West Hydrogen Alliance (NWHA) has called for the formation of an independent net zero body to lead the introduction of hydrogen.

On 19 November, it published its report, *Public attitudes to hydrogen and Net Zero*, outlining how awareness and understanding of hydrogen is low among the general public and confusion over what net zero means. Despite this, it found people do understand the need for change and there is an openness to switch to low carbon technologies, though the key barrier to gaining public support will be cost.

On hydrogen specifically, once its long-term benefits were explained, the public were found to be supportive of its impact and prepared for some level of disruption as the change occurs.

NWHA made three key recommendations for government, including the creation of an independent net zero body to lead the introduction of hydrogen and other net zero technologies to the general public. This body would take on the role of public education, working with government, industry, academia and the general public to raise awareness of the net zero agenda and manage the different stakeholders involved.

It called for a communications campaign to be implemented now, ensuring net zero – "a complex topic" – has the time to be defined and understood before driving widespread behaviour change.

Elsewhere, it called for government to set out a clear roadmap to net zero, explaining that a clear policy framework needs to be in place to encourage long-term investment, while communication between all branches of government is key to ensure a consistent message.

NWHA also recommended a national net zero skills programme is developed to support the required reskilling to realise the net zero transition. It noted that as well as the importance of younger generations being prepared with these skills, there is an opportunity to reskill those impacted by closing industries and the pandemic.

UK must invest in net zero North Sea "now"

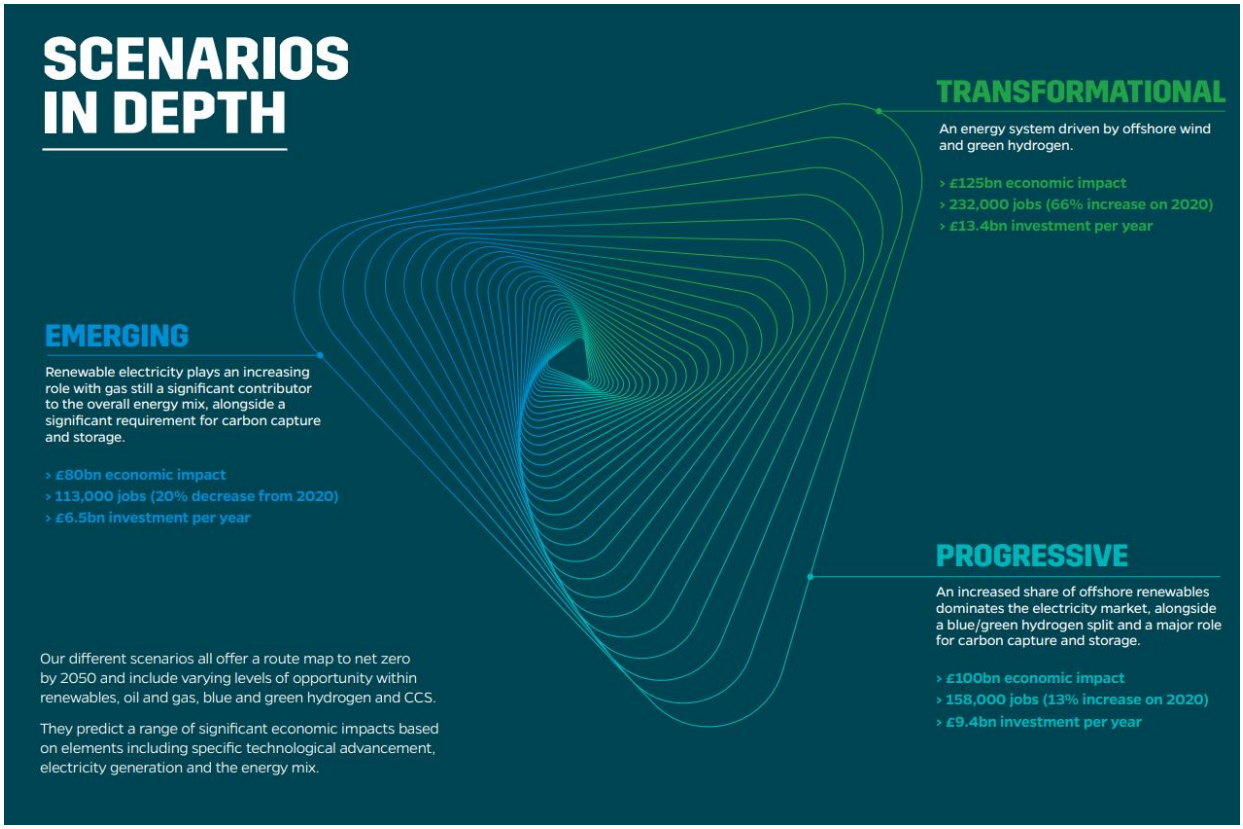
The UK offshore energy sector must invest now in technology innovation to create a net zero North Sea or it will not become a global leader in clean energy, a report has warned.

On 30 November, the Oil and Gas Technology Centre (OGTC) and the Offshore Renewable Energy (ORE) Catapult published a report, *Reimagining a Net Zero North Sea: an integrated energy vision for 2050*, setting out a direction for the UK's net zero offshore energy system.

It stated that investment at pace – up to £416bn over the next 30 years – would accelerate new job opportunities, potentially mitigating major job losses otherwise expected over the next decade, while resulting in up to £125bn per year for the UK economy and delivering savings of £154bn by 2050.

Figure 2: Overview of 2050 net zero scenarios

(Source: OGTC & ORE Catapult)



The vision is built on four main pillars of offshore wind, oil and gas, hydrogen, and carbon capture and storage (CCS). All are considered interdependent and interacting to achieve the 2050 goal.

Deployment of between 60GW and 150GW of offshore wind by 2050 is central to a net zero North Sea, supporting green hydrogen production as well as electricity for domestic consumption and export, while electrification and integration with renewables of oil and gas was cited as key, alongside technologies that deliver net zero production emissions from the sector.

The report highlighted hydrogen as a "substantial economic opportunity" for the UK, with blue hydrogen becoming a critical intermediate solution in the transition and acting as a bridge to green hydrogen. It would help to build a hydrogen economy and create demand which,

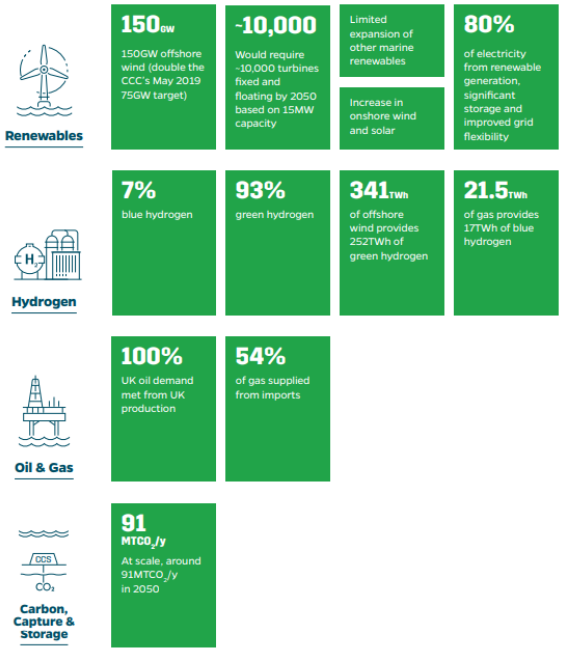
without, the ability to harness the full potential of green hydrogen could be at risk. It added that action and investment in green hydrogen is required now as part of a long-term strategy with the aim of replicating the success of cutting the cost of offshore wind.

Widespread deployment of CCS, meanwhile, will decarbonise oil and gas, as well as blue hydrogen, while enabling the development of a net zero North Sea. Early adoption would dovetail with demand for blue hydrogen in the near term, laying the foundations for large-scale production of green hydrogen in the medium term.

Based on the Committee on Climate Change's Further Ambition scenario, the report explored three scenarios of its own, each of which see the UK reach net zero by 2050 using a combination of energy solutions to meet demand – though resulting in differing levels of economic benefits and green jobs.

Figure 3: The key assumptions of the report's "transformational" scenario – an energy system driven by offshore wind and green hydrogen

(Source: OGTC & ORE Catapult)



It set out that at present (2020), blue and green hydrogen are not commercially available, gas import dependency is rising year on year, floating wind is being trialled in UK waters, and CCS is under development though not operational. The North Sea has a total economic impact of £40bn, 140,000 direct and indirect jobs, UKCS imports stand at around 45%, while average investment is £10bn per annum.

It's in the report's "Transformational" scenario where the greatest change is seen in an energy system driven by offshore wind and green hydrogen.

This would see an economic impact of £125bn, 232,000 direct and indirect jobs, which would mark a 66% increase in 2020, UKCS imports falling to around 10% and investment of £13.4bn per annum.

Driven by £416bn cumulative investment through to 2050, the report set out how realising this vision would require floating wind to access deeper waters and increased capacity; a scale-up of green hydrogen, requiring significant cost reduction and efficiency gains; a scale-up of blue hydrogen, with cost reduction and efficiency gains by 2035; a fast-track consenting process for new offshore deployments, both wind and hydrogen; and oil and gas electrification to extend field life and secure domestic supply.

Colette Cohen, CEO at OGTC, said: "These detailed scenarios paint a picture of what the UK's offshore energy system could look like by 2050. None are definitive, but they highlight the need to drive investment and innovation today. There are tremendous opportunities for the UK, but we need strong alignment and urgent action from industry, governments and regulators to realise these benefits."

Green hydrogen feasible at 50% cost reduction

For hydrogen to be a viable alternative to conventional fuels, the cost of producing it from renewables must fall by over 50% by 2030, S&P Global has said.

On 19 November, the agency published a report, *How Hydrogen Can Fuel The Energy Transition*, in which it set out that green hydrogen costs need to fall to $2-2.5/kg by 2030. This could be achieved with solar or wind production costs of $20-30/MWh and if electrolyser costs were to fall by 30-50%. With the levelised cost of renewable power accounting for up to 60% of green hydrogen costs, a decline of $10/MWh would see the cost of hydrogen reduce by $0.4-0.5/kg.

Furthermore, if the electrolyser capital cost were to fall by $250/kW then this would drive the hydrogen cost down by another $0.3-0.4/kg. Meanwhile, an increase in capacity utilisation factors to 50% – up from 40% – would cause a further fall of $0.2-0.3/kg.

The report added that simultaneously supporting carbon capture and storage (CCS) in a bid to produce blue hydrogen would boost the supply of more competitively priced low carbon hydrogen. Assuming availability of oil and gas deposits, or salt caverns for CO2 storage, there is the potential for greater volumes of blue hydrogen in the short to medium-term. A similar ramp-up in green hydrogen volumes is limited by the fact that the majority of renewable energy capacity over the next decade will be needed to replace conventional generation or meet increasing electricity consumption.

"World first" as flow batteries and tidal power combine to produce hydrogen

The European Marine Energy Centre (EMEC) has announced a "world-first" project where flow battery technology will be combined with tidal power to produce continuous renewable hydrogen.

On 9 November, EMEC said it will deploy an Invinity Energy Systems 1.8MWh flow battery at its tidal energy test site on the island of Eday. The combination of tidal power and flow batteries will be used to power EMEC's hydrogen production plant, resulting in a demonstration of continuous hydrogen production from variable renewable generation.

EMEC highlighted how commercialisation of green hydrogen marks an essential step towards a 100% renewable future, drawing on the Offshore Renewable Energy Catapult's estimations that developing a green hydrogen industry could result in 120,000 jobs and £320bn to the UK economy by 2050. The project has been funded by the Scottish government, through the Highlands and Islands Enterprise, and is expected to go live next year.

Royal Mail to trial hydrogen-powered van

Royal Mail is to trial a dual fuel hydrogen van in Aberdeen for a 12-month period, to determine whether hydrogen is operationally suitable within its fleet.

On 30 November, it announced that the Ford Transit van has been converted to dual fuel -with up to 60% of its power coming from green hydrogen. It is able to travel up to 120 miles in dual fuel mode and will be trialled at the Altens Delivery Office in Aberdeen. The van has been provided by the City Council as part of the EU-funded Civitas Portis project, which is setting out to support Aberdeen in improving its air quality and sustainable transport options.

Should the preliminary trial prove that hydrogen is workable within Royal Mail's fleet, then the results will be considered in future strategy developments for the company.

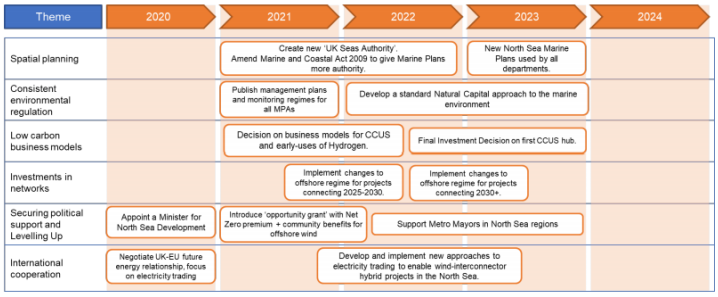
Report sets out 2050 vision for the North Sea

The government has been told to bring forward a new Net Zero strategy for the North Sea.

On 3 November, Policy Exchange published *The Future of North Sea*, stating it to be strategically central to meeting the UK's 2050 Net Zero target. Fully developing offshore wind could see it provide a third of the UK's energy needs, with full development of low-carbon hydrogen and carbon capture, utilisation and storage (CCUS) growing this further. This could generate £20bn per year of investment in coastal regions and lead to a net increase of 40,000 direct jobs connected to the North Sea energy industry, levelling up regions across the East coast.

Figure 4: Proposed policy timeline

(Source: Policy Exchange)



By 2050, the report set out that the North Sea could host up to 100GW of offshore wind, generating nearly half of the UK's electricity needs; sequester 100mn tonnes a year of carbon dioxide; provide the majority of hydrogen production, resulting in UK hydrogen consumption growing up to 20 times; and have remaining oil and gas platforms electrified, with some infrastructure reused for CCUS, while skills are applied to CCUS, hydrogen and floating wind.

However, there are a number of barriers to realising this, such as spatial planning. Greater coordination is needed due to increasingly congested seas and the UK's "first come, first served" approach to planning marine space. Other obstacles include business models for new low-carbon technologies, with hydrogen and CCUS needing support or clear routes to market; cross-border collaboration; and economic benefits, with the government needing to ensure they are captured locally "as far as possible".

The report called for a strategy that accelerates investment and jobs in North Sea regions, as well as making progress towards Net Zero. It should be underpinned by four key principles: taking a holistic approach to the diverse activities in the North Sea; harnessing the low-carbon development of the North Sea to level up coastal communities; using markets and competitive procurement, where possible, to support private enterprise in delivering net zero; and engaging with international partners to take a whole-basin approach to the development of the North Sea.

It made a series of recommendations to form the basis of the strategy, beginning with the creation of a new UK Seas Authority (UKSA), which would coordinate development across UK seas; applying environmental regulation consistently across all economic activities and incentivising net improvements in the marine environment; and using new "Future Marine Scenarios", produced by the UKSA, to help to identify the investments in North Sea networks needed to unlock net zero.

It also called for tailored support to be introduced for new low-carbon technologies, such as hydrogen and CCUS, with government told to make a final decision on the business models for each by mid-2021 to enable early deployment. The government was also told to look to concentrate the development of low carbon hydrogen production in North Sea industrial clusters, with the report adding that it should deploy low-carbon hydrogen in non-industry uses through "increasingly ambitious pilots" in the areas surrounding these clusters.

Hydrogen features in Government's Spending Review and Infrastructure Strategy

On 25 November, the UK Government published it's 2020 Spending Review (SR20). A £100bn capital investment was pledged for 2020-21 for infrastructure and to 'level up for a greener, stronger future'.

In respect of 'innovative clean technologies', £1bn of funding has been committed to a Carbon Capture and Storage (CCS) Infrastructure Fund along with 'additional investment' in low-carbon hydrogen production, offshore wind and nuclear power.

The commitment to 5GW of low-carbon hydrogen production by 2030 in the Prime Minister's Ten Point Plan for a Green Industrial Revolution was reiterated in SR20 with support outlined in the form of a £240mn Net Zero Hydrogen Fund and £81mn multi-year commitment for 'pioneering hydrogen heating trials'.

Pioneering heating trials will include development of a Hydrogen Neighborhood which could in turn be expanded to a 100% hydrogen town by 2030. The plan laid out timescales in more detail, suggesting that hydrogen heating trials in a local neighbourhood would begin from 2023, and look to be expanded from 2025. In addition, £160mn has been committed for modern ports and manufacturing infrastructure with a promise of establishing at least ten freeports across the UK.

SR20 was released simultaneously with the long-awaited National Infrastructure Strategy, which reinforced many of the government's green commitments including 'green growth areas' in traditionally industrial areas with low-carbon hydrogen, port infrastructure, CCS and offshore wind. It confirmed establishment of four CCS clusters by 2030, in addition to 'at least one CCS power station'.

Other stand-out points: it referenced £20mn being pledged for alternative marine fuels, including for hydrogen vessels in Orkney and a hydrogen port in Teesside. It also implied there would be further thinking around the expansion of the Renewable Transport Fuel Obligation for maritime low-carbon fuels.

Ofgem backs hydrogen research facility

A first of its kind offline hydrogen research facility has been awarded funding from Ofgem's Network Innovation Competition.

On 30 November, National Grid, which is partnering with Northern Gas Networks and Fluxys Belgium, outlined how the £12.7mn facility will be built from a range of decommissioned assets to create a representative transmission network to see how transmission assets could be used to transport hydrogen in future to heat homes and deliver green energy to industry. It will receive £9.07mn from Ofgem, with the remaining funds coming from project partners.

Blends of up to 100% hydrogen will be tested at transmission pressures to see how the assets perform. It will be kept separate from the main National Transmission System, ensuring testing can take place in a controlled environment with no risk to the safety and reliability of the existing gas transmission network. Construction will begin in 2021, with testing then getting underway in 2022.

DNV GL is the lead delivery partner for designing, constructing and operating the high-pressure hydrogen research facility at its site in Spadeadam in Cumbria. The HSE Science Division will support on the project, with academic partners Durham University and the University of Edinburgh.

INEOS and Hyundai join forces on hydrogen

INEOS and Hyundai have signed a memorandum of understanding to explore opportunities to accelerate the global hydrogen economy.

Announced on 22 November, it will see the pair jointly investigate opportunities for the production and supply of hydrogen as well as the worldwide deployment of hydrogen applications and technologies. Both companies will, at first, seek to facilitate public and private sector projects focused on the development of a hydrogen value chain in Europe. It follows INEOS' announcement of the launch of a new business dedicated to developing clean hydrogen capacity across Europe, supporting the drive towards a net zero future.

EDF issues EOI invitations for Sizewell connected hydrogen and direct air capture projects

Announced on 23 November, EDF Energy has published details of plans to construct and operate two demonstrator projects at its East Suffolk site.

The first project will see construction of a hydrogen electrolyser with an expected capacity of up to 2MW. This would enable production of up to 800kg of hydrogen each day which could be used for vehicles and equipment used in construction of the proposed nuclear power station at Sizewell C. It would also look to provide hydrogen produced to local markets such as ports, railways, buses, industry and local authorities.

Applicants will be expected to project manage the demonstration, supply the electrolyser, and provide hydrogen-fuelled equipment and vehicles. Following project demonstration, a large-scale hydrogen facility supplied which heat and power from Sizewell C could be developed. Applications will need to be submitted by 8 January 2021. Expression of interest documentation here. In a second interesting move the company has published details of a Direct Air Capture (DAC) project. The project would see a DAC system powered by heat from Sizewell C, creating the possibility of a carbon negative project. Applicants here would be expected to project manage the demonstration, provide the DAC technology, design the plant, and explore scalability for a future long-term plant at Sizewell C. Application deadline is 18 December 2020. Expression of interest documentation here.

European Commission maps out offshore energy ambitions

The European Commission has set a target of 300GW of offshore wind by 2050 as part of plans to substantially grow the amount of offshore renewable energy across the continent.

On 19 November, it presented the EU Strategy on Offshore Renewable Energy, also proposing 40GW of ocean energy and other emerging technologies to complement the increase in offshore wind. It is expected to result in new opportunities for industry, generate green jobs and strengthen the EU's leadership in offshore energy technologies, while ensuring protection of the environment, biodiversity and fisheries.

It is forecasting that investment of almost €800bn will be needed between now and 2050 to meet its objectives, with the Commission pledging to provide a clear and support legal framework, help to mobilise all relevant funds to support the sector's development and ensure a strengthened supply chain as supporting actions.

On hydrogen specifically, the strategy highlights Europe's opportunity to ramp up renewable power generation and increase direct use of electricity for a wider spectrum of end uses to support indirect electrification through hydrogen and synthetic fuels. It also states achieving its objectives will help to decarbonise hard-to-abate sectors with renewable hydrogen.

Hydrogen and East Anglia – a continuing clean energy success story?

Addressing the All-Party Parliamentary Group for the East of England on 4 November, Hydrogen East director Nigel Cornwall summarised how the region is a frontrunner in contributing to meet the UK's Net Zero carbon target and highlighted his organisation's plans for assisting the region in its aim of being the UK's Clean Growth region.

East Anglia already an energy powerhouse

The East of England already has exceptional foundations on which to build. It is at the heart of the world's largest market for offshore wind, hosting over half of GB's operational fleet and capacity growth in the pipeline.

Elsewhere in the region, nearly 200MW of battery storage projects have been granted permission to build, and there are already 55 solar projects with over 570MW of capacity (in addition to abundant small-scale installations). It is also leading the way on energy-from-waste and biomethane injection.

There is a hub of new nuclear in Suffolk and North Essex. The 1.2GW Sizewell B site currently powers about 8% of UK homes. Subject to final government approvals, the planned 3.2GW Sizewell C station could also provide the backbone of an electricity system that is increasingly intermittent. It could also provide a template for how to integrate new innovative technologies with baseload generation.

Equally important, the Southern North Sea (SNS) is the UK's gas capital, with 30% of national requirements entering via Bacton. As the UK transitions to a Net Zero economy, there are enormous opportunities to repurpose the existing offshore assets and redeploy the skilled workforce to bring forward new technologies such as carbon capture and storage and hydrogen production. In fact, East Anglia offers access to Europe's largest potential CO_2 storage network.

Finally, there is also the ability to access continental markets through the Interconnector UK and BBL pipelines to Belgium and the Netherlands respectively.

Making a major contribution to the regional economy

The current and future impact of the energy industry on the region is profound.

In 2019, there were over 800 businesses and 11,800 employees working in offshore energy locally. Given the growing offshore wind fleet, the operation and maintenance opportunities alone are forecast to reach £1.3bn by 2025. Across the full suite of energy projects, we could see over £59bn of capital investment across the East of England by 2040. Extensive investment in the region in skills is already underway, with flagship projects such as the £11.4mn Energy Skills Centre in Lowestoft working to build-up a skilled energy workforce for the future.

These factors in combination have led the New Anglia LEP to describe East Anglia as the UK's Clean Growth Region, and it has set out a programme in its Local Industrial Strategy targeting further clean energy, digitalisation and agri-tech development as three key growth markets.

What about hydrogen?

The Local Industrial Strategy name-checked hydrogen as an area of possible early development but it was light on detail. That is not a criticism as, in the two years since its publication, national and global interest in hydrogen has grown exponentially. And then came the adoption of the Net Zero target in summer 2018, which is requiring all of us to consider the scale and depth of the change needed to abate climate deterioration and adaptation.

Which is why I formed Hydrogen East with Johnathan Reynolds of Opergy earlier this year. Hydrogen East is not a trade association or member services company. We are an independent research body that wants to improve understanding of the emerging hydrogen market and promote its uses in the regional economy.

We both believe that hydrogen has immense potential in helping to meet the 2050 Net Zero target. Its neither feasible or desirable to "electrify everything", and targeted hydrogen deployment in electricity, heating and transport is the most likely available pathway to closing the emissions abatement gap especially on "hard-to-reach sectors" in energy and transport use.

Many other regions are increasingly holding the view that hydrogen could be a key component in their own energy transitions, with Germany, Spain, Japan, Canada and Australia (among others) adopting aggressive hydrogen support and development policies. From an industrial strategy and innovation perspective – as well as a carbon abatement perspective – it is critical that the UK doesn't get left behind.

The good news is that the East of England already has an abundance of assets and infrastructure that can be developed or repurposed; against this we don't have heavy industry or many large industrial loads to drive this forward. So we need to think differently about the opportunities and possible pathways.

In the context of the East of England that means looking to identify pockets of potential hydrogen demand across different economic sectors, aggregating them and linking them with increasing hydrogen availability. It is a bottom-up strategy, centred on a place-based approach, and consolidating demand.

There is a trade-off between building scale and emerging supply options, be they through the use of blue hydrogen in existing networks or green hydrogen produced by electrolysers, powered by a combination of surplus wind, solar or nuclear production.

What is Hydrogen East doing?

We only launched in late July, but so far we have identified three priority target workstreams, all of which we are hoping to fully scope throughout 2021.

The first we call the Bacton-SNS Clean Energy Hub (or Bacton 2.0). This looks to develop the aging Bacton gas terminal site through use of CCS in the SNS as well as the production and transportation of blue hydrogen using existing onshore and offshore gas assets to stimulate supply and accelerate decarbonisation of the existing gas system.

Over time this could be combined with a transition to deployment of green hydrogen mainly from offshore wind, with potential siting of electrolysers close to, or on, gas platforms. But a key objective is to understand the linkage between offshore and onshore and what is physically possible, and then to identify how and when the green hydrogen economy based predominantly around additional offshore wind development can be accelerated.

We are close to having secured the necessary funding to take this workstream forward later this month.

The second workstream is a similar concept around use of production from Sizewell, and possibly over time the new development at Sizewell C, to drive electrolysers with hydrogen output being used for transport and heating as part of a Sizewell-Leiston Clean Energy Hub.

EDF Energy is already looking at the possibility of building a demonstration electrolyser to help it fuel diggers and construction vehicles and other forms of local transport to help decarbonise Sizewell construction. There is also an important opportunity to tie in with activities at the East Coast ports.

We are hoping to scope this workstream in detail in early 2021.

The third workstream, which we launched late October, is called the New Anglia Clean Transport Hub. It entails supply of hydrogen for use in agriculture, food processing and transport in West Suffolk where there are emerging plans to switch over refuse wagons, agricultural vehicles but also buses.

Looking beyond that, there are rail lines in the east of Norfolk and Suffolk that are earmarked for conversion to hydrogen use, as well as opportunities for using hydrogen to power leisure boats on the Broads.

Over the longer term, hydrogen (and associated ammonia) production could be a key strategic move for use by shipping at the East Coast ports, including Felixstowe. This might also fuel the boats involved in future offshore wind construction.

A bright outlook

In conclusion, these are early days in a very exciting project that is as far as we can see different to other hydrogen assessment and development programmes in the UK.

We are focused on aggregating and scaling demand locally and developing an empirical place-based approach, building up from detailed spatial mapping work of the existing economy and infrastructure. We are learning as we go along, but so far have achieved a high level of interest and buy-in from regional stakeholders.

But what is clear is that the East of England will continue to offer real opportunities for the development of a regional hydrogen economy because of its unique access to existing and future energy assets and infrastructure. It has many economic sectors that can be decarbonised through steady roll-out of hydrogen, especially in agriculture, transport (HGVs, rail and shipping) and, in certain places, heating.

Only through successful deployment of hydrogen will we be able to hit Net Zero and the regional aim to be the UK's Clean Growth Region. But the outlook looks better than promising. Follow Nigel on **@HydrogenEast** but also for more general clean energy and innovation updates on **@NewAngliaEnergy**.

Hydrogen East

Building a regional Hydrogen Economy across the East Anglia

Suffolk Hydrogen and the Net Zero Challenge

16 December 2020

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This publication is a compendium of news stories we posted during the prior month focusing on policy, regulatory and market developments in the fast-moving hydrogen space.

If you would like to receive a copy directly, please contact michael.brown@hydrogeneast.uk.

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