NORTH EAST
Chamber of Commerce

HYDROGEN REPORT

SUPPORT • CONNECT • REPRESENT

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CONTENTS

SUMMARY
report recommendations:

- The North East has a leading role to play in hydrogen, and the government's industrial strategy should build on our existing strengths.
- Hydrogen fuel could be used in long distance transportation where issues with charging prevent electrification.
- There needs to be a focus on engagement with primary schools and creating diversity within the engineering sector to create the talent pipeline for the future of hydrogen.
- Businesses need to use digital technology as well as open days and work experience to demonstrate the opportunities in hydrogen in the region.
- The government needs to price match green hydrogen to natural gas through a subsidy to incentivise a transition away from natural gas in key sectors.
- Capacity on the national grid is essential to allow for electrolysers for green hydrogen. At a regional level we need to examine the North East's current grid capacity and our future needs across different sectors including clean energy.
- Collaboration is needed between the government, local authorities, industry and utility companies to find innovative waste water solutions for hydrogen and carbon capture projects.
- The region needs to be able to clearly promote opportunities in energy to attract investors to the North East.
- There needs to be a long-term plan on clean energy from government including the role of Great British Energy to provide certainty for businesses and to encourage investment.
- There needs to be support for businesses to invest in clean energy including hydrogen.
- The government's industrial strategy should learn from hydrogen trials in other countries as well as within the UK.

Introduction

This report, produced in partnership with Womble Bond Dickinson and Teesside University, focuses on hydrogen in the North East.

North East business are at the heart of the UK's net zero revolution. Supporting green innovation will be essential in creating a stronger, fairer North East through investment in sustainable energy generation in the region.

The UK needs a cross-sector infrastructure strategy to support the adaption of existing infrastructure for hydrogen and other fuels. Investment in decarbonisation and sustainable energy generation will generate positive inward investment returns, accelerating the pace at which the UK can achieve energy resilience and boost business confidence.

Green energy is a developing sector in Teesside. This includes hydrogen, offshore wind, and carbon capture and storage projects based primarily around large regeneration sites on the banks of the River Tees. It is estimated that over the next five years significant investment will create approximately 10,000 jobs[1].

Teesside already produces half the UK's total output of hydrogen and is the location of the UK's first hydrogen transport hub which could be operational by 2025, including a research and development campus[2].

Lhyfe, a company which specialises in creating renewable hydrogen sites, is also proposing to build a plant at Neptune Bank Power Station in Wallsend. The North East also has companies such as GeoPura leading on hydrogen solutions.

The government has recently published an industrial strategy green paper focusing on clean energy as a key sector for the UK[3]. The paper highlights rapid growth in global demand for low-carbon products, with McKinsey & Company estimating a global market opportunity of £1 trillion for British businesses in the period to 2030[4].

The Hydrogen Innovation Initiative has also reported that if the UK secured a 10% share of the hydrogen technology market this could deliver £46bn per annum to the UK economy by 2050. This would include 410,000 jobs across the hydrogen sector[5]. There is a key opportunity for the North East to benefit from these jobs and to grow the hydrogen sector in the region.

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Can hydrogen energy play a key role in the renewable energy transition of the North East's economy to achieve net zero by 2050?

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The UK has ambitious targets to reach net zero by 2050, and decarbonising the energy sector will entail innovation in the choice of the energy options available that have location-specific advantages.

Hydrogen is increasingly seen as a pillar of the future energy landscape due its flexibility and potential application. Hydrogen emits only water vapor during combustion, making it a clean alternative to fossil fuels.

Green hydrogen is made by using clean electricity from existing sources of renewable energy, such as solar or wind power, to electrolyse water. Blue hydrogen is produced through the conversion of natural gas via a carbon capture and steam reforming process.

Hydrogen's high energy density makes it viable for use across many sectors. It is forecast to likely contribute about 35% of the energy mix by 2050 for use in heating homes, powering heavy industrial machinery and in the transport sector. This could include decarbonising heavy-duty transport like shipping, rail and freight, where battery technology has limitations.

LEVERAGING THE NORTH EAST'S INDUSTRIAL AND INFRASTRUCTURE STRENGTHS

The North East holds potential for adding hydrogen to the energy portfolio that will power the rebirth of industrialisation.

In the last few decades, the region has seen the exit of fossil fuel-powered industries such as the steel industry that provided jobs to the local economy and contributed to the development of critical infrastructure in the region.

Recent developments in the energy sector have shown promise in making the North East, especially the Tees Valley, become the hub of the UK's renewable energy development. Its proximity to the coastal areas creates the potential for offshore wind power generation using turbines for green hydrogen production.

The conversion of wind power via electrolysis will support the storage of excess renewable energy generated. Hydrogen fuel cells act as a means of storing energy which could be reconverted to electricity when needed.

The region also has access to large-scale hydrogen storage facilities – the salt caverns beneath the North Sea are a natural hydrogen storage solution for future use.

ADDRESSING THE POTENTIAL BOTTLENECKS

While the opportunities to tap into the renewable energy sector in the North East look promising, several concerns need to be addressed to ensure the hydrogen energy potential for reducing carbon emissions and creating jobs could be fully harnessed.

- Community engagement: communities are suspicious of the plan to develop hydrogen around their localities and the implication for their safety due to the volatile nature of hydrogen fuel.
- Availability of storage and transport infrastructure: investment is required for the infrastructure needed to store and transport hydrogen fuel.
- Market and policy uncertainties: currently, the business model for hydrogen is almost non-existent. Government incentives and policy direction is needed for hydrogen fuel development investors to encourage investments, guaranteed future markets and return on investments. Hydrogen energy development is a time intensive endeavour and will take a few years to complete before the investment could yield returns. Hence, the need for security of investments.
- Lack of skills and awareness of career opportunities in the sector: hydrogen energy development can unlock potential for job opportunities for young people looking to gain employment in this sector that promotes sustainable business. Companies need to promote their values to attract younger people to the hydrogen sector.

A VISION FOR THE NORTH EAST'S HYDROGEN FUTURE

- To unlock the opportunities that lie in the development of both blue and green hydrogen in North East, a suite of solutions needs to be in place.
- When developing hydrogen projects energy development companies and investors need to engage with local communities. Engagement is needed throughout projects to ensure the support of the local community.
- Health and safety policies need to be in place to boost potential user confidence to transition to the hydrogen energy.
- Heads of local and regional governments can act as ambassadors of the hydrogen energy transition in the region.
- The government will play a critical role in addressing issues around infrastructure, market and policy uncertainties relating to hydrogen. The government should create regulatory frameworks to bring confidence to the hydrogen sector and enable investors to safely develop the infrastructure needed for hydrogen to be used in the North East.
- Further and higher education institutions in the North East should raise awareness amongst their students of the career opportunities in hydrogen. This can be achieved through career day talks and site visits.
- Universities in the region should use their research capabilities to help advance the use of hydrogen technology in the North East.
- The North East should learn from global best practise around the use of hydrogen. This will help to fast-track innovation in the region.

Teesside University

Powering the future: hydrogen in the North East

Hydrogen is at the core of the UK's net zero ambition. Delivering a thriving hydrogen ecosystem features as a key investment priority for public entities and financial institutions including the newly-created Great British Energy and the National Wealth Fund. Recent policy and legislation, such as the Energy Act 2023, have provided strong foundations to enable a low-carbon hydrogen economy.

The North East, with its chemical and process engineering facilities, already stands as the UK's leading hydrogen hub with huge potential domestically and beyond.

The region has benefited from several support schemes for hydrogen in transport[6] and carbon capture enabled hydrogen production[7], and has further potential for aviation, heating, maritime and other sectors. Despite this progress, three major challenges stand in the way of hydrogen reaching its full potential in the region: costs and investment, infrastructure and supply chains, and workforce. Let's have a closer look.

COSTS AND INVESTMENT

Known as the "chicken and egg" problem of the hydrogen industry, production needs guaranteed demand/buyers and buyers need guaranteed supply to invest in hydrogen. How can this vicious cycle break to offer cost-effective hydrogen production solutions and boost investment?

Small production facilities are a starting point, but what will drive costs down is development at scale. The examples below show that more funding is needed from the early stages of project development and adequate supply chains.

The expansion of the GeoPura facilities in the North East[8] is a great example of cracking the chicken and egg problem. GeoPura's cost-effective solution includes generating green hydrogen, and manufacturing and supplying hydrogen fuel cells. GeoPura has received funding from a variety of sources, including the UK Infrastructure Bank and Barclays Sustainable Impact Capital, to increase the capacity of its manufacturing facility in Newcastle[9], and from HSBC UK and others.

However, there are different solutions being adopted in other countries to address this challenge. In Germany, international auctions conducted under the H2Global program[10] will secure hydrogen and its derivatives supplies for industries like steel. The first auction for the supply of at least 259,000 tonnes of green ammonia has already been awarded[11], marking a significant step towards transforming Germany as an industrial base and achieving its climate targets. Along with subsidies approved by the European Commission and allocated through the EU Hydrogen Bank (the “Auction-as-a-Service” scheme)[12], Germany has also provided a generous €818 million in funding to three large hydrogen projects owned by the company RWE [13]. This is within the pan-European Important Projects of Common European Interest (IPCEI) Hy2Infra project[14].

On the other side of the Atlantic, the US has a range of federal and state level funding initiatives designed to support the growth of hydrogen production as well as its use. On a federal level, the Infrastructure Investment and Jobs Act, the Inflation Reduction Act and grants from the Department of Energy (DOE) are the primary support mechanisms for the hydrogen market. Several states have introduced policies and incentives as well. Last year, the DOE disbursed $7 billion in federal grants to fund seven hydrogen hubs and boost further private investment. However, pending legal challenges against the relevant rules hold back the investment potential of hydrogen in the US.

INFRASTRUCTURE AND SUPPLY CHAINS

Policy decisions on electrification vs hydrogen on industrial decarbonisation are pending, but when it comes to integrating hydrogen seamlessly with existing energy systems and industrial processes, infrastructure and supply chain challenges arise.

The North East faces several constraints on electricity infrastructure. Electrolyser (green hydrogen) projects will need to get connected to the grid. A connections reform is underway to accelerate those projects necessary to decarbonise the energy system by 2030, in line with the new Clean Power by 2030 ambition and the upcoming Strategic Spatial Energy Plan. These plans will tell us what, where and by when generation and transmission infrastructure is needed, and it will be crucial for project developers to follow and get involved in the drafting processes.

How can we ensure secure flows and reserves of hydrogen? Hydrogen transportation and storage infrastructure is crucial but the industry needs certainty and support to build or repurpose the existing network.

Although hydrogen storage in fuel cells is an option, some developers find that the use of salt caverns will be a game changer in establishing the hydrogen economy. Whatever the choice, a new support scheme for transport and storage expected in the coming months will be helpful.

Similar support schemes exist in other countries. For example, Germany has launched a €3 billion support scheme[15] for the construction of the Hydrogen Core Network (HCN). The scheme covers investment for the repurposing of existing gas pipelines to transport hydrogen, and to build new hydrogen pipelines and compressor stations. In the US, New York recently awarded $8.1 million[16] to eight innovative clean hydrogen projects selected through the Hydrogen and Clean Fuels programme, progressing technologies to decarbonise industrial process heat and better integrating clean hydrogen production with renewables and grid support services.

The North East also faces challenges with water supply which adds an extra layer of complexity in bringing hydrogen projects to life. Water desalination and waste water solutions face extra hurdles due to regulatory difficulties. The Environment Agency in their report[17] on the environmental capacity of Teesside finds that environmental and water challenges will delay the permitting of hydrogen and carbon capture infrastructure. They recommend a collaboration within the industry and with the government, local authorities and utilities to find innovative solutions to address these challenges.

Along with infrastructure, building a hydrogen economy needs strong and robust supply chains. These include the following areas: production, conversion, storage, movement, utilisation and support services. Data from the Hydrogen Supply Chain Directory[18] of Innovate UK Business Connect reveals a good supply chain in the North East in all areas with the exception of facilities for conversion. However, this is not enough to drive a hydrogen revolution in the area and is certainly behind compared to the south, which has double the supply chain capability.

The answer to the supply chain challenge is not simply more funding. As with environmental challenges, more innovation and more collaboration is needed to establish hydrogen domestically and to attract overseas supply chain companies. The North East can boast examples of building successful supply chains in the electric vehicles, high voltage cables and blade manufacturing sub-sectors. These examples can provide learnings that can be transferred to the hydrogen sector.

NEED FOR SKILLED WORKFORCE

Sourcing a skilled workforce is one of the biggest challenges in the net zero journey for businesses and was one of the key findings in Womble Bond Dickinson's 2025 Energy Transition Outlook[19]. This is also true for the hydrogen supply chain. Workforce demand in clean energy will only increase in the coming years.

The dynamics in the North East – the rich industrial tradition in chemical and process engineering – offer a good starting point to attract, reskill or upskill people from carbon-intensive sectors to cleaner industries such as hydrogen.

However, effective public campaigns raising awareness on the clean energy transition and its benefits for local communities and the local economy are necessary. Engagement early in the education system through school visits, adjusting school curricula to include energy transition and apprenticeship schemes, for example, will help to further unlock the employment potential of the region.

An inspiring example for the North East is the new skills passport[20] in Scotland, a first version of which is expected early this year. This passport will help the oil and gas workforce to transition to a low-carbon industry, ensuring not only a clean but also a just transition. Introducing a skills passport in the North East could possibly allow the region to retain talent with transferable skills from the chemicals and manufacturing sectors to the hydrogen economy.

But this is not the only example the North East can follow. Germany's commitment to transition away from coal was and is accompanied by just transition measures. Those were put in place gradually over the past decades[21] in response to the coal industry decline and eventually the political decision to phase out coal in 2020. Examples include EU support schemes such as the Just Transition Fund[22] which can be used, among others, to finance hydrogen projects in selected regions of Germany expected to be the most negatively impacted by the transition[23]. There is also the RES-SKILL[24] project that aims to transition coal workers into the renewables sector with minimal retraining and the Cooperative Training programme at Coal Sites[25] which helps young people in coal regions to find training and apprenticeships in local companies after they complete school.

In the US, the Hydrogen Education for a Decarbonized Global Economy (H2EDGE) [26] programme aims to develop and grow the emerging industry workforce in the regional hubs and to improve workforce readiness through training and education. The programme is addressed both to newly trained workers and those transitioning from other sectors into the hydrogen industries.

SEIZING THE OPPORTUNITY

Optimism amongst investors and energy suppliers in achieving the energy transition and commitment of commercial consumers to decarbonise operations are the two key findings from the Womble Bond Dickinson 2025 Energy Transition Outlook [19].

The new ambitious Clean Power by 2030 plan for a decarbonised energy system in Great Britain can only boost this optimism and commitment. The plan sees hydrogen as a key component of this transition, while the recommended pathways to achieve a clean power system by 2030 seek to address all the challenges we have identified above.

Where does that take us? To our starting point. This is the time for the North East to seize hydrogen opportunities and to leverage the industrial tradition of the region to become one of the leading hydrogen hubs in the UK and beyond.

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Feedback from business roundtables

As part of this report, the Chamber conducted two roundtables with businesses, one focused on the production and storage of hydrogen, the other focused on the skills needed for hydrogen roles in the North East.

Attendees highlighted that the North East has some key strengths allowing for the production and use of hydrogen. The region already has facilities and skills for chemical and process engineering which could be tailored to hydrogen and other new energy opportunities. The North East also has available land to develop close to our manufacturing and processing sectors.

PRODUCTION AND STORAGE OF HYDROGEN

In order for the hydrogen sector to grow in the North East there needs to be use cases identified.

Heavy industry such as municipal waste, shipping, rail freight, buses and heavy plant machinery were highlighted by our members as possible use cases for hydrogen, as well as, importantly, in sustainable aviation fuel.

Hydrogen could also have a role in long distance transportation where electrification is not viable.

In order to make hydrogen sustainable there needs to be a focus on replacing grey hydrogen with green hydrogen. There are also opportunities to use the low grade heat from hydrogen production as an energy source.

The ability to switch between green hydrogen and natural gas will be important in allowing firms to start to use hydrogen. This is already being trialled in asphalt production. There could be further opportunities in the North East's manufacturing sector to use hydrogen in paint shops.

Overall, there would need to be a steady demand for hydrogen to allow for the production of hydrogen in the North East.

A key challenge in producing hydrogen is that the electrolysers used in producing green hydrogen would require a lot of power. There could be the opportunity to link to nuclear energy, offshore wind and other renewable energy generation in the North East in order to power an electrolyser.

The storage of hydrogen is also a current challenge. Salt caverns in the region could be used to store hydrogen but this would come at a cost to develop these sites.

Skills needs for hydrogen

Data from Lightcast shows that from September 2023 to September 2024 there were 336 job postings in the North East related to hydrogen[27]. There were jobs across the region covering Newcastle, Sunderland, Country Durham and Teesside.

These roles were mostly related to engineering, including process, civil mechanical and electrical engineering roles. There were also project management, health and safety, and research roles.

The North East already has a strong engineering sector with many transferable skills used for hydrogen. However, our members have highlighted that there needs to be more diversity within the engineering sector and positive action campaigns and myth busting from businesses to encourage applicants.

Engagement with schools and young people will be critical in creating a talent pipeline in engineering for green jobs in the North East. Businesses should focus on primary schools to engage with children early. There could be an opportunity in schools to link environmental lessons to green jobs in the region.

Careers advice at secondary schools highlighting opportunities in the North East is essential. Businesses have a role to play in offering open days to pupils followed by possible work experience opportunities.

Businesses also need to make the most of digital technology to engage with younger people, such as using augmented reality to show how key developments will progress, as well as social media.

There are challenges with providing placements for students due to particular health and safety complexities in the engineering sector which means more resourcing and time needed to organise placements. There needs to be support from government to allow businesses to provide placements for students.

Colleges have highlighted that there is a particular challenge with the introduction of T Levels and the need for 45 days of real-life experience as a part of the course. Additional options, as well as T Levels, will be needed for the engineering sector due to challenges around securing placements for students.

There is also a need to engage with the wider local community on any hydrogen developments in the region, making sure that the benefits are clearly communicated and accessible to local communities. This includes job opportunities, environmental benefits, energy costs and addressing any safety concerns.

The procurement process can also be used to increase engagement with the local community through working with the supply chain and using companies who are able to deliver growth locally.

Strategy needs for hydrogen

In order to support the growth of hydrogen, the government needs to price match green hydrogen to natural gas through a subsidy. This will incentivise a transition away from natural gas in key sectors.

Capacity on the national grid is also essential to allow for electrolysers for green hydrogen. Grid capacity has been raised by many of our members across different sectors as a priority for businesses.

We need to examine our current grid capacity and our future needs across different sectors at a regional level, including clean energy. There could be an opportunity for the region's combined authorities to lead on this and feed into the government's infrastructure strategy.

The mayors can also play a key role in promoting hydrogen and the energy sector as a whole in the North East. The region needs to be able to clearly promote opportunities for investment in energy to attract investors to the North East.

There are also opportunities to work with sector bodies such as the North East of England Process Industry Cluster to identify key users of hydrogen in the chemicals and feedstock sectors.

Businesses will have health and safety concerns around hydrogen. Health and safety policies and regulations and requirements need to be clarified for businesses embarking on the hydrogen journey.

Hydrogen regulations also need to be consistent across the UK, making it easier for businesses to invest.

Our members have highlighted that planning policy needs to be joined up in the North East to ensure that land can be developed for key energy sites.

Following the release of the government's industrial strategy green paper, there needs to be a long-term plan around clean energy, including hydrogen, to provide certainty for businesses and to encourage investment.

Within this plan there needs to be an outline of the role of the newly-created Great British Energy, as well as support for businesses to invest in clean energy. There also needs to be additional support for businesses looking to switch to cleaner energy usage.

Hydrogen case studies in the UK

NORTHERN GAS NETWORKS have been blending up to 20% of hydrogen with natural gas on a public gas network in Winlaton, Gateshead. This will help to gather evidence to demonstrate the hydrogen blend will be both greener and safer than natural gas[28].

TEESSIDE has the potential to be first blue hydrogen production in Europe, along with a substantial green hydrogen production site. H2Teesside and HyGreen Teesside could deliver over 15% of the UK government's target of developing 10GW of hydrogen production by 2030.[29] Blue hydrogen will use carbon capture technology to store carbon produced. Teesside has also been identified by the government as a key site for carbon capture technology for emissions both from industry and from hydrogen production[30]. The region has the potential to lead on hydrogen production and the use of carbon capture technology.

The North East also has companies such as **GeoPura** leading on hydrogen solutions. They are using renewable energy, such as solar or wind, to create a green hydrogen fuel. This fuel is then transported to locations where a local generator converts it to electricity. Their hydrogen power units have been used to power live BBC Springwatch broadcasts, and they've been used at the Isle of Wight Festival and Ministry of Defence sites[31]. This highlights the possible use of hydrogen to power generators in a range of settings. Encouraging the growth of these companies in the North East will be essential in the government's industrial strategy.

In **WALES** work is underway to establish green hydrogen generation demonstrator plants on industrial sites in south Wales and the south west of England. Some firms will receive a 20% hydrogen and 80% natural gas blend into their existing boiler as part of the trial, whilst other firms will trial a 100% hydrogen boiler. Wastewater from industrial processes will also be used as feedstock for the electrolyser[32].

In **BRADFORD** there are plans for a hydrogen refuelling station with an electrolyser and storage for green hydrogen and space for car and larger vehicle refuelling[33].

ABERDEEN is also investing in building a hydrogen refuelling facility for buses and trucks, powered by a solar farm. It aims to produce over 800 kilograms of green hydrogen per day – enough to fuel 25 buses and a similar number of other fleet vehicles. Phase two could see production scaled up to supply over three tonnes per day of green hydrogen for road, rail, freight and marine, by 2030. Phase three could scale up further to supply hydrogen for heat in buildings and potential opportunities to export hydrogen[34].

Hydrogen case studies outside the UK

GERMANY has accelerated their investment into hydrogen, supporting the use of hydrogen in chemical, steel and transport industries[35], as well as in the automotive sectors with the use of hydrogen fuel cells in passenger vehicles, alongside battery technology[36].

As the automotive industry and chemicals are key sectors for the North East, there could be opportunities to learn from trials in Germany.

In **DENMARK** a national strategy has been produced with a focus on the production and use of green hydrogen in shipping and aviation, as well as in heavy road transport and industry[37]. This could help to shape the UK's approach to hydrogen.

JAPAN is testing how to transport hydrogen. A trial has successfully transported liquefied hydrogen manufactured in Australia to Japan via sea. They are also testing the use of hybrid hydrogen fuel cells and hydrogen as a fuel on trains. Japan accounted for 24% of hydrogen-related patent applications worldwide from 2011 to 2020, ranking top[38].

In **FRANCE** successful trials from Hyliko have led to heavy goods vehicles being retrofitted[39]. A green hydrogen refuelling station has been built for heavy goods vehicles with green hydrogen provided by Lyfhe. There are opportunities to learn about the use of hydrogen in heavy goods vehicles and the refuelling process as well as how subsidies from the French government support the growth of hydrogen.

In the **NETHERLANDS** there are plans to build a hydrogen pipeline to link industries together as electrification can only partly reduce industry emissions. The national hydrogen network will give all industrial regions access to hydrogen infrastructure using mainly existing and partly new pipelines[40].

SINGAPORE has published their National Hydrogen Strategy in 2022 outlining its commitment to developing hydrogen as a key pathway. The Maritime Port Authority of Singapore is planning to use hydrogen to create ammonia and using ammonia as power generation[41].

A final word

North East business is at the heart of the UK's net zero revolution. The region is already a leader in hydrogen, and with the right tools and support our businesses can go further and faster to deliver our low carbon transition.

There is a clear opportunity for the region to build on our engineering strengths to attract, reskill or upskill people into industries like hydrogen.

The government's industrial strategy highlights clean energy industries as a growth sector for the UK. With the region's combined authorities producing their own growth strategies, devolution provides the potential to clearly promote the North East as a leader in renewable energy. This will help to attract investment and create green jobs in the region, contributing to a stronger, fairer economy.

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